


At the Heart of Great Science is Opportunity




Impact Report



Partnering Researchers
with Schools


 **“Every student involved reported the whole experience as “life-changing”. Orbyts is definitely one of the coolest things I’ve been exposed to in my 15-year career.** D. Fleming, Chemistry Teacher

 **“No other scheme comes close to achieving the diversity and breadth of student engagement which then translates to genuine STEM futures and teacher retention.** Dr. Becky Parker MBE, Physics teacher at an All-girls School



 **“The Orbyts project has been the most successful project that we have been fortunate enough to work with and its importance cannot be overstated.** Head of Physics at School in North London

...life-changing opportunities...

 **“I would have no hesitation in endorsing the Orbyts project, which I think has been of great benefit to my students, and in recommending it to other schools.** S. Clark, Science Teacher at South-West London School

 **“The number of participants has mushroomed from 10 to 20 this year and we predict continued growth in the future. EVERY student who took Orbyts at GCSE decided to take Physics at sixth form.**
Non-specialist Physics Teacher at All-girls School in South London



Orbyts projects include exploring: exoplanets, cancer diagnosis and treatment, using fluorescence to identify the causes of Parkinsons disease, quantum computing and Jupiter’s spectacular aurorae.



Orbyts believes that science should be truly **inclusive** for everyone, regardless of income-background, ethnicity or gender.

To facilitate this, we pair researchers with schools to **empower** school students, researchers and teachers through inspirational science research partnerships.



Orbyts Leadership Team

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Suddenly, I didn’t feel so out of place anymore.
 Vee Cudmore,
 Year 10 Girl

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It is important to notice that the NCS is located in the second most deprived London Borough. The poverty rate in Newham is 44% compared to 22% across the rest of London. For deprivation affecting children, Newham is ranked third nationally with 41% of children living in poverty. 88% of our cohort are from a Minority Ethnic background and over 41% are eligible for the 16-19 bursary and/or FSMs. A large portion of the students at the NCS is eligible for free school meals or pupil premium.

The high level provision offered by the Orbyts researchers raised enthusiasm and interest in STEM disciplines among our students, while simultaneously equipping them with additional skills and knowledge that they would not have had access to otherwise. Complex concepts were presented in a highly accessible manner, further stimulating our students’ curiosity for the subjects. The researchers introduced our students to python programming, as well as analysis and interpretation techniques of large data sets, skills that are of fundamental importance at research level in all areas of physics and STEM.

Several of the female students taking part in the project decided to apply to physics at university, after participating in Orbyts. These were inspired both by the content and the overall experience, as well as by the high calibre female researchers from Orbyts who visited our school every week for several months and acted as role models for them. Most of the students who took part in the project in the year 2021-22 are now studying physics, engineering or material science at universities. Their participation in Orbyts was pivotal in making informed decisions about their academic future.

S. Maugeri, Physics and Maths Teacher at Newham Collegiate Sixth Form

Hello!

We are delighted to welcome you to our first Orbyts Impact Report. Over the past six years we have seen the programme enable a transformational impact on young people, researchers and teachers alike and we're excited to share that with you here.

Orbyts creates inspirational partnerships between scientists and schools, providing school students with relatable science role models who support the students to lead their own original science research projects. The evidence shows that these partnerships are empowering young people and providing them with the skills and confidence boosts needed to defy the systemic biases and dispel the harmful stereotypes that have historically prevented science being more inclusive (for example, schools report 100% increase in girls taking A level physics, following Orbyts involvement at GCSE).

To date, Orbyts has created 100+ partnerships between researchers and schools that have enabled more than 1500 school students to undertake research projects on topics from life in the Universe to black holes to quantum computing and early diagnoses and treatment of cancer. Our goal is to ensure that STEM becomes more inclusive; we mandate that at least 50% of each of our cohorts are girls, at least 50% are pupil premium, and our students self-identified from over 48 ethnicities.

Aware of the extensive time demands on state-school teachers, we prioritise schools with low numbers of physics specialist teachers to provide additional support and enable these research opportunities in environments where they may not otherwise be possible. Many of our partner teachers report that alternative programmes are not viable for their schools because of infeasible time requirements or prerequisites on specialist knowledge that they do not have time to acquire.

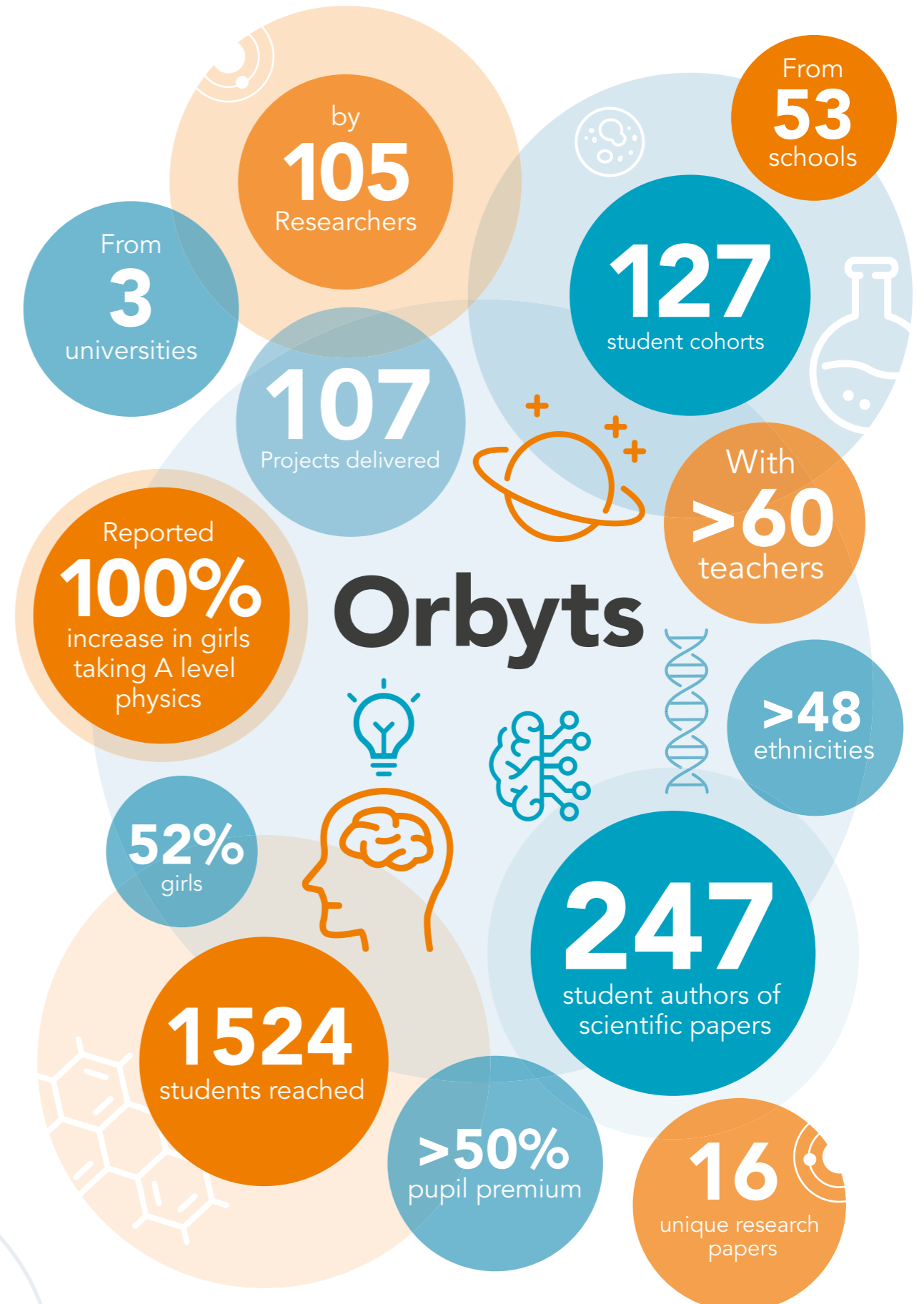
Through our unique bridge between schools and scientists, Orbyts has enabled 247 school students to author scientific papers on discoveries. We believe this is world leading. This authentic involvement in creating new science, and the humanising impact on students' perceptions of scientists is opening new doors for students, researchers and teachers alike.

Finally, a big thank you to the incredible teachers and researchers who put so much of themselves into their projects and the amazing school students who work so hard on these projects to produce such exciting new scientific findings. We're excited to continue to expand these opportunities to more students, researchers and teachers in the coming years. If you'd like to get involved, then we would love to hear from you!

Thank you for taking the time to explore this Impact Report.
The Orbyts Leadership Team



Partnering Researchers
with Schools



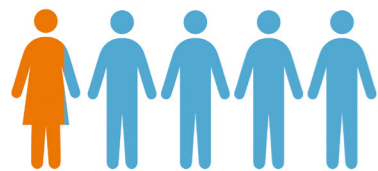
The Need: Challenges in UK STEM

UK science education faces significant inclusivity, education and skills challenges.

Diversity and Inclusion

STEM subjects, and particularly physics, suffer from a systemic lack of diversity and long-standing barriers to inclusion. Girls, Black students and students from low-income backgrounds are highly under-represented at all levels of physics from GCSE onwards [1,2]. Less than 20% of post-16 physics students are girls [3] and students from the most deprived backgrounds are 3 times less likely to take A level physics and 6 times less likely to achieve the top grades than those from the highest income backgrounds [2].

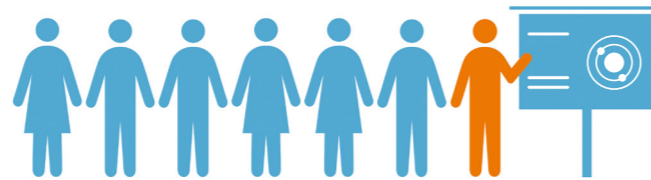
Research has shown that having science-related contacts and networks is a key element that contributes to a person's overall science capital [4]. Young people from lower socio-economic areas have less science engagement opportunities and fewer science role models and therefore typically have lower science capital, which directly limits science career opportunities [5].



Less than 20% of post-16 physics students are girls.

Shortage of Specialist Teachers

UK science education faces a chronic shortage of physics teachers. One in seven UK schools do not have a specialist physics teacher, and schools with higher levels of disadvantage are disproportionately more likely to use non-specialist physics teachers [6]. Research shows that students that have a specialist physics teacher are more likely to study physics at a higher level [7]. The severe shortage and low retention levels of physics and computing teachers is cited as key in limiting diversity in STEM and contributing to the UK STEM skills gap [8].



1 in 7 UK schools do not have a physics teacher.

The UK Skills Gap

The UK has a significant STEM skills gap – a strong disparity between the needs of STEM jobs and the existing STEM skillbase. For example, in the UK space industry, 95% of organisations experience skills-related challenges which have increased from 67% in 2020 [9]. This particularly affects skills in software, AI/machine learning, data analysis and modelling.

Almost half of employers report that the shortage of STEM graduates is a key barrier in recruitment [10,11].

For references, please see page 37.

How Orbyts Addresses these Challenges

Involvement in Orbyts projects has shown to increase the uptake of post-16 STEM subjects. Orbyts projects are proven to:

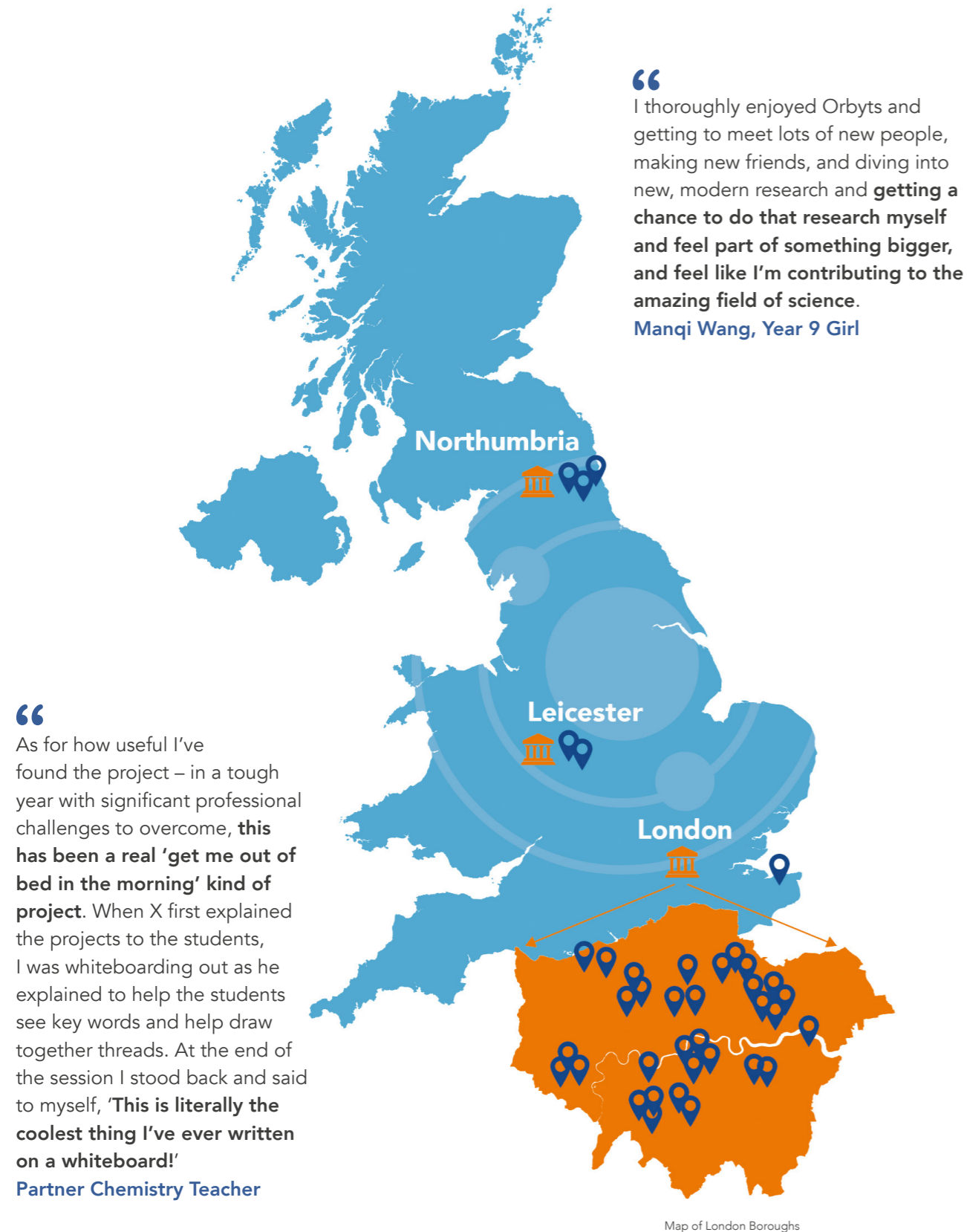
- ① Dispel harmful stereotypes about who can be a scientist and build a sense of belonging in science;
- ② Significantly grow pupils science capital;
- ③ Increase pupil's confidence in their ability to do science;
- ④ Provide rigorous technical and interpersonal skills training; and
- ⑤ Empower pupils with the skills and confidence to enable pursuit of STEM career pathways, should they wish to take this route.

Orbyts projects support over-worked and over-timetabled teachers in reigniting their passion for science and to gain unique subject specialist knowledge, helping retain specialist physics and science teachers in UK schools.

Image below, left: A photo of the ALMA antennas with the Milky Way in the background. Students at Highams Park School used ALMA observations to investigate planet formation. Credit: ESO/B.Tafresh.



Our National Impact



Impact on School Students

“Suddenly, I didn’t feel so out of place anymore.”

Orbyts is breaking down barriers to STEM education and making science more inclusive.

Building a Sense of Belonging through Real and Relatable Role Models

Orbyts fellows provide relatable role models who humanise science research on an individual level, **dispelling harmful stereotypes and misconceptions of who can be a scientist,** increasing pupils’ sense of belonging in science.

“
People enjoyed our findings, asked interesting questions and made intrigued observations. Knowledgeable students who’d been studying astrophysics far longer than we had, looked to us for guidance. **Suddenly, I didn’t feel so out of place anymore.**
Vee Cudmore, Year 10 Girl

“
Just being in front of a scientist was **massively powerful for them.** Hearing X share his route into a career in science with many imperfections (sorry X!) they could identify with, **allowed them to visualise a future in science many thought closed to them.** Putting early-career researchers in front of school students is so important. It’s had an **unimaginably powerful humanising impact for our students.** One of our key goals as a science department is to ensure students have a solid appreciation of their place within the universe and this project has surpassed anything I could have possibly imagined for this – not only have our students been consistently blown away by the science of other planets, it has helped them better understand the value of their own one.
Chemistry Teacher at Partner School

86%

After participating in Orbyts, 86% of students reported feeling like **science is for them.**



Impact on School Students

"The confidence building I've seen them go through in the last few months has been amazing."

Building School Student Confidence

Confidence is a significant barrier to science for students from widening access backgrounds [5]. The long-term engagement style of Orbyts fosters a sense of agency and ownership of the science research which builds pupil confidence in their ability to do science.

“

The end of year conference is a huge success, it pushes the students far outside their comfort zone and makes them **realise what they are capable of**. **Head of Physics at Orbyts Partner School**

“

More than half of the students in the project are female – of these more than half are not currently studying physics. **The confidence building I've seen them go through in the last few months has been amazing**. Most of them started the project very nervous, thinking there was no way they'd ever understand anything and doubting that there'd be anything they could possibly offer of value. The first time I heard one of these students cry out, 'Hey, wait! I get this! this is cool,' my heart skipped a beat. This was coming from a student who at the start of the project didn't know about the basic wave properties of light due to the combination of courses undertaken in previous schools and subject choices since joining ours. **Chemistry Teacher at Orbyts Partner School**

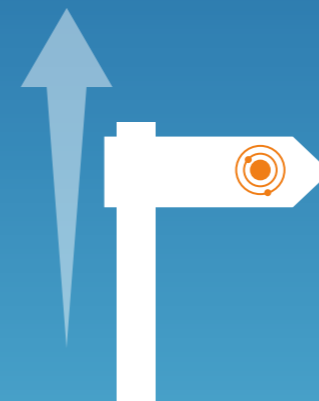
88%

After participating in Orbyts, 88% of students rated their confidence in science as **good to excellent**.



86%

After participating in Orbyts, 86% of students could see themselves **working in a job related to science**.



Opening Pathways to Science

Orbyts is shifting perceptions of who can be a scientist by helping students to see realistic pathways into science for themselves.

Image above, right: Uranus Observations in the X-rays (pink) taken by NASA's Chandra X-ray Observatory and IR, taken by Keck. Produced by Orbyts school student K. Feigelman from ESO Keck and Chandra X-ray data and featured in the NASA press release.

“

What we did with X **really changed my view of science** – I took biology in year 12 because I couldn't choose sport science! **I never thought Physics could be something I could do**. Just being part of it showed me more possibilities of science I'd never even thought of and sparked interest in other parts of science which I will never forget. Even though I'm not going into science as a career **I developed a lot of other skills and like understanding of scientists as a team**. **Year 12 Girl with English as an Additional Language (EAL)**

“

All of the Year 12 students mentioned Orbyts on their UCAS application forms and of the cohort, 6/8 students enrolled on STEM courses at university. For the following cohort, 6/7 went on to study STEM subjects at university. Another important part of the project has been getting to know the scientists. The students have been very keen to ask them about their degree subject choices, what they do, the skills they use, and general advice about their future. To be able to get to know these with young scientists, finding out why they chose their area of study, and what they enjoy about what they are doing has been invaluable. **Alex Farrer, Teacher at Partner School**

Impact on School Students

"I had no idea about coding but now I realise it's something I can actually do."

Building Essential Technical Skills and Scientific Vocabulary

Orbyts projects equip students with data analysis and coding skills, as well as expanding their scientific vocabulary. The projects actively utilise precisely the skills required in science careers and those for which there are national shortages. Regardless of whether the pupils pursue STEM further, problem solving skills and analytical thinking are crucial across careers and sectors.

“

The Orbyts project helped me see that science was something that anyone could participate in and if they were interested enough, they could be successful. **I learned about simple computing language (python) for analysis and realised it can be used by anyone – I had no idea about coding but now I realise it's something I can actually do.** **Year 12 Student with English as an Additional Language (EAL)**

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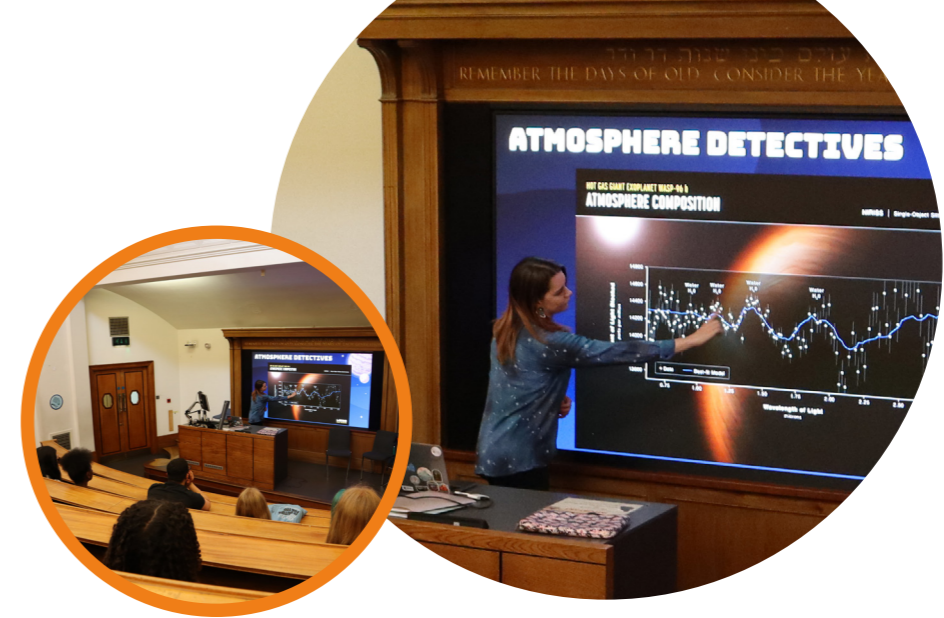
The content the girls are covering in Orbyts is fascinating, naturally – we did exoplanets last year and are now onto galaxy classification – but most importantly, **it is the set of skills they are learning that really sets this apart – advanced algebra, python programming, applying neural network and artificial intelligence principles, intense teamwork and friendly co-operation.** **Non-Specialist Physics Teacher at All-girls School in South London**

“

All bar two students in the project speak English as a second language – **their levels of scientific literacy and their scientific vocabularies have grown immeasurably.** **Orbyts Partner Teacher**

78%

After participating in Orbyts, 78% of students rated their scientific knowledge and vocabulary as **good to excellent.**



Building Interpersonal Skills

In addition to the technical skills, development of interpersonal skills is a key outcome of pupils' involvement in Orbyts including communication and presentation skills and collaborative working. Pupils' also noted that through their involvement in Orbyts projects they met new people and built new friendships. Forming working relationships is a key transferable skill across all career sectors and leads to better interpersonal and collaboration skills. Building friendships through a mutual interest in a subject is key in creating a comfortable working environment for learning and increasing pupils' sense of belonging in STEM.

“

The Orbyts project was an amazing experience overall that helped me overcome my fear of presenting and boosted my confidence in a way that I can use it to my advantage now and in later life. **Year 10 Girl from South London School**

“

Participating in Orbyts, taking the train to London, supporting my peers who stood up to speak on our own project, were all incredible experiences. After Orbyts begins again, in a regular weekly pattern, I look forward to joining in **with my new friends again and feeling like I belong and am welcomed among them.** Hopefully, I can write a second article next term about Orbyts, about our discoveries, about the stars. **Vee Cudmore, Year 10 Girl**

83%

After participating in Orbyts, 83% of students rate their scientific presentation skills as **good to excellent.**



Impact on Partner Teachers

"...this has been a real 'get me out of bed in the morning' kind of project."

Involvement in Orbyts projects has been shown to have a positive impact on partner teachers. Teachers report that their involvement with Orbyts projects:

- 🕒 Increases their desire to remain in teaching;
- 🕒 Inspires their teaching delivery;
- 🕒 Improves their specialist subject knowledge;
- 🕒 Re-energises and reconnects teachers to their love of science; and
- 🕒 Impacts the wider school community.

In turn, this is improving teacher retention in Orbyts partner schools.

The partnership model of pairing a researcher with a teacher is critical for widening access to science. Orbyts partner teachers benefit from all the positive aspects of being involved in the research project without the burden of preparing and delivering the project alone.

It does this while providing valuable and inspiring CPD that then leads to new subject knowledge which teachers leverage across the school and wider community.

“

Given the very high rate of loss of science teachers from the profession, having such opportunities for re-energising teachers can be very important for recruitment and retention of teaching staff.

Orbyts Partner Teacher

“

Meeting the PhD students reconnected me with the excitement of studying science at university level and **reminded me what science education can be about. Orbyts Partner Teacher**

“

As for how useful I've found the project – in a tough year with significant professional challenges to overcome, **this has been a real 'get me out of bed in the morning' kind of project. Orbyts Partner Teacher**

“

The project has fed back down through the school with Orbyts members giving presentations to lower year groups and **it's even changed my teaching to my 13-year-old students** – all my magnetism stuff is now fed through the lens of the importance of our magnetic field and what the aurora on Earth tell us about the conditions necessary for life here... **Multiple other staff have become involved and have had valuable subject knowledge gains, and through the school publications the wider school community** – parents etc. have also become enthused and are talking with their children about the project even if they're not directly involved.
Orbyts Partner Teacher

Impact on Scientific Researchers

"...the curiosity of the Orbyts students encouraged me to examine my core physics and has driven my work."

Involvement in Orbyts projects is shown to have a positive impact on researchers, who report extensive development in areas important for their own science careers (and careers beyond science), including:

- 🕒 Project and people management training beyond that available in a normal PhD;
- 🕒 Step changes in their communication and teaching skills;
- 🕒 Subject knowledge enhancements;
- 🕒 Growth in their own confidence;
- 🕒 New insights into their own research;
- 🕒 Advances in their research profile; and
- 🕒 Career path refinement.

“

For a researcher, the benefit of an additional project and potential paper are clear. It is the myriad of seemingly simple but stimulating questions asked from the students, such as, 'Does air make a shadow?' that have affected my scientific thought process the most. As researchers we often forget the importance of the fundamental science behind our work but the influence of the curiosity of the Orbyts students encouraged me to examine my core physics and has driven my work.

Abid Razavi, Space Plasma Physics PhD Student, Mullard Space Science Laboratory

Image below, left: Students at St Richard Reynolds Catholic College research included evaluating predictions of the Northern Lights in Earth's atmosphere. [More information on the project and the school student's poster presentation is on the Orbyts website.](#)



Impact on Scientific Researchers

“

I've been fortunate enough to have been a part of Orbyts for the last two years. The Orbyts programme has helped me gain invaluable skills and develop as a researcher in more ways than I ever expected. Orbyts has enabled me to gain confidence and ownership in my research, as well as giving me the opportunity to project manage and improve my public speaking and teaching skills in a proactive yet fun way. Working with students on an Orbyts project has been one of the most rewarding experiences I have encountered during my research career so far. By supporting students on their own development journey and providing them with positive encouragement in STEM related subjects, it has been incredible to see the students become more confident in their work and become enthusiastic researchers themselves across the short 14-week programme.

Shannon Killey, Space Physics PhD student at Northumbria University

“

I see significant benefits to our researchers from participation in the Orbyts programme. The satisfaction that Orbyts Fellows have from their research appears to increase, as they see their research practice grow from an individual endeavour, to a project where they lead an entire group and enable a shared contribution to knowledge. It is rare to have this opportunity at an early stage in the research journey; leadership of research groups tends only to be available to academics much later in their careers. In addition, researchers gain all the more general benefits from teaching activities: Orbyts Fellows develop advanced communication skills and grow in confidence and mastery of their research. **Professor Clare Watt, Northumbria University**



Research Projects Spotlights

Students at Oasis Shirley Park explored how the Martian surface environment is shaped by the planet's plasma environment. [Read more about this Orbyts project on the website.](#)

Spotlight: Searching for Life on Mars from an All-girls School

St Bernard's High School, an all-girls secondary school in Westcliff-on-Sea, partnered with PhD student Connor Ballard to undertake an Orbyts project exploring the possibility of life on Mars and they did this by launching their own experiment into space!

To do this, industry partners, Thales Alenia Space, enabled the flight of a stratospheric weather balloon. This "MARSBloon" emulates the Martian environment by exposing samples to increased radiation as well as low atmospheric moisture, temperatures and pressures.

The school students sent samples containing Antarctic cyanobacterial mats, collected during the 1902–1903 Antarctic Discovery Expedition, to the stratosphere to investigate how the signatures of life change in simulated Martian conditions. This has implications for current Martian research, informing how we search for life on the Red Planet.

“

I enjoyed learning about new and different things like the conditions on Mars. I also enjoyed being able to make samples to send to the end of space. Orbyts has let me become more involved in science and made me think of what career paths there are in science. **Poppie Johnson Adams, Student, St Bernard's High School**

“

It was an interesting experience, discovering new things, such as what a microbial mat is, infrared spectroscopy, the atmosphere on Mars etc. Working with the PhD student helped me learn more about the geology of both Mars and Earth and the rover Perseverance on Mars. I had never sent anything into space before and the effect on the samples that we sent was overall similar but the fact that we worked with Thales Alenia Space made me wonder if I wanted to do this in the future. The trip to UCL was phenomenal as we got to see the other research from schools such as 'Juno about Jupiter' about the northern lights in Jupiter. Overall, the experience was amazing.

Trishy Tran, Student, St Bernard's

“

Students came away with a tangible understanding of techniques used to search for evidence of life beyond our planet, culminating in the Orbyts conference where the results were presented, instilling a sense of joy in their work as they explained the outcomes to other Orbyts students and connected to the broader context of their research. The students' findings were later published in the journal Research Notes of the American Astronomical Society. **Connor Ballard, PhD Student**

“

During Orbyts I really enjoyed working with Connor, he was really helpful. I loved the university visit and I loved presenting our work to everyone else as well as seeing the other presentations. Orbyts really helped me realise that I really like physics and chemistry. **Olasubomi Olatubosun, Orbyts Student, St Bernard's High School**

“

The experience the students had in meeting and working with Connor, our PhD student, was exceptional; hearing about the work he is involved in and its application in Space Science was something they would not have in their usual school day. The school workshops, presentation and university visit allowed them to see the application of the skills they have developed and broadened their knowledge of the field of science and scientific careers that they could aspire to. Connor's teaching and guidance was incredibly engaging and the students really valued the knowledge and experience of a 'real scientist'. Being able to use material from such a well known expedition as Scott's and sending the samples to space were fantastic opportunities for the students and were very exciting to be part of. **Laura Panter, Head of Biology, St Bernard's**



Spotlight: Quantum Computing at Newham Collegiate Sixth Form

Over the past 2 years, the students at Newham Collegiate Sixth Form, a state school in the second most deprived London borough, have undertaken Orbyts projects on quantum computing and quantum mechanics with Dr. Abbie Bray, Dr. Cornelia Hoffmann and Robert Banks.

This year they worked on optimisation problems. Examples of optimisation problems include maximising profit, finding the shortest route, or designing seating plans. Optimisation problems are ubiquitous, yet notoriously difficult to solve due to the large number of combinations to check. In the example of seating plans, for just 30 people, there could be up to 265 million trillion trillion arrangements to try. Classically, each permutation would have to be considered in turn.

Quantum mechanics allows us to consider more than one arrangement at once, by making use of a principle referred to as superposition.

With the students, we investigated how continuous-time quantum walks (CTQWs) might be used to help tackle optimisation problems.



“

It allowed the students to work collaboratively with the people around them and have ownership of their solution. They also had no problem in telling me my solution was wrong (or missed some exceptional cases) – they were often right about this too! It was a genuine pleasure researching with these budding academics. By using Python, we were able to explore a wide range of parameter settings for the CTQWs. The research we carried out together formed the foundation for a paper that we have now written up and can be found at [arXiv:2306.10365](https://arxiv.org/abs/2306.10365).

Robert Banks, PhD Student, London Centre for Nanotechnology

Of the 20 students in the 2021–2022 Newham Collegiate 6th Form cohort, five of the girls went on to take undergraduate physics at the university that their partner researcher was from. Of this group, **Darshana Kottaisamy** said:

“

Orbyts was an incredible experience for me. From learning new concepts in quantum physics to being able to analyse data from computational models in Python, I had the opportunity to expose myself to the area of academia which is not shown to school students – research. Overall, I had an amazing experience taking part in Orbyts and being able to learn a lot more about the bizarre nature of quantum physics.

Their teacher, **Serena Maugeri** said of the impact:

“

Several of the female students taking part in the project decided to apply to study physics at university, after participating in Orbyts. They were inspired both by the content and the overall experience, as well as by the high calibre researchers from Orbyts who visited our school every week for several months and acted as role models for them.

Most of the students who took part in the project in the year 2021–22 are now studying physics, engineering or material science at universities. Their participation in Orbyts was pivotal in making informed decisions about their academic future.



Spotlight: Medical Physics Research at Schools across London

The UCL Medical Physics Orbyts Hub – launched in 2022 – aims to extend the application of Orbyts projects to physics in medicine and biology.

Pairing with five schools across London (St Gabriel’s College, Park Academy West London, Wimbledon High School for Girls, Ark Globe Academy, and London Academy of Excellence Stratford), six researchers created bespoke medical physics research projects for school students. Together, they explored new research on topics of proton therapy, X-ray imaging, brain PET imaging computational methods, and near-infrared spectroscopy for brain and muscle imaging.

Researchers involved in the program emphasized the development of their communication skills and the unique perspectives they gained on their own research. As Biomedical Optics PhD student **Musa Talati** shared:

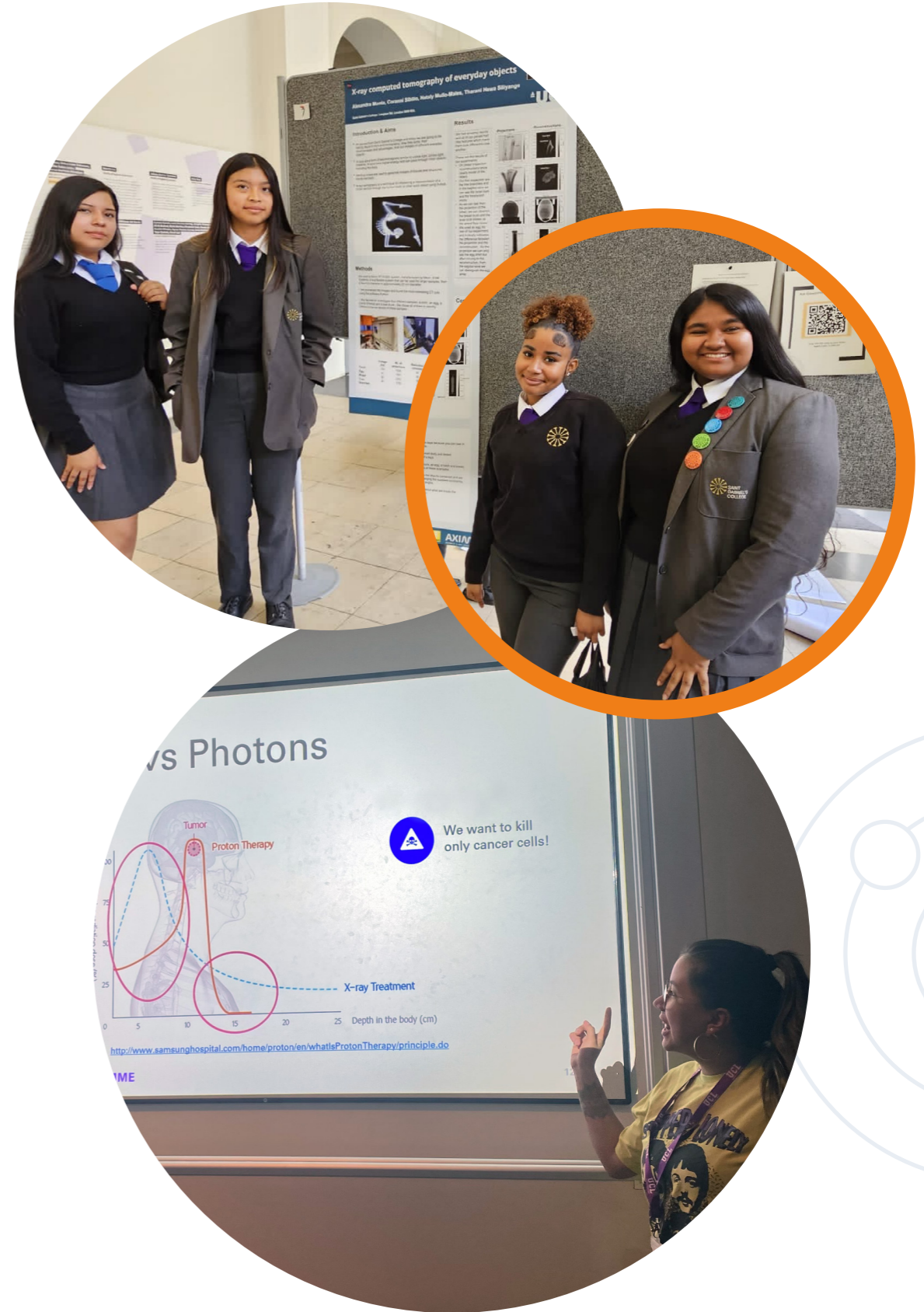
“Orbyts provided an invaluable experience for us fellows. The students have given me a unique perspective on my research and made certain that I understood the basics of my own work well enough to teach them! Some of the experiments they devised used refreshing thinking that we could all learn from. I hope their time with Orbyts motivates them to bring that thinking into research!

The hub had a unique bilingual project with English as an Additional Language (EAL) students with Latin American backgrounds from St Gabriel’s college. The project was run by **Carlos**, who is originally from Colombia, and it allowed the students to explore applications of his research on X-ray computed tomography. **Claudia Lopez**, the school teacher, emphasized:

“Having a researcher who is Latin American, who runs sessions in Spanish if needed, was a great opportunity to offer this opportunity to EAL students at different stages of language acquisition, who otherwise wouldn’t have gotten... being able to take part in something like this has built their own confidence.

School students reported exploring new career paths and gaining valuable insights into the Medical Physics industry:

I found it fascinating to see how the Medical Physics industry is developing... it was interesting to see how it links to physics and provided me with a possible career choice.



Spotlight: Space and Solar Physics in Newcastle

In 2021, Orbyts piloted a new hub in North-East England to directly engage schools in Newcastle with world-leading scientists at Northumbria University. The Hub has excelled, reaching over 100 school students across 12 space and solar physics research projects to date.

The North-East Hub strategically targets a key geographical area with elevated levels of socio-economic deprivation and low social mobility, where Newcastle is identified amongst the highest priority areas in the UK Government Levelling Up agenda.

“

It has been an enriching experience, and we, at Jesmond Park Academy, are truly thankful for the chance to contribute to such an innovative and impactful initiative. The project not only provided us with valuable insights into modelling particle acceleration using the Fermi-Ulam Model, but it also allowed us to collaborate with a diverse and talented group of individuals. Our primary researcher was Jordan Talbot, a dedicated and enthusiastic scientist who engaged the students from day one. The guidance and support from the project team were instrumental in the learning and growth of the students throughout the duration of the programme. I appreciate the dedication and hard work that the Northumbria University team has put into making the Orbyts Project a success. The knowledge and skills the students gained during this experience will undoubtedly have a positive impact on their academic and professional journey. **Mrs Jennifer Axon, Partner teacher, Jesmond Park Academy**

Innovative Research Led by Students

Project topics ranged from machine learning analysis of radiation belt electrons to mapping solar flares. The impacts on students has been clear, with feedback citing significant skill development for areas including coding, communication, and team-work.

The benefits of the North-East Hub partnerships extend more broadly. Our emerging Hub is excelling at generating the symbiotic relationship between impactful public engagement and cutting-edge research within Northumbria University. The programme is highly valued across the research group as a platform for both skill development and enabling quality research advancements.

“

Through leading a project I have developed project management skills as well as the ability to discuss my research in depth at various levels, whether with school students or the general public. Assisting in an Orbyts project allowed me to learn about topics I otherwise would not have been exposed to, helping me understand concepts in my own research. Both projects have immensely increased my confidence in presenting and teaching. **Morgan Stores, PhD student, Northumbria University**

“

Orbyts is a wonderful programme that promotes and highlights the importance of diversity to our group members. There are disparities in opportunities in other areas of the country, but those disparities in Newcastle are pronounced. Helping students from schools who are keen to promote STEM subjects through widening participation and other key diversity programmes is absolutely what is needed.

In terms of benefits to our students, it is fantastic to see how much our early career researchers grow from having the opportunity to design, deliver and finish research projects over a short amount of time – it is amazing to see! **Professor Jonathan Rae, Northumbria University**



Image below: Intense solar flares occurring within the Sun's dynamic atmosphere. Students at St Mary's Catholic School used spacecraft data to identify how electrons are accelerated within solar flares. [The students presented their work at an Orbyts conference, and their presentation can be found on the Orbyts website.](#)



The First North East Hub Conference

Students presented their research results and engaged directly with research scientists from PhD to professorial levels. We provided tours of the university campus, including a tour of the multi-million pound Northumbria Space Technology Laboratory.

The conference included a bespoke talk on navigating the university application process (including routes via Widening Participation) and a talk by Dr Natasha Jeffreys (a world-leading expert in solar physics).

Students came away with an authentic and personal connection to the cutting-edge research and diverse range of researchers, all within their home city.

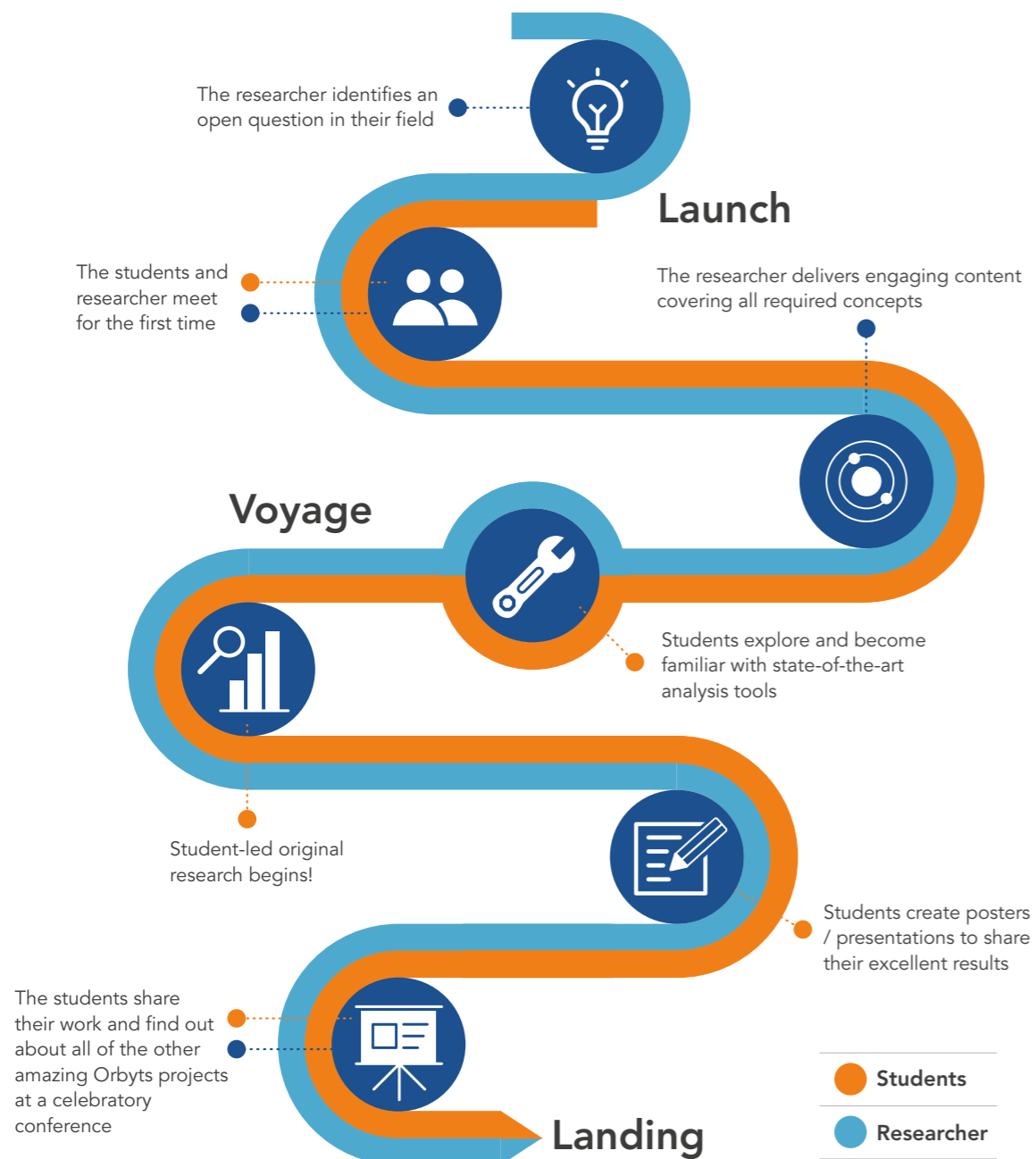
“

...the project has made me feel even more inclined to pursue physics at university as well as a profession in scientific research. **Orbyts School Student**

Programme Design

Orbyts pairs researchers with schools to facilitate school-student-led science research.

Through continuous feedback from 107 bespoke research-with-schools projects over 6 years, we have developed the following research project design, which includes carefully considered researcher training targeted at each point on the path. This maximises the student, researcher and teacher experience while enabling authentic cutting-edge research projects to be undertaken in schools.



What's Next – Orbyts STAR...

"I can say with confidence that going to that first Orbyts session was the best decision I ever made."

We aim to continue to expand Orbyts to groups who have historically been excluded from science across the UK.

Orbyts STAR:

One group who has largely gone undiscussed and underrepresented in science is that of students suffering from long-term health conditions. Living with long-term medical conditions can feel isolating without adequate, individually tailored support. The unpredictability of such conditions can prevent these students from engaging with science at the traditional school level whilst also having other negative effects such as making it harder to maintain relationships with their peer group and reducing their confidence in their intellectual abilities.

This year we will pilot the Orbyts STAR (Students Advancing Research) project in partnership with **Great Ormond Street Hospital (GOSH)**, to facilitate a bespoke research project for their school students. STAR acknowledges and aims to address these issues by providing a flexible, inclusive and understanding environment for hospital school students to get involved with and take the lead on cutting-edge research associated with the ESA Ariel mission, under the guidance of a researcher who suffers from a chronic illness herself.

“ I was fascinated by the research we were doing and I spent the full hour with brand new people who did not treat me like I was ‘sick’ or unworthy of being there... I have been into hospital several more times since then, but I never felt left out or excluded. When I came back they caught me up on what I had missed and didn’t try to smother me with sympathy, instead I was treated with respect and kindness and we all carried on. **Sophie M., Orbyts School Student**

The STAR project was co-created by Orbyts school student, Sophie, who has experienced some of these challenges herself but found that Orbyts gave her a safe space to focus on her love of science instead of on her illness. Sophie, alongside her wonderfully supportive physics teachers, is involved in the project at every step helping to steer the direction of the project to ensure that it is as accessible, understandable and most importantly enjoyable as possible for our hospital school students.

She hopes that STAR will give other young people in a similar position the same life-changing opportunity as she had at a time when it is most needed.



“

I can say with confidence that going to that first Orbyts session was the best decision I ever made. I loved it and enjoyed all the other sessions since. I wish I had started this project years ago. It has made me rediscover my love for learning through something I am passionate about. This opportunity saved me and I want to give others the same chance I was given. This is why I believe we need to expand and support extra-curricular research projects in hospitals.
Sophie M., Orbyts School Student

STAR is intended to be a long-term endeavour. We aim to collate our findings throughout the entire process and make them publicly available in the hope of encouraging the creation of more hospital-school based projects across the UK.



Orbyts
STAR



What's Next – Orbyts UK...

School students are designing a CubeSat to be launched on a high-altitude balloon, carrying a payload of AmbaSat sensors.

Orbyts is expanding, all over the UK.

Orbyts Leicester

Orbyts has recently expanded to the midlands and is establishing a new hub in Leicester. The Hub ran 2 pilot projects with local schools in the 2022 – 2023 academic year and has expanded to 4 project partnerships in 2023 – 2024.

The expansion of Orbyts to new universities also expands the scope of cutting-edge science research topics covered, building on the unique speciality research in each institution. At Leicester, we have projects studying features in the northern lights and linking these to the structure and dynamics of the Earth's magnetic field. These research projects support the upcoming joint European Space Agency and Chinese Academy of Science spacecraft, SMILE which will study the Earth's magnetic field. Another project focusses on exploring Jupiter's upper atmosphere and uses data from the NASA Juno spacecraft.

In the coming year, we hope to continue to sustainably build the Leicester Hub as we establish relationships with new partner teachers and local schools.

Orbyts North-East

Our North-East Hub is continuing to evolve and grow, and we are exploring new avenues that exploit Northumbria University's strengthening industrial partnerships. This year, Professor Rob Wicks is piloting an Orbyts project in partnership with AmbaSat – a UK company based in North-East England that provides satellite manufacturing equipment. School students are designing a CubeSat to be launched on a high-altitude balloon, carrying a payload of AmbaSat sensors. This project engages the students in design, electronics, operations, and programming of the CubeSat and sensor systems. The project is being undertaken by a group of students from years 10, 11, and 12. This pilot will enable our North East Hub to directly engage students with a broader range of research careers within STEM and target a wider range of skill development areas.

An additional area of focus will be growing outside of Northumbria University. We aim to enable new partnerships outside of Northumbria University by targeting other local universities/research institutions to expand our impact across the North-East.

Orbyts Scotland and Wales

In 2024, we also aim to launch pilot programmes at Edinburgh University, Swansea University and Cardiff University to support students across the UK to take part in Orbyts.



Thanks

We are indebted to a huge number of people and organisations for the existence of Orbyts.

Orbyts would not exist without the generous support of the UCL Access and Widening Participation Office. They have supported us not only with annual grants but their incredibly hard-working team, who are devoted to widening access to education, have been endlessly supportive with advice, safeguarding support and school connections.

We also owe a substantial debt of gratitude to the Ogden Trust, and we feel deeply honoured to be their first Collaborative Funding Partner. Through this, they have sustainably seeded and enabled Orbyts expansion, in addition to an ongoing independent evaluation (2022–2024). Orbyts was also supported by funding from the UK Space Agency, European Research Council, EPSRC and STFC, who each enabled either pilots at new hubs or enabled us to sustain the programme for an additional year during 2020-2023. Finally, we thank NEON for their support and the national recognition of our impact on widening access.

Beyond these organisations, Orbyts would not be what it is without the teachers and researchers who give so much time to the projects, and the school students who work so hard on them.

Particularly, we would like to thank our Orbyts fellows of the last 6 years: Hannah Osborne, Maria Niculescu-Duvaz, Christian Lao, Carlos Navarrete-Leon, Shannon Killey, Tomas James, Connor Ballard, Megan Joseph, Qasim Afghan, Abid Razavi, Affelia Wibisono, Alex Bader, Alex Robson, Alex Smola, Ali Francis, Alice Sheppard, Prof. Amelie Saintonge, Andreea Varasteanu Andy smith, Apoorva Updahyay, Aysha Aamer, Billy Edwards, Catherine Regan, Charalambos Ioannou, Chiara Lazzeri, Choong Ling Liew-Cain, Prof. Clare Watt, Constance Laine, Cornelia Hofmann, Cynthia Ho, Damien De Mijolla, Daniel Darby, Dimitrios Millas, Dirk Scholte, Flavien Hardy, Frankie Staples, Gordon Yip, Holly Andrews, Prof. Ilias Tachsidis, Prof. I. Jonathan Rae, Jack Baker, Jana Smutna, Jeffersson Agudelo, Jingting Liu, Jonathan Holdship, Jordan Talbot, Katy Chubb, Kendra Gilmore, Lara Anisman, Lidice Cruz Rodriguez, Lily Grieg, Lucy Hogarth, Luke Keyte, Manasvee Saraf, Maria Lara Perez, Maria Walach, Mario Morvan, Mark Cunningham, Maryam Alamer, Matt Cheng, Matthew Rickard, Mayur Bakrania, Morgan Stores, Musa Talati, Mustafa Mahmoud, Nabil Brice, Nawin Ngampoopun, Prof. Nick Achilleos, Noor-Ines Boudjema, Oiivia Dalby, Osnat Katz, Pascal Foerster, Pawel Markiewicz, Poala Tiranti, Priya Patel, Quentin Changeat, Robert Banks, Romain Meyer, Ruth Kelly, Ryan Brady, Ryan French, Sachin Reddy, Sam Grafton-Waters, Sam Rennie, Sam Wright, Sarah Bentley, Serena Skov Campbell, Sian Brannan, Simona Nitti, Steffy Angel Rajamani Girija, Suman Chakraborty, Teia Mihaelescu, Tom Holden-Dye, Vishal Singh, Wilf Somogyi, Yash Saneshwar.

And our partner teachers: D. Fleming, W. Whyatt, J. Barker, J. Barroca, S. Maugeri, M. Yates, S. Horn, M. Baird, B. Edgar, A. Farrer, A. Webb, B. Cummings, C. Kenrick, C. Lopez, D. Bouzounieraki, D. Denyer, D. Elliott, D. Holly, D. Stackhouse, D. Theodorakis, E. Pedram, F. Sheikh, G. Barnes, J. Axon, J. Powell, J. Shearer, L. Beevers, L. Briggs, L. Colquhoun, L. Panter, M. Densham, M. Horncastle, M. Liu, M. Pereira, M. Wilkinson, M. Yazdi, O. Adekola, P. Aspery, P. Goodfellow, B. Parker MBE, R. Dunn, R. Howard, R. Morisiya, S. Ali, S. Clark, S. Fuge, S. Lynch, T. Williams.

Orbyts was founded as a component of the Twinkle Spacecraft by Dr Clara Sousa Silva, Dr Laura McKemmish, Dr Katy Chubb, Dr Tom Rivlin, Dr Maire Gorman, and Prof. Jonathan Tennyson, with extensive support from Dr Marcell Tessenyi, Prof. Giovanna Tinetti and Anita Heward.

Since 2017, Orbyts has been managed voluntarily by Dr William Dunn (2017–), Lucinda Offer (2018–2019), Dr Jonathan Holdship (2018–2019), Dr Jasmine Kaur Sandhu (2019–), Dr Mark Fuller (2019–), Dr Abbie Bray (2021–), Dr Michaela Mooney (2022–) and a team of incredible PhD students.

We recognise that within UK academia most PhD students are paid below the national living wage. For many Orbyts fellows, the programme resonates deeply and personally because they are from demographic groups that Orbyts aims to support in schools. Consequently, to ensure we do not culturally tax Orbyts fellows and to minimise any burden on PhD students, wherever possible, we pay UK-based PhD students for their time spent on Orbyts (up to 4 hours per week).

This Impact Study was produced by: W. Dunn, A. Thompson, J. K. Sandhu, M. Mooney, C. Ballard, C. Navarrete-Leon, C. Lao, M. Fuller, A. Bray, H. Osborne, M. Niculescu-Duvaz, K. A. Devoil, S. Killey, S. Rennie, M. Joseph and H. Jones.

A Request for Support

Orbyts currently sits precariously positioned with no financial support beyond our upcoming 2024 programme. If you've read this Impact Study and think that Orbyts might be something you would like to support, then we would love to hear from you.

Connect with us by Email: info@orbyts.org

Website: www.orbyts.org

Twitter: [@orbyts1](https://twitter.com/orbyts1)

Interested in Joining Us?

If you are a researcher or teacher and you would like to get involved in Orbyts or just want to find out more then we'd love to hear from you. Email: info@orbyts.org



Partnering Researchers
with Schools

Orbyts Publications

Many of our partner school students and teachers have contributed ground-breaking findings and discoveries in publications. Below are a list of scientific publications that include Orbyts school students and teachers (spotlighted in bold):

Electron Rescattering Picture in a Strong-Field Laser Regime: Diverse Initial State Geometry under Coulomb Influences

A.C. Bray, **K. Ahmed, R. Ahmed, N. Amanuel, J. J. Antony, J. Connole, D. Fahmiduzzaman, S. Hussain, J. Joarder, M. Khan, M. Khan, D. Kottaisamy, A. Tahsin, R. Tariq, A. Thomas, C. Novogreblevski, G. A. Previti, F. A. Rahman, A. Rahman, T. Rahman, U. Sahil, K. Shkrepi, M. Strickland, H. Rahman,** and **F. Shejuti**. Electron Rescattering Picture in a Strong-Field Laser Regime: Diverse Initial State Geometry under Coulomb Influences (2022). UCL Discovery

Continuous-time Quantum Walks for MAX-CUT are Hot

R. J. Banks, **E. Haque, F. Nazef, F. Fethallah, F. Ruqaya, H. Ahsan, H. Vora, H. Tahir, I. Ahmad, I. Hewins, I. Shah, K. Baranwal, M. Arora, M. Asad, M. Khan, N. Hasan, N. Azad, S. Fedaiee, S. Majeed, S. Bhuyan, T. Tarannum, Y. Ali,** D. E. Browne, and P. A. Warburton. Continuous-time quantum walks for MAX-CUT are hot (2023). arXiv:2306.10365

Testing the Limits of Biosignature Detection in Ca-sulphate Mixtures Through a Simulated Martian Environment

C. J. Ballard, L. J. Preston, D. Shah, R. Hills, **S. Cabrelli, J. Cassar, A. Enoma, M. Greenstein, P. Johnson-Adams, S. Okoboi, T. Tran, J. Wang,** P. Goodfellow, L. Panter, A. Clarkson, P. Hunter, W. R. Dunn (2023), *Testing the Limits of Biosignature Detection in Ca-sulphate Mixtures Through a Simulated Martian Environment*, Research Notes of the AAS, Volume 7, 10.3847/2515-5172/ad103f

Jupiter's X-Ray and UV Dark Polar Region

W. R. Dunn, D. M. Weigt, D. Grodent, Z. H. Yao, **D. May, K. Feigelman, B. Sipos, D. Fleming, S. McEntee,** B. Bonfond, G. R. Gladstone, R. E. Johnson, C. M. Jackman, R. L. Guo, G. Branduardi-Raymont, A. D. Wibisono, R. P. Kraft, J. D. Nichols, L. C. Ray (2022), *Jupiter's X-Ray and UV Dark Polar Region*, Geophysical Research Letters, e2021GL097390

Quantifying the Dust in SN 2012aw and iPTF14hls with ORBYTS

M. Niculescu-Duvaz, M. J. Barlow, W. Dunn, A. Bevan, **O. Ahmed, D. Arkless, J. Barker, S. Bartolotta, L. Brockway, D. Browne, U. Esmail, M. Garner, W. Guz, S. King, H. Kose, M. Lampstaes-Capes, J. Magen, N. Morrison, K. Oo, B. Paik, J. Primrose, D. Quick, A. Radeka, A. Rodney, E. Sandeman, F. Sheikh, C. Stansfield, D. Symister, J. Taylor, W. Wilshere,** R. Wesson, I. De Looze, G. C. Clayton, K. Krafton, M. Matsuura (2022), *Quantifying the Dust in SN 2012AW and iPTF14hls with Orbyts*, Monthly Notices of the Royal Astronomical Society.

Original Research By Young Twinkle Students (ORBYTS): Ephemeris Refinement of Transiting Exoplanets

B. Edwards, Q. Changeat, K. H. Yip, A. Tsiaras, J. Taylor, **B. Akhtar, J. AlDaghir, P. Bhattarai, T. Bhudia, A. Chapagai, M. Huang, D. Kabir, V. Khag, S. Khaliq, K. Khatri, J. Kneth, M. Kothari, I. Najmudin, L. Panchalingam, M. Patel, L. Premachandran, A. Qayyum, P. Rana, Z. Shaikh, S. Syed, H. Theti, M. Zaidani, M. Saraf, D. de Mijolla, H. Caines, A. Kokori, M. Rocchetto, M. Mallonn, M. Bachschmidt, J. M. Bosch, M. Bretton, P. Chatelain, M. Deldem,**

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A Study of the Soft X-Ray Emission Lines in NGC 4151. I. Kinematic Properties of the Plasma Wind

S. Grafton-Waters, **M. Ahmed, S. Henson, F. Hinds-Williams, B. Ivanova, E. Marshall, H. Udueni, D. Theodorakis,** W. Dunn (2021), *A Study of the Soft X-ray Emissions Lines in NGC 4151. I. Kinematic Properties of the Plasma Wind*, Research Notes of the AAS, 5(7), 172.

Original Research By Young Twinkle Students (ORBYTS): Ephemeris Refinement of Transiting Exoplanets III

B. Edwards, C. S. K. Ho, H. L. M. Osborne, **N. Deen, E. Hathorn, S. Johnson, J. Patel, V. Vogireddy, A. Waddon, A. Ahmed, M. Bham, N. Campbell, Z. Chummun, N. Crossley, R. Dunsdon, R. Hayes, H. Malik, F. Marsden, L. Mayfield, L. Mitchell, A. Prosser, V. Rabrenovic, E. Smith, R. Thomas,** A. Kokori, A. Tsiaras, M. Tessenyi, G. Tinetti, J. Tennyson (2021). *Original Research By Young Twinkle Students (ORBYTS): Ephemeris Refinement of Transiting Exoplanets III.*, *Astronomy Theory, Observations and Methods Journal*, Vol. 1, No. 1 / November 2021 / arXiv preprint arXiv:2111.10350.

Opening Pupils Eyes to the Sun

R. French, A. James, D. Baker, W. Dunn, S. Matthews, **B. da Silva Pestana, G. Graham, B. Shackell, A. Smith Carretero, G. Trindade** (2020), *Opening Pupils Eyes to the Sun*, *Astronomy & Geophysics*, Volume 61, Issue 6, December 2020, Pages 6.22–6.23, <https://doi.org/10.1093/astrogeo/ataa085>

Original Research by Young Twinkle Students (ORBYTS): Ephemeris Refinement of Transiting Exoplanets II

B. Edwards, L. Anisman, Q. Changeat, M. Morvan, S. Wright, K. H. Yip, **A. Abdullahi, J. Ali, C. Amofa, A. Antoniou, S. Arzouni, N. Bradley, D. Campana, N. Chavda, J. Creswell, N. Gazieva, E. Gudgeon-**

Sidelnikova, P. Guha, E. Hayden, M. Huda, H. Hussein, A. Ibrahim, C. Ike, S. Jama, B. Joshi, S. Kc, P. Keenan, C. Kelly-Smith, A. Khan, G. Korodimos, J. Liang, G. L. Nogueira, N. Martey-Botchway, A. Masruri, O. Miyamaru, I. Moalin, F. Monteiro, A. Nawrocka, S. Musa, L. Nelson, I. Ogunjuyigbe, J. Patel, J. Pereira, J. Ramsey, B. Rasoul, T. Reetsong, H. Saeed, C. Sander, M. Sanetra, Z. Tarabe, M. Tareke, N. Tasneem, M. Teo, A. Uddin, K. Upadhyay, K. Yanakiev, D. Yatingiri, W. Dunn, A. Kokori, A. Tsiaras, E. Gomez, G. Tinetti, J. Tennyson (2020), *Original Research by Young Twinkle Students (Orbyts): Ephemeris Refinement of Transiting Exoplanets II*. Research Notes of the AAS, 4(7), 109.

A Multi-Annotator Survey of Sub-km Craters on Mars

A. Francis, **J. Brown, T. Cameron, R. Crawford Clarke, R. Dodd, J. Hurdle, M. Neave, J. Nowakowska, V. Patel, A. Puttock, O. Redmond, A. Ruban, D. Ruban, M. Savage, W. Vermeer, A. Whelan,** P. Sidiropoulos, J-P Muller (2020), *A Multi-Annotator Survey of Sub-km Craters on Mars*, *Data*, 5(3), 70.

Temporal and Spectral Studies by XMM-Newton of Jupiter's X-ray Auroras During a Compression Event

A. D. Wibisono, G. Branduardi-Raymont, W. R. Dunn, A. J. Coates, D. M. Weigt, C. M. Jackman, Z. H. Yao, C. Tao, F. Allegrini, D. Grodent, **J. Chatterton, A. Gerasimova, L. Kloss, J. Milović, L. Orlandiayni, A.K. Preidl, C. Radler, L. Summhammer, D. Fleming** (2020), *Temporal and spectral studies by XMM-Newton of Jupiter's X-ray auroras during a compression event*, *Journal of Geophysical Research: Space Physics*, 125(5), e2019JA027676.

Observations of CH₃OH and CH₃CHO in a Sample of Protostellar Outflow Sources

J. Holdship, S. Viti, C. Codella, J. Rawlings, I. Jimenez-Serra, **Y. Ayalew, J. Curtis, A. Habib, J. Lawrence, S. Warsame, S. Horn** (2019). *Observations of CH₃OH and CH₃CHO in a Sample of Protostellar Outflow Sources*. *The Astrophysical Journal*, 880(2), 138. Accompanying press release example

Orbyts Publications

(Continued)

MARVEL Analysis of the Measured High-resolution Spectra of NH

D. Darby-Lewis, **H. Shah, D. Joshi, F. Khan, M. Kauwo, N. Sethi**, P. F. Bernath, T. Furtenbacher, R. Tóbiás, A. G. Császár, J. Tennyson (2019). *MARVEL analysis of the measured high-resolution spectra of 14NH*, Journal of Molecular Spectroscopy, 362, 69-76.

MARVEL Analysis of the Measured High-resolution Rovibrational Spectra of C2H2

K. L. Chubb, **M. Joseph, J. Franklin, N. Choudhury, T. Furtenbacher, A. G. Császár, G. Gaspard, P. Oguoko, A. Kelly**, S. N. Yurchenko, J. Tennyson, C. Sousa-Silva (2018), *MARVEL analysis of the measured high-resolution rovibrational spectra of C2H2*, Journal of Quantitative Spectroscopy and Radiative Transfer, 204, 42-55.

Marvel Analysis of the Measured High-resolution Rovibronic Spectra of 90Zr16O

L. K. McKemmish, J. Borsovszky, **K. L. Goodhew, S. Sheppard, A. F. Bennett, A. D. Martin, A. Singh, C. A. Sturgeon**, T. Furtenbacher, A. G. Császár, J. Tennyson (2018). *MARVEL analysis of the measured high-resolution rovibronic spectra of 90Zr16O*. The Astrophysical Journal, 867(1), 33.

Marvel Analysis of the Measured High-resolution Rovibrational Spectra of H232S

K. L. Chubb, O. Naumenko, **S. Keely, S. Bartolotto, S. Macdonald, M. Mukhtar, A. Grachov, J. White, E. Coleman**, A. Liu, A. Z. Fazliev. (2018). *Marvel analysis of the measured high-resolution rovibrational spectra of H232S*. Journal of Quantitative Spectroscopy and Radiative Transfer, 218, 178-186.

MARVEL Analysis of the Measured High-resolution Rovibronic Spectra of 48Ti16O

L. K. McKemmish, T. Masseron, **S. Sheppard, E. Sandeman, Z. Schofield**, T. Furtenbacher, A. G. Császár, J. Tennyson, C. Sousa-Silva (2017). *MARVEL analysis of the measured high-resolution rovibronic spectra of 48Ti16O*. The Astrophysical Journal Supplement Series, 228(2), 15

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Orbyts Leadership Team



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Orbyts Coordinator



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STAR Lead



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Quantitative Evaluator



Connor Ballard
MSSL Hub Lead



Prof Jonathan Tennyson
Orbyts Co-founder



Image above: Students at Highams Park, Preston Manor and LAE Stratford investigated how the future Ariel mission can observe Exoplanets in systems like this one. Credit: Exoplanet concept, envisaged by Midjourney.

“

I was on the first cohort of Orbyts. I can truly say Orbyts is one of the reasons I am a researcher today. First of all, Orbyts gave me the academic achievements such as the published paper to use in my personal statement to university and subsequent CV applications to my masters and PhD course – they even asked me about this during my PhD interview. This is something that people from my background struggle greatly with. But Orbyts gave me so much more than this. Having the insight into research at such a crucial age was really inspiring to me. The enthusiasm that all the researchers had for their projects confirmed my own passion for science and gave me role models to make this appear more achievable. Just getting to work at a university during my A levels seemed amazing to me at the time and to be back here today as a researcher really showcases what Orbyts can do for students from underprivileged areas.

Megan Joseph, PhD researcher at the London Centre for Nanotechnology at UCL.

