

TOTAL BUDGET UPDATE for Q1 2023/24 as at 30/6/2023

Committee	Budget	Actual
Finance & Policy	£ 165,449	£ 27,472
Community Services	£ 192,882	£ 51,204
Leisure Services	£ 191,130	£ 93,633
Human Resources	£ 273,108	£ 57,933
Development & Planning	£ 500	£ -
TOTALS	£ 823,069	£ 230,242

Notes:-

- It is not possible to forecast a budget outcome this early in the year.
- Note that the LS actual amount looks high - remember that this includes a half-year Public Works Loan Board payment c. £45,000 and also includes our venues facilities budget (repairs and maintenance to the venue buildings).
- By the end of Q2 we will be able to get a better picture of the final year outcome estimate.
- I have no concerns regarding the budget at this time. **Cathy Whitaker**

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JUST FOR INFORMATION - LIST OF POLICIES WHICH WILL REQUIRE UPDATING / REVIEWING OVER THE YEAR

NTC SCHEDULE OF REVIEW OF POLICIES, CODES AND PRO' as at 15/05/2023

CODE	NAME	LAST REVIEW DATE	DATE DUE FOR REVIEW	NOTES	NEXT ACTION
	Standing Orders	March 23	March 24		
	Financial Regulations	March 23	March 24		
	Committee Terms of Reference	January 23			
	Scheme of Delegation to Officers	April 22			
P1	Customer Care and Complaints Policy	June 19			
P2	Procurement Policy	June 19			
P3	Environmental Policy	June 19			
P4	Equality Policy	June 19			
P6	IT Website and Electronic Communications Policy	June 19			
P5	Information and Data Protection Policy	June 19			
P7	Community and Social Policy	June 19			
P8	Community Engagement Policy	June 19			
P9	Quality Policy	June 19			
P10	Protection of Children and Vulnerable Adults Policy	May 22			
P11	Volunteers Policy	July 19			
P12	Small Grants Policy	November 22			
P13	Treasury Management Policy	July 19			
P14	Communications Policy	September 19			
P15	Marketing Policy	September 19			
P16	Publicity Policy	September 19			
P17	Training and Development Policy	September 19			
P18	Business Continuity Policy	September 19			
P19	Flag Flying Policy	September 19			
	Health and Wellbeing Policy	January 22			
P21	Dignity at Work Policy	January 23			
C1	Members' Code of Conduct	May 22		LGA Code 2020	

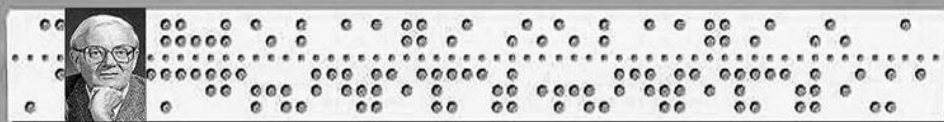
C2	Social Media Guide for Members	July 20				
C3	Officers' Code of Conduct	May 19				
C4	Protocol on Member/Officer Relations	May 19				
A1	Management Structure	September 19				
A2	Committee Structure	September 19				
A3	Glossary of Terms and Acronyms	May 17				
A4	Asset Register	May 23				
A5	Employee Handbook and Personnel Policies	September 19				
A6	Publications Scheme and Information Guide	September 19				
A7	Mayor's Allowance Scheme	September 19				
A8	Risk Management Scheme	March 23				
A9	Town Emergency Plan	July 18				
	Privacy Policy	September 19				
	Health and Safety Policy	September 19				
	Newmarket Neighbourhood Plan	ongoing				
	Checklist for large dwellings	April 19				
	Sickness and Absence Policy	August 20				
	Performance Management	October 20				
	Introduction to Constitution	May 19				

The Bill Tutte Alborada Trust Scholarship

*Intent, Implementation
and Impact*



October 2022



The Bill Tutte Alborada Trust Scholarship

Intent, Implementation and Impact

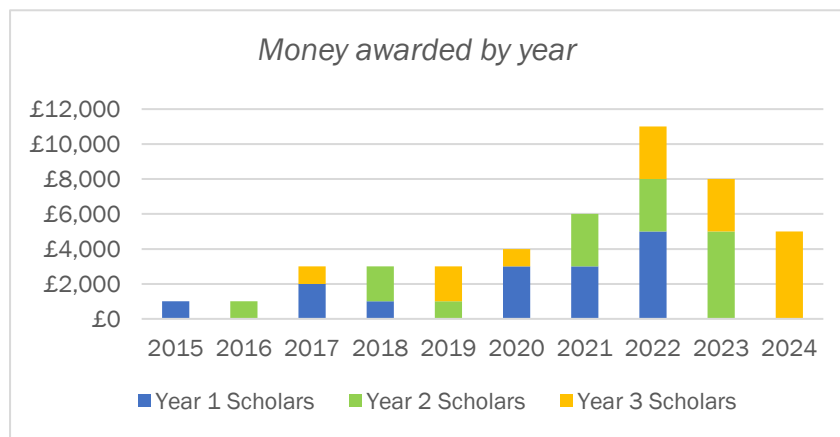
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Introduction

The Bill Tutte Alborada Trust Scholarship was set up in 2014, in memory of the Mathematician and Computer Scientist Bill Tutte, who was born in Newmarket in 1917 and who deciphered the Lorenz cypher at Bletchley Park in World War II.

The Scholarship is administered by the Bill Tutte Memorial Fund (registered Charity no. 1151333), and was originally endowed with £16,000 from donations at the time of the creation of the Bill Tutte Memorial on Newmarket High Street, and generously supplemented in 2019 with a donation of £25,000 from the Alborada Trust, as well as donations from the Newmarket Festival and Newmarket Rotary and others. We have to date awarded 15 scholarships, totalling £45,000, but we have now committed all our current funding and so we are looking for benefactors who would like to help us to support a new generation of talented local Mathematicians and Computer Scientists – and maybe even to find the next Bill Tutte.



Note:

The figures given here for 2023 and 2024 represent future payments to current scholars. The Fund has sufficient money to make these payments, but without additional funding will be unable to award any further scholarships.

Part I

1. Intent

1.1 Bill Tutte: a short history

Bill Tutte was born in 1917 in Newmarket, the son of a gardener. He was educated at Cheveley Village School and won a scholarship to the Cambridge and County Day School for Boys at the age of 11. In 1935 he earned a place at Trinity College, Cambridge, and in 1941 he was invited to Bletchley Park, where he broke the German Lorenz cipher. Without ever seeing a Lorenz machine, he deduced that it had a series of rotors, the first of which had 41 teeth. He and his team went on to describe all 12 rotors correctly, “one of the greatest intellectual feats of WWII”, which revealed vital information on German capabilities and intentions. Tutte also invented a statistical method to accelerate the deciphering, which led in 1943 to the creation of Colossus, the world’s first programmable electronic computer, by GPO engineer Tommy Flowers. Tutte and his colleagues at Bletchley Park have been credited with shortening the war in Europe by two years, saving countless lives.

In 1948, Bill Tutte emigrated to Canada, joining first the University of Toronto, and then, in 1962, the University of Waterloo, Ontario. He became an eminent professor, acclaimed for his work in the field of Combinatorics – the basis for search engines. He was elected a Fellow of the Royal Society in 1987 and made an Officer of the Order of Canada in 2001. He died in 2002 and is buried in Canada.

1.2 The Scholarship

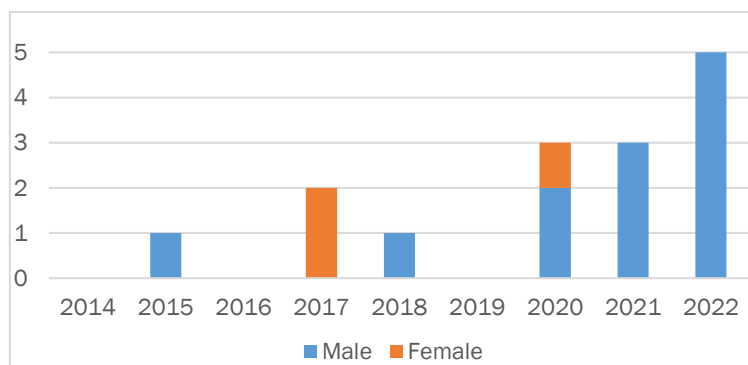
The purpose of the Scholarship is to honour Bill Tutte by encouraging young people in Newmarket and the surrounding area to study and excel in Mathematics and Computer Science. The Scholarship consists of a yearly payment of £1,000 for a maximum of 3 years of undergraduate study.

Scholars must demonstrate outstanding potential and achieve at least an A grade at 'A'-Level Mathematics, and have been offered a place at a British university to study Mathematics or Computer Science. They must live within an 8km/5 mile radius of the Bill Tutte Memorial on Rutland Hill in Newmarket, or be able to demonstrate a strong connection with Newmarket. They should demonstrate commitment to their studies, either by overcoming difficulties in order to succeed, or by developing their interest in the subjects independently.

2. Implementation

2.1 Scholarships awarded

We have now awarded 15 scholarships. These are strictly awarded to candidates who meet the criteria – we award no scholarships in years where there is no suitable candidate.



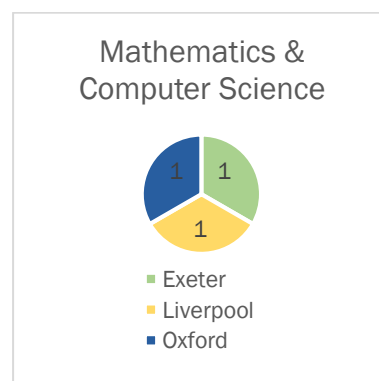
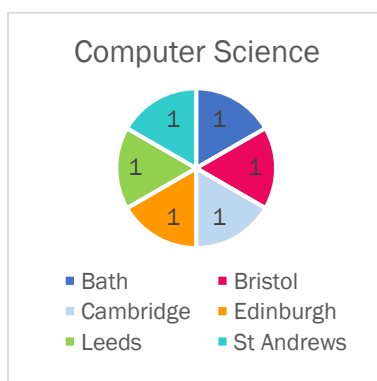
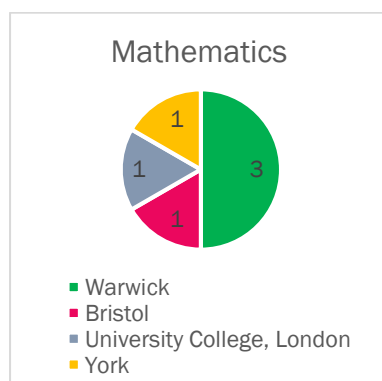
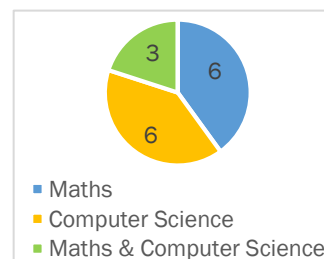
2.2 List of Scholars

2015 Joshua Evans
 2017 Tia Lowman; Emma Rooney
 2018 Matt Timmons-Brown
 2020 Luke Beardsmore; Thomas Bidewell; Adriana Fisher
 2021 Blake McAdam; Leo Saiu-Bell; George Wood
 2022 Jamie Earle; Peter Lillistone; Jack Peck; Ethan Sparrow; Liam Swarbrick

2.3 Subjects studied and destination universities

This scholarship is for students of Mathematics or Computer Science. 40% of our Scholars take each subject area, with another 20% taking joint honours. One scholar was initially studying Mathematics and Physics, but has now changed to study Mathematics alone.

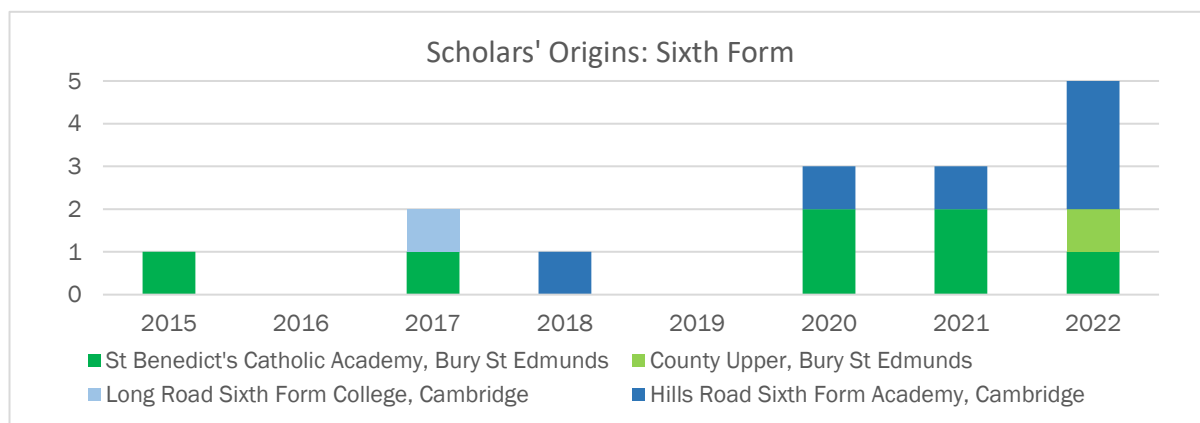
Our Scholars have studied at a range of excellent UK universities. The University of Warwick is particularly popular as a destination for our Mathematicians, but our Computer Scientists are studying at universities across the UK.



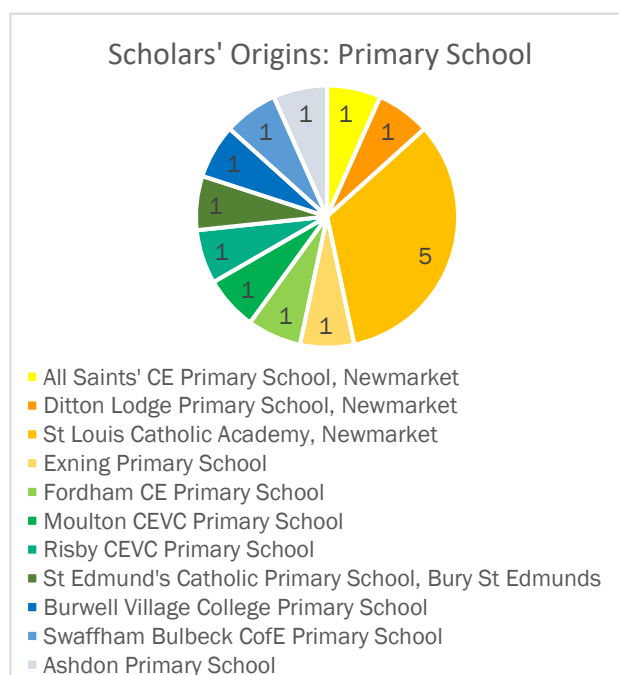
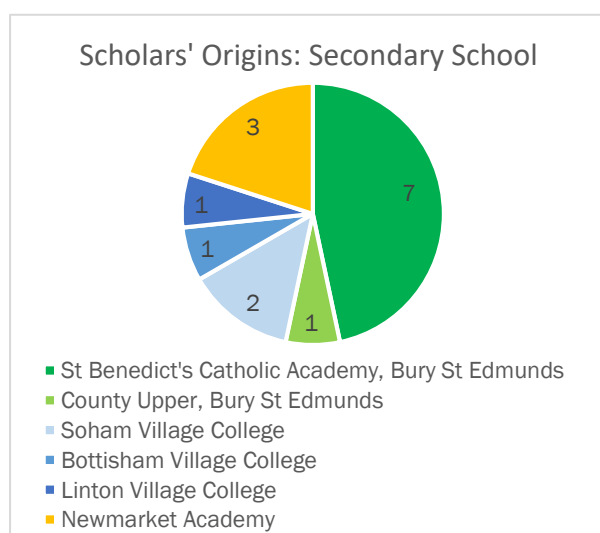
3. Impact

3.1 Community impact

There is no sixth form provision in Newmarket, so it is unsurprising that analysis of Scholars' backgrounds reveals a broadly even split between sixth forms in Bury St Edmunds and Cambridge (shown below in shades of green and blue respectively).



Examination of the secondary schooling of the Scholars shows that 20% were educated in Newmarket (shaded yellow below) and 27% in the Cambridgeshire Village Colleges (shaded blue). St Benedict's Catholic Academy in Bury is consistently producing talented applicants, although the fact that Joshua Evans, our first Bill Tutte Scholar, came from this school may have raised the profile of the Scholarship there. The primary school data shows that just over half (54%) of the Scholars began their education in Newmarket or Exning (yellow shades), while 42% attended village primary schools, half of these being in Suffolk and half in Cambridgeshire (or just over the border in Essex), with just one Scholar coming from a Bury St Edmunds primary school.



This means that the impact of the Bill Tutte Scholarship has been felt throughout the area the Trustees initially targeted (within an 8km/5 mile radius of Newmarket) – children who began their education in villages as well as in the larger towns have benefitted. This is entirely appropriate for a Scholarship in memory of a Mathematician who was born in Newmarket and began his education at Cheveley Village School.

3.2 What our Scholars say

Our five 2022 Scholars are just off to start their university studies; we have a wealth of information from earlier scholars to show the positive impacts of the Scholarship.

3.2.1 Focus on study

"The Scholarship was extremely valuable to me as its financial support allowed me to focus on my studies ... instead of needing to consistently work a part-time job." (Emma)

"Due to the high cost of University, some people are forced into doing part-time work to supplement their loans. This naturally takes time away from studying ... The Scholarship has meant that I have had more time to spend on my studies." (Luke)

"The Trust's support allowed me to fully focus on my studies without financial worry resulting in not only higher marks in exams and assignments, but also a deeper appreciation and love for my subject." (Tom)

"I am able to spend more time studying during my time at uni. This is due to the scholarship as I would have had to spend that time working a job instead." (Blake)

"I would like to thank the trustees of the Bill Tutte Alborada Trust Scholarship; I am very grateful that I have not had to worry about finance and have been able to concentrate on my work." (George)

"Moving out of university halls to private housing naturally caused my living costs to increase somewhat - the scholarship helped both cover these costs." (Joshua)

3.2.2 Health and wellbeing

"In my case, considering I have a severe nut allergy, this has necessitated my being in a Studio - this allows me to have separate cooking facilities. Naturally, this type of accommodation comes with a not insignificant price premium. The Scholarship helps by reducing this premium." (Luke)

"I am less stressed so am able to study better." (Blake)

"I was overjoyed when I found out that I co-won the Bill Tutte Scholarship because it meant that I could afford to buy a MacBook Pro ... I have very bad eyesight and struggle to read if the font is too small and my eyes strain if I read large chunks of text but the macOS software has built in accessibility settings which provides a solution to these problems such as easy enlargement of all documents and webpages and speech controls so the computer will read text out to me if it gets too much for my eyes; all of this makes it much easier for me to do work." (Tia)

"I will be forever thankful to the Bill Tutte Trustees ... As a sufferer of ME/CFS and Anxiety Disorder, pacing energy is a key factor in maintaining good health. I truly believe that the fund has greatly impacted my progression in my degree ... I can manage my time and health to continue with my studies, tutoring and experience in the financial field. I have to make choices fitting to me and my obstacles, and the scholarship has contributed in enabling me to do this". (Adriana)

3.2.3 Equipment

"The Scholarship also enabled me to purchase a new laptop and an external monitor to support my studies, [and] to develop and explore an interest in embedded software (writing software to control electronics) by allowing me to purchase different hardware components." (Emma)

"The scholarship has been valuable to me as I used the money to buy an iPad and Apple Pencil which have made taking notes during lectures and tutorials much easier and quicker. It also allows me to have all my work in one, much more compact place so I always have all my work with me. The iPad is also very helpful for the organisation of all my notes. One further benefit is that my notes are backed up just in case something happens to my iPad, so I can't actually lose my notes which is much safer than them being on paper." (Leo)

"The Bill Tutte Scholarship ... allowed me to purchase a laptop, which made taking notes in lectures and revising from them a lot easier, as well as enabling me to better take part in group coursework

activities, and work more freely and efficiently... course-related textbooks which helped me read around and develop a more solid understanding of the taught concepts. ... web hosting and software subscriptions, as well as ... access to cloud computing and high-performance computing services... Without the help of the Bill Tutte Scholarship, I doubt that I would have been able to access these services as easily." (Joshua)

"The funding goes towards college expenses such as textbooks and teaching materials and is invaluable." Matt

3.2.4 Extended study opportunities

"As well as funding the very start of my Placement Year at Arm, the Scholarship enabled me to purchase a couple of paid online courses (embedded software was not something taught by my degree). This definitely increased my skillset in this area and I believe significantly increased my employability, ultimately leading to the job I do now." (Emma)

"The scholarship boosted my CV and helped me get interviews for companies I could only wish to work at, and the financial support allowed me to travel to these interviews where I managed to secure myself a placement for my Year in Industry." (Tia)

3.2.5 Extra-curricular opportunities

"The scholarship also provided the financial backing to explore many extra-curricular activities that would have otherwise been out of reach, such as joining my university's rowing club or paying the deposit fees for climbing Kilimanjaro - a truly once in a lifetime experience." (Tom)

"The Scholarship ... allowed me to ... spend my spare time making the most of lots of different opportunities (both socially and academic) ... These opportunities include: joining clubs/societies to meet likeminded people (e.g. I joined a walking group and had many day/weekend trips around the South West) [and] participating in events such as coding hackathons." (Emma)

3.3 Promoting Mathematics and Computer Science and encouraging aspiration

3.3.1 Publicising the Scholarship

The award of Scholarships is always featured in the *Newmarket Journal*, to encourage younger students to study these subjects, and to inspire them to aim high.



2015



2017



2018



2020



2021



2022

Photographs courtesy of Newmarket Journal

3.3.2 Scholars' annual reports

To qualify for the next year's payment, Scholars write a short annual report. Part II of this document gives a sample report from each of the ten Scholars who have completed a year or more of their scholarships.

3.3.3 Scholars' prizes, awards and degrees

Joshua Evans:

- *BP Centurion Award*, 2016 (national award for outstanding 1st and 2nd year STEM undergraduates)
- *Netcraft Prize*, University of Bath, 2016
- MComp (Hons), First Class, *Computer Science*, University of Bath, 2019 (First Class in all years)

Emma Rooney:

- *Dean's Commendation* for 'Exceptional Performance', University of Exeter, 2019.
- BSc, First Class, *Computer Science and Mathematics (with Industrial Placement)*, University of Exeter, 2022 (First Class in all years)

Tia Lowman

- BSc (Hons), First Class, *Mathematics and Computer Science with a Year in Industry*, University of Liverpool, 2021 (First Class in all years)

Matt Timmons-Brown:

- *Class Prize in Computer Science*, University of Edinburgh, 2022 (for ranking highest overall over all the years of his degree)
- *JP Morgan Prize*, University of Edinburgh, 2022 (for the highest performance in Year 4 of his degree)
- BSc (Hons), First Class, *Computer Science*, University of Edinburgh, 2022 (First Class in all years)
- *Thouron Award*, University of Pennsylvania, 2022 (highly prestigious scholarship for UK graduates)

Luke Beardsmore:

University of St Andrews:

- *Christopher Strachey Prize* (Best student in *Foundations of Computation* module), 2020-21
- *Deans' List* (grade average above 16.5/20 [First Class]), 2021 (Luke's actual average was 19.3/20)
- *Computer Science Best in Year Prize*, 2021
- *Deans' List* (grade average above 16.5/20 [First Class]), 2022 (Luke's actual average was 18.6/20)

3.3.4 'Passing it on'

The scholarship which Bill Tutte himself won was the foundation for all his subsequent achievements, and so it is fitting to honour him by 'passing on' such an opportunity to the next generation of Mathematicians and Computer Scientists. A number of our Scholars are already using their own time to 'pass on' opportunities to others:

- **Joshua** took on the role of Student Ambassador at the University of Bath, "representing the computer science department at events such as open days and applicant information events".
- **Emma** worked "as a Student Ambassador for Exeter University (which included giving talks and working with school children to promote STEM and the University)".
- **Tia** was Treasurer for the Salsa Society at the University of Liverpool, playing a key role in organising a Liverpool Latin Festival which raised just under £4,000 for Cancer Research UK.
- **Matt** produced a talk giving a student's perspective on getting involved with higher-level robotics, explaining how to secure internships and research experience, which can be accessed here: [Robotics at University & Beyond - PiWars 2021 Talk - YouTube](#)
- **Adriana** is volunteering with Action Tutoring, "helping students facing socio-economic disadvantages further their future opportunities by having a foundation in mathematics."
- **Tom** has taught English to asylum seekers in Coventry for STAR (Student Action for Refugees), and joined the Warwick In Africa Community which works to improve education in Africa.

In addition, the Trustees would like to thank all the Scholars and former Scholars who have so kindly and enthusiastically responded to our request for information for this document, even though they themselves will not benefit from any funding it secures for the Scholarship.

3.4 Scholars' next steps

3.4.1 Destinations for former Scholars

Joshua Evans:

Lecturer (from Feb 2021) and PhD student in Computer Science, University of Bath, researching skill discovery in reinforcement learning (from Sept 2019).

Emma Rooney: Graduate Software Engineer (from August 2021) at *Cambridge Design Partnership*, a technology and design consultancy with clients across the Consumer, Medical, and Industrial sectors; Emma's work involves designing and implementing software for client products.

Tia Lowman: Software Developer at *Entrust*, a cyber security company handling data encryption (from Sept 2021).

Matt Timmons-Brown: Thouron Scholar, studying for a Masters in AI/Robotics at the University of Pennsylvania (from Sept 2022).

3.4.2 Fields of interest and publications

Joshua Evans: *"My primary research interest is developing hierarchical reinforcement learning methods that allow agents to learn useful skills for solving difficult sequential decision problems. I am also interested in the generalisation problem in AI more broadly, with a focus on reinforcement learning."*

Matt Timmons-Brown: Matt's MSE in Artificial Intelligence, Robotics at University of Pennsylvania is focussed on advanced areas of Computer Science and Machine Learning. He has written *Learn Robotics With Raspberry Pi: Build and Code Your Own Moving, Sensing, Thinking Robots*, No Starch Press, 2019

Luke Beardsmore: Final year project: *"I am going to be attempting to optimise the performance of disease epidemic simulations by running them on GPUs. Early experiments suggest it will be possible - so over the year I will hopefully be able to optimise different simulation algorithms."*

3.5 Expressions of gratitude

"Thinking about [the Scholarship] ... reminds me of how grateful I am to the Trust for enabling me to make the most of my time at university, so thank you once again to you all!" (Emma)

"I truly am so grateful ... It helped me live my best life in Liverpool, gain a first in my degree, and secure two jobs, both in the cyber security field. Thank you for everything!" (Tia)

"Thank you for all of the support that the Bill Tutte Trust has given me over the years. The Thouron Award is still administered by the Thouron family - I was interviewed by Rupert Thouron (the grandson of the original founder) - and I am sure you will be interested to hear that he spoke with great interest about my Bill Tutte scholarship and about Tutte's work itself." (Matt)

"Thank you very much for helping to fund my degree." (George)

"Thank you again for continuing to run the Scholarship and I hope that you are able to secure additional funding so that it can benefit more people." (Luke)

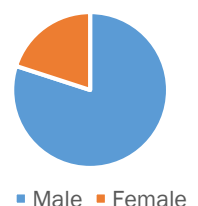
"Thanks again for everything you have all done for me!" (Joshua)

4. Future aims for the Scholarship

Our primary aim at the moment is to arrange more funding, so that we can award more scholarships in the future. In addition, the Trustees would like to address the lower number of female scholars, and also to encourage applicants who have studied at Bill Tutte's former school, in Cheveley.

We will soon be reaching our 10th year, and we would like to organise an annual event, where all our past and present scholars can meet, along with benefactors and younger students who might like to apply for the Scholarship in the future.

Gender of Scholars



Part II

Annual Scholar Reports

A sample report from each of the ten Scholars who have completed a year or more of their Scholarships.

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Thomas Bidewell.....	2nd Year Report.....	20
Adriana Fisher.....	2nd Year Report.....	23
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Leo Saiu-Bell.....	1st Year Report.....	27
George Wood.....	1st Year Report.....	28

Bill Tutte Scholarship Yearly Report 3: Joshua Evans

At the University of Bath, the third year of study presents students with the opportunity to specialise their studies by choosing subjects from a list of optional units – so, this year, I was able to specialise in artificial intelligence (AI), with most of my unit choices being related to AI. Alongside this, a major component of the course, both in terms of time investment and assessment weight, was the undertaking of a year-long research project, which I chose to perform in the AI field of reinforcement learning. In my first semester, I achieved an average grade of 87%, and have achieved an average grade of 91% in the second-semester work which has been marked and returned to me thus far.

Before detailing my year at university in more detail, I think that it is worth mentioning first that last summer I had a summer placement at Sartorius Stedim Biotech, a pharmaceutical company whose UK branch is based in Royston. My work involved migrating a control application for one of their drug manufacturing machines from a purely Android-based solution to the more modern, cross-platform Xamarin platform. The job gave me a great deal of experience in software development, as well as working in a professional environment – I enjoyed my time there very much, and both my supervisors and I believe that the project I contributed to went well.

The research project that I decided to undertake this year, and which I plan to link into my master's year research project, was related to the AI sub-field of Reinforcement Learning (RL), a sub-field which had caught my eye during second year, where it had been introduced as part of the AI unit. All students working on research projects were supervised by an academic from the department, and I was lucky enough to be supervised by Dr Özgür Şimşek, who is one of the leading experts in the field, and who was a very supportive and helpful supervisor. Together, we decided to base my project on a topic known as Hierarchical Reinforcement Learning (HRL), which deals with how an artificially intelligent agent can learn to build up high-level, complex behaviours from lower-level, basic behaviours, and use them to solve problems which are currently difficult for artificially intelligent agents to solve. It's a very active research area and is considered to be a major open problem for the field currently. We recognised that many of the real-world problems which cause problems for artificially intelligent agents are solved very easily and intuitively by people. So, my project, entitled "Using Hierarchical Games to Explore How People Solve Sequential Decision Problems", involved implementing a series of tasks and games which embody interesting aspects of problems which were hard for computers to solve, and then collecting and analysing data about how people approached these tasks. By learning how humans combine basic behaviours into more complex behaviours to solve these problems, we could start to understand how to build artificially intelligent agents which could do the same in the future. We plan to conduct a larger study and perform further data analysis next year, hopefully producing a novel method for complex behaviour discovery and use by HRL agents.

As mentioned, I chose mainly AI-related units this year, but also covered some other branches of computer science such as networking, human-computer interaction, safety-critical computer systems, advanced algorithmic complexity (P-NP problem, NP-Hardness etc.), and quantum computing. The AI units that I studied covered many advanced, often bleeding-edge topics, including multi-agent systems, social simulation, robotics, artificial consciousness and emotion, as well as topics such as the regulation of AI and the ethics surrounding it. There were many overlaps with other areas of computer science, such as human-computer interaction, as well as other subjects such as neuroscience, psychology and sociology, which is natural when you consider the nature of AI.

Notably, under the recommendation of my project supervisor, I was also allowed to take a masters-level unit on reinforcement learning a year early, since it tied into my project and suited my interests well. This advanced unit took a deeper look into the underlying theory and mathematics behind reinforcement learning, as well as giving me plenty of opportunities to apply my knowledge across various coursework assignments and a large project. For the unit's project element (separate from my year-long research project), I decided to replicate/further some results produced by Google DeepMind in 2013, where they taught a machine to learn how to play various Atari games from scratch with only raw pixel value.

My Final Year at University: Emma Rooney

Returning to Exeter after my Industrial Placement to complete the 4th and final year of my degree felt very different compared to previous years, due to the ongoing effects of the Covid-19 pandemic. There would be no in-person lectures, with face-to-face sessions being almost entirely replaced by pre-recorded videos and Zoom calls. Additionally, events and opportunities to socialise were restricted for most of the year. However, I still managed to spend lots of time with friends and made many great memories.

Once again, I took a variety of modules. In Maths I studied Fluid Dynamics (which built upon knowledge gained in my second year) and Theory of Weather and Climate (I really enjoyed studying the real-world application of fluid dynamics and thermodynamics modelling the Earth's natural systems). In Computer Science, I studied Enterprise Computing (which looked at ways in which businesses can architect software and use different techniques to deliver software services more efficiently and reliably), Learning from Data (implementing and comparing the performances of machine learning algorithms on large datasets), and High Performance Computing (how vast numbers of computer processors and memory are aggregated to create extremely high performance systems).

Since this was my final year, I also had to do a Computer Science-based Individual Project. In this, I would work under the guidance of a supervisor to research, design, and implement a software system of my choice. Typically, I chose to develop a prototype wearable Contact Tracing solution with the aim of providing a digital alternative to mobile app-based systems for those without modern smartphones. My design consisted of a BBC Micro:bit microcontroller connected to a WiFi chip and used radio signals to detect other Micro:bits in close proximity to it, storing details of contact events. The wearer could transmit these contact events over WiFi at the press of a button (e.g. in the case of testing positive for an infection) to a Raspberry Pi-based server which stored them in a database. This database was queried daily by all Micro:bits, checking if any of their locally-stored contacts matched those found in the database of positive cases and alerting their wearer if so.

The project had many challenges and considerations, including user privacy and data security, and battery life and memory limitations of the Micro:bit wearables. I found it to be a steep learning curve for multiple reasons: this was the largest project I had attempted up to this point and it had many time constraints, I had no prior experience of reviewing and comparing published academic papers (especially on topics I was still learning the basics of- not light reading!), and I also had very little experience of writing embedded software and interfacing with electronics.

However, it was my own choice to take on an embedded software project and I did so because this was a field I had developed an interest in through exposure on my Placement year. This project showed me just how much I had to learn about this field, and so I purchased additional hardware components and took some online courses (both funded by my Scholarship) to support my personal learning.

Since this was my final year at university, a proportion of the Spring term I dedicated to job hunting. I knew I wanted to work as a Software Engineer, particularly developing embedded devices, so focused my search on this. My choice of Individual Project and self-study ultimately paid off, as it gave me lots of relevant experience to talk about in interviews! I am delighted to say that I have accepted a job as a Graduate Software Engineer at Cambridge Design Partnership- a technology and design consultancy based just outside of Cambridge- and will be starting my new role in August.

Outside of my academic studies, socialising was limited due to the pandemic restrictions. But while larger organised events could not go ahead, I enjoyed lots of time with friends inside my 'bubble' playing games, watching films and TV, and taking walks around the city (discovering many areas of Exeter that we had not explored before!). I also continued to work as a Student Ambassador for the University, delivering virtual presentations and running online Q&A sessions for prospective students.

My final exams this year were all online (and taken at the desk in my university room) and had an open-book policy, though (unfortunately!) all the usual time restrictions were still in place. I sat one

exam per module (5 total) and each consisted of an online exam paper answered through a combination of typed and handwritten work (we had 30 minutes to scan and export the latter to a PDF) submitted at the end of the exam by uploading it to a website.

While the online exams (and online University as a whole) were very different to my previous experience, I am pleased to say that I passed all my modules and overall have achieved a First Class degree in Computer Science and Mathematics from the University of Exeter! I am very proud of what I have achieved and learnt during the past 4 years.

My graduation ceremony has been postponed to Summer 2022, when (hopefully) we can celebrate with a large event and without Covid restrictions.

I have enjoyed my time at University more than I ever could have imagined, and have made many fond memories with some fantastic friends for life. I will miss Exeter, but am already planning my next visit back! However, I am also looking forward to starting my new job in August and am excited to see what the future holds.

I would like to conclude by thanking the Bill Tutte Memorial Fund Trustees for their support during my time at university. The scholarship has enabled me to make the most of every opportunity and I am very grateful for their generosity.



Graduation in Summer 2022

Matthew Timmons-Brown – Bill Tutte Alborada Trust Scholarship – The University of Edinburgh – Year 3 – BSc Computer Science

As another year passes, I am pleased to share with all of the trustees of the Bill Tutte Alborada Trust, that I have completed my penultimate year at the University of Edinburgh studying Computer Science. Year 3 has been a very different year to my previous two, but, despite the pandemic, I have been able to continue the charge ahead in my studies, experiences and more! I feel in a fantastic place for my fourth and final year of my Bachelors (students in Scottish Universities study 4-year undergraduate degrees), and I am looking forward to returning to Edinburgh in September.

Updates from Y2:

Trustees may recall in my report at the end of the last academic year that there were numerous events and activities that had just occurred or were about to. Before delving into my report for the next academic year, I thought it best to start with an update on those:

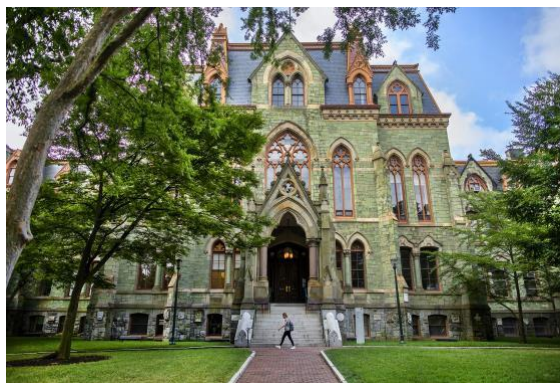
Internship at Amazon Robotics



Over the course of summer 2020 I worked at [Amazon Robotics](#) as a Robotics Software Developer Engineer intern. I described previously that Amazon Robotics is a wholly owned subsidiary of Amazon that is responsible for automating warehouse activities. Amazon uses a fleet of over 200,000 robots to move products and robotic shelving - it was fascinating to gain an insight into what's behind one-day shipping!

The whole of this internship was completed remotely and, while this was quite tough and isolating at points, overall, it was a great experience and I developed both my technical and business skills considerably. As part of my project, I proposed and implemented a novel proof-of-concept project that used machine learning to measure the fullness of the moving robotic shelves. This allows Amazon to vastly improve their inventory understanding, and I was told by senior technical managers that they believed that it could enhance operations performance by 9% compared to previous methods - saving the company over \$80 million per year!

Year Abroad at the University of Pennsylvania



Trustees may recall that last year I was selected by Edinburgh to take part in a prestigious whole-year exchange to the [University of Pennsylvania](#) in the United States. The only Ivy League University that Edinburgh has an exchange agreement with, I was one of three students nominated in my year to attend. Trustees may also recall my disappointment when Penn decided to cancel their exchange programmes back in September. There was tentative hope that, if the COVID-19 situation improved, I would have been able to go to Penn for a single semester exchange between January-May 2021, however this also did not happen.



Exchanges to American Universities are going ahead in the upcoming 2021-22 academic year, however this is somewhat bittersweet as Edinburgh does not permit 4th year students to go on exchange, and consequently I will not be able to attend! I have, however, not let this deter me from my hopes of US-based study - read on to learn more.

Outside my London accommodation for my 2021 summer internship



Academia:

While Edinburgh originally promised that this academic year would be a "hybrid" learning approach - where lectures were online and small group learning was in-person - this turned out to not be the case. Unfortunately, due to the worsening of the pandemic and the particularly hardline restrictions in Scotland, all of the planned in-person teaching elements were cancelled and moved online (Though all of the measures didn't stop me getting COVID back in October!)

While I enjoyed the self-paced element and I am quite an independent learner by nature, the 100% online learning was not without its challenges. Most notably, traditional collaboration, be it with fellow students or with Professors, was a little trickier over Zoom. From the beginning however I decided to just make the most of the situation and lean into the benefits of online University - one of the main perks being extra time that I could utilise in my work in the Robotics Lab (next section).

Overall, I am pleased to share that I achieved First Class grades in all my courses this academic year. In my first semester I undertook studies in a variety of Computer Science areas. For example, one of my courses was *Introductory Machine Learning* (Grade: 80%), which provided a fascinating first look into how we can give [computer systems some form of intelligence](#) - such as recommending movies on a website like Netflix, or inferring conclusions from large amounts of data, such as improving cancer diagnoses. Machine Learning is a cutting-edge field in Computer Science where great advances are being made every day, and one of my key interest areas in my studies.

Operating Systems

University of Edinburgh

Matt Timmons-Brown

3.3.2 Process Termination

Process terminates when it finishes executing its final statement and asks OS to delete it by using the `exit()` syscall. May return a status value to its parent process via the `wait()` syscall. All resources of the process are then deallocated and reclaimed by the OS.

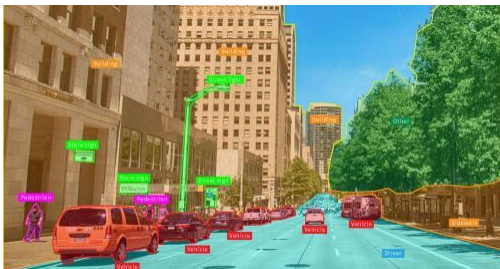
Termination can occur in other circumstances - process can cause termination of another process via a syscall (usually only can be invoked by the parent of the process that is to be terminated, ie if child exceeds usage of resources, task assigned to child is no longer required or if the parent is exiting).

Some systems don't allow child existence if parent is terminated, this is called **cascading termination**.

When process terminates, resources are deallocated by OS, but entry in process table remains until parent calls `wait()`. A process that has been terminated but whose parent has not yet called `wait()` is called a **zombie** process.

If parent does not invoke `wait()` and instead is terminated, it leaves child processes as **orphans**. Unix makes init into their parent, init periodically issues `wait()` to free orphans when they submit their exit status.

Some of the notes that I have written in my Operating Systems course



A traditional Computer Vision problem – semantic segmentation, where each pixel in a frame is classified by what it belongs to (ie: car)

In this semester I also studied *Computer Vision and Robotics* (Grade: 78%), where I learnt about how robots use [cameras to understand](#) and process their environment, as well as how we can use algorithms and advanced techniques to control robotic movement - this tied in well to my ongoing work in the Robotics Lab at University! I also undertook a *Large Informatics Practical* (Grade: 94%) where I programmed software to control the movement of a drone, and a course in *Professional Issues* (Grade: 78%), where I learnt about and researched pertinent ethical questions in the IT industry (culminating in an essay about Chinese technology company [over-work culture](#), where I drew upon my experiences working in China with Huawei in 2019).

After the Christmas break, I studied four more courses in Computer Science. One of these was the *System Design Project* (Grade: 73%) - an infamously difficult course at Edinburgh where students are grouped into teams of 8-10 and tasked with creating a commercially-viable robot that solves some task. I was elected as the Team Leader in my group and we developed **RoboGardener**, a garden robot that could be used to autonomously collect garden debris (such as pine-cones). Like the others, this course was completely online and thus we had to prove our robot concept in simulation rather than building it as in previous years. Managing a team of 7 others, with members distributed across the world from Canada to Japan, was quite challenging, but we ultimately pulled through



My CAD design for RoboGardener – a gardening robot that clears up garden debris

with one of the most commended projects. RoboGardener was judged by industry experts from companies such as Bloomberg and Amazon, and I was delighted that my team was awarded the "Best Use of Artificial Intelligence" by Amazon! Specifically, Amazon was impressed with our machine learning approach to recognising garden debris. You can see the whole project (including presentation videos created by myself) at my team's website here: <https://robogardenerteam.github.io>

In this semester I also undertook interesting courses in *Operating Systems* (Grade: 94%), where I learnt about how computer systems are created and programmed. Of particular interest to the trustees may be my *Computer Security* course (Grade: 89%), where I studied cryptography, code-breaking and the fundamentals of the field that Bill Tutte himself helped to define. It felt like a great honour to be one of his scholars when learning about this specifically.

As this was the third year of my studies at Edinburgh (out of a total of four), this was the first year where my grades will go towards my final degree classification: my third year will count for 50% of my final classification, as will my fourth year. Finishing this year with a very strong First Class (85%) means that I am in great academic standing, and I just need to keep this up for a few more courses to graduate with a high-grade First Class overall!

Robotics Lab:

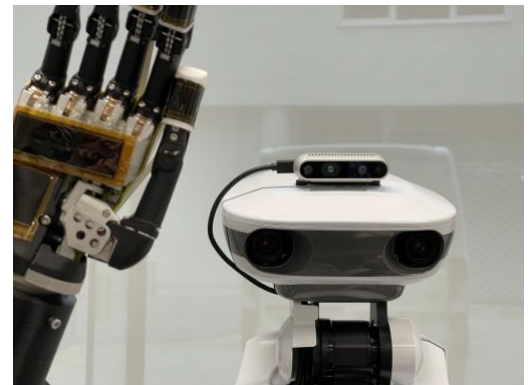


Mounting a robotic hand to one of the Nextage robots

Alongside my studies, I plunged into deeper robotics research work whilst at Edinburgh this year. My previous Bill Tutte reports detail my employment at my University's [SLMC Robotics Lab](#) research group, where I am employed under [Professor Sethu Vijayakumar](#) - a world-leading robotics academic. In my role in the research group, I am responsible for 9 humanoid robots (they have 2 arms, a torso, and head!) called the Nextage robots. In the year prior to this one I created some basic demos with these platforms and spent my time learning about the fundamentals of robotics.

In this academic year, I spent 20+ hours a week working at the lab being a key part of a joint industry project between the manufacturers of the Nextage robot and the University. In this project I worked on enhancing and improving

human-robot interaction through hardware, perception, and motion planning research. I created a system where the robot used its cameras to recognise an object on a moving conveyor belt, pick it up and then place it on a moving robotic shelf. This involved a complex mixture of software and robotic theory, and it was very rewarding to have a complete working demo, that you can watch [here](#) (note this video is not publicly released yet and should not be shared).



In particular, Prof. Vijayakumar was impressed with my work on this project, and my contributions as an undergraduate working with PhDs and post-doctoral researchers. (He even mentioned my work when he was interviewed on a podcast with the politician Ruth Davidson! At 38 mins [here](#)) It is with great excitement therefore, that I will be doing my undergraduate thesis underneath Prof. Vijayakumar's guidance, and I hope to contribute to the advancement of the field of robotics in some small way!

Internship at ARRIVAL:



ARRIVAL Van – an electric van with other 10,000 preorders from UPS and other customers

ARRIVAL



Over the course of Summer 2021 I have been interning in London as a Mobile Robotics Intern for a new and nimble hyper-growth start-up company called [ARRIVAL](#). ARRIVAL is currently revolutionising the commercial electric vehicle space by developing electric vans, buses, Uber cars and more - critically, it is creating these advanced EVs at price parity with their fossil-fuel equivalents.

ARRIVAL only [came out of stealth at the start of 2020](#), but since then have IPO'd and are worth in the region of \$20 billion! Robotics is at the forefront of ARRIVAL's business, with the company developing a new manufacturing paradigm called "microfactories". In these, a mixture of robots are used to assemble vehicles on the spot and in a much smaller factory footprint than in traditional vehicle manufacture. This is the business's unique selling point, and the main reason why they can produce electric vehicles cheaply for the mass commercial market.



ARRIVAL Microfactories – this is where the electric vehicles are manufactured on the same spot

Unlike last year, my whole internship has been in-person in their Kensington office, and this has been fantastic to get an idea of how a mature start-up, especially one in the robotics space, operates. I am privileged to be working with some extremely intelligent people who I am trying to learn from as much as possible. Most notably my manager was hired from [Boston Dynamics](#), the world's most advanced robotics company, to head-up ARRIVAL's robotic pursuits. Everything is under strict non-disclosure, so unfortunately, I cannot share more about what exactly I am working on, but I can tell you that it is exciting, company-critical work!

Year Ahead – Year 4 and finishing at Edinburgh:

As previously mentioned, I have one more year of my bachelor's studies at Edinburgh left before graduating in Summer 2022. In this year I will be returning to Edinburgh with the promise of further "hybrid" learning - the University has confirmed that lectures will still be held online but hopefully I will be able to get at least a little bit of in-person teaching!

A large part of my time this year will be consumed by my undergraduate thesis, but I also intend on taking a wide range of courses from *Computer Graphics* to *Advanced Machine Learning*. Personally, I am also keen to continue learning about and exploring entrepreneurial ideas in my spare time, as well as keeping up my passion for road cycling.

Masters Plans – USA, UK

With my Edinburgh graduation only a year away, I am looking to the future. Currently I am interested in pursuing master's study in Computer Science, and I would like to take the opportunity to do so potentially in the United States, especially since my exchange was cancelled. Masters' programmes in the USA usually last for 1-2 years and are extremely expensive - approximately \$100,000 per year.



With a price tag as dear as this, I could only go with the support of a full tuition scholarship. This summer I have spent considerable time researching American Universities and the full scholarships available to British students (some scholarships, such as [Fulbright](#), only partially cover fees). At time of writing, I have identified a few that I will be applying to in the coming months:

- [University of Pennsylvania Computer Science Masters](#) (2 years) - [Thouron Award](#)
- [Harvard Computational Science and Engineering Masters](#) (1-1.5 years) - [Frank Knox or JFK Scholarship](#)
- [Stanford Computer Science Masters](#) (2 years) - [Knight Hennessy Scholars programme](#)

All these Universities and scholarships are very competitive, and some even include entry exams that I am currently studying for alongside my full-time internship. In addition to American applications, I am also considering applying to Oxford and a few British Universities, though I am particularly keen to get the US experience I missed out on!

Considering the great expense of studying in the US and how competitive the scholarships are that I am looking at, I was wondering if the Trust or any Trustees were aware of any other funding avenues that I have not already considered? Any advice or guidance would be greatly appreciated!

Conclusion

Overall, I am pleased to tick off another great year of my undergraduate degree and can't wait to see what the future will bring. In all of this I am of course deeply grateful for the financial assistance that the Bill Tutte Alborada Trust has been able to provide. The funding goes towards college expenses such as textbooks and teaching materials and is invaluable!

If any trustees or friends of the Trust have questions or would like to chat, please forward my details:

mtimmonsbrown@gmail.com

LinkedIn: <https://www.linkedin.com/in/mtimmonsbrown/>



Bill Tutte Scholarship – Year 2 in Review

My Second year at university has been even better than the first which I didn't think could be possible!

I am so grateful to have won the Bill Tutte scholarship, it has allowed me to say yes to so many more opportunities than I could imagine. The scholarship boosted my CV and helped me get interviews for companies I could only wish to work at, and the financial support allowed me to travel to these interviews where I managed to secure myself a placement for my Year in Industry which is part of my Mathematics and Computer Science course at the University of Liverpool.

I am very proud to say again that I averaged a first in all of my modules at University and I believe the honour that I am representing Bill Tutte and his loved ones had a major part to do with it as I want to do them all proud and try the hardest I can.

Other than the academics, I have also made the most of the social side of university. This year my schedule became a lot busier, as alongside my lectures and completing assignments, I also did 8 hours of dance a week, competed in Ballroom and Latin Dance competitions most weekends and I was the treasurer for both the Dancesport Team (Ballroom and Latin) and for the Salsa Society. Times got very hectic and stressful, but I love to fit as much as I can handle into my schedule because there is no better time than the present to do this. On the salsa society committee, in addition to handling all the finances for our classes and socials, I also had the biggest position in organising our annual Liverpool Latin Festival where we managed to raise just under £4000 for Cancer Research UK; we were all incredible proud of this result as it was over £2000 more than last year and we do it all in honour of our Cuban Salsa teacher Karen who is now finally in remission from Breast Cancer.

As I have mentioned, I love seizing every opportunity possible before it is too late, so I managed to handle my finances very well this year so I could afford to go on two trips with university. In February I went to Lisbon with the Maths Society and at Easter I went skiing in Andorra with LivSnow. These two trips were both such highlights of my year as I could see so many pretty sights, experience new things and make some new friends as I took the brave chance of going on these trips not really knowing anyone going on them. I especially loved the ski trip as I hadn't been skiing for 7 years prior to that and had missed it so much.

This year I have made so many more friends, and bonds I have with the people I met in first year have grown so much stronger. Having good friends around you at university will make the experience so much better as they will be there with you to create amazing memories and they are there to support you if you ever need it; and I am so lucky to have met such amazing people. Another highlight of my year was going with my friends to watch the Champions League Final in our Guild Hall which had the most amazing atmosphere (especially when we scored a goal) as did the city that night after our win (Go Liverpool!!!)

Since the 15th July I have officially become an employee of Ivanti, which is an amazing global company who create software to find solutions for the purpose of unifying IT; I am currently working with an amazing team on creating a new product for the company. Stepping into industry standard work is very challenging but the support here is incredible, so far I have mainly been learning the coding languages we are going to use on our product (mainly C#) and I have created a mini C# project to test my knowledge. I have enjoyed every part of the experience so far and cannot wait for everything I will do and learn in the future.

Bill Tutte Alborada Trust Scholarship Report 2021-2022

Luke Beardsmore, 3rd year, University of St Andrews

In the past year, I completed the third (penultimate) year of a Computer Science degree at St Andrews.

Curriculum

In third year, you take three modules per semester. In addition, a software engineering team project module is spread across the whole year. The team project module accounts for the equivalent of two normal modules worth of credits.

In Scottish degrees, grades attained in third and fourth year are used to determine your final degree classification. Students attaining a credit-weighted average of 16.5 or above over the two years are awarded First Class honours.

First semester

In the first semester, I completed "Logic and Reasoning", "Operating Systems" and "Component Technology".

"Logic and Reasoning" is a theoretical module that introduced us to new proof techniques such as Natural Deduction. In addition, A-Level maths topics such as proof by induction and proof by counterexample were covered in more depth, with a greater focus on their use within Computer Science. In the practical part of the module, we learned how to use Prolog, a programming language that uses a knowledge base to solve problems.

"Operating Systems" follows on from the "Computer Systems" module I completed in Year 2. The focus of this module was on the functions of an operating system kernel and how it interacts with the computer hardware. This included learning how memory management, file storage and scheduling worked. In addition, we were taught how an application can interact with the low-level operating system functions through system calls as well as how to manage multi-threaded or multi-process applications using various concurrency control mechanisms. One of the coursework assignments involved reimplementing a Linux command line utility using system calls and assembly language.

"Component Technology" covers topics relating to how real-life applications can be developed so that ongoing development can occur easily. Many of these topics relate to how applications are developed in large enterprises. We learned about frameworks that facilitate ease of change in an application as well as principles for developing applications in such a way that each individual application component can be changed without affecting other areas of the application.

Second semester

In the second semester, I completed "Computational Complexity", "Databases" and "Data Communications and Networks".

"Computational Complexity" focused on the analysis of programs in order to determine their scalability by looking at how the execution time grows relative to the input size. We learned about the classification of algorithms into categories such as P, NP and NP-Complete based on their asymptotic time complexity and relationships to other algorithms. Concepts such as polyreductions were introduced to show the relationships between problems and the resultant impact on an algorithm's classification. The effects of a discovery of a polynomial time algorithm for an NP problem were discussed. These included the ability for some modern cryptographic techniques to be broken as well as the ability to solve difficult problems such as speech recognition far more effectively.

"Databases" covers topics related to how data can be structured on a computer in a way that it is easy to process and maintain. This involved learning how to create SQL databases and the various ways data can be queried. We also covered how the data within a database can be secured as well as mechanisms for writing functions and procedures that can be executed directly on the database, avoiding the need for application-level logic to be developed. In addition to the practical aspects, we learned the theory behind how data can be stored and indexed. For queries, we learned how they can be represented in relational algebra, and how a query can be rewritten so that it has a lower performance overhead.

"Data Communications and Networks" follows on from the "The Internet and Web: Concepts and Programming" module I completed in Year 2. Topics covered by this module included how to measure the performance of a real-life network and how various commonly used protocols function. We also learned how to design your own protocol both theoretically and practically as well as how networks have evolved and the new technologies that were required for this evolution to take place.

Software Engineering Team Project

The team project aims to give students experience in building a real life application in a small team of four or five. The project this year was to develop an application for reviewing code associated with an academic paper. This involved developing a web application that included the ability to comment on code files as well as a review pipeline to manage the review of a given academic paper's code.

In addition to developing the application, we were required to negotiate a protocol for exchanging information about code submissions with eight other groups. I was responsible for the development of the vast majority of this protocol. This involved defining a specification that other groups could use to implement the functionality as well as assisting with testing and debugging of problems.

This module definitely gave me an insight into how to manage both my group as well as the interactions between the other groups in a way that ensured that a working product was developed.

Attainment

<u>Module</u>	<u>Grade (out of 20)</u>
Logic and Reasoning	17.5
Operating Systems	18.8
Component Technology	19.4
Computational Complexity	17.6
Databases	18.6
Data Communications and Networks	18.0
Group Project	19.3

Prizes and Awards

In the course of the 2021/2022 academic year, I was awarded the following:

Deans' List

Awarded to students who average above 16.5 (First Class) across all modules in the academic year

Tom Bidewell – Bill Tutte Memorial Fund – The University of Warwick – Year 2 – MMath (Integrated Masters)

It is my great pleasure to report back to the trustees of the Bill Tutte Memorial Fund on what has been a fantastic 2nd year studying maths at the University of Warwick. With the easing of covid restrictions, university life has returned almost entirely back to normal, creating a stark contrast between my two years at university. I have thoroughly enjoyed this year both socially as well as academically and have pushed myself well beyond my comfort zone. I am truly grateful for the financial aid the scholarship has provided as many of my extra-curricular activities would not have been a viable opportunity without it.

Academics

This year was definitely a step up mathematically, from the level of content covered in lectures, to the rigour necessary when answering questions, to the language used when discussing topics. Although requiring some getting used to, this step up actually permitted deeper, more meaningful discussions on much more interesting topics. As a result, I have begun to hone into the area of maths that particularly fascinates me. My favourite module this year was *Introduction to Mathematical Biology* which covered models on pandemics, chemical reactions and wildlife conservation to name a few. Covering the Covid-19 model was especially interesting as the lecturer himself is a modeller on the government's SAGE team for combatting the pandemic and so gave us a unique insight into how the government uses these models. For this module I attained 83% and am looking to take modules in this area in the future. I could potentially see myself studying this at masters level, with perhaps a more computational angle on the subject. I also enjoyed the deeper study of Ordinary Differential Equations (ODEs) permitted this year. The module *Theory of ODEs* rigorously explained the background behind the techniques used to solve these equations creating a new-found respect for the subject. With topics discussed in this module relied heavily upon in numerous others this year, I could see clearly the depth and power of this module and despite its difficulty, I attained an average grade of 78%. We also explored these equations in a computational capacity in *Differential Equations: Modelling and Numerics* using python code to model numerical methods for solving differential equations. Being fully assessed by coursework, this module required commitment and good time management resulting in me attaining an average grade of 90%.

Although I preferred the applied modules, much to my surprise I enjoyed and performed well in many of my pure modules as well with average marks of 91% in Algebra 2 which explored group actions, rings and fields (looking at and manipulating certain sets to discover various properties, very pure!) and 86% in Analysis 3 which rigorously covered integration (finding the area under a graph), different types of convergence of certain sequences (for example if the sequence is made up of functions) and complex analysis. This last part has fascinated me for many years, I remember discussing it during my interview for this scholarship! Although covered in its own module in later years, we got a brief overview here, covering topics like the Cauchy-Riemann Equations and Contour Integration which was captivating. I will definitely look to study this further during my time at Warwick.

Overall I attained an average grade of 79.6% which I am particularly happy with. At the start of the year, we were told the 2nd year of the maths course at Warwick is the hardest of the entire degree due to the increase in complexity over such a wide breadth of modules, so I am happy to come out with a strong First putting me in a good position looking forward.

Extra-Curricular

With the easing of covid restrictions, university life truly returned to normal this year with many societies meeting in person. Given the lack of opportunities last year, I made a conscious effort to participate in as many events as possible and consequently have taught English to asylum seekers in Coventry for STAR (Student Action for Refugees); danced at a

ceilidh with Warwick's Folk Society; been to multiple classical music performances in Leamington Spa; and partaken in social events with Warwick's Raising And Giving (RAG) society as well as their French society.

However, the one society I full committed to was rowing. I started at the beginning of the academic year and quickly fell in love with the sport: it's the perfect mix of individual and team sport, pushing you to your physical limits whilst constantly improving your technique as a crew. The entire club was

incredibly welcoming and I have made good friends there. My highlights this year have been *head* races (longer distanced races) in Henley and on the Thames (Head of the River Race) as well as the club's annual ball. Joining the boat club (another name for the Rowing Sports Club) was undoubtedly the best decision I've made so far at university and I will definitely continue rowing throughout the remainder of my degree and beyond. I am particularly grateful for the scholarship as this sport required a fair number of fees (to use/maintain the boat house and for races) as well as buying kit and the scholarship meant I could cover these without worry.



Head Race at Henley in a 4+ (4 rowers with one oar each and a cox). Feb. 2022



Head of the River Race on the Thames in an 8, I'm stroke (the first rower, the one with the white sunglasses). Mar. 2022



The Novice Men (beginner) squad with our captain at ball. Feb. 2022

Summer

Last year, I signed up to climb Kilimanjaro with Warwick's RAG society. After almost two years and various fundraising events raising over £2500, I finally did it! We flew out at the end of June and completed the 6 day trek from the base of the mountain walking through cloud forests, alpine deserts and past glaciers. Parts were definitely challenging: summit night/day involved a 1AM start followed by 17 hour walk up to the peak at 5,895m and then back down to a lower camp which the physical exhaustion combined with the altitude, resulted in genuinely one of the toughest things I've ever had to do! However, our group bonded very quickly and moral was kept high the entire trek, not to mention our amazing guides who supported us the whole journey. The scenery and views were spectacular and I loved every moment of it – a truly once in a lifetime experience. I am immensely

grateful for the financial support provided by the scholarship as this trip, although a charity event, required a lot of funding from the individual from kit to paying for vaccines and visas which would definitely have been a source of worry without the scholarship.



At the summit of Kilimanjaro! Fantastic views but a little chilly! Jul. 2022

Following Kilimanjaro, our travel company offered an extension trip going on a safari and then spending a week in Zanzibar which I decided to take.

The safari was fantastic seeing lions, zebras, and elephants amongst many

others and in Zanzibar we went on numerous excursions such as snorkelling, spice farms and sunset boat cruises. I had a fantastic time and formed strong friendships there, we're having a reunion in November!



Safari in the Ngorongoro crater. Jul. 2022



Post sunset cruise on a beach in Zanzibar! Jul. 2022

I also managed to secure a summer internship as a statistical officer in the Maritime Freight Statistics group of the Department for

Transport for the Civil Service. I was tasked with performing data analysis on congestion at UK ports. As this was a completely new project for the

department, I had to process the dataset myself in order to collect what I needed (a much harder task than would first appear) which involved extensive R and SQL coding. These processed data were then put into PowerBI where I could visualize what was happening. My work culminated in presenting my findings to senior members of the Department for Transport, the Department for International Trade and the Office for National Statistics. I thoroughly enjoyed my time at the Civil Service, the people were welcoming and friendly and there were numerous team bonding events, such as Sports Days or whole departmental evening drinks, which were not only fun but allowed me to discover how people truly felt about working there – all positive! As a result, I will now definitely consider the Civil Service when applying for jobs during my final year at Warwick. This internship was particularly valuable as although I had some experience with R, I now feel confident in my coding ability for both R and SQL as well as using PowerBI, a tool I had practically no experience with. This will be especially useful when applying for future internships and jobs.

Summary

There could not be more of a difference between my first and second years at university. This year I finally felt what university really should be from the in-person lectures to the societal meets to the sports clubs actually competing against other universities. I thoroughly enjoyed the year and am looking forward to returning to Warwick after my year abroad studying maths in Paris. I recently moved to the city and I cannot wait for term to start! The scholarship has been incredibly useful this year allowing me to pursue rowing as well as purchase gear, visas and vaccines for Kilimanjaro. It will be especially useful in the year to come as just living in Paris is already looking to be expensive, let alone my commute to university and extra-curricular activities. I look forward to writing to you next year with hopefully even more stories from another exciting year!

ANNUAL REPORT

ADRIANA
FISHER



**Mathematics BSc
Undergraduate**

**University of
Bristol**

Year Two

My second year saw some changes to the system of teaching. Although a lot of teaching, lectures, and workshops remained virtual, the progression back into more interactive teaching began. The assessing for this year consisted of an in person timed examination, and coursework.

I faced some challenges; since I sat my GCSE at home, my A Levels were affected by Covid-19, and university exams last year were online, this was my first in person examination since SATs. I had to manage my ME and anxiety, and focus, in order to overcome this obstacle for me. I sat the exam, and achieved 78% in my coursework for this year.

This year, I felt transferring to a Mathematics BSc would be a better fit for me and my objectives. Although I still have an interest in exploring physics modules as part of my optional unit choices, I have transferred to single honours mathematics. I have found myself enjoying and succeeding most in the mathematic modules on my joint honours course. Since before applying for university, I've had a focused ambition to work in the financial sector, so the mathematics course would still allow me to pursue this, if not focus on financial modules more. However, I believe the transfer is more suited to my interests and ambitions, as my enthusiasm and results in the mathematics modules have been stronger. I can still explore physics modules, while focussing more on mathematics.



**ACTION
TUTORING**
infinite potential

Outside of university, I have been able to continue to volunteer with Action tutoring, helping students facing socio-economic disadvantages further their future opportunities by having a foundation in mathematics. Mathematics is fundamental and teaching is something everyone should have access to. Action Tutoring aims to unlock the potential of children and young people who are facing disadvantage.

Additionally, I began to expand my experience in the financial sector, by enrolling on a Book keeping and Accounting course. From this I will obtain an AAT Foundation certificate, which will contribute to my knowledge of the financial sector.

I am extremely grateful for the Bill Tutte Alborada Trust Scholarship; I can manage my time and health to continue with my studies, tutoring and experience in the financial field. I have to make choices fitting to me and my obstacles, and the scholarship has contributed in enabling me to do this.

My focus is to further explore mathematics and complete my degree. My ambition continues to be a career in finance and the actuarial sector.



Report for Bill Tutte Scholarship

Blake McAdam – July 2022

I have just completed the first year of my BSc Mathematics degree at York University. The year consisted of six modules: applied mathematics, statistics, maths skills, real analysis, calculus and algebra. For each module there was a minimum of fortnightly homework which counted for 5% of the final grade. I did my end of year exams in the summer and I achieved a 2:1 overall. I have enjoyed my first year so much that I am considering whether to convert onto the integrated Masters course or do a Masters at the end of my current degree.

Maths Skills (end of year exam result: 1st)

This consisted of three main parts – a group project followed by a presentation on the project, as well as an end of year exam. My group chose to do our project on chaos and randomness because there are a lot of interesting sub topics to explore like the Lorenz system, entropy and fractals. I did my part of the report on quantum theory and tried to show how probability arises in quantum theory. I included real life examples - from as basic as the double slit experiment to as complex as why it is impossible to identify an electron's momentum and position accurately at the same time. We each presented our sections to two supervisors and 12 of our peers, followed by a question and answer session on our topics. The end of year exam was on methods of work such as hypothesis tests which fed into the other modules so that we had a good understanding of the methods.

Statistics (end of year exam result: 2:1)

This was only taught for the first term and we learned how to use RStudio. There were lessons every week where we learned how to code then had homework where we applied what we learned. Using RStudio instead of writing the calculations made it a lot easier get the answers for complex probability questions because it is clearer to see what you are doing and there is less chance of mistakes.

Real analysis (end of year exam result: 2:1)

Real analysis introduced me to a new way of thinking and covered an introduction to axioms which are the ground rules of mathematics which everything is built off. This was one of the most difficult modules to do because I had never done anything like it before. It involved writing maths in more formal manner and explaining certain more complicated solutions in sentences rather than calculations to prove answers to questions.

Applied Mathematics (end of year exam result: 1st)

This module was divided into 2 parts:

Part 1 was elements of Newtonian mechanics – this included problems like finding equilibrium points given an equation in the potential energy and whether they are stable or not. This could be done by differentiating the potential.

Part 2 was mathematical modelling which covered four topics – dimensional analysis, growth and decay, coupled systems and partial differential equations.

The topic that I found the most interesting was coupled systems where we studied the oversimplified predator-prey system. This is the relationship between predator and prey. When the numbers of prey increase the number of predators will follow the trend upwards. Then as there are more predators more prey is being killed so the numbers drop. This means there is less food so less predators survive and their numbers drop. Less predators means less animals to eat the prey so the numbers go up again. This cycle repeats.

Calculus (end of year exam result: 2:2)

In this module, I learned about maximal domains, algebra of limits, continuity, l'Hopital's rule and the mean value theorem, as well as doing more complex derivatives and integrals. This was an extension of my knowledge from A Level. We started with simple integrals like one-sided limits and progressed onto harder things which challenged me like differential equations with integrating factors.

Algebra (end of year exam result: 2:1)

In algebra we learned about different ways to manipulate equations. One of these methods was row manipulation in which a matrix is manipulated in three ways: switching rows, adding rows or multiplying a row by a number. This simplifies the matrix which lets you solve the determinant.

Bill Tutte Scholarship Year One Report by Leo Saiu-Bell

I have successfully completed my first year of studying mathematics at University College London.

All the modules I have taken in my first year have been mandatory - Analysis 1, Algebra 1, Applied Mathematics, Mathematical Methods 1, Analysis 1, Algebra 2, Newtonian Mechanics, Mathematical Methods 2.

In Analysis 1 I learnt about sequences and series, continuity and differentiability. In Analysis 2 I learnt about sequences and series in further detail, and developed the theory of integration.

In the Algebra 1 and Algebra 2 modules I studied logic, sets, functions, permutations, fields, determinants, and matrices. Logic was my favourite topic in Algebra because I found that it is very applicable to many of my other modules – particularly analysis – as it is very useful for forming arguments in proofs. I'd covered parts of the matrices topic in sixth form so it was very interesting to go back to it and I noticed a few small details that I'd missed the first time I studied it.

In Applied Mathematics and Newtonian Mechanics I learnt about waves and oscillations; we covered partial differential equations for the first time - this was while solving the wave equation which was very interesting. The Newtonian Mechanics topics were largely topics I'd covered in sixth form: force, torque, momentum, and energy, but in much greater detail. For me, these were the most challenging modules as we were building on ideas we'd already started to develop so we went into more depth than we did in the other modules.

The Mathematical Methods modules were my favourite. In Mathematical Methods 1 we covered vectors, complex numbers, methods of integration, ordinary differential equations, and probability, though there was nothing new introduced in probability that I hadn't already covered in sixth form. In Mathematical Methods 2 I studied computer programming for the first time, specifically Python. I really enjoyed this topic despite it being relatively basic as it clearly has a lot of very important applications. We also learnt about multivariable calculus which I also thoroughly enjoyed - this was probably my favourite topic of the whole year.

I recently chose four out of eight of the modules which I will be taking in my second year. I have chosen Analysis 4 as it is a very important module for being able to take more modules in third and fourth years, specifically probability and statistics modules which I intend to take when the time comes. I have chosen Probability and Statistics as this is my favourite mathematical topic. I am very much looking forward to studying the Probability and Statistics module as this will be the first time I will have the opportunity to study these topics in more depth than I have done in sixth form. I have chosen Computational Methods and Mathematical Methods 4 as my third and fourth modules as, much like Analysis 4, they are very important modules for allowing me to take more specific modules in third and fourth year.

Overall I have really enjoyed my first year at university, I have found it challenging but very interesting, and I am very much looking forward to my second year.

Bill Tutte Alborada Trust Scholarship Annual Report

George Wood

I have recently finished my first year studying Mathematics and Computer Science at Jesus College, Oxford University. This report describes my experiences throughout the year.

The first two modules I studied this year were 'Introduction to University Maths' and 'Introduction to Complex Numbers', during week 0 and week 1 of Michaelmas Term.

The modules I studied for the rest of Michaelmas Term were:



The view from the staircase to my room

- **Analysis I** – formally defines the real numbers and their properties, formally defines sequences and series, and proves several results about convergence of sequences and series.
- **Linear Algebra I** – covers the basics of matrix algebra and introduces the notion of a vector space. (A vector space over a field is a set of 'vectors' together with a vector addition operation and a scalar multiplication operation, with the expected properties.)
- **Probability** – formally defines random variables and introduces the tools to work with them.
- **Functional Programming** – introduces the Haskell programming language. A functional language is one where a program is viewed as a collection of mathematical functions, which makes it easier to reason mathematically about the program.

Most of the lectures this term took place online due to Covid restrictions.

In Hilary Term, the modules I studied were:

- **Imperative Programming part 1** – introduces the Scala programming language and the idea of loop invariants, which are helpful in proving correctness of a program involving loops
- **Imperative Programming part 2** – introduces the idea of abstract data types.
- **Continuous Mathematics** – covers the calculus that is required for Computer Science, such as multivariate calculus and numerical methods for optimisation.
- **Analysis II** – involves working with functions of the real numbers with the object of defining the derivative of a function and proving several properties of differentiation.
- **Linear Algebra II** – involves defining the determinant of a matrix as well as eigenvalues and eigenvectors.
- **Groups and Group Actions** – defines a group, a set of objects together with a binary operation on them that is associative and has an identity (e.g., 0 for addition) and inverses (e.g., negative numbers for addition). The first half of this module took place in Hilary Term and the second half took place in Trinity Term.

The lectures this term mostly took place in person, with the exception being the Continuous Mathematics lectures as the lecturer was on sabbatical.

In the first half of Trinity Term, the modules I studied were (as well as the second half of Groups and Group Actions):

- **Imperative Programming part 3** – introduces Object-Oriented Programming, which involves building a program from interactions between objects, which are constructs that store data about their state and operations that can be performed on them.
- **Analysis III** – involves formally defining integration of a real valued function and proving some of its properties.

The rest of the term was spent revising for the exams which took place in weeks 8 and 9. I was particularly pleased with the Imperative Programming exam. I also achieved a distinction for the practicals that I did throughout the year.

I spent a great deal of my time in my room this year. This was at least partly because I caught Covid at the start of Michaelmas Term so had to self-isolate during the end of week 0 and week 1. There were some benefits to Covid. For example, although most of the lectures took place in person from Hilary Term onwards, they were also available online. In most cases, I attended the in-person lectures in the Mathematics and Computer Science departments, but for Analysis III, I found that they went too fast for me to keep up with my notes, so the lectures being available online was really helpful.



In my room with the bastion wall behind me

Most of my time was spent either working or relaxing in my room, although I also joined the Oxford Doctor Who Society during Trinity Term. It was no hardship to spend so much time in my room because I had a very good room in the Ship Street Centre right next to college this year. Interestingly, some of the walls of my room were actually part of a bastion from the Oxford city walls, and date back to the 12th Century. I even had my own Tudor fireplace – not functional of course!

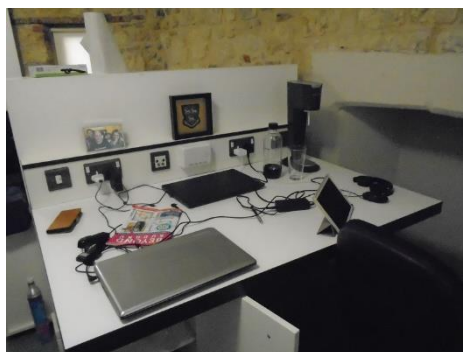
I would like to thank the trustees of the Bill Tutte Alborada Trust Scholarship; I am very grateful that I have not had to worry about finance and have been able to concentrate on my work this year.

I am very much looking forward to my second year.

George Wood,
1st August 2022



Breakfast in Hall



My desk



Outside my corridor in Ship Street

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Report to	Finance & Policy Committee
Subject	Funding request
Purpose	Decision
Classification	Unrestricted
Meeting date	17th July 2023
Item number	14
Written By	Cathy Whitaker CLERK

Summary: This report outlines information regarding a request for the Committee to consider annual funding to the Bill Tutte Scholarship fund. It should be read in conjunction with the emailed document 'Bill Tutte Alborada Trust Scholarship'.

1.	Introduction
a.	The emailed document gives full information regarding the Bill Tutte memorial, the scholarship and its funding.
b.	Scholarships are considered annually for A level students to fund each student at £1,000 per year for three years at university.
2.	Context
a.	Sponsorship is being sought to be able to continue funding students at university in this way.
3.	Proposal/Options
a.	Newmarket Town Council to sponsor the scholarship fund annually at £1,000.
4.	Financial/Resource Implications
a.	Current year budget – vire £1,000 from Grants 4076/101 in the F&P Committee budget to a new account code – 'Bill Tutte Scholarship sponsorship'
b.	Subsequent year budgets - £1,000 to be incorporated into the onward annual budgeting process.
5.	Next Steps/Recommendations
a.	Recommendation to FTC that NTC sponsor the Bille Tutte Alborada Trust Scholarship annually at £1,000 per annum.

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