

ACS STEM NEWSLETTER

Issue: February 2024

Oxford University Computing Challenge

January - February

“I took part in the OUCC (Oxford University Computing Challenge) as a follow-on round to the Intermediate Bebras Challenge. I enjoyed taking part, as it was a new experience and learned new things. I liked the fact that it was designed to challenge us and required problem-solving skills. The challenge definitely benefited all the participants, as we got to learn aspects of coding we hadn't known before. It was a great experience and I'm sure we all felt pleased knowing that we qualified for this next round and took part in something we had never done before.” (Swati, Year 9)

“When I was asked by Miss Kerai to take part in the Bebras challenge, I started investigating to find out more about the challenge, which is a combination of mathematics and coding. It seemed interesting, so I decided to take part. After achieving the gold award on Bebras, I was asked to move onto the next stage: OUCC (Oxford University Computing Challenge). In preparing for the challenges, I improved greatly on my coding knowledge and thinking outside the box. Although I was nervous in the beginning, it was a great achievement and I am very happy that I took part, and I'm looking forward to participating again next year!” (Vrishab, Year 7)

Intermediate Maths Challenge

January - February

“Taking part in the IMC (the Intermediate Maths Challenge) was a wonderful experience; not only does it hone your maths and logical reasoning skills, but it generally helps in the standardized maths problems you may get in class, since it allows you to perceive each equation in a number of different ways, which in some cases might be different from the ways teachers approach it in the classroom.

The experience was really interesting overall, and it gives you a sense of excitement seeing your answers pop up in the multiple choice; along with that moment of joy, it also encourages you to answer the rest of the questions and boosts your motivation, which could be applied to many other subjects. I'm glad I took part in the challenge and I think it really pays off.” (Student, Y10)

"The Intermediate maths challenge was a rare and exiting experience to take part in. It's an opportunity to expand your knowledge in ways that you can't even imagine. Before taking part in the challenge, I did not know what a hypotenuse was, but now I can confidently say it's the longest side of a right-angled triangle. The challenge not only helps you expand your knowledge, but it's also an experience that doesn't come around so often and I am very grateful to have been a part of it. I won't mind if I don't get a reward; I'm glad I was able to participate and do my best."
(Student, Year 9)

"Participating in the Intermediate Maths Challenge throughout the years I have been at Alperton has been a rewarding experience. Although the challenge is tough, it fuels my determination to improve. The challenge in itself has numerous benefits – it has not only sharpened my mathematical abilities, but has also taught me patience and resilience. I am truly grateful that our school is committed to making sure we grow in every way, by providing us with challenges such as this."
(Wajiha, Year 9)

Nuclear Loan kit

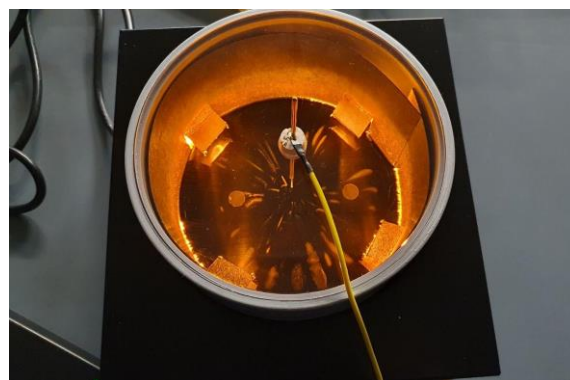
01/02/24

Our science teacher Dr Mahmood has secured a loan deal from the University of York for our school to teach nuclear physics. As part of the loan kit we have a nuclear chart at our Stanley Avenue school made from LEGO blocks that can be seen during break and lunchtime. We also have a dice, Geiger counter and cloud chamber (an instrument that cost over £800). The loan will allow us to keep the kit until the end of this term. The kit has been used to teach radioactivity to Year 10 and Year 11 students and required practical for our A level physics students. The kit has also been secured for the next academic year.



This model is a 3D representation of the stability of the known isotopes of the first ten elements of the periodic table.

The different colours of the LEGO bricks and towers represents the decay mode of the isotope, and the height represents the mass excess per nucleon of the isotope, relative to that of iron-56.



The cloud chamber can be used to view high energy alpha particles, lower energy beta particles, and electrons produced by gamma rays interacting with gas molecules.

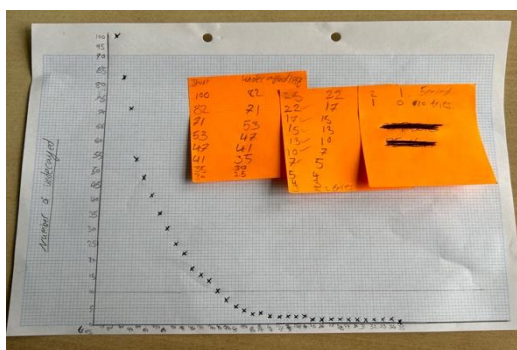
As you look into a cloud chamber, you can see the tracks of electrically charged particles as they pass through the chamber.

Many substances are radioactive and emit these charged particles that travel through the air until they are absorbed. A cloud chamber is a good way to show this radiation, as well as the radiation that is present in our environment (background radiation).



The Geiger Counter is used to detect and measure ionising radiation with audible clicks for each ionising event detected. We can see the Geiger Counter on the left displaying the counts coming from the mineral rock sample. **(Dr Mahmoud)**

Students' experience with the kit
01/01/24



**Translating it into
Physics (Half-life)**

“In my STEM activities, I have learned various ways to use random objects, such as dice, to recreate scientific concepts. One topic I was interested in was the alpha decaying or half-life, where I used 100 dice and a table to show how many tries it took for all 100 dice to roll a 6. If it rolled a six, it was decayed and was removed from the total amount on the table. During this activity what I enjoyed the most was learning about how atoms react when they lose electrons in the radiation they give off to give shells of electrons a stable arrangement. I enjoyed doing this task and plotting it into a scatter graph to clearly explain the definition of half-life. The concept is rather complex and since half-

life is about half of the life of the original life, it relates to the number of radioactivity nuclei in a sample, the time it takes and the activity to fall to half of its original value. By doing this activity I was able to see that it was a rather simple topic to understand when using a graph, which allowed us to see the activity of radioisotopes decaying per second. This activity will be really helpful for my work experience at NPL for science and engineering.” **(Yug, Year10)**



Enrichment

Physics and Biology Olympiad

02/02/24-04/02/24

Year 12 Biology

“Before taking the biology Olympiad my knowledge was restricted within the curriculum. Taking this competition made me realise that there are many more aspects of biology to be explored and understood. These aspects consist of using statistical methods to obtain data for biological research for topics like migration (that lies under the broad unit of the ecosystem), or how different factors affect the appearance of animals and how different animals have different mechanisms and responses to their environment. This concept was indirectly

taught through a question regarding how certain environments affect the appearance of lizards, a type of reptile. Although we had to be independent, I was able to answer the question through my previous knowledge of the topic.

There were many elements of thrill and enjoyment in this competition whilst answering both familiar and unfamiliar questions. Some of the unfamiliar ones contained unfamiliar formulas and keywords. These are now being covered in class, and because I had already come across them, I am now able to remember the keyword and concept behind it, as the questions were a form of active recall. Biology hasn't always been my favourite subject, but because of this competition, it has challenged me to expand my knowledge outside the curriculum and truly love biology for what it is, which is not only about the substances we are made of or the interactions we have with the environment, but also about what we encounter within our daily lives - it can be found everywhere and anywhere. Due to this competition my curiosity for biology has further expanded and amplified my passion and aspiration for this subject". **(Year 12, Biology Student)**

"The biology Olympiad consisted of two exams, each lasting 1 hour and 45 minutes. The exams primarily consisted of multiple-choice questions that covered various aspects of biology, including human, animal, and plant biology. Additionally, there were calculation questions that required a high level of skill and concentration to solve. The exam, however, was designed according to our curriculum, and some of the questions were familiar to us from our classroom learning. Personally, I found the questions related to the human body particularly interesting, as this is the area of biology that captivates me the most. Overall, the test was quite challenging, and additional reading outside the classroom is beneficial. Nevertheless, it was a rewarding

experience, and I actually found it quite enjoyable to complete. I hope to achieve the gold award, as I believe I performed well on both papers. However, ultimately, what matters most is the participation and effort put forth. I would like to express my gratitude to the science department for providing us with this incredible opportunity." **(Ahmed, Year 12)**

Year 11 Physics and Biology

Last week, I was fortunate enough to be able to participate in both the Physics Olympiad and Biology Olympiad at our school. I was extremely delighted to be given the opportunity to apply my current knowledge of Physics to more challenging questions, as it allowed me to apply and develop my scientific skills in different scenarios. Moreover, I found that it was quite helpful as it enabled me to identify a few gaps in my understanding of the subject, which I'm very thankful for, and it was extremely beneficial for my revision.

In terms of the Biology Olympiad, the questions were much more challenging; however, I tried my best to answer them by using logical reasoning.

The two Olympiads have most certainly offered me a valuable experience and I appreciate it we were able to do them at our school. Irrespective of the award I will receive, I believe that being able to participate is a worthy reward in itself. The Olympiads have sparked my passion for the world of science, and was quite useful for me, as I am keen on pursuing a career in STEM. **(Najiha, Year 11)**

"Participating in the Physics Olympiad has left a lasting impact on me, as I am particularly interested in Physics. The Olympiad tested our knowledge on topics that we were taught over the past two years and was a great problem-solving activity for my GCSEs. It consisted of

challenging problems as well as questions on general knowledge about physics-related topics, therefore being highly rewarding for students who have a strong interest in Physics. Being presented with new and complex problems further encouraged me to reflect on these topics, helping me to learn and grow. What I liked most about the challenge is that regardless

of the result, one will always benefit from the experience and better understand the importance of physics. Overall, taking part in this challenge made me feel more confident in my abilities, and I hope more students will continue to take part in these enrichment activities to expand their knowledge and interest in the subject. (Ankul, Year 11)

Physics Review Magazine

03/02/24

"Our school has been collaborating with the Physics Review Magazine and the University of York to review monthly physics research articles. This opportunity will help us, as teachers, to enrich our expertise and continue to keep up to date with the latest advancement in the field of physics, and will also benefit our students, by showing them how research is communicated. Both teachers and students will have the opportunity to review the articles and inform the authors of their opinion." **Dr Mahmoud**

Review for this month article:

"*Michelson's Stellar Interferometer*: Ron Holt and *The Physics Review Magazine*

Who doesn't love finding treasure? Opening a chest and seeing a sparkling array of gold. Well, you need to only look up at the night sky to see the universe's treasure chest of shiny objects, with the king of the trove being the famous Betelgeuse red giant star. This is what Physicist Ron Holt explores in his article *Michelson's Stellar Interferometer* and how a concept known as optical interferometry was used to determine the angular diameter of this burning ball of helium. Holt's study is a fascinating exploration of the intricacies of Astrophysics, putting into perspective just how mystical the uncharted map of the

universe is. So much so that *The Physics Review* magazine seeks to include this article in their next edition, and sought the feedback of the student body in response to whether this would be a suitable addition. Let the treasure speak for itself." (Tariq, Yr12)

STEM Clubs & Activities

10/02/24

"All students are encouraged to take part in extracurricular and enrichment activities. Some of these activities are focussed on STEM, which stands for Science, Technology, Engineering and Maths.

During one of these STEM workshops, we performed an experiment to test for hydrogen(H), oxygen(O) and carbon dioxide(CO₂). To test if hydrogen is present in a test tube, a lighted splint can be held near its mouth to see if it ignites. To test for oxygen, we can take a glowing splint and place it in a sample of gas - if it re-ignites the gas is oxygen. To test for carbon dioxide, we need to bubble the gas through limewater and check if the limewater turns milky or cloudy white.

Physics Club

As part of our STEM enrichment, our science teacher Dr Mahmoud has arranged a Physics Club for students to take part in practicals, debates and demonstrations. It will take place during lunchtime in E320 from 13:40-14:10 on 28th February, 13th March and 27th March.

The Oxford University Computing Challenge

Over the week of 16th January, the OUCC (The Oxford University Computing Challenge) challenge took place. This was a challenge to encourage students to develop their skills and produce programmed solutions to computational thinking problems. **“(Mathushika, Year 8)”**

Trip to QMUL - Yr12 Physics and Chemistry students, and Yr11 Triple Science students

14/02/24

“On 14 February, we had the opportunity to visit Queen Mary University and attended physics and chemistry masterclasses in which we learnt about the different careers that chemistry and physics lead to. We also had the chance to see how university life is for students who study physics or chemistry and learned more about their lab work and research.”
(Student, Yr 11)

“Overall, the trip was well rounded and would benefit anyone studying STEM and thinking of taking a Research Degree. During both the physics and chemistry masterclasses we expanded our knowledge in a way which doesn't just answer a

question on a test paper, but provided us with insight into research and how equipment is used in an actual "work" or real-life application environment. Additionally, this experience revealed how all sciences are interconnected and can't be considered separately as just Physics, Chemistry, or Biology. They all work together, taking ideas and research from each field to expand the technology and knowledge in another, such as waves and the idea of oscillations, which are not only used in Physics, but also in Chemistry to explain the movement of nuclei and particles.”

(Tomasz, Year 12)



“I enjoyed the trip to QMUL as it was extremely beneficial in seeing how university life is like for students studying science, and I found the trip educational as well as fun. I would definitely recommend this trip to any students interested in pursuing science and going to university. We started the day with a masterclass session on Spectroscopy which was very enjoyable as we had the opportunity to learn new things which

were connected to what we had studied in class. Additionally, we were able to visit a science lab where university students were working on projects - this was really interesting to see. We also had a short tour of the campus, and found out what the different buildings were used

for, and lastly, we received another masterclass in a lecture room. I would like to thank all of the teachers who planned this amazing trip, as for the first time we had the chance to see what university life is like. I would recommend it to any student, as it will be an experience that you will always remember.” **(Student, Year 11)**.

I was greatly charmed by Dr. Anthony E Philips’s lecture. He simply light up the room and made the lecture very engaging. He was able to condense all the information from his research into a digestible and easy-to-understand format, making his teaching accessible to both A-Level Chemistry and A-Level Physics students. It was this easy-to-understand format that made the content of his presentation so intriguing to me and sparked an interest in wanting to learn more about energy scavenging and caloric materials. The trip was exceptionally insightful when it came to the fundamentals of PhD-level research and allowed us to take a peek into the multifaceted nature of the field of science. We came to understand the overlapping nature of the sciences (biology, chemistry, and physics), as in practice, you cannot really compartmentalise the fields. Additionally, I was quite impressed by the succinct presentation Dr. Anthony E. Philips held on material physics, as it efficiently and

engagingly broke down the crux of his research – an alternative, practical way of cooling objects through the interchanging of the properties of caloric material and phase change materials. Along with this, the sheer size of the campus added to the inviting feel of the university’s brandishing buildings, specifically made for each science department and the different branches of research, providing a feel similar to the Chocolate Factory from *Charlie and the Chocolate Factory*. Despite the fact that we were unable to have a tour of the lab, as it was in use, we were able to gain insight into what it takes to operate and maintain a lab, with the level of automation being quite astounding. Based on the masterclass we participated in, I have personally been pushed to research topics such as spallation or energy-scavenging material, and as a result, I would most definitely recommend this experience to others, as it has been quite inspiring. **(Student, Year 12)**

“The trip was very immersive and interactive and definitely made me see chemistry in a different light, as the masterclasses provided a deep insight into topics beyond the specification. It has also made me consider a career in scientific research, now that I have learned more about the different branches and facilities.” **(Amiro, Year 12)**

“The trip to Queen Mary university was packed with knowledge, enjoyment and meaning. As a year 11 student, being able to go made me feel honoured and grateful for the opportunities our school has in store for us. The trip left a lasting impression on me, as I was able to gain a better understanding of A-levels physics and chemistry, as well as knowledge of what lies ahead of us after A-levels. It was undoubtedly such a rewarding trip, helping me organise my thoughts regarding my future career. The trip inspired me and I

think I finally understood Dr Mahmoud's words, that "It is the experience that matters most, not the result". I deeply express my gratitude towards Mr Oliviera and Dr Mahmoud for setting up such a helpful trip.” **(Iqra, Year 11)**

“The trip was very useful and informative, and what inspired me most was Dr Mahmoud’s expertise and enthusiasm, which made the experience even more worthwhile.” **(Muneeb, Year 12)**

Physics and Biology Olympiads results released

15/02/24



Intermediate Physics Olympiad Jan-Feb 2024 Results

Between 29 of January - 2 February, 91 of our Year 8 to Year 11 students took part in the Intermediate Physics Challenge. The results have been released and as a school we did really well, just as we did in the Astro Olympiad Competition run last autumn. Please see below a breakdown of our results:

Gold Award - 5 students: Ankul , Kunal, Neev, Suliman, Raj

Silver Award - 20 students: Najiha, Iqra, Nikola, Ashvathan, Sarah, Milan Patel, Georgiana, Mudrika, Jasmine, Oliwier, Jankita, Yashica, Ayaan, Albatool, Urvi, Kyshani, Eesa, Komal, Kai

Bronze - 46 students

Commendation - 20 students



British Biology Olympiad Jan-Feb 2024 Results

Between 29 January - 8 February, 33 students took part in the British Biology Olympiad. The results have been released and as a school we did really well. Please see below a breakdown of the results:

3 Bronze (Safa, Muntas, Yaqub)

8 Highly Commended

8 Commended

14 Participation

Overall our pupils have done really well in both the Physics Intermediate Challenge and British Biology Olympiad and participation in itself is a success. Students took part in a problem-solving activity and sat an online test taken by many of the top-achieving students in the UK. Congratulations to everyone who took part in this amazing enrichment opportunity.

(Dr Mahmoud)

STEM Potential program run by Imperial College

16/02/24

For individuals who are interested in a STEM career, the Imperial College's STEM potential programme is a fantastic experience. I've met some amazing people during the programme, and I can see myself pursuing my university education on campus. It is well worth making the trip to Imperial College for the workshops and exciting experiments they offer. First, we had a tour of the campus, and then in the chemistry workshop, we did a practical on bath bombs which consisted of citric acid and bicarbonate soda. Maths proved to be as equally fun, as we explored geometry and topology, constructing paper modules of planes. Without a doubt, I wholeheartedly encourage any year 10 students to take part in this programme!
(Amani, Year 10)

Google Classrooms group for Year 7 to Year 13 students, dedicated to STEM only

18/02/24

ACS STEM is an important part of your journey as a student from year 7 all the way to year 13. Most of you would have noticed that there is a new Google Classroom class you have been added to before half term, titled STEM, with the relevant year group (STEM-Yr7, STEM-Yr8, STEM-Yr9, STEM-Yr10, STEM-Yr11, STEM-Yr12, and STEM-Yr13). This class will include:

- any STEM-related activities specific to your year group;
- posts of upcoming events that you can be part of;
- a weekly scientific article that will give you a better insight into the latest news from the scientific field;
- an electronic version of our monthly STEM newspaper;

(Dr Mahmoud)

NPL (National Physical Laboratory) Workshop for yr10

21/02/24



“On 21 February we welcomed to our school two amazing guest, Louise and Umar from the National Physical Laboratory (NPL) who came and delivered four workshops to more than 100 science students. The workshops talked about what the NPL is, what options are available to post-GCSE students, including apprenticeship, A-levels, T-level, and the difference between masters, integrated masters, degree, degree-apprenticeship and PhD. They also discussed about the various programmes the NPL offer, which include work experience for Year 10 - Year 13 students, as well as what they are looking for in the application. Umar, who is carrying out an apprenticeship with NPL, shared what he does and what a typical day is like, including the projects he has been involved in. The session included addressing misconceptions, a career talk, and projects the NPL were involved in, such as a farmer who asked if they can design a machine to measure the ripeness of cauliflower so they can all be cultivated at the same time, or measuring how red ketchup is.

Our guests praised our school and looked forward to working more closely with us in the future, including a possible visit to the NPL and getting our students involved in the NPL academy and NPL work experience. Students also received a 3D printed mini-figure with each colour representing a different SI unit (green for ampere and pink for mole)“ **(Dr Mahmoud)**

The workshop was extremely useful and helped us understand what career opportunities are available to us and how the NPL can help us get started on our path. We were also explained the differences between apprenticeships, BTECs and degree apprenticeships. It was also very reassuring to know that even if not everything goes according to plan, there are always other options available, which made me feel more confident about the future. **(Student, Year 10)**

I enjoyed taking part in the workshops and having the opportunity to learn from other people's experiences and how their decisions led them to NPL. It was also very helpful to find out more about apprenticeships and that there are so many jobs related to STEM, some of them I did not know about before the workshops. **(Student, Year 10)**