Letter from the Editor

We report on our three productions: Leeds: the first City of Maths, MathsCity Leeds, and MathsWorld London. We shall concentrate mainly on the City of Maths developments with brief summaries of our interactive exhibition spaces in Leeds and London. The City of Maths is where most of our energy has been concentrated since the start of the year.

But first we report on the retirement of Professor Emirita Margaret Brown as Chair of the Trustees of MathsWorldUK. We are very fortunate to have Lynne McClure as her replacement. Margaret and Lynne tell us about themselves in the two posts below.

Our featured mathematician for this issue is Fields Medallist, Professor James Maynard.

As usual, I call on all our readers to rally round our various causes and to support us in any ways they can.

I hope you enjoy this issue. It is long, but interesting.

Margaret Brown

Margaret was a founding member of MathsWorldUK from its inception in 2012. She is retiring as Chair of our Trustees due to ill health, but she will remain active on several of our committees, Margaret writes:

House of Commons 2014, Margaret Brown and Geoff Wain

"It was sometime in the Autumn of 2010 that I had a phone call from Geoff Wain, an old friend whom I hadn't then seen for many years, suggesting we meet for lunch. We had first worked together back in the 1970s when he was chair and I was secretary of the group of maths teacher trainers in universities, and had then met from time to time on committees, at conferences and as external examiners. Geoff had by 2010 retired from being Dean of the School of Education at Leeds University and had then spent some years in Malaysia helping open a new university, so the phone call was out-of-the-blue.

Over lunch Geoff reminded me that we shared some unfinished business, arising from our membership of a Royal Society committee which had launched the Pop Maths Roadshow in the 1980s. This was a travelling exhibition, organised largely by Geoff, which visited several cities in the UK over 2 years, the local university taking responsibility for hosting the exhibition for a period of 2-4 weeks, organising school visits and local publicity. It had been very successful, attracting more than 250,000 visitors in total, but the intention that the exhibits should come to rest finally in a

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permanent maths visitor centre was sadly never realised as it proved impossible to raise any funding.

I was in the process of retiring from my position as Professor of Mathematics Education at King's College London, and though still involved in some research projects, was looking forward to a gentle retirement embroidering, re-learning to play the piano, and helping with the care of the 8 grandchildren. Having sat on three key curriculum committees (the National Curriculum Mathematics Working Group, The National Numeracy Strategy, and the maths group of the Rose primary curriculum review), directed a large mathematics assessment project (Graded Assessment in Secondary Mathematics – GAIM) and been chair of the Trustees of a major curriculum development group (The School Mathematics Project – SMP), I had already decided I would never again get involved in curriculum or assessment battles with governments, examination boards or just with other committee members.

But Geoff's proposal had a certain attraction – it would involve only enthusiasts whom we chose because we had shared aims, liked them and valued their opinion; it would be independent of government or other national agencies; and we would only take on as much work as we could each reasonably manage. The objective of creating and spreading positive attitudes to maths among the whole population, and in particular among children, had always been one of my key life aims, so there seemed to be no good reason to refuse the invitation. Once again, Geoff became Chair and I, Secretary, of the first Executive Committee of what became MathsWorldUK.

In the early years Geoff and I spent a lot of time visiting people we thought could help, and/or inviting them to meetings (in particular, an initial launch at King's College London in January 2012). The contacts included, in the UK, people who were involved in running science visitor centres or museums or building science exhibits, people involved in maths outreach activities, and people who could offer valuable support (like the professional associations of mathematicians and maths teachers). They were, with one or two notable exceptions, enthusiastic and helpful, though none was willing to act as a business partner. We also contacted people we thought might support us with funding, from business, industry, government and relevant charities, with, it has to be said, very limited success. Maybe the approaches were a bit premature. Meanwhile Geoff, with the later help of a new secretary, Roger Fiskin, dealt with the administrative and governance side, ensuring we became a registered charity and company.

A holiday in New York in 2012 provided me with an opportunity to meet two of the people who were planning to open there later that year what would become the US National Museum of Mathematics (MoMath); members of our Executive Committee arranged trips to the long established Mathematikum in Giessen, Germany, and brought back slides of the mainly interactive exhibits. Both these contacts were to prove invaluable; in particular, we worked with MoMath to organise the first International Matrix Conference in Leeds in 2016 for people involved in maths visitor centres and associated outreach. There were over 100 attendees from over 20 countries who all agreed it was very successful and so has been repeated biennially in different locations.

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MATRIX 2016: Margaret Brown is second from left and Geoff Wain is third from left.

Because of the funding problems it became clear that progress in the UK would be slow, so our plan was to start with raising money for a few exhibits which we could take to science and maths fairs in the UK, and gradually build up towards enough exhibits for a travelling exhibition, which we could take to existing science and other museums with temporary space.

Audience responses at the fairs were very positive; we were particularly pleased to note that some of our exhibits simultaneously provided fun for toddlers, challenge and knowledge for secondary students, and an opportunity for earnest discussion among maths professors.

Thanks to generous funding from an American source, we were able to able to make a step-change in activity in 2018, starting with recruitment of a Chief Executive Officer, Dr Katie Chicot, seconded from the Open University. It also allowed payment to a part-time maths content consultant, Dr James Grime, and purchasing of enough exhibits, mainly from Mathematikum, to enable the design and assembling of a travelling exhibition. This was eventually installed within the Winchester Science Centre early in 2020, with staff trained for the opening to the public, but sadly the opening date coincided with the start of the first national Covid lockdown. When the Centre re-opened, they needed all their floor area to space out their own exhibits, so that the travelling exhibition had to be put into storage. But the pandemic was not all bad news; we heard that some retail units in Leeds were being offered rent-free to charities who could attract footfall back into the city centre. A business plan suggested that with continued support from our American funder, by charging reasonable ticket prices we could cover setting up expenses and the recurrent costs including staffing. In October 2021, with some

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trepidation, we opened MathsCity in Leeds. Thankfully, crowds of families in Leeds soon arrived at weekends and half-terms, with school groups during the week following more slowly. Geoff had thus happily succeeded in his original aim of establishing a maths visitor centre, and moreover in his home-city. However, by this time, approaching 90, he was finding the responsibilities too heavy, so I had taken over first as Co-Chair and then as Chair of the Trustees.

When former Prime Minister, Rishi Sunak, visited MathsWorld London in November 2025

Having chased a couple of apparent opportunities which turned out to be dead ends, we were extremely lucky to then find some generous funding sources in the City of London, so our next step had to be to establish a visitor centre in London. As in Leeds, we visited several premises before we found a suitable one and were able to open MathsWorld London in a railway arch close to Blackfriars in October 2025. That summer was hectically busy for Katie and our Leeds, and then London, manager Max Hughes, since it required a move of MathsCity to a new site in Leeds, while getting MathsWorld ready to open in London, whilst also preparing to launch Leeds as the first City of Maths in 2026/7.

Having experienced cancer problems since 2024, I thought it time to resign at the beginning of 2026 and let a younger generation oversee the next phase of development of MathsWorldUK. I have been remarkably fortunate with all the wonderful people who, whether as Trustees or in a variety of different capacities, have travelled on this journey with me, starting of course with Geoff, and I am so grateful for all they have done to get MathsWorldUK this far. It has been an exciting experience, and I have made so many friends on the way. I couldn't be happier that Lynne McLure will be taking over from me as Chair of the Trustees, and I greatly look forward to hearing about the next steps in its evolution."

Margaret and Lynne at Margaret's farewell lunch

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Lynne McClure

Lynne will formally become the Chair of our Trustees in September, and in the interim our Deputy Chair Professor Tom Ward will run our meetings. Lynne writes:

"I'm delighted to be taking over the Trustee reins from the amazing Margaret Brown, who has been at the front of the MathsWorldUK initiative since the beginning. She is quite an awesome act to follow! I'm looking forward to working with our wonderful CEO Katie and the rest of the team, including our other trustees.

MathsWorldUK is now at an interesting stage – we have two successful centres and the first City of Maths in Leeds. We have learned a lot about what works best in our centres – both in terms of activities and organisational strategies. We work with many different partners. We are in the process of rationalising our web presence and have become more knowledgeable around fund raising – we have some very loyal funders – although of course we are always seeking others. Our next goal is to work towards bigger centres and ultimately we aim to buy a permanent building.

So why me? All my working life (and now my life in 'retirement') has been involved with mathematics in one way or another. After a psychology degree I trained to be a secondary maths teacher and soon realised I knew quite a lot about maths but not very much about how learners learned. So, I retrained to be a primary teacher and that is really where my heart still lies. I became head of a small primary school and combined that with leading teacher training courses at Westminster College – now part of Oxford Brookes University. A promotion for my husband meant a move to Edinburgh where I set up my own consultancy, travelling all over the world to work with mathematics teachers in a huge variety of schools and settings and also working part time with various projects, including NRICH in Cambridge, of which I later became director. I moved between the Cambridge Maths Faculty and Cambridge Assessment to direct the DfE funded Underground Maths, and then the Cambridge Maths Project, all of which were amazing experiences whilst working with fantastic colleagues.

And then retirement – at which, as I like to joke, I am not very good. I feel that I have had such a rewarding career that now is the time to pay back. As well as MWUK, I am a trustee of National Numeracy, the Academy for the Mathematical Sciences where I chair the Education workstream, and the Cambridge Philharmonic Society with which I sing. Currently I chair the DfE maths curriculum drafting group, working with amazingly knowledgeable colleagues, and the Local Governing Body of the Cambridge University Maths School. I visit Ethiopia each year where I support a Gates project on very early numeracy. I'm also a Parish Councillor – which brings its own special problems! We love spending time with the families of our four daughters including, as I write, 7.9 grandchildren, all of whom are (of course) enthusiastic about maths….."

At Launch of MathsWorld London, November 2025

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MathsWorld London

Up to the end of May half-term, we have sold 35,098 tickets and have had 4,251 school students through our doors, totalling 39,349 visitors to the MathsWorld London since we opened at the end of last October. Our projected footfall target for our first year was 45,000 visitors and so we are well on course to significantly exceed this number. There have been times when the centre has been too busy, so we have had to restrict the numbers attending in any half hour interval.

We have now appointed a MathsWorld deputy manager, Rosie Barber, who started on 14th April. The immediate focus will be on balancing the workload between our manager, Max Hughes, his deputy manager, and the other front-line staff.

Rosie Barber has written a few words about herself. She writes:

"I graduated from the University of Warwick in July 2025 with a BSc in Maths. In my final year, I chose the new Communicating Maths module which sparked my interest in public engagement in mathematics. I joined as an enabler when MathsWorld London first opened, and now after a few months as an environmental Analyst Consultant, I'm very excited to be returning to MathsWorld as Deputy Manager. I'm enjoying supporting Max in running the centre and am looking forward to coming up with new fun and exciting things we can do in this incredible space and helping MathsWorld to continue to grow. In my spare time, I play the trumpet in a wind orchestra and previously played cornet, baritone, and trombone in a brass band."

Holiday activities

For the February holidays Max organised an origami artist to run sessions in the centre. The public made hundreds of stars, and the artist made a rocket and satellite to go with them. This is now an installation towards the rear of the centre, as shown in the photo to the right.

For the Easter holiday, the activity was curve stitching easter eggs and an egg hunt around the centre. For the May Half-Term, we ran an activity on Origami Encryption.

Lates

We have initiated a year-long monthly series of Late events on Tuesday nights, which are ticketed (£5 for those with a year-long pass, or £8 otherwise). These Lates last around two-and-a-half hours. Lates to date include:

- Meet the Enigma Machine (James Grime)
- The Maths of Shakespeare's London (Rob Eastaway)
- MathsWorld Space Late (Affelia Wibisono and Ellie Sleightholm)
- MathsWorld LGBTQ+ Comedy Late (Merry Martyn, Alex Franklin, James Arthur, Willow Marler)
- The Hidden Maths of Knitting (Allison Kiddle)
- Geometric Art Draw Along (Ayliean MacDonald)
- Sound of Silence (Ben Sparks).
- Islamic Geometry (Samira Mian)

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Other Events

- Simon Singh gave a lecture to celebrate the collaboration between G-Research, MathsWorld London, and the King's Maths School
- Max Hughes spoke about MathsWorld at a festival honouring the work of Martin Gardner in San Francisco
- We ran staff at Maths Fest and Inside Maths events at the Royal Institution
- Max Hughes visited parliament in November as part of our collaboration launching Maths Week England.

Publicity: We were visited by @sumsofanarchy who has half a million followers on social media. She made a very complimentary video of the centre:

https://www.facebook.com/sumsofanarchy/videos/mathsworlduk-is-a-great-half-term-activity-for-the-kids-thatll-get-their-brains-/1453964943096132/

MathsCity Leeds

Maths City Leeds is performing on target since we moved into the new premises on Canal Wharf. This means it is almost paying for itself. The main importance of MathsCity right now is the role it is expected to play during our two-year programme for Leeds, the first City of Maths. This programme was launched at the beginning of the year.

Leeds, the first City of Maths

The City of Maths is the main focus of our activity at the moment because it is our biggest project to date, backed by very substantial funds from three independent sources, and prominent Leeds-based organizations. Some key points to note are:

- Engagement metrics were up on most expectations, considerably so in the hits on social media. The launch competition entries were higher than expected. Almost all secondary schools have signed up as have 134 of 226 primary schools.

- Participation with the supermarket chain Asda has gone very well. Excellent maths challenges are scattered throughout three stores. City of Maths Ambassadors had a high profile in Asda. We continue to recruit Ambassadors for City of Maths.

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- In conjunction with Leeds Rhinos, we are contributing to a series of numeracy-sport-based activities aimed at Key Stage 2 pupils. We produced resource packs for schools and there will be visits to the Rhinos AMT Stadium in Headingley. Our Head of Maths and Schools at City of Maths, Ruth Holland (pictured in the second photo above, third from left, with two Rhinos colleagues and our CEO Katie Chicot), has said "We are thrilled to be partnering with Leeds Rhinos Foundation on this exciting programme. Sport is a powerful way to bring maths to life – whether it is analysing performance data, understanding scoring systems, or exploring patterns and strategy on the field, or maths that underpins much of what happens in the game". We are working with the scouts, cubs, guides and brownies to roll out a collection of maths activities. Participants are awarded a City of Maths badge for undertaking maths activities.

- One of the big events in the City of Maths are the two Light Nights on October 28 and 29. Following a selection process between 3 international artists, the Flemish artist Nele Fack was selected to create and deliver the co-commission between City of Maths and Light Night Leeds. Nele's initial proposal can be viewed here. The concept is built around the mathematical idea of Duality. The light projections on the City Hall will reveal mathematical principles hidden within the architecture of the City Hall whilst showing different instances of duality in mathematics.

- Excellent plans have been submitted for the Maths Playground in Horsforth Park. The Charity CIVA and the Richmond Project have funded the project. Leeds City Council has run the final public consultation and now the design is being finalised.

Ella Wild, the project leader for City of Maths, writes:

"It's been an exciting start to the City of Maths project, with a range of events and initiatives now live and kicking! Our ASDA shopping challenges are in Middleton, Pudsey and Killingbeck stores, setting shoppers problem solving skills as part of their shop – from guesstimating the amount of bread sales in ASDA last year to finding as many items as possible in the shape of a triangle!

We've also been busy delivering a range of events across Leeds, from being part of the family fun day at Leeds City Museum during February half term, to most recently being part of Leeds Literature Festival with guest speaker Sarah Hart at Leeds Mathematics School who explored the connections between maths and literature through her critically acclaimed book 'Once Upon a Prime'. We are looking forward to delivering more maths engagement and maths busking at a range of events leading up to the Summer, from STEMFest to Lark in the Park.

Most recently, we worked with the University of Cambridge to bring a replica of John Venn's cricket bowling machine to Leeds - we've been busy this week delivering a series of workshops to local schools where school children had the opportunity to build a mini bowling machine replica, culminating in a public event on Friday 19th and Saturday 20th June in Leeds city centre, where members of the public were challenged to fire mini versions of the bowling machine, with the replica model also on display.

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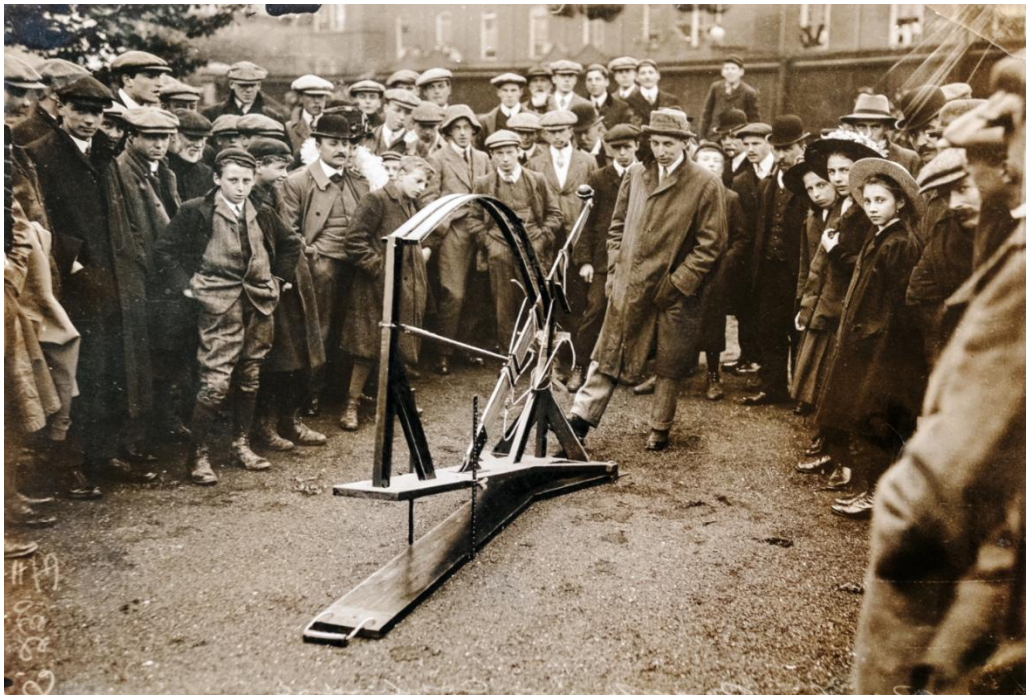
All events listings and further details can be found on our website:
https://www.cityofmaths.co.uk/whats-on"

Students at Rosebank Primary School building a mini Venn Bowling Machine



John Venn's original Bowling Machine

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From left to right: Revanth Taneeru (City of Maths Ambassador), Dr Rebecca Chadwick (City of Maths Ambassador), and Thomas Glenday (Head of Design and Technical Services at the Department of Engineering, University of Cambridge) at Rosebank Primary School.

Our City of Maths Head of Maths, Ruth Holland, has written:

"The Hull Mathematician, John Venn, is known around the world for his famous diagrams, but his bowling machine reveals another side of his personality – inventive, playful and endlessly curious. These workshops and events give people the chance to experience mathematics in a completely different way, combining history, sport, engineering and hands-on problem-solving. We're delighted to be working with the University of Cambridge to bring this remarkable story to Leeds."

Feature: Professor James Maynard, Ambassador for MathsWorldUK

This is our third article in which a top professional describes the importance of mathematics in his working life. In this issue we feature the young mathematician, James Maynard.

Professor James Maynard FRS is Professor of Number Theory at the Mathematical Institute in Oxford. In 2022 he was awarded the prestigious Fields Medal for his work on Prime Numbers. James is an Ambassador for MathsWorldUK, and as such he was asked to write an article for this Newsletter. This is his contribution:

"I love what MathsWorldUK is doing – I strongly feel we need to find new and different ways of bringing the fun and joy of mathematics to everyone, and I'm delighted to be an ambassador. To me the playful act of discovery is a vital part of what mathematics is all about, even in my job as a research mathematician. Indeed, I think being able to keep a childish sense of joy has helped me immensely through my professional career; it is what causes me to wake up wanting to think about mathematics and keeps me motivated when I've been stuck on a research problem for months on end. I imagine that I would never have been lucky enough to make serious

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mathematical discoveries or be awarded the Fields Medal if it hadn't been for this rather naive enthusiasm driving me, and I feel incredibly lucky that I get to spend my days doing something so fun – I think it's the best job in the world!

I've had a passion for mathematics and mathematical thinking from a young age. To an outsider observer it might have looked clear that I was always moving towards research in pure mathematics, but it never felt like that at the time. Fortunately, at each career stage I've always been able to choose to do the things that I find most interesting and pleasurable, be it specialising in maths subjects at school, pure mathematics at university or research in number theory during my doctorate and professional career. I'm now a research professor at the University of Oxford and split my time mainly between doing theoretical research and training others – be it meeting research students or giving undergraduate lectures.

I'm a pure mathematician who works in the field of 'number theory', which is one of the oldest areas of mathematics studying properties of the whole numbers. A particular area of interest for me is on the distribution of prime numbers. Number theory is notorious for having many important simple-to-state problems that have thwarted the efforts of the world's best mathematicians for hundreds of years, and this is particularly true for questions on primes. Prime numbers are the 'building blocks' of whole numbers under multiplication, and so are central objects throughout pure mathematics, with applications to computer science and internet security. Despite their fundamental nature, many basic theoretical questions about prime numbers are very poorly understood by mathematicians. It is this combination of questions being simple and fundamental, yet at the same time completely mysterious which I find totally compelling.

One of my favourite problems in number theory is the 'Twin Prime Conjecture'. This claims that there should be infinitely many pairs of primes which differ by exactly 2, like the pairs (5,7), (11,13) or (17,19). This problem is well over a hundred years old, but is still very much open and still attracting current research interest. Although we can find billions of twin prime pairs using a computer, proving that there are infinitely many probably requires a big breakthrough on our theoretical understanding on the distribution of primes. Despite this problem having attracted some of the greatest minds in mathematics over the past 100 years, we are still making progress on it. One result that I proved with collaborators is that there are infinitely many pairs of primes which differ by at most 246. Although 246 is quite a bit bigger than 2 (which is what the Twin Prime Conjecture asks for), it was only just over 10 years ago that it was first proven that there were infinitely many pairs of primes differing by at most some fixed number (a breakthrough result by Yitang Zhang). This is because the 'typical' gaps between primes get larger and larger, so we need to find ways to prove that there are pairs of primes unusually close together."

Stop Press

As we were going to press the following article appeared in Mathematics Today, Vol 62, No 3, June 2026, page 68. It is reproduced here with permission of the author and the Institute of Mathematics and its Applications.

Interactive Classroom Ideas from MathsWorld

I had been keeping an eye on MathsWorld London since it was announced, and it quickly made its way onto my to-do list for the school holidays. As head of maths at a secondary school, I'm always looking for ways to bring the subject to life beyond the classroom, so the chance to visit as a mentor for the Mathematics Teacher Training Scholarships programme was one I took straight away.

From the moment I arrived, it felt different. The space is bright, full of energy and far more interactive than a typical museum. I went on a Saturday morning, so it was busy, but what stood out

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straight away was how engaged the children were. They weren't being told to enjoy maths; they just were. That's something we work hard to achieve in school, and it doesn't always happen easily, so seeing it happen so naturally was genuinely refreshing.

What makes it work is how hands-on everything is. You're not just looking at exhibits; you're trying things out, testing ideas, seeing what happens. Before you realise it, you almost forget you're meant to be learning anything at all. One of my favourites was the elliptical billiards table. Watching the paths of the balls reflect in such a predictable way is a really clear visual for angles and loci. I've already found myself referencing it in lessons, partly because it sticks, but also because students actually remember it.

There are also clear links to maths in the real world. Exhibits connect ideas to architecture, nature and design in a way that is obvious. It reinforces the point that maths isn't something that lives in a textbook or a classroom; it's everywhere. That idea of maths underpinning everything is something I talk about a lot in the classroom, and this gives plenty of examples to draw on.

Upstairs there is the added challenge of spotting hidden animals within the exhibits, with a very handy online checklist to keep track (just don't refresh the page). It sounds simple, but it does make you look more closely, and you do end up sticking with things for longer than you expect in order to reveal the animal. Some of them definitely took a bit of thinking and I spent longer than I care to admit on level 3 of the Cipher Wall.

Building 3D shapes with Polydron took me straight back to my own school days, which was slightly unexpected, but it also reminded me how effective physical models are for developing spatial understanding. The Giant Bubble was another highlight. It took a few attempts to get all the way to the top, but it's a great example of how something quite simple can lead into discussions about geometry and optimisation. The Sandbox was something that many people kept coming back to as it was always mesmerising with the range of map projections you can switch between. There was also a physical version of the car park puzzle game I have on my phone, where you slide vehicles around a grid to free a blocked car. Being able to physically move the pieces and work through it was far more satisfying than tapping away on a screen.

The staff are also amazing. They're visible, approachable and clearly know what they're talking about, which helps you get the most out of each exhibit, and they're also able to give you hints if you get stuck. The website adds a lot as well. Key exhibits have explanations, applications, history and ideas to take home, or to the classroom.

We also explored the Bankside Maths Trail, which was a nice way to extend the visit. It takes maths out into the local area and links it to the history around you, with some impressive landmarks along the way. It is a good reminder that maths does not just sit in a classroom or even inside a museum; it is integral to everything.

If anything, that was the bit that stuck. Not any single exhibit, but the sense that it gives students permission to explore without the usual pressure that sits on top of maths in school. That is not easy to replicate. It's already made me think more carefully about how I bring more hands-on maths into lessons. For families, MathsWorld's a great option for the holidays, while schools also benefit from the dome building workshop designed for educational groups. I just wish I lived closer!

Kerry Ackerman
Maths Scholar 2017/2018

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