



6th Form

# Fortnightly

08-05-2017

# FOCUS

## Dear parents, carers and students

Welcome to this edition of the 6th Form Fortnightly Focus.



### Diary Dates

**15th May**

Move to early lunch for exams

**29th May - 2nd June**

Half Term

**3rd June**

Graduation

**28th June**

Bristol University visit

**3rd - 8th July**

Art exhibition

**5th July**

Year 13 Prom

**18th July**

Year 12 celebration evening

**21st July**

Last day of Term

Welcome back after the Easter break. The summer term is an incredibly busy time of year for sixth formers at Tavistock College. Graduation, year 13 prom, year 12 celebration evening, Product of the Year and the annual Art exhibition, but most importantly, exam season is upon us. All students have been given their statements of entry which indicate the date, time and location of their upcoming exams. I have also attached a copy of the exam timetable to this edition of the focus and will put the upcoming exams in the weekly bulletin. There are also a small number of important AS examinations that our year 12's will be sitting. Tutors are working with students to provide study skills support as we enter this critical time of year for students sitting their A level and B.tec examinations.

Due to Theresa May calling a snap election, there will be many students now eligible to vote much sooner than they anticipated. Anyone not already on the electoral roll must register by 22nd May to be able to vote in the General Election on 8th June. Students can register online and it will only take a few minutes, but they must have their national insurance number. (You don't need to register again if you've already registered.)

Younger voters are less likely to be registered or cast their vote. It has been estimated that only 43% of people in the 18 – 24 age category who are on the electoral roll, voted in the 2010 General election. It is suggested that even less participated in the EU referendum. As a co-operative sixth form, we encourage all young people to participate in our community, and encourage all students to register and to cast their vote. It is vital for young people to have a voice on the issues that will affect their futures, they truly do have a vested interest in participating in their democracy. *Tom Galli*

### Meningitis vaccination

We have received important advice from Public Health England, advising all year 13 students to have a Meningitis vaccination.

"Did you know that as a Year 13 student you should now book an appointment with your GP to protect yourself against meningitis and septicaemia?"

Meningococcal disease is a rare but life-threatening disease caused by meningococcal bacteria. Meningococcal bacteria can cause meningitis and septicaemia and both diseases are very serious and can kill.

As a Year 13 student you may have received a meningococcal vaccination a few years ago (in Year 9 or 10) which will have given you protection against meningococcal C. You now need to receive a vaccination to protect you against meningococcal W. It is very important that you receive the vaccine as older teenagers and young people are most at risk. It is being offered in response to a rapidly growing increase in cases of a highly aggressive strain of meningococcal W. This disease can cause meningitis and septicaemia that can kill in hours, and those who recover may be left severely disabled. The vaccine also protects against three other meningococcal groups too – A, C and Y.

Make sure you book an appointment with your GP as soon as possible; you may already have received an invitation from them. If you are going to University in September, make sure you get vaccinated before you go.

For more information please talk to your parents/carers or staff at your school, or visit <http://www.nhs.uk/Conditions/vaccinations/Pages/men-acwy-vaccine.aspx>

### TAVISTOCK COLLEGE ENDOWMENT FUND 'A Registered Charity'

#### Do you need financial help to support your education?

The Tavistock College Endowment Fund is a registered charity set up in 1932. Its purpose is to help pupils of the College with the expenses of education.

Grants can be awarded:-

- To support education costs.
- To provide assistance with clothing, tools and instruments on leaving school.
- To fund travel abroad to pursue education.
- To provide facilities for recreation and social or physical training.
- To provide financial assistance to study music or other arts.

#### Eligibility

Young people under the age of 25 who are attending the college or have attended at any time for not less than 3 years and are resident in either the urban or rural areas of Tavistock (In the opinion of the trustees).

The trustees meet in **January May and October** each year to determine applications. Application forms are available from the Principal's office or can be downloaded from the college website. <http://tavistockcollege.devon.sch.uk/index.php/our-college/tavistock-college-endowment-fund/>

Applicants should provide **as much detail as possible** regarding family income and reasons why funding is required. Students should note that Trustees rarely fund the whole cost of a school trip or project. They expect the student or their family to raise funds or contribute towards the cost.

**Please supply as much detail as you can when applying for a grant.**

# Exam timetable

Date	Start	Length	Year	Component Title
Tue 16 May	13:00	01:30	12/13	GCE Law Unit 1
Tue 16 May	13:00	01:30	13	Geography Global Challenges
Wed 17 May	09:00	01:30	12/13	Core Mathematics C1
Thu 18 May	09:00	02:00	12/13	Media Studies: Media Cncpts TV Wrtn
Thu 18 May	13:00	01:00	13	GCE Applied Business Unit 3
Fri 19 May	09:00	01:30	12/13	Further Maths Further Pure FP1
Fri 19 May	13:00	01:30	12/13	GCE Law Unit 2
Fri 19 May	13:00	01:15	13	Geography Geog.Investigations
Mon 22 May	09:00	02:00	12/13	Design & Techn DT1-Product Design
Wed 24 May	09:00	01:30	12/13	Core Mathematics C2
Wed 24 May	09:00	01:30	13	Mathematics Statistics S3
Wed 24 May	09:00	01:30	12	Health & Social Care Human Lifespan Development
Fri 26 May	09:00	02:00	13	Perform Studs: Prfmnce Cntxts 1 Wrtn
Mon 05 Jun	09:00	01:30	12	Applied Science Principles and Applications of Scien
Mon 05 Jun	13:00	02:30	13	Geography Contested Planet
Wed 07 Jun	09:00	02:00	13	Media Studies: Crtl Prspt Media Wrtn
Wed 07 Jun	09:00	01:30	13	Further Maths Further Pure FP2
Wed 07 Jun	09:00	01:30	12/13	Mathematics Statistics S1
Wed 07 Jun	09:00	01:30	12	Sport Anatomy and Physiology
Wed 07 Jun	09:00	02:00	12	Engineering Principles
Wed 07 Jun	13:00	02:00	13	Psychology ADV Paper 1
Thu 08 Jun	13:00	02:00	13	Perform Studs: Prfmnce Cntxts 2 Wrtn
Thu 08 Jun	13:00	02:00	13	Sociology ADV Paper 1
Fri 09 Jun	09:00	02:30	13	Design & Techn DT3-Product Design
Fri 09 Jun	09:00	02:30	13	History A: Rebln Dsrdr Undr Tudrs Wrtn
Fri 09 Jun	13:00	01:30	13	Geography Geographical Research
Mon 12 Jun	13:00	02:00	13	Business Studies Market People & Global BU
Mon 12 Jun	13:00	02:15	13	Biology A: Biological Processes Wtn
Tue 13 Jun	13:00	01:30	13	GCE Law Unit 3
Tue 13 Jun	13:00	02:15	13	Chemistry A: Prdc Tble Elmnt Phy Chm Wtn
Wed 14 Jun	09:00	01:30	12/13	Mathematics Mechanics M1
Wed 14 Jun	09:00	02:30	13	English Language ADV Paper 1
Wed 14 Jun	13:00	02:00	13	Psychology ADV Paper 2
Thu 15 Jun	09:00	02:15	13	English Literature Drama
Thu 15 Jun	09:00	02:15	13	Physics A: Modelling Physics Wtn
Thu 15 Jun	13:00	02:00	13	Sociology ADV Paper 2
Fri 16 Jun	09:00	02:30	13	Computer Science: Computer Systems Wrtn
Fri 16 Jun	09:00	01:30	13	History A: Eng 1445-1509: Lnc Yrk Hny Wtn
Fri 16 Jun	13:00	02:00	13	GCE Law Unit 4
Fri 16 Jun	13:00	01:30	13	Mathematics Mechanics M2
Fri 16 Jun	13:00	01:30	13	Decision Mathematics D1
Mon 19 Jun	09:00	02:00	13	Business Studies Activs Decision & Strats.
Mon 19 Jun	09:00	02:15	13	Chemistry A: Synths & Anlytcl Tchnqs Wtn
Mon 19 Jun	13:00	01:30	13	GCE Religious Studies Unit 3B
Tue 20 Jun	09:00	02:00	13	Biology: Cntrl Genomes & Envmt Wrtn
Tue 20 Jun	09:00	02:30	13	English Language ADV Paper 2
Tue 20 Jun	09:00	02:15	13	Biology A: Biological Diversity Wtn
Tue 20 Jun	13:00	01:30	13	Core Mathematics C3
Tue 20 Jun	13:00	02:00	13	Sociology ADV Paper 3
Wed 21 Jun	09:00	01:00	13	History A: Italy 1896-1943 Wrtn
Wed 21 Jun	09:00	02:15	13	Physics A: Exploring Physics Wtn
Thu 22 Jun	09:00	03:00	13	Spanish SN4: L SN4
Thu 22 Jun	09:00	01:00	13	English Literature Prose
Thu 22 Jun	09:00	02:30	13	Computer Science: Algrthms & Pgrming Wrtn
Thu 22 Jun	13:00	02:00	13	Psychology ADV Paper 3
Fri 23 Jun	09:00	01:30	13	Core Mathematics C4
Fri 23 Jun	13:00	01:30	13	GCE Applied Business Unit 15
Fri 23 Jun	13:00	02:00	13	Business Studies Investigating Business
Mon 26 Jun	09:00	01:30	13	Biology A: Unified Biology Wtn
Mon 26 Jun	13:00	01:30	13	Further Maths Further Pure FP3
Mon 26 Jun	13:00	01:30	13	Mathematics Statistics S2
Tue 27 Jun	09:00	01:30	13	GCE Religious Studies Unit 4C
Tue 27 Jun	09:00	01:30	13	Chemistry A: Unified Chemistry Wtn
Thu 29 Jun	09:00	02:15	13	English Literature Poetry
Thu 29 Jun	09:00	01:30	13	Physics A: Unified Physics Wtn

## Disaster Hotspot Philippines

by Emma Sampson

### Earthquake- 1990

- 7.7 magnitude, along with multiple aftershocks.
- Luzon Island, 16:26 local time- people out and early home commute, more risk of falling buildings causing death. Stampedes out of multi –storey buildings caused death.
- 3 main roads into the city blocked by landslides which occurred as a consequence.
- Baguio, sitting on 7 fault lines, is one of the most risk-prone cities in Asia.
- 1500 people killed as a result.
- The excessive number of daily quakes is because Pacific plate is subducting beneath the Philippine plate to the east while the west/north-western part of the Philippine plate is subducting beneath the continental Eurasian plate.

### Volcano- Mount Pinatubo

- Largest eruption in the world, in the past 100 years.
- The death toll was reduced due to the proximity of the USA air force base which helped with evacuation.
- Lahars damaged every bridge within 18 miles making further aid very tricky.
- Falling ash destroyed crops and was a disaster for the agricultural economy.
- The islands of the Philippines are actually built on combination of folding at the boundary and volcanoes formed from magma that has risen to the surface from the mantle below
- Mount Pinatubo had been monitored carefully in the months before it erupted.

### Landslide- Leyte Island 2006

- The Philippines gets large amounts of rain. As a result the soil is easily displaced and landslides occur.
- Prior to 2006 landslide there had been 27 inches of rain in less than 10 days.
- When the landslide struck it took a matter of seconds to kill an entire village, including a school of 246 students and 7 teachers.
- The death toll was over 1000.
- Scientists and locals argue that there was illegal logging which contributed to the mass landslide.
- The area got support from the World Bank 2 days after the landslide but there was little to save as even the room tops of homes were submerged.

### Typhoon- Angela 1995

- On average there are 10 typhoons a year in the Philippines.
- Manila, the highly populated capital, was struck by a typhoon in 2016, disrupting international travel, killing 4 and causing over 380,000 to have to move out of their homes.
- One of the most notable typhoons is Typhoon Angela.
- It was a Category 5 typhoon with 180 mph winds, causing 9.33 billion Philippine pesos in damage.
- The frequency of the typhoons in the Philippines make it very hard to recover and be able to prevent such damage reoccurring due to expense and the constant destruction.

### Vulnerability can be measured using:

SWOT (+, -, opportunities, threats), Risk mapping, access model (better for explaining), and computer methods.

To conclude, the Philippines are clearly at risk due to its vulnerability to 4 major disasters, all of which have occurred previously causing catastrophic devastation. For this reason, it must be concluded that it is a disaster hotspot, based solely on the number of natural hazards which occur as a consequence of its location. However, it must also be considered that the frequency of these events are a factor which influence the extent to which it is a disaster hotspot, because typhoons occur up to 10 times a year, and a major earthquake, volcano eruption and landslide has occurred all within the last 35 years. This makes recovery extremely hard because they are constantly being hit with damage so buildings are repaired to a minimum as they cannot afford to replace them with reliable materials. Therefore in the long term the Philippines will remain vulnerable because the controllable factors, like better prediction technology and resistant buildings won't be built as they are already a poorly developed country and the money spent each time on repair mean there's never any spare to develop. In addition monetary assistance from the World Bank is often too little too late, such is the example in the Leyte Island landslide.

# The Fractured History of Kurdistan by Oscar Agnew

The Kurds are a Middle Eastern race hailing from the plains of Mesopotamia, a land they've farmed, built and fought over for generations past. They predominantly belong to the Sunni Muslim creed, but many other religions are represented as well. Many have emigrated from their homeland and Kurdish enclaves can be found across major English cities like London and Birmingham. Early in the 1900s, many Kurds began to return to their traditional homeland in an attempt to reclaim it, and create a fully autonomous state known as Kurdistan. After World War One and the Kurd's help with the defeat of the Ottoman Empire, the Allies drew up plans for a Kurdish state in the 1920 Treaty of Sevres. Unfortunately, these plans were scrapped three years later when the Treaty of Lausanne created the modern state of Turkey, and claimed much of the Kurd's potential land. The Treaty did not include the Kurds and they became minorities in the various countries they now inhabited. Since then every attempt to construct an autonomous state has been crushed.

In 2013, when ISIS was enjoying the height of its power in the Middle East, it turned its hateful gaze upon a number of nearby Kurdish enclaves in the north of Syria. ISIS launched repeated attacks that were repelled by the YPG (the militant wing of the Syrian Kurdish Democratic Unity Party) but in June 2014 they overran the city of Mosul and totally routed the Iraqi army. As a result, ISIS fighters seized weapons stockpiles and diverted more troops to fight in Syria. This defeat also threw the Iraqi Kurds into the fight and the Kurdish government in the region sent their "Peshmerga" fighters to pick up where the Iraqis had left off.

There were a number of small clashes in the region for some time but later in the same year a major shock offensive by ISIS routed the Peshmerga, and allowed the IS militants to pursue a genocidal campaign against the Yazidis and other minorities whose settlements they had captured. As a result of this, A coalition force led by the United States launched multiple controversial airstrikes in northern Iraq and also sent military advisers to help the Peshmerga. Other Kurdish institutions from across the Middle East also came to offer assistance. The ISIS attack was eventually halted, but their defeat had started a diplomatic conflict with Turkey when IS attacked the town of Kobane and forced thousands of Kurdish civilians across the border into a country that resented them. Turkey flat out refused to attack the IS positions near the border and banned Turkish Kurds from crossing the border to defend it, triggering protests across the Kurdish community.

Eventually the Turks capitulated and allowed Peshmerga fighters to help defend Kobane late in 2014. Two months, 1600 dead and 3200 destroyed buildings later, Kobane was successfully recovered from the Islamic State. Alongside the American coalition, the Kurds have successfully driven ISIS back to within 30 miles of their capital at Raqqa. The significant Kurdish losses and assistance calls into question once again the possibility of a land to call their own.

So why is Turkey so hostile towards its Kurds? The answer is not particularly clear cut and goes back to the end of WWI, when the Kurds were snubbed at Lausanne. The Kurds made up a tiny portion of the infant state and often received very harsh treatment from authorities, resulting in a number of uprisings. These uprisings were met by more repression, which was met by more uprising in a vicious cycle that continued for decades. Eventually a group called PKK was formed and started a civil conflict with the government over the creation of an independent nation within Turkey's existing borders. This war had claimed around 40,000 lives as of March 2016 and the only ceasefire attempted collapsed as a result of ISIS terror attacks. The Turks have also been shelling YPG positions in Syria in attempts to keep them from capturing key positions. The Turkish government lumps the YPG in with the PKK, labelling the both of them as being terror organisations.

Meanwhile in Syria, the local Kurds make up even less of the population and have been subjected to even more brutality by al-Assad's government. They mostly exist as citizens of no nation, and are often redistributed in campaigns to make Arabs the predominant race in areas of the country. The main Kurdish governing body here is the aforementioned Syrian Kurdish Democratic Unity Party, or PYD for short, who campaign for the creation of a democratic state within Syria, but not total independence. They also seek to ensure that a Kurdish clause is included in any final settlement of the Syrian War.

Finally, the Kurds of Iraq have historically been the better off of all the Kurdish groups, but that is not to say they've been welcomed with open arms. The Kurds here are represented by the Kurdish Democratic Party, which was formed in 1946 with the goal of achieving autonomy from the Iraqi government. Though the Kurdish problem was addressed in the late 50s, the possibility of independence was rejected by the predominantly Arab government. The KDP responded by launching a war, which lasted nine years before they were given their own state within Iraq proper. Eventually this also collapsed and fighting began anew in 1974, followed by a new party called the Patriotic Union of Kurdistan splitting from the KDP. By the 80s Iraq was settling Arab families in oil rich areas inhabited by Kurds, which was accelerated when the Iraq-Iran War started and culminated in Saddam Hussein's infamous 1988 Sarin gas attacks.

After Iraq's defeat in the Gulf War, the Kurds launched another rebellion. This led to the creation of a US-enforced no fly zone over the area, which let the Kurds implement joint self-rule between the KDP and the PUK. Unfortunately, this collapsed into an internal power struggle after just three years, leading to four years of yet more bloodshed. Both parties co-operated in the second Gulf War, and have notably participated in all national governments formed since Saddam Hussein's death.

In summary, the history of Kurdistan is a bloody one, and looks to remain that way for some time. Hope does remain with the Iraqi Kurds, but the disagreements there and the war with ISIS in the west keep the Kurds in a seemingly never ending kaleidoscope of conflict and oppression. With a potential ISIS defeat on the horizon, and substantial Kurdish assistance in achieving it, their prospects of a homeland are again called into question. But, like the Israelites of old, there is a long road between now and a nation to call their own.





## Wear a Hat Day Friday, 31st March

Generous sixth formers raised just over £125, and spent the day wearing some wonderful headgear, for the charity Brain Tumour Research. We had particularly good reason for wanting to support this charity as it has been recently helping one of our ex students and her family. Many thanks to all who contributed. Pictured above are some of 12 Byron getting into the spirit of things....

## Year 13 Drama

Saturday 13th May - Main Hall

### HOME

When home isn't where the heart is, how do you find your way back there?

Starring: Alyssa Benito, Joseph Buncle, Georgina Hiles, William Hutchison and Richard Montague,

### HORIZON

Is an unexamined life worth living?

Starring: Sian Elder, Caleb Prouse, Izzy Simpson and Zach Woodward.

## Virtual Reality

Media students were treated to a virtual reality experience last week as former student, Nick Peres, demonstrated just a few of the future industrial applications of the new hardware.

Nick, who now works for the NHS in technology development, brought an Oculus rift system to show Tavistock students the potential for this technology.

So, students were first shown how VR could be used for entertainment by placing them inside a trailer - for example, we saw the trailer for Ghost In The Shell from the main character's perspective.

Perhaps most popular with the students was a traditional arcade target shooting game - however now they actually were able to hold the weapon and shield. Immediately, students were considering other applications of this - what game they'd develop, how they'd improve existing games, and so on.

Perhaps most exciting were the industrial uses for the tech - Nick explained that he was using it to train surgeons in a virtual environment, but he has also seen practitioners using it to virtually simulate building plans in architecture, car designs in the motor industry, or even virtually 'hang out' with life-like representations of friends on Facebook.

So the key message to students was that this tech exists now, but we are only scratching the surface of how it might be utilised - it's relevance in each sector is literally in their generation's hands.

*Simon Hunter*



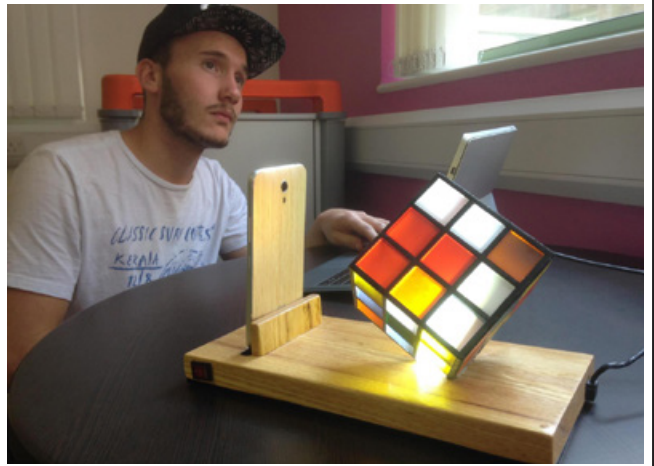
## Gallery Space



Josh Coombe



Dominic Newton



## Dance Macabre

by Samuel Beard

I happened across a man one day,  
Who bade me join his dance macabre.  
And so I did.

And I danced and danced,  
Until he bade me stop.  
And so I did.

He reached for me with splinter-fingers  
And showed me the others.  
And the dancers, who had moments before  
Been graceful, were now  
Twisted, stunted fiends.

And then the man bade me run  
From his dance macabre.

And so I did.

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## Sixth Form Student Leadership Opportunities

Head Boy and Head Girl

House captains and Vice Captains

Bedford

Drake

Glanville

Fitzford

Tremayne

Therefore we are looking for twelve members of Year 12 to be our new student leadership team for 2017-18. This year we have re-established the house system of the school, something that has been both positive and welcomed in the community as a whole.

We will be holding interviews for the above posts during the first week back after half term and it would be great to receive as many applications as possible, from students that want to make a positive contribution to the school and the local community.

Applications are by letter and to be received by Mr Galli no later than Friday 26th May 2017, in your letter you will need to make it clear which role you are applying for and the reasons why you think you will be suitable for the role.

I very much look forward to reading your letters of application and being able to work with you next year on the students leadership team at the college.

## SLT Link

Mr G Smith

This is my 12th year in education and I have taught mathematics to a variety of ages throughout those years. More recently I have mostly taught sixth formers mathematics and I relish the challenge and opportunities that mathematics offers. My role in the College has also changed. I now lead on the whole school curriculum and timetable and line manage the sixth form.

I do not run the sixth form at Tavistock College, this is Mr Galli's job who is Director of Sixth Form, but I help the sixth form team make decisions and to ensure that high standards of achievement are maintained. With my whole school curriculum role I work with Mr Galli and Mr Jacob to ensure that the option blocks are set correctly and try to make the sixth form as inclusive for the young people of Tavistock as possible. Ultimately my job is to make the sixth form as good as it can be and listening to parents and students in order to do this. If you have any questions or comments then you can email me: [g.smith@tavistockcollege.org](mailto:g.smith@tavistockcollege.org)



## Meet the Tutor

Mrs V Froud

Human geographer, enjoys the study of demographics and primary/secondary impacts on people due to natural events the most.



Socially into water sports, kayaking, Stand up paddle boarding, surfing, sailing, RIB driving, but I am rubbish at water skiing! Just moved from skiing to snowboarding following fourth orthopaedic surgery on my leg- the boots are so much more comfortable! Spend several hours a week doing Pilates and basically outdoors at much as possible.

I always have music playing- but a real mixture. Can't stop playing the new You Me At Six album at the moment though! Mrs Jones (History) and I share our 90th birthdays this year- so we are celebrating by hopefully jumping out of a plane.

Geography has always been a passion as it is so relevant and contemporary, we look at social, economic, environmental and political geography so we literally cover so many fascinating topics.

My mantra- PMA (positive mental attitude) as my exam classes will tell you, I mention it a lot. If you want to do it, if you work for it, if you believe you can do it- you will!

## The Extended Project Qualification

For any students considering the undertaking The Extended Project Qualification, please see the outline below and the wonderful project on a 3D printed camera (condensed) by Will Dax (on the next page).

If anyone is interested, see Mr Chambers who is leading the EPQ.

The Extended Project Qualification (EPQ) is a Level 3 Qualification which allows students in the sixth form to study beyond their A-Level syllabus and prepare for university or chosen career. It is worth half an A-Level so can be used to earn extra UCAS points. The EPQ takes the form of either a 5000 word essay or producing an artefact together with a 2500 word essay. In both cases, students need to fill out a production log which involves recording their initial planning as well as detailing how they intend to research the project using primary and secondary sources. Students can start the EPQ in Year 12, submitting their initial proposal for approval, and need to have finished it by the end of the spring term in Year 13.

For the EPQ, each student is assigned a supervisor who meets with them on a fortnightly basis providing guidance and support. Supervisors also offer study skills advice to help with organizing ideas as well as managing time and resources effectively. Students are able to choose an area of interest which is related to a curriculum subject they are studying in the sixth form. They need to be genuinely committed to their selected topic because the course involves extended independent study challenging them to work independently as they would be expected to at university or in working life. On completion, they are required to deliver a presentation explaining how they compiled their project as well as answering questions about their findings and how they overcame any challenges. A key part of the EPQ is the provision of evidence for all planning stages of the project development and production. For this, students need to record their meetings with supervisors as well as the ways in which they are using their primary and secondary research sources. We ensure that supervisors and centre co-ordinator check the student production logs regularly to ensure they are being completed at regular intervals. The production log is a key component for the success criteria as much as the project itself so by maintaining high standards of recording students can achieve a higher grade.

It is important for all students taking the EPQ to take their final presentations seriously as they are important evidence to show students have used a range of skills, including, where appropriate, new technologies and problem-solving, to take decisions critically and achieve planned outcomes. Students deliver the 10-15 minute presentation to a non-specialist audience and practise beforehand with their supervisors. We have found that students succeed when they understand the true relevance of the EPQ to their chosen university course or pathway in further education. Many put it on their personal statement and last year a number of students who dropped a grade at A Level got into their preferred university because they achieved an A or B grade at EPQ. Finally, EPQ has proved a rewarding qualification for sixth form students who wish to extend their knowledge and understanding about a given topic beyond the parameters of the A Level curriculum.

# Tavistock

## COLLEGE





## EPO

For my Extended Project Qualification I have attempted to understand the basic principles behind a simple traditional camera. To start with I researched the ideas of the early innovators of photography, especially Henry Fox-Talbot. However to understand this more deeply I have attempted to designed and make my own functioning camera. Like these pioneers I have borrowed available pre made parts from other pieces of equipment and like them used available contemporary technology. A 3D printer was used to create the plastic outside shell and inside components, whilst the shutter mechanisms and lenses were from a kit camera I had previously constructed. To learn about the camera's roll in the photographic process I have tried to follow a similar path to those early pioneers in my own learning journey.

Henry Fox-Talbot was a nineteenth century gentleman who lived in Lacock Abbey, Wiltshire, where in 1835 he experimented with a small wooden box camera which became known as the first British camera. He borrowed a lens from is microscope (in the same way as I borrowed the shutter mechanism and lens from my first kit camera) as these components are too complicated to make on their own. He placed the camera on the mantelpiece above the fire place pointing towards the window which was the main source of light. He used writing paper placed in the back of the camera to record the image. This paper was coated in salt solution and silver nitrate, creating silver chloride which is sensitive to light. I could only use photographic film for practical reasons and time constraints. After two hours of exposure Fox-Talbot produced a successful tiny negative the size of a postage stamp. Fox-Talbot admitted he was a poor draftsman who wanted to record nature more successfully than he could with either pencil or paint. He is quoted as saying "How charming it would be if it were possible to cause these natural images to imprint themselves durably and remain fixed on paper". My research has also included the Frenchman Louis Daguerre together with Hill and Adamson from Newhaven, who were also early photographers.



Henry Fox-Talbot holding his first camera



First British photograph



To assist me in my basic understanding of how a camera works, I began by taking apart a shop bought disposable camera, presuming this to be the easiest available entry point into discovering the essence of photography. On 26<sup>th</sup> September 2016 I therefore started to make detailed notes and sketches of this camera, starting by measuring the dimensions of the outside of this newly purchased camera, in order to give me an idea of the extent of my own design (see figure 1.1 ). This was then followed by detailed observations of the top and the inside of the camera (see figure 1.2).

By being able to reverse engineer the components of the shop bought camera I realised that, although this being a simple design, the level of complexity to produce an image from a camera like this one, was great; especially as I needed to create a basic functioning instrument, similar to those first developed by the 19<sup>th</sup> century photographers. At this point I began to realise what a huge challenge I had set myself.



Top view of the disposable camera showing shutter release button



Rear view of the disposable camera showing view finder and film winder



Front view showing lens, view finder and flash.

Taking the shop camera apart I found out that the only way to take the film out was by snapping off the bottom, meaning that this camera can only be used once. The view finder was not attached to the lens meaning it is not an SLR (Single Lens Reflex) camera. This camera was made up of three main components the front, back and inside. From studying the inside mechanism I found out that the shutter on the camera is actually a small piece of thin plastic that covers a circular hole acting as a door, this small piece of plastic is quickly moved up and down when you press the shutter release, exposing the light sensitive film to light and imprinting your picture onto the film. This disposable camera although small, was very complicated, as it had many springs and tiny components all connected to making sure the film could be wound on the correct distance and that there would be just one exposure per shot.

On the 28<sup>th</sup> September 2016 my next step was to find out how a film camera worked was to take apart the 'Lomography Konstruktor', which is a kit camera which I previously built myself. Whilst taking this apart I wrote down every single dimension and made a sketch of each one (see pictures). From taking apart this camera I gathered that it was much simpler than the disposable one as it contained fewer components. The camera consisted of three main parts: the front of the camera, the back door where the film can be accessed and the middle, where the film is kept and rolled forward and backwards. I decided to base my camera around this camera as it was a simple and practical design. It also kept closely to the concepts of early photography. Whilst taking this camera apart I observed that the shutter was very simple because all it had was one lever and a button. So I decided to use this shutter mechanism on my camera as making my own shutter mechanism would prove very complicated and time consuming. I also decided to use the lens from this camera as it works very well with the shutter and to make my own lens would also be too difficult.

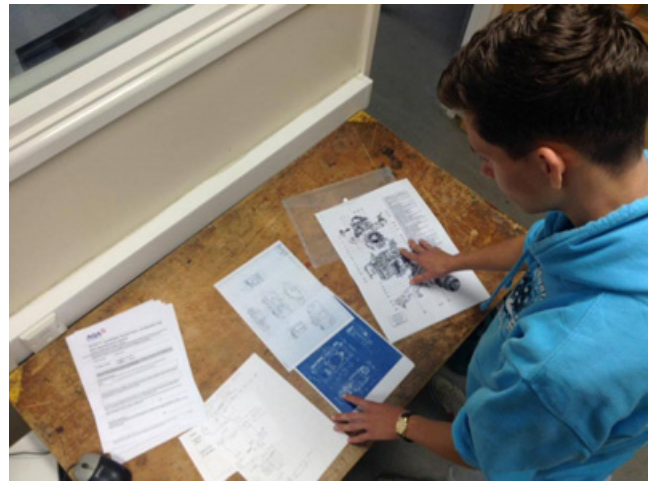


William Dax



Reverse engineering of the Lomography Kit Camera

Looking at how other cameras are designed and made



Before I started designing my first prototype, on the November 8<sup>th</sup> 2016 I attended two classes arranged by the school on how to use new software called 'Rhino 3D'. This is a new designing software which is more advanced than 'Google Sketch Up' and is able to construct more complex 3D shapes, possibly for my new camera casing using multiple layers of printed plastic. However, after I learnt how to use this software I decided not to design my camera on it as it was too complicated for my purpose, whilst I still had a much to learn from it. Having researched this direction of development, and after much reflection, I decided to return to 'Google Sketch Up', even though it isn't as advanced, I am more familiar with it and it is fit for purpose. My camera is a simple design and can be easily designed on 'Sketch Up' and the 3D printer would still print out the plastic as needed.

I made my first proto type for the front and base of my camera which took me two days starting on the 14<sup>th</sup> of November. I based most of the dimensions off the 'Lomography Konstruktor' as I was would be using the shutter mechanism in my camera. I then printed it on Mr Keegan's (Head of Design and Technology) 3D printer. He printed it in 100% density and this took about four hours to print (See picture below). I came to the printer the next morning to see that my first prototype has printed successfully. As you can see this model is printed in black plastic, it has the front and base and at this stage, so I was going to have a rear side that opens up, for accessing the film. From looking at this first print I could already see some changes that would need to be made. The first one being that I forgot to draw a small section of the base in the front of the casing, which could be easily fixed. The other was that I had made the base too long.



First Printed prototype in black plastic

Once I had analysed my first 3D printed component I started on designing prototype two for the front and base. Here I started to change the dimensions on my design to make improvements over the last one. I made the base shorter in length, whilst I also fixed the problem I had where some of the base that didn't print. I also reduced the thickness of the circular rim on the front face as I felt this was too thick and I added a small hole on the side of the camera where the shutter release leaver goes. When I was ready to print my second prototype Mr Keegan's printer had broken and so could not print anything! Luckily there was another 3D printer that Mrs Neil (ICT teacher) was able to let me use, but this would only print in green. As I was only printing prototypes, this did not bother me. I was very pleased when this printed out just how I wanted.

The next step on the 20<sup>th</sup> November in making my camera was to design the back, as this is where a door will be attached by hinges. Here the film can be put in and taken out. I designed this on 'Google Sketch' from scratch, using the entire dimensions from the front and base that I had already printed to help me make the back fit (see picture). This also printed just how I wanted it too. I wanted to see if the back fitted the front so I put them together and I found out that the base was still too long, so I trimmed it up in school so that it fitted properly. Looking at them together made me think that it was going to be very difficult have a moving door that must not on any account let in any light, because the photographic film is extremely sensitive to the tiniest infiltration of light. However, on the 16<sup>th</sup> January 2017 I had a brain wave! I realised that I didn't need a back or hinged door to change the film but a lid instead. This made everything a lot more easier to make and involved less risk of letting the light in. I felt that this was not only a simpler design but it also improved the strength of the whole camera. The lid will sit on top of the camera and will have to be taken on and off when the film needs to be changed (see figure bellow).

From having this new idea I set about designing the new component, where the font base and back were all one (see picture below). Once I had designed it I sent to be printed, as I thought this would print out well, but when I went to see how it had printed the base did not print at all and I wasn't sure why as there were no obvious mistake on my 'Google Sketch Up' design. I explained my problem to Mr Keegan and showed him the missing base. Mr Keegan looked very carefully at my 'Sketch Up' design and spotted that one of the connecting lines from the base to the side was not touching and this was out by less than a millimetre. I had also printed the hole on the side too small and in the wrong place. This taught me to pay attention to the tiniest of details!



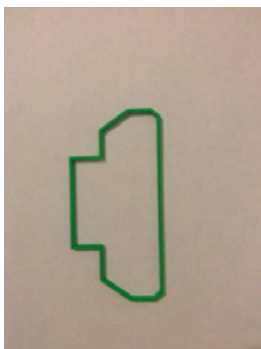
First print of my new design but unfortunately the base did not print.

With my next prototype of the front, base and back I made sure that all the lines were connecting so that the base would properly print this time, moving the hole on the side more central, larger and higher up. I also removed the circular rim completely on the front face, as I felt this added nothing to the performance of the camera. When I printed this camera it printed out well, including the base this time. I was happy with everything except that the hole was slightly too far to the right by a couple of millimetres so I quickly made this change and send it back to the printer.

The next stage on 5<sup>th</sup> December, once I was happy with the outside shell of the camera, was to design the inside. I created this using the other 'Sketch Up' design of the outside. I deleted all the sides of my other design so that I was just left with a base which I shrunk by about 3 millimetres so that it could fit inside. Then started to design the inside component where the 35mm photographic film will be stored. I had to create two circular spaces at either end for one side the film to go and the other the film to be wound in to. I had to remove a large section in the centre to make room for the shutter mechanism. I also had to create square hole on the centre for the light to be shined through so it could expose the film successfully. I sent this to Mrs Niel's 3D printer and it printed exactly how I wanted it too. I put the printed component inside the outside shell and it seemed to fit. However, when I went to put the shutter mechanism in it did not fit because I hadn't made enough room, so it was back to the drawing board again!

From discovering that I had not left enough room for the shutter mechanism I needed to change this, so I went back onto 'Google Sketch Up' yet again to change this. Still persevering, I made the side much thinner so that shutter had plenty of room then I sent it to be printed. Once it had printed I carefully placed it inside the outer shell and tested if the shutter mechanism would work. Crossing my fingers, it appeared to be working fine and there was enough room for all the components to move, but on closer inspection, I could see the shutter was not opening and closing when it should have been. On reflection, I realised that this was because I was about 1 mm off and one of the leavers didn't quite have enough room. I went back onto 'Sketch Up' to fix this problem, however it would not print correct because the width was too small for the printer, and I felt exasperated! So what I ended up doing was to manually melt away the amount of plastic with a soldering iron, and once I had done this the shutter worked fine. I was now ready to move onto the last stage of the construction process.

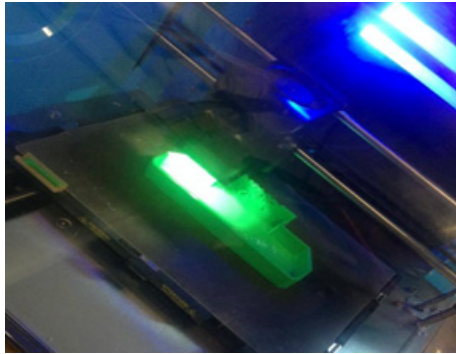
This final part on the 3<sup>rd</sup> March was to make the lid, so again I used the outer shell of the camera to help me measure the dimensions of the lid. I had to make it 3mm thick so that it was strong and would keep the light out. I also had to make it 2mm larger around the perimeter where it would fit on top snugly, so I made a 2mm lip where it would stay on and not slide around. I had some trouble printing this one at first as only the sides would print and this happened to me frustratingly twice (see picture below). I redesigned the base on 'Sketch Up' and it finally printed and fitted my camera perfectly. With my confidence restored, I realised that all I had to do now was to print the two holes for the wooden winders to go in. These would move the film around inside the camera. When I printed it out, one of the holes fitted and the other one was slightly off, so I made those changes quickly and this print was perfect. I then set about cutting the two wooden winders to the right length, adding the appropriate grooves for one to hold the canister of film and the other for the user's fingers to grip onto when winding the film on. These could be then easily slipped into place.



First print of the lid and the base did not print properly.



The final camera was now ready to print from the 3D printer, but there was still one potential problem. As I was still unable to access Mr. Keegan's 3D printer, which printed in black, I had to use Mrs. Neil's which only printed in green. As I had no choice but to take the risk, I gingerly pressed the start button. Out came the camera and hey presto all the components fitted together well! The camera was now ready to be tested...



Final print of the camera being printed on the 3D printer in green plastic.

To my great frustration the green plastic moulding of the outer cover let in too much light and the film did not develop successfully in the dark room. So still soldiering on I painted the outer cover with three layers of Humbol black enamel paint. Once dried, I attempted test it again. I also shone a torch into the shutter area to test its effectiveness and this seemed fine. So back into the dark room and... SUCCESS!!! The final developed shots had a slightly blurred focus as expected and the contrast could have been better, but I was very pleased with the results.

From looking closely at my first shoot, I discovered that that the closer my camera was to an object, the more in focus it became. I decided to do another shoot on close up portraits. When I developed this new shoot, I was pleased to discover that they were in focus and that there was a lot more contrast in the images. I decided to take close ups of people's faces by holding the camera very close to them ( as there is no view finder ) and estimating what would fit into the frame. I took these photos on really bright day, with the sun behind me so that my subjects' were facing the sun, as I needed as much light as possible, because in my last shoot I felt that the images came out too dark. I am very pleased with the level of detail that I captured on their faces. The contrast of textures from the brick wall highlights the details of my subjects' features. You can see both the tone and contrast on their faces and the shadows cast by the sun and even that subtle detail of hair follicles. The scratches on my images are not related to my camera, but are from the development process and the school's equipment.

From my experience I feel that the use of reverse engineering has been essential in understanding the functions of a camera, especially with the help of the cheap shop bought camera and the basic kit camera. I was able to marry these practical ideas with the efforts of the early pioneers. Trial and error with lots of perseverance played a major part, particularly with appropriate measuring to enable moving components to work properly. The management of light was effected by the functioning of the lens and shutter within the camera, together with coating of extra layers of black paint over the final printed plastic outer casing. Moreover, like the very early cameras, mine did not have a view finder which added to the anticipation of my results. These experiences have made me a more sensitive and appreciative photographer, where art, science and technology have combined to

create this amazing invention. I also hope that my extended project may help other fellow students of photography gain similar insights.

#### Next steps

- Adjust the focus on the lens as the current images are slightly out of focus.
- Attach a view finder by redesigning the lid, so the user can clearly focus on an image.
- Printing the camera with a thicker, black plastic outer shell.
- Attach dials with directional arrows onto the wooden film winders, so that the user is able to clearly understand how to wind the film forward.
- Designing clips instead of elastic bands to secure the lid for convenient, secure and regular access.

#### Implications as a future tool for learning

- Using 'Google Sketch Up' design software to create and modify future similar projects.
- Understandings the extent and limitations of the 3D printer when undertaking practical tasks of this kind.
- Gaining an insight into the perseverance involved in achieving a final result.
- Understanding the importance of extremely accurate measuring.
- The relevance of using research and the ideas of others as a springboard for new ideas.



Showing the top of the camera painted in black. All the other areas of the green outer casing were also painted black, making it resistant to light infiltration.



This picture shows the top of the camera from the inside and the underside of the lid. It is green because that was the only available colour it printed in. You can see two felt circles on the underside of the lid, this is to stop light getting in. The lens and the shutter mechanism had to fit snugly into my carefully measured plastic casing.



Front top view showing the lens, shutter release and wooden film winders.



Photographic film and one of the wooden winders combined with a plastic kit camera winder.



View of the rear side and wooded turners to enable the film to be wound forwards and backwards.