# SCHOLARS' PATHWAY



RUGBY SCHOOL

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### **FOREWORD**

Looking back at my time at Rugby, I realise how effective the teachers were in encouraging me to develop and follow my own academic interests, both in the classroom and beyond - for example in the local cement quarry, where we had occasional geological excursions and collected a range of fossils. (As I write, I am looking at the specimen of the large bivalve *Plagiostoma gigantea* that I collected on one of those trips and still have, nearly fifty years later.) My teachers nurtured in me an excitement for knowledge, scholarship, and intellectual curiosity across a wide range of disciplines, and not just the sciences I studied at A-Level. That excitement was crucial in my path through University and in my subsequent academic career, and I am always grateful to the teachers who encouraged me. So it was wonderful to read in this booklet about the range of things the pupils are doing now, and I can really feel the same sense of excitement and engagement in what they write. Dr Davies and Dr Smith say that the most important thing they want the Scholars to take away is 'a genuine, deep-seated love of learning and research', and I couldn't agree more with that aim. It is really good to see that the same intellectual values that helped me so much at Rugby as are strong as ever.

Prof Christopher Howe (M 72-77) Dept of Biochemistry & Corpus Christi College University of Cambridge



### PATHWAY ACROSS **FIVE YEARS**

### DB

• DEVELOP INDEPENDENT, CRITICAL THOUGHT • MIXED COHORTS PROMOTE **IDEAS ACROSS YEAR GROUPS** FORTNIGHTLY ARTEFACT SESSIONS NATIONAL SPACE CENTRE AND MEDIEVAL LEICESTER VISIT

### **UPPER SCHOOL**

• PURSUE AND DEEPEN **OWN INTERESTS** • TAKE PART IN ENRICHMENT EVENTS • DEBATING WITH PEERS • ORGANISE EVENTS • ENHANCED OXBRIDGE SUPPORT

### EB

• DEVELOP INDEPENDENT, **CRITICAL THOUGHT** • MIXED COHORTS PROMOTE **IDEAS ACROSS YEAR GROUPS** FORTNIGHTLY ARTEFACT SESSIONS OXFORD AND HISTORY OF SCIENCE MUSEUMS VISIT

### FB

• SPARKING CURIOSITY • BUILD ON INTERESTS • BECOME PART OF THE SCHOLARLY COMMUNITY • BARBER INSTITUTE OF FINE ART AND LAPWORTH GEOLOGY MUSEUM VISIT

## **INTRODUCTION TO THE** SCHOLARS' PATHWAY AT RUGBY

Rugby School is a very special place to pursue academic excellence, and it is hoped that the activities showcased in this publication will provide a flavour of some of the opportunities of which Rugby pupils can take advantage.

The Scholars' Pathway seeks to create a vibrant, intellectually stimulating environment in which students are challenged, and, in turn, are encouraged to question the world around them. The guiding principle of our work as Keepers of the Scholars is to develop intellectual curiosity; this is fostered among Scholars from F Block to XX, and the Scholars' Pathway provides excellent support for, and builds confidence in, our pupils. From Scholars' sessions, based around interrogating and researching an artefact, through trips to museums and galleries, to upper school departmental enrichment sessions and external speakers, students are pushed to think for themselves, to think critically, to examine problems from multiple angles, and not to be satisfied with easy answers.

The combination of the Scholars' Pathway and enhanced Oxbridge support plots a natural path towards applications to highly academic universities, and creates a strong foundation for academic success in public examinations. The most important thing we want the Scholars to take away, however, is less tangible: a genuine, deep-seated love of learning and research, nurtured at Rugby, that they will be able to draw on for years to come.

While all academic Scholars are automatically enrolled on Scholars' activities, we also actively recruit other academically bright and enthusiastic students who would benefit from, and bring a lot to, auditing the Scholars' activities.

Dr Andy Davies and Dr Thomas Smith Keepers of the Scholars and Heads of Oxbridge



FB (YEAR 9)

## SCHOLARS' SESSIONS

Sessions for F Block Scholars focus on sparking curiosity, building on students' existing interests and further expanding their intellectual horizons. One of the main aims is also to foster a sense of scholarly community, and F Block Scholars meet fortnightly as a whole year-group cohort. F Block Scholars also enjoy an annual trip to the Barber Institute of Fine Art and the Lapworth Geology Museum at the University of Birmingham, as well as the Head Master's Lecture and the Scholars' Dinner.

## **ACADEMIC SCHOLARS' TRIP**

The Academic Scholars' trip in the Lent Term was to Birmingham University, when we visited some of the attractions on campus aimed at enriching an understanding of areas such as Geology and the Fine Arts.

descendant have been carried down from its ancestors. Beginning with Lapworth Museum of Geology, we were tasked with researching all around the museum with the aim of filling in a quiz. The museum journey began Another section of the museum contained a collection with information about the Big Bang, which marked of large rock samples arranged into different types. An the start of the universe and time. This section then information board labelled each rock sample and its detail. The collection contained three types of rocks. flowed into other sections about the consequent time periods, each one in chronological order. Each of these Firstly, igneous rocks, formed by magma or lava cooling and solidifying. Secondly, sedimentary rock, which can sections contained information about how the earth and the life on it changed throughout that period with be formed in four different ways: by the deposition of the weathered remains of other rocks; by the some sections including a world map to show what the earth looked like during that time period. It illustrated a accumulation and the consolidation of sediments; by pattern of change whereby all of the land was created the deposition of the results of biogenic activity or by precipitation from solution. The third rock type in the and started as a single mass; then, as time went on tectonic activity split the earth up into continents which collection is metamorphic rock, which arises from the moved further and further apart from each other, transformation of existing rock types, in a process called leading up to the earth as it is today. metamorphism, which means "change in form". This is usually caused by high pressure and heat subjection, causing changes in the rock. Metamorphic rock can be Each section describing a 'geological era' contained fossils of organisms or other artefacts of historic and formed from igneous rock, sedimentary rock, or even geological importance that were around at the time. old metamorphic rock.

For example, in the section of the museum about the Jurassic era there were skeletons of dinosaurs; with one section featuring a computer-generated model of a prehistoric lizard. Shown on a screen with a simulation of the lizard moving around, this was created by reconstructing what the animal would have looked like by using just a fossil. Interestingly,



they were not able to accurately tell what colour the animals of the prehistoric time would have been using fossils, and therefore the colour of the lizard would have been based on using animals of this current era, which are descended from that species, as there is a possibility that the genetics depicting the colour of the

The other sections of the museum considered tectonics and how this affects our earth, as well as a crystal collection with many luminescent crystals, that when exposed to a certain type of light, glow and flares in a range of stunning colours. I would say that this was everyone's favourite part of the museum, and it



sparked curiosity and interest in all of the Scholars who attended the trip.

Our next stop was the iconic Old Joe tower. Here, we had a group debate about whether we think the tower should be taken down due to its association with the Second Boer War. The tower was commissioned and paid for by Joseph Chamberlain, who has been associated with doing many bad things throughout his life, with historian David Nicholls calling him 'arrogant and ruthless and much hated '. This means that there has been a lot of controversy over the years, as the money that was used to build the tower may have been blood money from the Second Boer War, or maybe even from slavery. After debating, we concluded that the tower should remain. However, we also considered that maybe it should be renamed, to help dissociate it slightly from its history. Conversely, the history of the tower is important and should be there for all to see, to help remember what happened, and why the tower was built.

We then visited the Barber Institute of Fine Arts. Here, we looked around the gallery, taking in all of the different styles and complexities of art, from the different time periods. All of the art in the gallery is at least 30 years old and arranged in chronological order, starting with the oldest art from the most dated period, and working through the years until the most modern art is reached at the end of the gallery. Many of the paintings in the gallery have some form of religious symbolism in them, as this art would have been salvaged and saved from

homes. Items such as personal portraits would not usually have been salvaged by art hunters or collectors, and therefore would not have made it to the gallery. Many of the Scholars, including myself, found this interesting, and were actively involved in discussions around this area of the gallery's history.

The visit to Birmingham University was very interesting. The favourite part of my day was the Geology Museum; however, all of the areas we explored were well worth a visit if you ever decide to go. I thank the staff for giving us the opportunity and look forward to Scholar Trips we will embark on in the future.

### By Elliott Godfrey, EB (FB work)



### **VESUVIUS IN ERUPTION**

### By Joseph Wright of Derby

On August 24th, 79AD, in an ancient Roman city by the name of Pompeii, Mt. Vesuvius unexpectedly erupted and destroyed what was once a grand infrastructure, reducing it to merely a pile of rubble. A total of up to 16 000 people died, thousands of homes were destroyed and parts of the city are still being uncovered from ash today. It exploded again in 1774, no doubt causing the same, if not more catastrophic damage. Yet, Joseph Wright, the creator of this beautiful art piece, describes this as 'one of the most wonderful sights in nature'. It intrigues me how we humans are able to find beauty in the most devastating and gruesome of things, even a lethal volcanic eruption, and how this demonstrates just how much we value beauty, perhaps even over life.

Wright witnessed the explosion himself and was commissioned to paint it in 1777 by the Earl-Bishop of Derby, who ended up never receiving the art piece due to a dispute that happened between them.

Taking a closer look at the painting itself, we can see the immense amount of detail that has been put into this piece, from the moon reflecting on the water to the texture on every branch, and the dimension of the clouds. The use of colour invokes a certain emotion in you. Red has connotations of danger and warning, shouting at you to run away; however, it blends seamlessly into this warm and welcoming yellow that has connotations of happiness and nostalgia. Wright



uses colours in this image to create a juxtaposition: you want to come closer but you know that you really shouldn't, however, would it be so bad to just let your palm face towards the light for just a second, and feel the warmth spread through your veins?

This mix of colours creates a unique sense of the safe and the dangerous, the familiar and the foreign, which gives the painting this dreamlike vibe. What Wright doesn't specify, however, is whether we are footing through a dream or being dragged through nightmare. He uses colour to confuse us, to make us feel as though the light is coming from the sun of the heavens, and not from the fires of hell. Or perhaps, he has no idea himself, whether the fantasy image that he has created is sanctuary or a danger zone. Either way, the way Wright plays with colour and pushes the boundaries of its meaning is extremely intriguing as it leaves room for his art to be interpreted, and for people to ruminate over it. A warm hue veils the entire painting, making it feel homely and peaceful, a harsh juxtaposition to the subject of the piece.

To conclude, I adore how in this piece, Wright toys with the serene and the severe, somehow making it cohesive and harmonizing the two opposite ends of nature that otherwise would usually contradict one another. He uses each one of them to let the other shine, highlighting nature's true beauty.

### By Diamond Kayode-Osunlana, FB

### EB/DB (YEARS 10 & 11)

## SCHOLARS' SESSIONS

Building upon the foundation laid in the F Block, sessions for E and D Block Scholars promote the development of independent, critical thought. Split into two mixed cohorts so as to stretch students and promote sharing of ideas across year groups, the E and D Block Scholars attend fortnightly sessions based around artefacts. At each session, the Keepers of the Scholars present a new artefact to the group on Arts and Humanities and STEM subjects, and pupils are given the chance to develop and conduct independent research into their own 'big question' provoked by the stimulus, writing up their findings in the form of an essay – a small sample of which are presented here. E Block Scholars enjoy an annual trip to Oxford to visit the Ashmolean and the History of Science Museums, while D Block Scholars visit the National Space Centre and Medieval Leicester, as well as attending the Head Master's Lecture and the Scholars' Dinner.

## **E BLOCK ACADEMIC SCHOLARS' TRIP**



The EB Academic Scholars' trip to Oxford began with a tour by Dr Davies around colleges and the grounds of the University and city.

This was a great chance to marvel at the incredible architecture and hear the stories behind the many statues and plaques in the streets.

Next stop was the University's Bodleian Library where we Overall, we really enjoyed the trip to Oxford as it was had the opportunity to spend some time looking around a fantastic experience and one which we will never its two exhibitions. The first was a detailed exploration forget. Not only was it academically enlightening, of 'The Anatomy of Melancholy', a huge and innovative with the museum opening our eyes to areas of history, encyclopedia of mental and emotional disorders art, geography and science that we may never have understood in the late Renaissance period. It was considered before, but it was also fun and brought us fascinating to see how much more we now understand closer together as a Scholars' cohort. about the world and the people around us. However, the remedies presented are not too far off: eating well, By Elena Newbould



exercise, laughter, reading, friends, and music; all things that are proven to make people feel happy.

The next exhibition was the one that really caught my eye: many different displays and artefacts relating to England and Europe in the Middle Ages. From letters about the Plague, to maps detailing the Anglo-Saxon invasion of England to a taxidermy fox, aptly placed in the centre of the room.

Our final port of call was the grand Ashmolean Museum, which was truly spectacular. With an exhibition to satisfy every Scholar's interests no one walked away without learning something new. Splitting into small groups, we were given two hours to explore as much of the museum as we could. There were more rooms than we could count, filled with everything from violins and glistening jewellery, to kimonos and tennis court-sized tapestries. My favourite artefact was the Alfred Jewel, a small jewel made for Alfred the Great to send as a gift to bishops. It contains a piece of coloured enamel, displaying the picture of a man surrounded by gold, and appeared on the head of pointer sticks for reading. Upon our return to School, we were asked to write an article on a chosen artefact, and this was the one I used.

## THE PEN



The pen, often seen as a mundane object, has formed the basis of our civilisation; used to record ideas and facts and lies for centuries. Everyone has a pen, either rolling at the bottom of their bag or propped in pen pots on desks across the globe. Pens have been used to sign documents starting or ending wars, used to write great works of literature or draw art masterpieces. These commonplace items underpin the great events of history and form a massive industry benefiting the economies of the world: the United States alone produces more than two billion pens a year.

The first type of pens was those used to carve into a surface either with carving tools or styluses. This method was used for forms of writing such as Cuneiform writing in ancient Sumaria (present day Iraq) at around 3000 BC. Cuneiform is an ancient writing system; cuneiform script is the oldest known form of writing in the world. It was used to record transactions and keep the economy operating smoothly, recognised by its wedge-shaped symbols on clay tablets. However, these methods produced texts that were either too heavy or brittle to transport, therefore impractical.

The Ancient Egyptians then developed the reed pen as the need for pens stemmed from the discovery of papyrus. They used tubular bulrushes or bamboo as the body of the pen. One end of the tube, which was filled with ink, was sharpened into the shape of a pen nib. You would squeeze the tube to allow the ink to

flow. Reed pens have been found in Ancient Egyptian sites from around 400BC. And some of the very early New Testament manuscripts were written on papyrus presumably with reed pens.

After centuries of using the reed pen, the guill pen emerged and would go on to be used for almost twelve centuries. The first allusion to the quill pen occurs in the 7th-century writings of Saint Isidore of Sevilla.

Quills were made of feathers and even the word 'pen' comes from the Latin 'penna' meaning feather. Goose feathers were those primarily used for guills. The more expensive ones were swan feathers, suggesting they could be used as a way of expressing wealth. The feathers were dried to remove any oils present in them that would affect the ink. The end of the feather was then cut with a knife to hone it, creating the tip of the pen. The guill was used by dipping the feather in ink, which would fill up in the shaft as a reservoir. These pens were durable but they had to be sharpened with a knife regularly, which is where we get the term pen knife.

Quills changed the way of writing, as before capital letters were used, but as the guill allowed for a smoother style of writing lower case letters were developed. Due to quills being used for such a length of time they are inevitably responsible for some of the most notable works of literature: Shakespeare himself, argued as one of the greatest writers of all time, wrote all his work with quills.

Quills were the primary way of recording writing until the development of the printing press. Before, books were mostly owned by the wealthy as they had to be handwritten, often by monks, but the invention of the printing press in 1439 by Johannes Gutenberg meant information could be shared quickly and in great numbers. This meant not only the upper classes could afford books. However this did not diminish the use of quill pens as they would go on to be used until around the 19th century. The quill pen was remarkable in that it was not only the first major advancement of the pen (and widely use worldwide), but it led to even more innovations.

Owing to the invention of metal nibs (1822) and the fountain pen (1827) quills were phased out by the 19th century as these pens were smoother and faster to write with because you did not have to constantly dip the pen in ink.

Ballpoint pens also arose in the late 19th century, but their patents were not yet used commercially. Ballpoint pens made their public entrance in the 1940s by Josef and Georg Biro, two Germans who fled Nazi Germany to Argentina. The Biro brothers filed a new patent in 1943 and sold their product in Argentina as "Birome". Ballpoint pens have a small brass or steel ball at the end. The ball distributes ink evenly and doesn't allow ink to dry. WWII pilots used them frequently because they didn't leak when they were way up in the sky, unlike other pens. Because they use guick-drying ink, ballpoint pens are also lefthanded writers' first choice. Most ballpoint pens have brass balls at the tip. However, some manufacturers make these balls out of tungsten carbide – a chemical compound known for being tougher than steel.

After WWII, many companies wanted to produce their own ballpoint pen and thus the pen and stationery industry blossomed. In the 1950s an American based company 'Parker Pens' released their first biro pen: 'The Jotter'. These were sold from \$3 to \$9 each and sold 3.5 million in its first year. Since then, all types of pens have been developed: from markers and highlighters to gel pens and felt tips. It now has formed into a colossal industry; in 2020 the demand for pens reached a value of around \$12 bn (or around £9.7 bn) and is predicted to expand at a CAGR (compound annual growth rate) of around 5%. Pens are the largest segment of the stationery industry making up nearly 35% share of the market.

The pen could even be argued as being responsible for the Apollo 11 mission's success. During the Apollo 11 expedition, Buzz Aldrin and Neil Armstrong

noticed that something had fallen off the circuit breaker. After a thorough examination, they realised that the missing piece was the engine switch and that they could not return to Earth unless they replaced it in some way. Buzz Aldrin came up with a curious solution – he jammed a felt-tip pen in the hole where the switch used to be. Fortunately, it worked and they were able to return. The pen literally saved their lives! Designed by Duro Marker, the pen used to repair the broken switch and bring the Apollo 11 astronauts back to Earth is on display at The Museum of Flight in Seattle, Washington, with the original broken circuit breaker switch. The pen is equipped with a pressurized ink cartridge and can function in a weightless environment, underwater and in extreme temperatures-still used by astronauts today.

From what started as a humble reed in ancient Egypt has evolved into a vital everyday commodity responsible for a flourishing market. Pens are used to jot ideas, write exams, sketch a still life and are so widely used they are even used for advertising: out of all the promotional products around the world, surveys show that the most common choice is promotional printed pens. Though I wonder how the pen will evolve in the future – while writing this article on a keyboard – will pens become less essential as a consequence of the rising use of electronic devices?

### By Imogen Marshall, DB (EB work)

### **HOW ORBITALS AND LIGANDS AFFECT COLOUR IN TRANSITION ELEMENTS**



Orbitals are the shapes of areas within atoms where there is a high probability (90%) of finding electrons. This inaccuracy is shown through Heisenberg's Uncertainty Principle, where he states that there is a limit to what we can know about the nature of a particle's physical properties. This is because in his equation of  $\Delta x \Delta p = h/4\pi$ , where 'x' equals uncertainty in position and 'p' equals uncertainty of momentum, the more you know about 'x', the less you know about 'p' and vice versa.

Each orbital has two electrons and when filled up, the following electrons go into the orbital with the next highest energy, therefore the valence electrons (the electrons in the outermost orbitals) are all the electrons in the biggest, partially filled orbitals, hence they are the ones that react. The circles in figure 1 represent these orbitals (the circles don't represent the shape). They are named with a number and letter – the number representing the



Figures 1 and 2





size of the orbital and the letter representing the shape. They are displayed along the y-axis where the further up you go, the higher the energy. The numbers within the sectioned off parts are the number of electrons that are required to fill each set of orbitals of the same size. Transition metals are elements that have partially filled d orbitals, and in this way, elements like scandium and zinc are not true transition metals.

We see colours in a chemical reaction because the opposite colour to the one displayed is absorbed. For example, copper (II) sulfate absorbs the red part of the spectrum, therefore the mixture of waves we see is blue. These complementary colours can be shown on a colour wheel (figure 3) and therefore predictions can be made on the shade of the product. However, something to be aware of is that the mixing of waves is different to the mixing of paint. This is because the secondary colours for light are primary colours for pigments (figure 4).

The aqueous ions of non-transition metals ions have colour whereas the aqueous ions of transition metals show colour. This is because transition metal ions absorb wavelengths from visible light, but why?

A ligand is any atom or molecule that is attached to a central atom, but the electrons for the coordinate covalent bond come from the donor. Some of these include water, ammonia and chloride ions, and what they have in common are lone pairs of electrons in the outermost orbital, therefore they are all Lewis bases. When these ligands bond with a transition metal ion, the energy of the d orbitals are raised due to the repulsion among electrons. When the energy levels are raised in transition metals, the



Diagram to show the colour of some aqueous transition metal ions with a specific charge



Figures 5, 6 and 7

energy of each orbital isn't equally increased and therefore splits them into two groups. For example when copper, with an outer 3d orbital has six water molecules bonded around it, the five orbitals will split into two groups of two and three. The number of orbitals that split depend on whether the transition metal's outermost orbital is 3d, 4d, 5d or 6d. The splitting itself depends on the complex of the transition metal which is shown in figure 5. For example in a tetrahedral complex, there will still be two groups, but the group with three orbitals will have more energy than the one with two. For octahedral complexes, the opposite is true which is conveyed through figure 5's diagram of the crystal field theory which also shows the size of the split.

De Broglie extended on Einstein and Planck's work are gained. Since it involves the transfer of electrons, of stating that light displays wave-particle duality, by changes of oxidation state affects the light absorbed. including matter (including electrons which are standing Hence elements like vanadium can have so many waves as shown in figure 6). If white light is passed different colours when reacted with a reducing agent. through the solution of an ion, energy from the photons are absorbed and the electron is promoted to a higher The atomic clock energy level, increasing the number of wavelengths The knowledge from energy levels in different atoms within the standing wave. This is called electron excitation has been applied to really interesting inventions like the and this behaviour is described by the Schrodinger atomic clock. This clock measures time by monitoring equation. The difference in energy between the two the radiation of a caesium atom at absolute zero. When groups determines which colour will be absorbed (figure transitioning between energy levels, the atoms interact 7), reflecting its complementary colour. Notice how the with a certain frequency of microwave radiation. arrows alternate in the orbitals shown in figure 7 because Caesium is used because it is so reactive which makes it of the Pauli exclusion principle where two or more reliable and its transition frequency is about 9.19 billion identical particles that have an odd, half-integer value spin Hz, (1Hz = 1s-1). However rubidium and hydrogen can cannot occupy the same quantum state. An important be used. This accuracy means thing to keep in mind is that white light causes electron that it can track changes in excitement and light of a different colour is emitted when the Earth's rotation and is also the electron returns to its ground state. The leap of an used for navigation by satellite electron doesn't really pass through space because orbitals networks. overlap. Therefore when an electron moves to another energy level, it doesn't 'leap' anywhere but just changes By Sam Lau, DB (EB work) the shape of its circular standing wave to have more or less wavelengths if it goes to a higher or lower energy Figure 8

#### References

https://www.wtamu.edu/~cbaird/sg/2014/06/18/how-can-an-electron-leap-between-atomic-levels-withoutpassing-through-all-the-space-in-between/ https://www.youtube.com/watch?v=O6g-7rUgrdg https://www.chemguide.co.uk/inorganic/complexions/colour.html https://www.chemguide.co.uk/inorganic/complexions/whatis.html#top https://www.youtube.com/watch?v=Ewf7RIVNBSA https://en.wikipedia.org/wiki/Uncertainty\_principle https://en.wikipedia.org/wiki/Atomic\_clock

level respectively. This is why the shapes of orbitals with a higher energy are more fluctuated and irregular looking. But there are several factors that affect the colour of an aqueous transition metal ion other than complexes including the ligand and oxidation states.

Ligands that cause a larger energy difference between the split groups are ones that create a stronger covalent bond because more energy is required to split them and promote an electron to a higher energy level, resulting in a different colour compared to a transition metal ion bonded to a ligand with a weaker electrical field, since it changes what wavelength of light is absorbed. From this, we can conclude that as the change in energy increases, the colour absorbed will shift from the red to purple end of the spectrum. The figure 8 shows some common ligands' ability to split orbitals. Whether you add a limited or excess volume of a ligand also affects the resulting colour of the solution.

What also increases the splitting of the d orbitals is an increase in the oxidation state of the metal which involves a loss of electrons. The opposite of an oxidation reaction is a redox reaction where electrons

CI-	smallest splitting			
F*				
он-				
H <sub>2</sub> O				
NH <sub>3</sub>				
CN-	largest splitting			

### **D BLOCK ACADEMIC SCHOLARS' TRIP**

At the end of the Lent Term the D Block Academic Scholars enjoyed a trip to Cambridge University. Upon arrival, we wandered between a number of the notable colleges, admiring the architecture of the likes of King's from across the Cam. We then moved to the first museum of the day, the Sedgwick Museum of Earth Sciences, where we explored the various fossils, minerals, and rocks on display. The museum had a collection of trilobites, creatures from the Cambrian era, which related back to a Scholars' meeting earlier in the term where we investigated the evolution of the eye from a group of photosensitive cells to the highresolution, image-rendering organs of today. After spending the morning there, we ventured into the city for lunch, before taking a short walk across the river to

the Museum of Classical Archaeology. With over 450 casts on display, there were plenty of artefacts from the Graeco-Roman period to explore, such as the Farnese Hercules and the Sounion Kouros, as well as busts of numerous emperors and philosophers. As we passed through the museum, we photographed the objects which interested us most, and afterwards, joined in a competition to write the most (academically) entertaining caption. Overall, an enjoyable day was had by all, with the trip also supporting the work we had been doing over the course of the academic year, in both the STEM and humanities Scholars' meetings.

By Charles Swinfen



### THE PROGRESSION OF MONGOLIAN **ARCHITECTURE AND ITS IMPACT ON CIVILISATIONS**



Over the centuries, architecture and its influence on society has stood as a fundamental representation of humanity; portraying the values, successes and eventual downfalls of civilisations over time. The evolution of architectural structures and designs, from mere practicality to beautiful showcases of civilisations, is a topic which I have always been fascinated by. The way in which our ancestors paved the way for the environments all around us through architectural legacies and traditions. In particular, I decided to zone in on the progression of Mongolian architecture, and within that discuss the term 'architecture' and its potentially false perceptions and limitations.

When discussing architecture and its continuous development over time, we are often inclined to think of world-renowned designs such as the Leaning Tower of Pisa, the Taj Mahal or the Empire State Building. The notion that a simple tent or "yurt" could be considered to be an architectural legacy; unacknowledged and inconspicuous, but nonetheless exceedingly influential, to this day, on modern architecture as we know it doesn't seem particularly plausible.

The yurt (or ger) is one of the earliest architectural prototypes in human history and was a prevalent

characteristic of the Mongolian architectural lifestyle and moreover could be argued to have been an influential element in the rapid and successful growth of the Mongolian empire. The Mongol empire existed in the 13th and 14th centuries. Mongolia encompasses expanses of open, grassy space, harsh winds and extreme temperatures, making traditional Mongolian architecture an exceptional feat of human ingenuity. Said empire stretched over the entirety of Central Asia; from the Korean Peninsula in the East, through China, Tibet and Iran in the Southwest and Georgia and Russia in the North. Their ultimate goal was the conquest to expand their empire under the leadership of the brutal Genghis Kahn who administered his entire empire from a large yurt. At its peak, the Mongol Empire covered the most contiguous territory in history and has had a significant subsequent influence on not only the presentday architecture of Mongolia but also on many other countries surrounding. Ancient Mongolian architecture had three fundamental goals; simple construction, easy transportation and decoration.

Despite the seemingly isolated purpose of practicality when it comes to the yurt, the entity actually comes with much more profound sentiments as well as cultural and spiritual significance. The round shape of the yurt is a symbol of the unbreakable harmonious relationship between nature and people. Originally designed as a microscope of the universe, the circular shape represents the sky whilst the circular shape represents the heart. The door always faced south, and the layout of the interior was based upon traditional customs and beliefs, with the head of the household sitting on the western side of the yurt. Pigments which were derived from semi-precious stones, plants and minerals were used traditionally for religious walls and tapestries within the yurt.

Yurts are circular tent-like dwellings which have been part of Mongolian culture since approximately 600 BCE and they are a structure designed to be put up and taken down with ease and primarily be used by nomadic families. The walls were typically made of felt with sharpened poles on the sides, attached by strings. A circle, placed at the top of two (pine) wooden pillars, supported the centre of the roof. This forms a self-supporting cylinder which is approximately head height. There would not have been any windows to let the light shine through the top. The natural simplicity

of these designs was skilful in uniting man and nature in one environment. Smaller yurts can typically hold about 10 people, with the largest being able to house over 20!

I find the contrast between the perception of the typical nomadic, pastoralist lifestyle of Mongolians and the surprisingly rich tradition of architecture and fine arts to be fascinating. The simplistic elegancy of the yurt in particular was a once functional structure, designed with the simple goal of being a portable home which was easy to take down and put up, which has now evolved to become a beautiful historical legacy. The influence of the yurt has furthermore become a symbol of unity amongst "the Stans": Afghanistan, Pakistan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Tajikistan. This is exemplified in the flag of Kyrgyzstan which features the pattern of a yurt crown in the centre of its design. The coat of arms of Kazakhstan is built around a knotted yurt crown.

The yurt; as a singular design, may not be particularly catching to the eve, however, its beauty comes from the effect created by the extensive, almost incomprehensible numbers of yurts which would have existed on every plain of grassland. These vurts have the alluring effect of looking like glittering pearls scattered across the jade-hued grasslands, an effect which one could argue reflects the amalgamated and unified ancient society of Mongols; all working together in their quest for expansion through conquering territory. The empire was expansionist, spanning all the way from the Persian Gulf to the Pacific Ocean at its largest. Consequently, all of the cultures within that catchment were, for a time, encompassed under Mongol rule, which provided artistic and architectural influence. Under the Yuan Dynasty, Mongolia imposed direct control over China and, during this period, the Mongols also turned to inspiration from Chinese cultures.

Contrary to popular impressions of the unchanging yurt, yurts underwent considerably momentous changes, with today's lattice-work yurt first appearing in the sixth century and replacing non-collapsible forms on carts only in the fifteenth century. Over time, the traditional design of the yurt has been adapted and evolved to pave the way for more permanent structures. An example of this is the ger-style building, which is a modern day take on a larger and more resistant version of the yurt.

Furthermore, modern Mongolian architectural structures heavily reflect and showcase the traditional design elements of the yurt; as Mongolia adjusted from a nomadic to a sedentary society, the yurt continued to be a fundamental feature of the nation's architecture. In the present, circular design elements, including domed roofs and circular courtyards are incorporated and seen in many modern Mongolian buildings, including homes, hotels and public buildings. Architects in modern Mongolia have skilfully combined traditional techniques with newer, more modern resources and designs to create buildings which are both functional and aesthetically pleasing.

Furthermore, the Ger Innovation Hub is a recent and impactful arrival to a neighbourhood in the Songino Khairkhan district. Built as a means of creating a loosely defined series of spaces which can be adapted for many functions; from preschool playtimes to innovation workshops for teenagers, training sessions for local businesses and drop-in meet-ups for the elderly. Cofounder of RUF Joshua Bolchover says, "we were inspired by the structure of the yurt itself" when building the project. This is an example of the positive influence the yurt has had on modern Mongolia, whilst the nation looks towards urbanisation and improved technological advancements.

So what does the future hold for architecture in Mongolia? The International Union of Architects showcased World Architects Day on the 5th of October 2020 with the slogan; "Towards a better urban future". Mongolia contributed to this shift with the Mongolian Chamber of Urban Development holding an exhibition displaying "Mongolian Architecture Today" at Northei Art Gallery. The exhibition was effective in promoting innovation, fresh architectural ideas and designs to aid governmental contraction as well as public infrastructure. Furthermore, the exhibition included architectural masterpieces which contributed to the historical development of Mongolian architecture. This included cultural and historic buildings. As Mongolia moves "Towards a better urban future" there is no doubt that this urbanisation will be sure to incorporate elements and features of cultural historic architecture such as the yurt. A tangible example of this is the Blue Sky Tower in Mongolia's capital, Ulaanbaatar. The design of this modern high-rise tower incorporates elements of traditional Mongolian architecture, such as the use of curved lines and decorative patterns.

Although it is evident that there has been a vast progression in Mongolia over the recent centuries in terms of its architecture, the yurt remains an important and righteous symbol of the country's cultural heritage. Today, more than half of Mongolians live in gers, including about 61% in the capital of Ulaanbaatar and 90% of the rural population.

Whilst the concept of shelter is a fairly unambiguous entity, the style of architecture was initially shaped by the climate of a particular location, the materials found to be readily sourceable, as well as the values of the society building them. As globalisation posed an increase in global connectivity, styles were seen to evolve. However, even in modern construction, there is still prominence in honouring the cultural and traditional nuances in the built environment. The influence architecture has over society is significant and the yurt is an exemplar illustration of the impact a seemingly trivial way of living can have on entire communities. Without the flexibility and versatility the

### References

National Geographic; https://education.nationalgeographic.org/resource/yurt/ The Guardian: https://www.theguardian.com/artanddesign/2020/may/17/yurt-opolis-mongolia-city-life-ulaanbaatar-community-hub Global Times: https://www.globaltimes.cn/page/202207/1269810.shtml Tibet Heritage Fund; https://www.tibetheritagefund.org/page/?r=101 The Art and Architecture of Mongolia: https://repository.upenn.edu/cgi/viewcontent.cgi?article=1038&context=ealc

yurt provided in terms of transport, it would have been impossible for the Mongol empire to have grown at the rapid rate it did. It could be argued that the yurt, an essentially primitive tent, can be accredited with the great success of the expansion of the Mongolian empire, a worldwide historic legend.

To conclude, the yurt, to this day, remains a dominant symbol of rich Mongolian culture, and its unique design continues to hold influence over the country's modern architecture as the cities begin to grow. As the world watches Mongolia move toward urbanisation and increased levels of development, its architecture will undoubtedly continue to evolve alongside, but the yurt will nevertheless always remain a part of the country's cultural identity.

### By Ellie Moynihan, DB

### THE FORMATION OF THE LENS & CHALLENGES TO THE DESIGN **ARGUMENT**



### The Importance of the Lens

The eye is an exquisitely intricate organ. So complicated is its structure and history that it is often heralded by Creationists as determinate 'proof' of irreducible complexity. By proudly misquoting Darwin, Intelligent Design advocates state that a "system which cannot function without even one of its components cannot have evolved from a more primitive form". They turn to the theories of fine tuning, specified information, and irreducible complexity to evince that the eye must have been designed, thereby proving the existence of God.

Whilst this is strongly disputed, the importance of the lens is clear. Before the lens, 'sight' was only possible in the rudimentary form of a single pigment spot, or cup. Such development, present now in snails or worms, allowed the organism to detect only the direction and intensity of light. Over the interval of half a million years, the evolution of the lens transformed this crude cup of cells into the complex lensed eye we now are familiar with; able to discern depth, colour, and shape, thereby allowing the organism to discriminate an object from its surroundings.

It is fair to say that the development of the lens can be considered the fulcrum from which the entire future

of a species pivoted. However, in the prebiotic soup, the gift of sight was not preordained. It was not an inevitable conclusion - nor did it come about by design. The existence of vision is inherent to our existence - but perhaps it is due to its inherence that we rarely consider how or why it evolved at all. This text aims to examine the evolution and anatomy of the lens, and to analyse the challenges it presents to Creationism.

#### Challenging Fine Tuning: Difference in Lens Composition

In the world of the Early Cambrian, sight was equivalent to nuclear arsenals; vision was commensurate with a superpower. The eyes that first appeared on trilobites 541 million years ago enabled them to become the first active predators, to seek and chase prey with unprecedented efficiency. The subsequent evolutions and counter-evolutions it provoked can be metaphorically compared to an arms race during the Cambrian-era Cold War. However, trilobites were not the only animals to change this evolution; fossil records illustrates that the Cambrian explosion gave rise to independently evolved eyes on hundreds of occasions, including the invertebrate compound eye and the vertebrate camera eye.

The first appears to have been the compound eye found today in spiders and crustaceans, members of the invertebrate group termed 'arthropods'. Here, an array of identical imaging lens directs light into many light-sensitive elements called photoreceptors. For small animals, this provides a wide-angle view and moderate spatial resolution; such visual abilities may have given trilobites an evolutionary advantage over their visually



Figure 1 Camera Eye vs. Compound Eye

deficient counterparts. However, as body size increased, selective pressures favoured the camera eye over the compound eye. The photoreceptors in the camera eye share a single light-focusing lens instead of many; and are arranged in the retina that lines the inner surface of the eye. The two varieties of photoreceptor, named rods and cones, allowed for day and night vision.

Another divergence in the evolution of the eyes is apparent in the compounds composing the lens. Trilobites used calcite; invertebrates used crystallins and novel proteins; and vertebrates used a wide variety of similar crystallin, and heat-shock proteins. It seemed that evolution had selected previously used enzymes, often co-opted from other functions, to fashion the lenses in the eye.

Let us examine the significance in this variety and divergence of evolution; the independent evolution of the eye disproves the first theory - fine tuning. If the eye were designed, then the structure must be specifically created for the function it is being employed in. However, this is untrue. Many organisms possess lenses distinct from present-day vertebrate lens. Modern insects and ancient trilobite calcite eyes show very different lens architectures, which refutes the claim that there is one universal, "optimum" design. The hundreds of evolutionary pathways suggests that there are a hundred different ways of reaching the same end - not one.

### Challenging Irreducible Complexity: Crystallin Evolution

The role of crystallin is not only vital for the refraction of light in the lens, but vital for the argument against Intelligent Design. 90% of the mass of a lens fibre is comprised of crystallin, the highly soluble, cytoplasmic proteins that are responsible for the refraction of light towards the retina. Crystallins generate a refractive index gradient in the lens, with the highest index in the centre and the lowest index at the periphery, shortening the focal length of the transmitted light and eliminating spherical aberrations.

Crystallins are intriguing from the standpoint of evolution, in addition to their structural importance in the lens. By analogy with other tissues that perform highly specialised duties, such as biconcave erythrocytes for oxygen transport, one would assume that the crystallins are uniquely specialised too. This, however, is not the case. Entirely different proteins may serve as crystallins, with a similar, focused image produced as a result. More astonishing was the recent discovery that crystallin had also been discovered in embryonic heart and kidney cells - and in aggressive breast cancer tumours.

This gives rise to the only conclusion possible; both  $\alpha$ -crystallins and  $\beta\gamma$ -crystallins present in the lens must have been adapted from proteins with pre-existing

TABLE 1. Lens Crystallins <sup>a</sup>					
Distribution	Crystallin	(Related) or identical			
All vertebrates	α β-γ	Small heat shoch protein; chaperonin (Microbial stress proteins)			
Birds and reptiles	ð c	Argininosuccinate lyase Lactate dehydrogenase B			
Some mammals	ζ η λ	(Alcohol dchydrogenase; quinone redu Cytoplasmic aldehyde dchydrogenase (Hydroxyl CoA dehydrogenase) (Ornithine cyclodeaminase)			
Frogs	P	(NADPH-dependent reductases)			
Many vertebrates	-	a-enolase			
Cephalopods	s Ω	(Glutathione S-transferase) (Aldehyde dehydrogenase)			
Jellyfish	J	?			

<sup>\*</sup>Adapted from Piatigorsky and Wistow (1991). The reference for  $\mu$ -crystallin is Kim (1992). Other references can be found in text and reviews (Wistow and Piatigorsky, Piatigorsky and Wistow, 1989; de Jong et al., 1989; Bloemendal and de Jong, 1991).

#### Figure 2

functions. This deduction is supported by research performed by scientists Piatigorsky and Wistow in 1991, who came to the revelation that all crystallin genes had evolved from other genes, identified by the protein sequence similarities. In mammals, crystallin bears strong homology to quinone reductase and alcohol dehydrogenase, the latter of which breaks down alcohol in the liver. It is a strange concept; to think that the protein which blesses man with the gift of sight, also blesses man with a hangover.

Clearly then, the eye is not irreducibly complex; the proteins used to make the lens were not created by the designer for this specific structure. Instead, the evolution of crystallin shows adaptation, as the lens fibre shows evidence of prior alternative usage.

Challenging Specified Information: Crystallin Homology The last hurdle which needs to be overcome in order to disprove the Design Argument is the theory of specified information, which assumes that the code for making crystallins is specialised complex information. Therefore, to refute the argument, one needs to prove that the information used to create crystallins also exists in organisms without lenses.

When a protein-protein homology search was performed on crystallins (Figure 3), it showed that for the crystalline alpha-B and all the vertebrates were

Gene			Identity (%)	
Species		Symbol	Protein	DNA
Homo sapiens		CRYAB		
vs. Pan troglodytes	chimp	CRYAB	99.4	99.8
vs. Canis lupus familiaris	dog	CRYAB	98.3	94.5
vs. Bos taurus	cow	CRYAB	97.7	93.7
vs. Mus musculus	mouse	Cryab	97.7	91.2
vs. Rattus norvegicus	rat	Cryab	97.1	92.0
vs. Gallus gallus	chicken	CRYAB	77.0	74.1
vs. Danio rerio	fish	cryaba	63.4	65.0
vs. Drosophila melanogas	ter fly	I(2)ofl	48.3	56.6
vs. Anopheles gambiae	mosquito	AgaP_AGAP007162	50.0	53.4

Figure 3

ref[35\_01128116.1] low molecular weight heat shock protein [Nitrococcus mobilis gh[EAR21063.1] low molecular weight heat shock protein [Nitrococcus mobilis No-231] Length-119

Score = 52.4 bits (124). Expect = 8e-06. Method: Compositional matrix adjust Identities = 35/102 (344). Positives = 57/102 (554). Caps = 9/102 (84) 
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#### Figure 4

almost identical, whereas the invertebrates were similar but divergent. The difference between the two is due to the difference of the lens compounds, as mentioned in section one. However, when matches were specified in bacteria (Figure 4), there were over 200 matches for bacteria with crystalline alpha-B, with the closest being nitrococcus nitrogen-fixing bacteria.

This strikes the proverbial last blow to the Intelligent Design argument. The homology search proves that all crystallin genes appear to have come from the divergence and duplication of previous genes. It contradicts the theory of specified information, which states the crystallins must have been created specifically for the eye. Therefore, the information for the production of crystallins cannot be considered specified complex information, as it exists in prokaryotic bacteria.

#### Irreducible Complexity and Creationism

As shown, the inconceivable intricacy of the eve has long been ripe battleground for theists and scientists alike. Since the proposed 'watchmaker' analogy in 1802 by William Paley, such complexities have been seized upon by Creationists, claiming that something so elaborate as an eye must have a creator. From this fallacy, the 'argument from design' was born, claiming that it defies logic to argue that the eye arose through natural selection and the accumulation of random mutations, choosing instead to accredit God.

If the eye was designed, as Intelligent Design supporters argue, we should see irreducible complexity within the eye. No part of the system should be able to function without all the parts intact. There should also be specified information - the information used to design the lens must have been created by the designer for the specific structure. Finally, there would be fine tuning; the structure must have been designed specifically for the function it is being employed in.

However, if the eye was evolved, there should be functional independence, in that the parts of the lens would have putative independent functions. There would be genetic homology; the information for making lens fibres would have arisen from existing information. Lastly, there should be adaptation, with the lens fibre showing evidence of prior alternative usage.

By examining the two possibilities, one can conclude that the evolution of the lens in the eye proves that there is no intelligent designer. Irreducible complexity crumbles instantly, as an eye without a lens is still able to perform its functions, albeit poorly. Specified information and fine tuning have been subsequently disproved by the presence of the crystallin protein elsewhere in the body, whereas proof of genetic homology and adaptation has been exhibited.

However, the most significant difference between the two perspectives is the concept of time. Whereas Creationists believe that the eve is eternal and unchanging, like their Creator; others believe that the eye is constantly evolving in response to its surroundings. Intelligent Design advocates believe that the eye is perfectly designed for its purpose, whereas in reality, the eye still bears the scars of evolution. The design of our eye is not perfect or intelligent, but in the revelatory light of evolution, it makes perfect sense.

By Fangyi Lin, LXX (DB work)

### **ACADEMIC CONFERENCE**

Nearly 30 DB students from Rugby School (including all the Academic Scholars), and several from Skegness Grammar School, participated in October's Academic Conference which had the theme of 'Sustainable Futures'. Participants had attended tutorials on how to choose a paper title, how to conduct academic research, how to reference an academic article and finally how to present their paper to their peers and teachers prior to the event. Students were required to research and write a draft paper during the summer vacation and were given feedback for a final version. At the conference, students gave a short presentation to a group of their peers and staff, followed by guestions from the audience.

There was an astonishing range of papers ranging from the more conventional "How realistic is the proposition that current forms of renewable energy production will allow the United Kingdom to fully rely on renewable sources by 2050?" to the more esoteric "To what extent does the implementation of a sports franchise have a positive impact on the sustainable development of a city?" Special mention for Jimmy Scanlon's brilliant paper on "Why is it so hard for revolution to sustain itself as government?" for which he was awarded a copy by the Head Master, the School's highest academic accolade. It is featured under the Upper School section of this publication. Alongside the presentations, delegates were treated to a keynote talk on 'Moving to a Zero Emissions Future', which emphasised the urgency of the need to tackle greenhouse gas emissions, delivered by Professor Julian Allwood, a leading climate expert and government advisor from Cambridge University.

A fascinating lecture by Dr Mark Whelan from UCL on 'What Can We Learn About Sustainability From Medieval Bees?' will be forever remembered for when a giant wasp stung one of the delegates during the talk! Finally delegates were treated to an amazing look at the electricity-generating technology that has been designed to extract energy on a small scale from erratically flowing waters in rivers and streams by the highly entertaining inventor AI Fothergill.



#### References

Piatigorsky, J. A Genetic Perspective on Eye Evolution: Gene Sharing, Convergence and Parallelism. Evo Edu *Outreach* **1**, 403–414 (2008). https://doi.org/10.1007/s12052-008-0077-0

Schwab, I. The evolution of eyes: major steps. The Keeler lecture 2017: centenary of Keeler Ltd. Eye 32, 302–313 (2018). https://doi.org/10.1038/eye.2017.226

Bateson, P. (2017). Appearance of Design. In Behaviour, Development and Evolution (1st ed., pp. 9-18). Open Book Publishers. http://www.istor.org/stable/i.ctt1sg5tz0.4

Lamb, T. D. (2011). EVOLUTION OF THE EYE. Scientific American, 305(1), 64–69. http://www.jstor.org/ stable/26002713

Piatigorsky J, Wistow G. The recruitment of crystallins: new functions precede gene duplication. Science 1991; 252: 1078-1079.

### WHY IS IT SO HARD FOR **REVOLUTION TO SUSTAIN ITSELF AS GOVERNMENT?**



It is fair to say that revolution, the change from one system to another, has punctuated the history of human society. While these revolutions take various forms and permeate various walks of life, a more recent phenomenon is that of political revolution based on libertarian ideologies. It is upon these revolutions specifically that this essay focuses. Intended to act as a brief exploration of the flaws inherent within revolution, I refer to the 20th-century examples in Russia and Spain. Naturally, this list is far from representative of liberal ideology as a whole and encompasses a mere slice of history and indeed an even narrower sample of cultures. Despite this, the subject matter of these two cases serves well to illustrate the problems which characterise revolution.

The cleavage between the ideology of Marx and its implementation in Soviet Russia is clear. While Marx's writing emphasised the reclamation of alienated dispositions or attributes<sup>1</sup>, the State developed simply into another alienating institution reserving the agency and liberty which self-actualisation necessitates. Some blame for this can be pinned on Stalinism as an authoritarian counter-ideology to the liberalism of Marx, but this seems naïve. The cornerstones of this dilemma are far more foundational. There exists a fundamental mistrust

among the intellectual elite for that which is determined and orchestrated by the masses: Chomsky describes 'the liberal ideology of the intellectual elite that aspires to a dominant role in managing the welfare state' (Chomsky, 2014). A profound hypocrisy exists in the ideology whose existence requires 'extirpating the habits of obedience and servility to the last root' (Chomsky, 2014)<sup>2</sup>, that the leadership of its implementation (that is to say, Lenin and Trotsky) possesses an elitism contrary to its goal. Edward Hallett Carr describes the state of Russian peasants following the 'wager on the strong'3: 'the peasant, cast adrift, could not make a revolution for himself. But he could, as the sequel showed, easily be harnessed to a revolution made by others' (Carr, 1953). The problem is obvious: the implementation of an ideology set on emancipating the proletariat's agency is not actualised by the proletariat itself.

A striking shift from Marxist ideology in Communist government is apparent in the Second Spanish Republic in the period from mid-1936 to the May Days of 1937. After Franco's insurrection, anarchist and collectivist authority supplanted itself widely across Spain<sup>4</sup>, notably in the Catalonian Generalitat. Collectivisation began to characterise agrarian production across the country; anarchists entered government attempting to increase the longevity and force of what was increasingly looking like a syndicalist revolution. Despite this, the republic was under primarily Communist leadership, Soviet military assistance an important reason for this. Over the coming months, a series of empty reforms from the republic proved regressive; the May Days in 1937 represented the ultimate defeat of the counter-revolution<sup>5</sup>. This revolution was one where a proletariat was defeated by the proprietors of Communism. Here, the meteoric gap between Marxism as ideology and Communism as government is apparent.

Now begins a series of hypotheticals. Having established two revolutions which, though in different ways, failed, the question of how a revolution might absolutely succeed must be addressed. First, let the issue of the State be tackled. It seems that when ideology attempts to actualise externalised qualities in the proletariat, as do Marxism and anarchism, it is paradoxical to implement this ideology as government through a centralised, alienated system like the State.

Momentarily, then, imagine that the State is done away with, as is the suggestion of anarcho-syndicalist ideologies, and instead government is not centralised, but held by the proletariat, thus bypassing the ugly consequences of dictatorship and iron bureaucracy. Yet, in this situation, another problem manifests: Engels, in a letter of 1883, suggests that to eliminate the State 'would be to destroy the only organism by means of which the victorious proletariat can assert its newly-conquered power'<sup>6</sup>. If the revolutionary spirit of a Civil War Spain were replicated in peacetime without the complication of an authoritarian State, how would the collaborative system which anarcho-syndicalism necessitates be put in place? Certainly, it seems naïve to imagine that this would happen passively. Suppose that even if this problem were overcome, an insurrection such as Franco's of 1936 were to take place in an anarcho-syndicalist society, the structure and organisation which the State provides would not exist, so a cogent military response would be an impossibility. The ability for a society to defend itself is necessary, not only following a revolution, but universally, otherwise it will inevitably be deposed by an aggressive, better-organised system. This is perhaps the most fundamental flaw of a libertarian revolution: to fulfil the conditions of a successful revolution<sup>7</sup>, the State must exist, and yet it must not.

To explore this paradox further, it is necessary to examine the causes of revolution itself. In Causes of Revolution (Gottschalk, 1944), Gottschalk outlines the conditions under which revolution may succeed<sup>8</sup>. Out of five conditions, he characterises the first two as demand. The demand for revolution, he suggests, relies on both provocation, societal problems attributable to the regime which cause discontent, and solidified public opinion, the knowledge that discontent is common across a group of people<sup>9</sup>. With these conditions in place, the common frame of mind which revolution necessitates exists; this is not enough. The next two conditions are characterised as hopefulness, a belief in the practicability of supplying the *demand* for revolution. The first of these is a program for reform, the ideological groundwork which acts as a cynosure of sorts for the revolutionary movement. Bear this condition in mind as it will reoccur later. However, for the program to be meaningful, the people must be led by 'someone whom they trust is going to lead them to the achievement of that program', hence the next condition, leadership. These four conditions describe the requirements of the revolutionaries for the success of a revolution. The fifth, on the

contrary, exists within the status quo, the weakness of the conservative forces. No matter how ready the revolutionaries are, if the anti-revolutionaries are strong (maintain the support of the army, industry, nobility, etc.), this readiness is futile<sup>10</sup>.

The success of a revolution, while related, is not the same as a revolution's gubernatorial success. Therefore, to link the former to the latter, some bridging is required. First, it must be made clear that, in the same way as conservative forces are weak in a society ripe for revolution, so are revolutionary forces following the success of a revolution. Indeed, in Russia, the supplantation of Bolshevik leadership led to a civil war; in Spain, anarchist power was fragile in the face of the Soviet endorsed republic, not to mention in the context of yet another civil war. Therefore, under a newly established revolutionary government, weakness, the fifth condition, is certainly met. The remaining four are all that are between the immediate overthrow of the new government: it is natural that counterrevolutionary spirit has its greatest demand following a revolution, the hopefulness stems from the knowledge of the revolution's weakness, and leadership has the tendency to manifest itself when leadership is required<sup>11</sup>. The only agency the new regime possesses over its fate is to consolidate power centrally via the State. Otherwise, the revolution will fail.

The anarchist revolutionary, following the usurpation of power, has, without the State, no means of supplanting control or consolidating power in any meaningful way. To suggest that the State could be abolished following this consolidation is naïve, partly because counterrevolutionary movements could easily gain momentum in the future and have all five conditions met thanks to the inherent weaknesses of decentralisation, and partly for the same reasons which torment the Marxist. The Marxist revolutionary gains power and consolidates it via the State, but because they mistrust popular leadership, the State, which has already proved itself to be the vessel by which revolution lives on, becomes alienated, and so the ideology is compromised and the revolution has failed. The government becomes opportunist, making decisions prioritising the preservation of the State at the cost of forgetting the ideology which the State once existed to implement. This, too, would be the downfall of an anarchist revolution which made use of the State initially.

An ideology predicated on distributing power among the workers requires the State both to take control



initially but also to sustain control in the future. What is clear, though, is that the State inherently compromises the sustainability of the libertarian ideology upon which the revolution was based, leading to authoritarianism and bureaucracy (which can at best feign libertarianism). Indeed, the State

becomes a system of trickery, selling itself to the people whose interests it does not represent as representative of their interests until eventually, it collapses.

By Jimmy Scanlon, LXX (DB work)

#### References

E. (1953). The Background of Revolution. Current History, Vol. 25, No. 144, 65-69. Chomsky, N. (2014). On Anarchism. London: Penauin Books. Claeys, G. (2018). Marx and Marxism. London: Penguin Books. Gottschalk, L. (1944). Causes of Revolution. American Journal of Sociology, Vol. 50, No. 1, 1-8. Marriott, E. (2016). The History of the World in Bite-Sized Chunks, (pp. 167-168). London: Michael O'Mara Books. Tucker, R. (1969). The Marxian Revolutionary Idea. New York: W.W. Norton & Co.

- <sup>1</sup> Marx's view of alienation is foundational to his writing. It is ultimately private property which Marx argues leads to the self-estrangement of the worker. Gregory Claeys describes the premise very deftly: 'Private property perverts our senses by commodifying them, which leads us to treat other people as a means to accumulate objects.' (Claeys, 2018), p. 64
- <sup>2</sup> Rosa Luxemburg, cited by Chomsky, (Chomsky, 2014) p. 46
- <sup>3</sup> Pyotr Stolypin, the Russian Prime Minister introduced reforms in 1906, allowing wealthier peasants, the kulaks, to opt out of their mir communes and buy up land, thus wagering on the strong.
- <sup>4</sup> Tellingly, this power was gained following the Communist-dominated Republic's hesitancy to arm the working classes (who intended to assist in resisting Franco's campaign). Clearly, armed workers and armed Fascists seemed rather congruent threats in the eyes of the Communists!
- <sup>5</sup> Chomsky's summation of this period highlights perfectly the split between the proletariat and the Communist government: 'In brief, the period from the summer of 1936 to 1937 was one of revolution and counterrevolution: the revolution was largely spontaneous with mass participation of anarchist and socialist industrial and agricultural workers; the counterrevolution was under Communist direction, the Communist party increasingly coming to represent the right wing of the republic.' (Chomsky, 2014), pp. 54-55
- <sup>6</sup> Cited by Robert C. Tucker, (Tucker, 1969)
- <sup>7</sup> A successful revolution, as in one which preserves its ideological framework to form the framework of its subsequently implemented system of government.
- <sup>8</sup> Here, success refers to the initial overthrow of the status quo, not to the preservation of ideology.
- <sup>9</sup> Gottschalk sums up this condition very clearly: 'The fact that I am discontented will not lead me to revolution unless I am aware that guite a number of other people are equally discontented and are likely to unite with me in the expression of my discontent.' (Gottschalk, 1944), p. 5
- <sup>10</sup>Gottschalk highlights that this final condition was the difference between the failure of the 1905 revolution in Russia, and the success of the October 1917 revolution. At both points in time, each of the first four conditions was met. (Gottschalk, 1944), p. 7
- <sup>11</sup>Fortunately for the Bolsheviks, leadership among the Whites did not manifest.

### SCHOLAR SESSIONS

Moving into the Upper School, the Scholars' Pathway opens up to allow more freedom for Scholars to pursue and deepen their own interests as they begin to develop their profiles to apply to leading universities. Sixth Form Scholars can take advantage of a panoply of enrichment events organised by departments where they are given the chance to research and present their own papers, as well as engaging in debate with peers and leading invited academic speakers. Students can play a leading role in organising events for Upper School Scholars as Secretaries of Hall Society, as well as attending the Head Master's Lecture and the Scholars' Dinner. One strand of the Upper School pathway is enhanced Oxbridge support, offered on a highly selective basis, which offers candidates protected time each week to work on developing their applications with personal, specialist mentors – something drawn out in a handful of example profiles in the pages which follow.



### QUESTIONS FOR EMILY POLHILL, XX

### Why do you want to study Chemistry at Oxford?

I think Chemistry is a subject that's always appealed to me. As a child I used to love experimenting: making perfumes in old Tic Tac boxes and leaving old mouldy foods for my parents to find. When I first started studying the subject, I had some very inspiring teachers who encouraged me to take up extra projects outside of lessons and really nurtured my interest. I distinctly remember learning about carbon for the first time and will never forget the sense of wonder I felt upon discovering that life exists only because of a few of its exceptional properties. This love of discovery remains with me and I firmly believe Chemistry will play a significant role as we attempt to solve some of the greatest challenges currently facing humanity. The threat of climate change and all the problems it poses, both now and in the future, really motivates me to pursue the subject, in the hopes that one day, I might have the opportunity to make a small difference in this field.

I am really excited by the possibility of spending the next four years studying this subject at Oxford. I was drawn to the practical focus of the course there, in particular the opportunity to spend the fourth year working full time with an established research group. Having had a taster at Rugby of the tutorial style of learning, I've discovered that I really enjoy the chance to discuss my ideas in depth and it has been invaluable to my understanding of the subject. I look forward to the chance to have more tutorials in the future.

#### What new insights and perspectives have you gained from the tutorials with Dr Belding?

I initially found the prospect of learning in a one-on-one environment very daunting but have absolutely loved the process. Throughout the tutorials, I was pushed to suggest ideas and attempt challenging questions, despite them being outside the range of my knowledge and began to overcome my fear of being wrong. I think my problem-solving skills have massively improved throughout the process. I learned how to rationalise my thoughts and present them in a logical order when approaching a question and the opportunity to practise 'thinking out loud' and explaining my approach has proved very helpful, especially in lessons.

#### What is the most interesting idea that you have explored in the tutorials?

I really enjoyed learning about Grignard Reagents which are chemical compounds used to form new carbon-carbon bonds. Victor Grignard received a Nobel Prize in 1912 for his discovery of an incredibly useful synthetic reaction, which is still used today in the manufacture of painkillers like ibuprofen and naproxen. I really loved the chance to learn about a reaction mechanism with important applications in the pharmaceutical industry and whilst it is beyond my A-Level specification, it continues to prove useful knowledge when tackling past paper questions.

#### What do you value most about the academic provision at Rugby School?

I genuinely feel that the academic support I have received here is outstanding. All my teachers, but especially Dr Belding, have gone out of their way to develop and challenge my understanding of their subjects and I have had teachers give up their afternoons or evenings to help me with topics I've struggled with. I also really value the chance to explore science outside of the classroom. Joining societies like Chemistry Enrichment has given me the opportunity to take part in the Chemistry Olympiad, teach science to younger students and take part in group projects. I particularly enjoyed working on a project to build a giant model of insulin, where I learned to build and identify various amino acids and also met new people with similar interests. Throughout my time at Rugby, I have been encouraged to learn not just for exams but for my own academic interest and the opportunity to explore my own interests has inspired me to continue to pursue the sciences.

### QUESTIONS FOR DR STEPHEN BELDING. CHEMISTRY TEACHER

### What is your academic background e.g. A Levels, universities and research area?

I was lucky to attend a high-performing state school in Aberdeen, Cults Academy, where I studied four Scottish Advanced Highers: Chemistry, Maths, Physics and Biology. From there, I read Chemistry at St John's College, Oxford University. I stayed in Oxford to complete a DPhil (PhD) entitled 'Computational Electrochemistry'. I enjoyed learning a new skill, computer programming, and using the output to study the movement of molecules in chemical reactions. The science is equally applicable to the movement of money in markets, traffic in cities and neutrons in nuclear reactors. Different friends have successfully gone into these industries. Over the course of our research, we published 23 papers including one in Angewandte Chemie, the top European Chemistry journal. I always remember the moment the results appeared on the screen, and the walk to the professor's office. Looking back on it, for five minutes, I had the privilege of knowing something about the world nobody else had ever known. As a DPhil student, I spent two years on the interview panel for undergraduate Chemistry admissions at Lady Margaret Hall. I have great respect for the tutors: it's really tiring giving 25 interviews in one day!

#### Can you describe what your teaching background is e.g. number of years, schools worked and positions I have been a schoolteacher for 11 years. I began my teaching career at d'Overbroeck's College, Oxford. I then moved to Merchiston Castle School, Edinburgh, where I also enjoyed serving as an Assistant Housemaster. I moved to Rugby School in 2017, and became the Head of Chemistry in 2019. In 2020, Rugby supported me in completing a part-time Master's at the University of Buckingham. I studied ISI inspection reports and how schools rated 'excellent' can become even better. In all three schools, I've had the privilege of working with amazing colleagues: examiners with decades' experience; housemasters on track to be headmasters, and the most amazing GCSE Chemistry teacher I'll ever meet anywhere!

### What have you covered in your tutorials with Emily?

A successful Chemistry application must be based on a complete and in-depth knowledge of the A-level syllabus. In order to truly understand a subject, it is also necessary to go further. By the end of Advent Term in XX, Rugby School's 1:1 tutorial system allows

our applicants to complete the A-level course, and the first term of a university Organic Chemistry degree. This process is demanding, but it makes our students interview-ready, as well as assuring a high A\* in the final exam. Our tutorials are based on Foundations of Organic Chemistry, by Hornby and Peach. At University, Dr Peach was one of the most outstanding lecturers. This is an excellent and concise book that is often recommended by Oxford Colleges. It is accompanied by a worked examples book. This allows students to work through the material actively and productively, leaving our weekly tutorials to practise higher level thinking.

### What have you found rewarding about the mentoring process?

Working with students who love Chemistry. They are motived and study the material, but the key to a successful interview, and for life, is being able to draw on ideas and make connections. The success of our tutorials turns on making this happen. Being there for the moment a student makes their own connection is the most rewarding part of teaching.



### QUESTIONS FOR SCOTT THOMPSON, XX

Why do you want to study Earth Sciences at Oxford? From a young age I have enjoyed learning about science and the world around me, and so Earth Sciences seemed like the perfect course. The course itself is broad and relevant in the contemporary setting, having use in the issue of climate change, and also looks into the past of our planet, which is of great interest to me. Ancient landscapes, prehistoric life, and the geochemical changes of the Earth are all fascinating topics that are often not covered in schools, and by taking this course it allows me to study and research those topics. Oxford University is academically outstanding with a focus on research, which is a rewarding experience, and the institution would encourage me to work hard and get a lot back in the process.

#### What new insights and perspectives have you gained from the tutorials with Dr Wheatley?

From the start of the tutorials until now, I have learned an immense amount, and each tutorial was enjoyable to partake in. Each tutorial allows me to use my current knowledge and apply it to new situations that I had not encountered before. For instance, when looking at palaeomagnetism and plate tectonics, I had to use my A level maths skills to translate gravity, though not having had to use it in such a way before. Another perspective that I have quickly grown to appreciate is

just how vast the geology of the planet is, and how what we see and know is just the tip of the iceberg.

#### What is the most interesting idea that you have explored in the tutorials?

Of the many ideas I have explored that have been interesting, I would have to pick my tutorial discussing the Anglian Glaciation, which occurred just under half a million years ago. This was a fascinating idea in that it covered a tangible distance into the past, looking at the UK landscape its effect can plainly be seen, and in the tutorial we further discussed how grooves in the rocks of U-shaped valleys can be attributed to different rocks carried by the glaciers. Also, the pictures of glaciers are a beautiful blue colour, which led to an interesting look into the reasons for this.

#### What do you value most about the academic provision at Rugby School?

To me, the thing I most value is the super-curricular conversations that occur in the classroom, allowing us to explore concepts that are beyond our current requirements, but do lead to equipping us well for university interviews in the future, through developing our way of thinking. Taking an example earlier this year from Chemistry, we briefly delved into the unusually low melting point of magnesium, which, guided by the professional knowledge of my teacher, led us on to concluding that its crystal structure was different to other group 2 elements.



### QUESTIONS FOR DR ALEXANDER WHEATLEY

#### What is your academic background e.g. A Levels, Universities and research area?

I studied for a BA and MSci in Natural Sciences at Pembroke College, Cambridge, specialising in Geological Sciences. My Masters work concerned ecological relationships between bryozoan colonies living on Chlamys opercularis (Queen scallop) shells. I trained as a teacher at King's College, University of London, completing my PGCE in June 2012.

From 2014 to 2019, I studied for a PhD at Duke University, in Durham, North Carolina. My thesis work concerned the history of the Amazon river and Andes mountains in South America. This included some clastic sedimentology, radioisotope analysis, statistical modelling and biogeographic modelling - along with extensive field work!

### Can you describe what your teaching background is e.g. number of years, schools worked and positions

Two years at Woodside High School in Wood Green, London, following my PGCE. I moved to Rugby immediately after returning from the USA, starting at the school in September 2019. I have been a Physics teacher here since then.

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#### What have you covered in your tutorials with Scott so far?

All sorts! Scott's first essay for me discussed his interest in palaeontology and past life, so we have spent a good amount of time looking at the fossil record and fossilisation. We have spent some of our time getting hands-on with rocks and analysing geological structures on maps, and our discussions have ranged from ancient environments to the physics of plate tectonics to the composition of the atmosphere. Earth science is a wide field, and I think it's important that Scott gets a flavour of the breadth of it.

### What have you found rewarding about the mentoring process?

Earth sciences aren't a primary curriculum topic, so it's been lovely to have someone who genuinely wants to learn more about this subject. More generally, having that one-to-one relationship with a motivated, hardworking student is a joy - as I watch Scott develop as a budding earth scientist. I know that my work is having a direct, positive impact.



### **OUESTIONS FOR LIKA GORSKAIA**

### Why do you want to study your subject?

My interest in literature doesn't necessarily stem from one place. I find the inherent combination of creativity and order within literary texts fascinating. I like to think that literature is the most 'human' art form, language being so fundamental to our lives. Analysis of prose and poetry has hence struck me for a long time as the most interesting way of trying to understand ideas. It was reading Wilde's The Picture of Dorian Gray that first made me think about English at university - I was taken in by the unembarrassed confrontation with human emotion that did not seem to me possible through any other medium. I returned to the thought more seriously a few years later to find myself still increasingly captivated by literature's capacity for depth and by the richness of language.

### What new insights and perspectives have you gained from the tutorials?

Our tutorials have given me the opportunity to look closely at texts in a wide variety of ways. I have enjoyed for instance considering, for the first time, different strands of literary theory as tools to inform our analysis, such as Marxist and post-colonial lenses. Looking at the different contexts in which authors are writing and considering the implications this has in terms of their works, or inversely the potential irrelevance of factors such as class and family history, has also been

enlightening. I have found developing 'pure' critical analysis skills through looking at unfamiliar texts without the comfort of any context at all perhaps most challenging and equally useful, learning in particular to pay closer attention to the importance of form, often subtly mimetic of the content itself.

### What is the most interesting idea that you have explored?

I really enjoyed presenting on the poem 'St Matthew' by D.H. Lawrence. I had the chance to deliver my thoughts on the poem and construct my own analytical perspective. My argument centred on the sense of isolation that seems inseparable from the human condition. Considering the historical context of the Modernist movement and the awareness of disorder that characterized the early twentieth century led me to form connections between the speaker's relationship with the 'otherness' of both divinity and the natural world and Lawrence's position as a writer in the 1920s.

### What do you value most about the academic provision at Rugby?

I really appreciate the personal approach to the extension sessions and the sense of freedom that comes with that. As a result of being a group of only two mentees and a mentor, I have felt that I can pursue the specific lines of thinking most interesting to me and develop my analytical skills quickly and effectively by having to take agency in discussions. In this way, our English extension sessions are reminiscent of the tutorial system at Oxbridge, and this has helped confirm that I see value in applying, since this style of learning has benefitted me so much. The range of activities relevant to English outside of these extension sessions is similarly something I am extremely grateful for: the senior literary society - Landor, the creative writing club, and events like the Poetry by Heart competition and this year's Modernist Night have all been great opportunities to continue engaging with my subject in inspiringly diverse ways.



### QUESTIONS FOR DR JULIAN MOYLE, **ENGLISH TEACHER**

### What is your academic background?

work of other writers of the period. We haven't just I studied for my BA at the University of Nottingham. I loved the English course and chose almost every focused on Modernism! We've also had space and time available module to ensure that I gained a good to explore other topics such as the development of the novel as a form in the 18th century, or the application grounding in every period of literary history, from Anglo-Saxon literature to the present. We had some of theoretical approaches to texts. My colleagues in the brilliant, distinctive lecturers and professors, including English Department have also delivered fantastic sessions Professor Kathryn Sutherland, whose tutorials completely drawing upon their literary interests and specialisms. changed my perspective on Jane Austen, and Professor John Worthen, whose enthusiasm for D H Lawrence What have you found rewarding about the was infectious. I then took a MA in Modernism at the Oxbridge mentoring process? University of East Anglia, before returning to Nottingham The most rewarding aspect of the process has been to pursue a PhD on the topic of iconicity in avant-garde witnessing Lika – and another student involved in the poetry. Iconicity involves a relationship of resemblance process – deliver fascinating presentations on areas of between a sign and the object, thing or concept that it individual interest. After researching a little-known D.H. refers to in the world, or in our perception of the world. Lawrence poem, Lika offered an interpretation of the The highlight of my PhD was a three-month research poem that was challenging, insightful and complex. She exchange at the University of Auckland, where I was then followed it up with an essay that offered a highly original reading of this difficult text. This is what delights able to engage with their extensive collection of first an English teacher most – when a piece of writing is edition volumes of modern and postmodern poetry. surprising and illuminating, causing the teacher to view also enjoyed delivering a paper in Jena, Germany, at a conference organised by an international research group something in an entirely fresh, new and unexpected specialising on iconicity. In recent years, I have attended way. Paradoxically, mentoring is most rewarding when further iconicity conferences - in Lund, in Sweden, you don't have to give too much direction to the student and, less exotically, in Brighton. As a result of these - when the student takes the initiative, proposing subject conferences, I have published chapters in three books on matter for discussion or pursuing follow-up reading or the topic of iconicity in literature. research of their own accord.

### Where have you taught?

My full time teaching career started at Oakham School where I very much liked being able to teach both A Level and IB. I then moved to Bloxham School, taking on the role of Master of Scholars, a role that involved devising programmes of academic enrichment for different year groups through the school. I'm now hugely enjoying working at Rugby – and it is great to be able to teach the IB again, alongside A Levels.

### What topics have you covered in tutorials with your pupil?

I wanted to explore some texts that relate to Lika's interest in the Modernist period, so we discussed some poetry by T.S. Eliot and William Carlos Williams. Williams is an interesting writer whose radical use of form aligns his work with the experimental poetics of Eliot and Pound, but he was also seeking to distance himself from Eliot's writing. So it makes for an interesting comparison. We've looked, too, at Emily Dickinson, who was writing before the Modernist period, but whose writing seems to anticipate the way that Modernist writers sought to unsettle literary conventions. We've also engaged with Robert Frost's poetry, a writer whose desire to continue writing in more traditional forms meant that he was never mentioned during my university course on Modernism, and yet his work seems to me to be just as complex and challenging as some of the more renowned Modernist writers. I hope that, from exploring these writers, Modernism has become an open term for debate and discussion, rather than how it is sometimes used – to establish too fixed a boundary between the difficult work of a literary elite and the more conventional



### **QUESTIONS FOR GABRIEL STONEY, XX**

### Why do you want to study your subject?

I want to study law because, simply, I find it very interesting. Studying law is more than just studying what the law is; law, especially the jurisprudence course as Oxford, focuses on law at a social phenomenon. I am interested in all the things attached to law: sociology, anthropology, history, politics, and even psychology. I went to an open day at Oxford earlier in the year. They portrayed the course in a very appealing way: they focus not just on what the law is, but what it should be. Often, law is related to morality, and the moral questions that surround law are perhaps the most interesting part of it all. Thinking further ahead than university, I feel as though law will give me a good foundation from which to build a career, whether I work in the legal profession or not.

### What new insights and perspectives have you gained from the tutorials?

In our tutorials, we have covered many topics, including questions about education, abortion, and arranged marriages. These topics are interesting in and of themselves, but I have also learnt a huge amount about how to structure an argument, deconstruct others, and write persuasively. In the tutorials themselves, we have disagreed, defended our views, accepted the views of others, and generally

reached a consensus. Throughout the process I have found that the conversations most concerned with the idea of morality were the ones I enjoyed the most, and the ones which provoked the most thought.

### What is the most interesting idea that you have explored?

Early on, we wrote an essay about punishment. We then had a very interesting conversation about the purpose of punishment and what kind of punishment is acceptable. After the tutorial, I did a bit more reading, to try to find the moral grounds of punishment. Needless to say, there is endless material on the subject. Outside of the tutorial sessions, I have been looking at "jurisprudence", the name of the course at Oxford, as well as one of the modules. I only learnt the term this year, but as it turns out, jurisprudence is very interesting. I have attended Scott Shapiro's online course on the subject, finding the material to be challenging but fascinating.

#### What do you value most about the academic provision at Rugby?

The provision of a work session on Tuesday afternoons has been very helpful. Without it, much of the work I have done would have been impossible. I also highly value the tutorial sessions, which ensure that I stay on top of my work and encourage me to think in far more depth than at any other time during the week.



### **OUESTIONS FOR HARI DHESI, ENGLISH TEACHER**

#### What is your academic background?

Having read Jurisprudence at Mansfield College, Oxford, I remain invested in the legal sphere and have thoroughly enjoyed mentoring two excellent students this year on the Oxbridge programme. Following my undergraduate degree, I completed an MA in Broadcast Journalism at City University, London. I then made the move into teaching, gaining my PGCE through the Teach First Leadership programme whilst teaching at an academy in Birmingham. After three years in teaching, I decided to try something new and spent a year at the accountancy firm KPMG in the tax department. Although I enjoyed my time there, I had always wanted to experience teaching at a boarding school and happily took the opportunity to do so when a place opened up in the prestigious Rugby School English department!

### your pupil?

As our sessions have progressed, I have found that both mentees have adopted an increasingly independent approach to pursuing their interest in law. This has been particularly pleasing as for students who have serious Oxbridge aspirations, the learning should primarily be taking place outside of tutorials with our meetings acting as a way of discussing and refining ideas, mimicking the Oxbridge style. It has also been very enjoyable to work with two highly motivated students who clearly thrive What topics have you covered in tutorials with from learning and take pride in their own development. Again, this motivation is a prerequisite for those who are serious about putting together a strong application at a I'm delighted to say that we have covered a range of issues in considerable depth during our tutorials. A time when gaining a place at Oxbridge has, arguably, particular highlight was mentoring my students through never been more competitive. Seeing both mentees the submission of their entries into the Peter Cane Legal bounce ideas off one another, and even disagree once Reasoning Prize held by Corpus Christi College, Oxford. or twice, has been particularly enjoyable, after all lawyers This year candidates were asked to apply the Wills Act love confrontation! Ultimately, regardless of whether my 1837 to a fictitious scenario as well as consider any mentees attend Oxbridge or other universities, I hope reforms that might be suggested in the current law. Both that these sessions have played their part in fostering their mentees entered fantastic submissions and were passion for legal matters.

Highly Commended by the college. On the day of the Prize Giving, Gabriel was announced as the winner of the competition, which was a fantastic achievement and a satisfying conclusion given his efforts. In other tutorials we have considered whether land owners should be subject to increased regulation under environmental laws and many different contentious issues during our LNAT practice sessions.

### What have you found rewarding about the Oxbridge mentoring process?

### **OXBRIDGE PROFILES**



### QUESTIONS FOR SACHA HOWELLS, (XX IN 2022)

### Why this course and College?

I have always wanted to go to Cambridge, ever since I visited the city when I was young. When it then came to researching potential courses, the flexibility and breadth of the Natural Sciences course structure really appealed to me; I have never truly been able to pick a favourite between Physics and Chemistry, and the possibility of studying both to a higher level was exactly what I wanted.

### How did you go about preparing?

I have always had a love of reading, so I read as many books on the subjects I wanted to study as I could manage. I also went to the super-curricular societies for Physics and Chemistry at school, where we would meet weekly and discuss an area of the subject which was not covered by the A Level specification. I also took several exams which relied on knowledge of course content to solve problems outside the expectations of A Levels, these were: the Cambridge Chemistry Challenge, Chemistry Olympiad and Physics Olympiad.

### What support did the School provide?

In addition to the aforementioned societies, the school provided a 3 hour slot on Tuesday afternoons, specifically for the purpose of preparing for my Cambridge application, allowing time outside of lessons and prep to sit practise papers for entrance

tests and, eventually, to have some interview practise. On that note, all of my teachers could not have been more supportive in offering their free time for practise interviews, I cannot understate how much they helped with the whole process.

### Who or what has inspired you?

Without a doubt, my family has been my biggest source of inspiration, my grandfather was an organic chemist, which was a strong influence from the sciences. Both my parents have always encouraged curiosity, discussion, and using evidence to back up any idea or opinion, which has had a huge impact on my outlook on life and education. I saw the sciences as an obvious progression from that attitude of constant curiosity and evidence-gathering to a field of study.

### What are you looking forward to in particular in your future study?

It's hard to put my finger on one thing, the whole prospect is just mind-blowing. Materials Science is a module which is available for my first year, and that is certainly something which I am looking forward to studying. However, I don't think I could honestly pick one, to be studying at Cambridge really is a dream come true and I am looking forward to every moment.

### **OUESTIONS FOR KALEGI MWATSAHU** SANGALE, (XX IN 2022)

### Why this course and College?

I chose to study Human Social and Political Science in Corpus Christi College. This course is constructed of a tripos of Sociology, Social Anthropology and Politics and International-Relations. I was attracted to the flexibility this allowed as a twist on a Liberal Arts course. Initially I had been very set on studying Law as a straight degree in university until I realised the essence of that desire was really my expanding interest in the conditions that breed inequity and injustice. In this sense, I found a commonality in law and HSPS. The course has a very macro-focussed lens allowing the study of systemic issues rather than individual case studies, which I found particularly interesting with regard to international development. My favourite thing, or perhaps sometimes the most challenging thing about this course, is that what it means to me will be very different to what it means to somebody else, and in this regard, it has a unique ability to tailor itself to the individual studying it.

After spending hours on extensive pros and cons lists, I decided to apply to Corpus Christi. This is one of the smallest colleges in Cambridge allowing for more of a community feel. While relatively centrally located, it is off the tourist track allowing for slightly more privacy. It has two libraries, one of which is open for 24-hours, which I was irrationally drawn to, but mainly, even considering the most menial details such as the aesthetic value, it was somewhere I could see myself living in for the next three years.

### How did you go about preparing?

There are three main ways in which I prepared during What are you looking forward to in particular in my application process. The first and most obvious your future study? was perhaps reading. Interestingly I did not ever read I am particularly looking forward to studying issues a book, journal or paper for the specific purpose of regarding types of governance including the discussion of whether the strongest form of governance may adding it to my application, but as I was genuinely passionate in HSPS, my the time I was submitting my perhaps be a form of benevolent dictator. Furthermore, I am excited about the introductory moduleapplication I found that I had read so much around 'International Conflict, Order, and Justice'. In the the subject unintentionally giving me a firm support while entering interviews. I think if you are applying context of the wider university, I think I will enjoy a less rigid approach to learning as opposed to A-levels for a social science course you do find that any additional information aids in an interview context. where the criteria for each subject is fixed. I will also I ended up using a pellet of information from a Netflix enjoy the increased scope for debate as we stray away docu-series I had watched a year earlier in from the concept of having an objective truth in the field of social science. my interview.

The second way was 1-1 sessions with the Head of Politics, considering politics made up a large composition of my course despite me not having taken it as an A-level. These sessions happened every week before my interview when I would have the opportunity to ask questions, debate current affairs and collate reading material.

Finally, I found talking to a person with similar interests, but opposing views, was helpful in providing alternate perspectives and well as challenging me in a style similar to an Oxbridge interview, while testing my independence of thought.

### What support did the School provide?

Different levels of support were found in different departments. For me, I think the 1-1 sessions in the Politics Department benefitted me the most. It could be reasonably challenging at times to find support as every application, and applicant, is unique and therefore no formulaic approach to produce success. Therefore my preparation was largely independent of the school, but the most useful input I received was from individual staff members with a particular interest in my field of study.

### Who or what has inspired you?

My biggest inspiration or motivator really was the platform in which as opportunity as such creates to make an impactful difference in the future. There are few people of colour, especially at an undergraduate level, who are awarded a position in such a prestigious institution, so in a way, I felt representative of a wider group in society, hopefully enabling me to be a part of opening more doors for others in the future.

### **ACADEMIC SCHOLARS' DINNER**

Near the end of each academic year, the Academic Scholars, from F Block to the departing XX, unite and share a meal together. However, this being a Scholars' dinner at Rugby, there was a lot more planned than just food. We were treated to two lectures before dinner, allowing for much insightful and intellectual conversation during the meal. Thanks to Dr Smith's contacts, we were lucky enough to host a history professor from the University of Leicester to deliver a lecture on Saladin and his legacy across the Middle East, but Mr Fisher's highly enthusiastic lecture on the Art of Science – with a specific focus on Einstein – certainly did not disappoint! The evening then settled down, with food, drinks and healthy debate for all. Finally, to wind down the evening, every table participated in a student-led general knowledge quiz, with nasty questions like 'Name all the Spice Girls and their stage-names', and 'Which Californian city is going to host the next World Lacrosse Championships?'. An E Block table were victorious! And finally, with our stomachs satisfactorily filled and our minds amply stretched, the evening concluded peacefully – with passionate debating among groups that their team was really the best; what else would you expect from the Academic Scholars?

A massive thank you goes to Dr Davies and Dr Smith, Keepers of the Scholars, for their efforts in setting the dinner up for us!

### By Neal Kulkarni, XX



'Pupils' attitudes to learning are excellent. They collaborate easily and willingly in shared challenge. The school provides many opportunities for students to commit to academic research, which for the more able leads to their habitually high levels of thinking.'

ISI Report 2022



