

# MATHSWORLD<sup>UK</sup><sup>®</sup>

## Newsletter No.9 January 2023

### Welcome

Welcome to the ninth issue of our newsletter. This issue is devoted to reviewing the first year of MathsCity and looking ahead to the creation of **MATHSWORLD**.

### The First Year of MathsCity

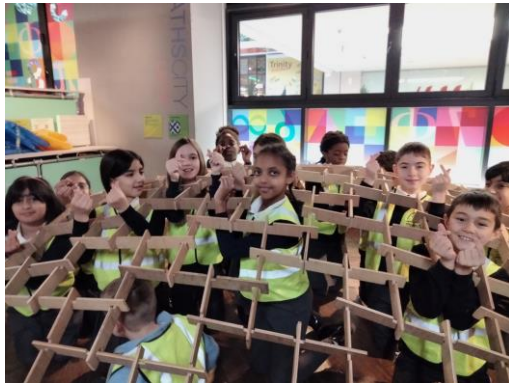
*"I hope these kinds of places start to pop up all over the UK because MathsCity is awesome."* (parent)

MathsCity is the first major production of MathsWorldUK. It is a dynamic interactive maths experience for people of all ages and abilities. It is now fifteen months since MathsCity opened to the public in Trinity Leeds, the main shopping mall in the centre of Leeds. We were extremely fortunate in being given the empty retail space in the shopping mall rent-free, courtesy of Trinity Leeds and a grant from the Leeds Business Improvement District. Trinity have renewed our lease until the end of this year.

We have made excellent use of the small space of 290m<sup>2</sup>, expertly designed for us by the Leeds-based firm, Workhaus. It houses some 23 medium-to-large-sized exhibits and 10 table-top exhibits, including mathematical games and puzzles. A combination of the small space available and restrictions due to Covid has meant that daily numbers have had to be severely restricted. Nevertheless, we are very pleased with our footfall, as we had just under 12,000 visitors in our first year. By the end of December 2022, our visitor

footfall was 14,550 - a very encouraging number. Well done to all those who made this possible!

Throughout this newsletter we showcase some of the best photos taken at MathsCity since its opening. Sense the wonder, the joy, and the concentration of the visitors, whether young or old.



Visitor feedback has been really encouraging. Here are two typical comments by parents, after a visit with their children:

1. *"As a self-confessed Maths geek, I desperately wanted to convince my family that we had to stop off at MathsCity [one year ago] on the journey back to Scotland after our holiday. It was quite a detour but not too much persuasion was required as #TeamSmith love solving puzzles (I even roped them into entering the BBC show 'Family Brain Games', hosted by Dara O Briain, a couple of years ago).*

*Maths City is obviously pretty new and it's relatively compact but the unit in the middle of Trinity Shopping Centre is crammed with intriguing hands-on Maths activities (often the Maths is actually hidden below the surface and kids could play with the objects without ever asking 'why?' but when they do, it's neat that there is Maths behind every cool effect here)!*

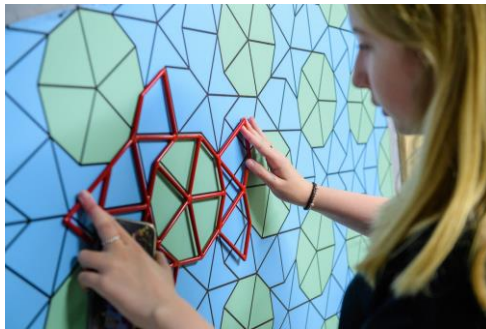
*The show-stopper is undoubtedly the giant bubble creator but you can also step into a kaleidoscope, build bridges, explore with mirrors, see a brachistochrone in action, be mesmerized*

*by patterns, stumped by puzzles, wowed by exhibits that tease towards probability and parabolas...*

*...there's so much to check out and even though we had the place to ourselves we could easily have filled a couple of hours enjoying all that Maths City had to offer!*

*It's reasonably priced and the staff on hand were enthusiastic, helpful and knowledgeable.*

*I hope these kinds of places start to pop up all over the UK because MathsCity is awesome."*



2. *"I hadn't heard of MathsCity until yesterday [two months ago]. Knowing I needed to pop to Leeds for something quick, and with my kids in tow, I was looking online for something we could do to bulk out the day, something they'd enjoy.*

*This came up on a few Leeds lists and sounded right up our alley - fun and educational. Not a full day but a few hours of diversion with something in the way of learning possible.*

*I kept it secret, and when they saw the shopfront, they ran right in. While it doesn't look at first glance as though you might spend long here, we spent two hours lost in puzzles and maths and codes. It was great!*

*I very proudly worked out codes and cyphers [sic], shapes and games (sometimes even WITH the boys!). The 5-year-old loved*

*the tessellating shapes, the 11-year old spent a lot of time with the bubbles. There are dozens of things to do, you can move on or stay with one puzzle as you choose. Staff can help if you're stuck, explain things, bring little ones a stool so they can see and touch.*

*The explanatory instructions help and give lots of good science/maths background. I would have spent longer there but the kids got hungry.*

*Toilets present, accessible throughout, I'd call this a bit of a hidden (and not overpriced) gem. As a school governor I'm also going to be recommending it to both my primary and secondary schools. Very young children will find a lot goes over their heads, it's best for ages 8-14, but saying that I bet adults get competitive about a lot here too!"*

We now have a new ticketing system in place which makes it easier for schools and individuals, or families to book online.

Many schools in Leeds and the surrounding area have brought whole classes to MathsCity, and one new Secondary Academy with only a year 7 cohort, brought all their pupils to MathsCity over the course of the year. Last year we received sponsorship through the International Centre for Mathematical Sciences (ICMS) which enabled us to offer ten free school visits for groups of pupils from 10 schools in Leeds. Under this scheme almost 400 pupils have visited MathsCity, with the numbers of boys and girls equally balanced. The ICMS grant also funded the delivery of three schools events and the development of three themed workshops with materials to support school visits and post-visit activity. The topics were: Geometry of Bubbles, Code Breaking, and Strategy Games. This year, the ICMS teamed up with Woongjin, the biggest educational publisher in South Korea and the 33<sup>rd</sup> biggest publisher in the world, to enable more schools with a high pupil premium to visit at a subsidised rate.

The grant also allowed us to cover an empty concrete wall space within MathsCity with a dramatic graphic of a fractal.



We also raised money to give 960 free tickets directly to families in schools with high levels of deprivation.

**Linda Rosen, the Manager of MathsCity, Writes:**

*Wow! Cool! Amazing!* - Just some of the positive comments we've heard from visitors to MathsCity over the last year. Reactions of "really difficult" and "why didn't I think of that" to solving the more challenging puzzles are very common.

The giant bubble is undoubtedly the star attraction, but our new Cipher Wall with its fiendishly difficult Level 3 has been popular, as have the other Coding exhibits. In MathsCity the exhibits can be enjoyed in different ways by all ages and abilities.

It's encouraging that many children are so keen on maths that they get stuck in quickly to the strategically placed Soma cubes or rush to the spinning paraboloid. It's even more encouraging to find people who are not keen on maths, or uncertain whether they really want to be here, when they discover something that holds their attention. Usually, they are the ones who don't want to leave!

We've noticed several repeat visits in the last couple of months, with children often bringing friends or different family members

along. Word of mouth is a good way to increase our footfall, as are websites promoting family days out and things to do during school holidays. Parents of autistic children have heard about MathsCity from their networks and forums, and they have been particularly pleased with how their children have engaged and focused on sensory exhibits.



School groups of Year 5 and upwards are a regular feature during term time. Seeing a group work together to build a Leonardo Dome, going inside and finally destroying it has been very satisfying. Even some brave teachers have ventured inside! While many pupils are in schools in West Yorkshire, some have travelled longer distances from Middlesbrough, Preston, Wigan, and Sheffield.

Other groups during the year have included home educators, special needs pupils, trainee teachers, community groups, the Boys Brigade and Beaver Scouts. We ran a couple of Pint of Science evenings in May which brought in members of the public who might not have known about us. In February we will be hosting a CPD session organized by the Leeds International Piano

Competition on maths and music. All these activities help to promote MathsCity to a wider audience.

Our busiest times have been during school holidays and especially half terms when, on some days, we've had nearly 180 people through the doors. The additional activities run by enablers and guest mathematicians have attracted a lot of families, and have included egg marbling, spirograph drawing, bauble making, Christmas tree fractals and origami.

The MathsCity shop stocks a range of popular maths books and puzzles, with our biggest sellers being *Rush Hour* and *The Genius Square*, both being among our popular exhibits. Signed paperback books by well-known media mathematicians also sell well.

Finally, a big thank you to my colleagues, enablers and volunteers who have gone out of their way to engage with visitors and make their visits enjoyable, informative, and satisfying.

We look forward to another successful year at MathsCity!

### **Evaluation of Visitor Experience at MathsCity**

It was important to evaluate the experiences of visitors to MathsCity and we commissioned an independent evaluation through the research consultancy firm, Hope-Stone Research.

Below is a summary of their main findings, which were carried out through pupil surveys, feedback boards, school visit observations, pupil focus groups, and interviews with teachers. 167 pupils completed the pre-visit survey, and 113 completed the post-visit survey. The feedback board received 117 responses.

- Self-reported enjoyment of maths increased, rising from 22% who said they very much enjoy maths pre-visit to 30% who gave the same response post-visit.

- Claimed enjoyment of Maths was higher among pupils from all ethnic minorities and boys, both pre and post visit. The biggest change pre- and post-visit was for pupils from ethnic minority groups, which increased from 28% who enjoyed maths very much pre-visit to 45% post-visit.
- Among those planning to take Maths A-level, reported interest in studying it at university increased significantly post-visit.

Some pupils were surprised at, or interested by, the ways in which the MathsCity visit altered their perspectives on maths as a whole - from how maths “can be more than just a textbook” to how applicable mathematics is to everyday life.

- Pupils and families overwhelmingly said they enjoyed their visit to MathsCity. Pupils described it as Fun, Cool, Exciting, Enjoyable, and Interesting.
- The sheer number of activities on offer and the variety of their content were appreciated by visiting pupils.
- Pupils enjoyed feeling challenged or having the opportunity to work on the experiments with their friends, including a competitive element.
- Adults accompanying children seemed to enjoy the activities as much as the children, with a number doing them on their own while the children explored elsewhere.
- Most pupils said that their visit was educational: 23% said they had learnt a lot, a further 65% said they had learnt something.
- They appreciated the way maths was presented via problem-solving skills and perspectives, along with the hands-on, activity-based approach of the sessions. *“I wasn't going to do maths [beyond KS4] because it's boring, but [now] I might, because some of it is fun”*. 31% of pupils reported that they felt more interested in maths after their visit.





## New Exhibits



We are currently working on the development of two complete thematic zones, one on coding and decoding and the other on the Mathematics of Planet Earth, including Climate Change. Each of these zones will include about twelve interactive exhibits. Dr James Grime will lead the development teams for these zones and each team will include top experts in the particular content of each zone.

## Some Recent Events

During the last year, members of the MWUK Board have spoken at conferences throughout the UK, but highlights of our activities must include the following.

A team of MathsCity enablers ran activities for school groups throughout the two days of the IMA Festival of Mathematics and its Applications at Sheffield Hallam University in July. Altogether, we reached hundreds of Sheffield school pupils.

Our CEO, Dr Katie Chicot, delivered the highly popular Code-breaking event to years 7 and 8 at Bruntcliffe Academy Morley, Leeds in December. This school is in an area of high deprivation and is one of the Gorse Academy Trust schools in the Leeds area that we are targeting to build a relationship with.

Katie and one of our Enablers, Merin Joseph, competed in the 24-Hour Maths Game Show, to see who could complete the *Genius Square* in the fastest time. Merin won hands down! Here's the

YouTube link - they are on from about 3 hours in:  
<https://www.youtube.com/watch?v=VakFxGLz5Ik>



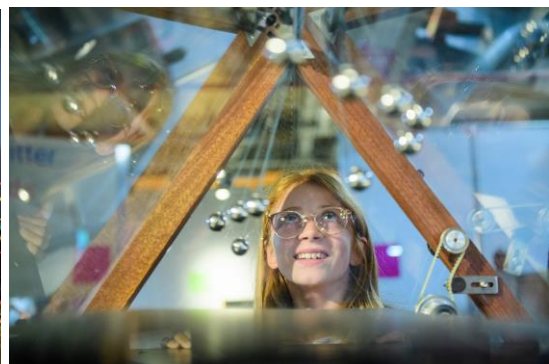
Professor Margaret Brown, our Co-Chair and President of the Maths Anxiety Trust appeared on the Radio 4 Podcast of Episode 15 of the series *Bringing Up Britain* hosted by Anjula Mutanda. This episode entitled *Why Does Maths Anxiety Make Me Anxious?* was broadcast on 21<sup>st</sup> September 2022.

Dr Kit Yates, who is director of the Centre for Mathematical Biology at the University of Bath and author of *The Maths of Life and Death*, is a Trustee of MWUK. Kit writes regularly in The Guardian. Most of his articles during 2022 were on the Covid pandemic, but his most recent on 4<sup>th</sup> January 2023 is a response to the Prime Minister's call for compulsory maths for all students to the age of eighteen.

## More Photos from MathsCity



^ Conic section



^ Let's swing



^ Our public event within the shopping centre at Trinity Leeds



^ Maths to suit all tastes...



...and shapes...



...and families



^ Primary school soap-bubblers



^ The Cipher Wall in MathsCity

## The Fourth MATRIX Conference, Paris

The Matrix conferences are to promote the public understanding of mathematics through mathematics discovery spaces and online platforms. Normally, they take place every two years, but the 2020 conference took place online, because of the Covid Pandemic. The 2022 conference was held in August/September at the renowned Institut Henri Poincaré in Paris, under the auspices of that institute working in partnership with the National Museum of Mathematics (MoMath) in New York and IMAGINARY in Berlin. In 2016, MathsWorldUK cohosted the second Matrix Conference, together with MoMath and the University of Leeds. We sent Dr Ruth Holland and our CEO, Dr Katie Chicot, to the Paris conference.



Ruth is a Trustee and member of the Board of MathsWorldUK, and she is the STEM coordinator and maths specialist working in outreach at the University of Leeds. She writes:

*"It was wonderful to meet in person with our global mathematical discovery centre and outreach community again, reconnecting with old friends and forging new partnerships. They listened with interest at Katie's update of the progress we have made with MathsCity and our promising initial evaluation, pleased with the success we have achieved and supportive of our continued efforts to grow and adapt. I enjoyed learning about the new ventures and exhibits that others are developing, many inspiring ideas which may lead to collaborative work in future zones. For instance, one of our next zones to be developed will be "Planet Earth" and Imaginary's 10-minute museum about the climate crisis was filled with ideas which could be included or adapted as this zone progresses. We were entertained by a mathematics and mime performance by Tim and Tanya Chartier, and able to get hands-on with dozens of activities kindly brought from across the world and shared with tasty treats from their origin!"*

*Our hosts gave us the Paris skyline as a backdrop to our reunion and we wait with excitement for Maison Poincaré to open and look forward to visiting again.”*

The Maison Poincaré is the new mathematical museum (Discovery Space) of the Institut, which is due to open very soon. The 94 delegates from 20 countries, including: France, Chile, the United States, Germany, South Korea, Italy, the United Kingdom, Turkey, Serbia, Spain, Sweden, Austria, Croatia, Poland, and Switzerland, also heard about new maths museums being developed in Seattle in the United States and in Istanbul, in Turkey.

They also heard from Katie about MathsCity and the plans to move towards our ultimate goal, **MATHSWORLD**.

Here is Katie’s introduction (in French):

<https://app.frame.io/reviews/5d58c6e4-febe-42b3-961a-8ac471ae016a/e3f2dc8a-4563-4f6e-be02-83807696d123>



^ Katie Chicot, speaking at the Matrix Conference in Paris

Many new ideas for developing interactive mathematics exhibits were discussed at sessions of the conference. We will draw on some of these ideas in developing future exhibits, first for MathsCity and then for **MATHSWORLD**.

## **News of Our Ambassadors**

Our Ambassador, Hannah Fry, has recently been appointed Professor of Mathematics of Cities at University College, London. Her recent series, *The Secret Genius of Modern Life* on BBC TV, is a



fascinating look at some of the amazing technologies of the modern world, revealing the mind-blowing stories behind their invention. Well worth watching!

### **Next Steps: The Way Forward**

Our immediate problem is where to locate MathsCity after the expiry of our lease at the end of 2023. We do not know at this stage whether Trinity Leeds will renew our occupancy of the present site. Consequently, we are beginning to explore other venues. At the same time, we have to consider how and where we situate our fully fledged Mathematics Museum or Discovery Space, which we are calling **MATHSWORLD** (see later section on the naming of our museum). We are looking at various options in Leeds, and we hope also to explore possibilities in Manchester, Nottingham and London.

In the meantime, we have decided to push ahead with planning and developing various zones which will form some of the content of **MATHSWORLD**. The development of three zones will continue in the coming year. Each zone will have ten-or-so interactive exhibits. These zones are Ciphers and Codes; The Mathematics of Planet Earth, including Climate Change; and Mathematics of Design and Engineering.

Until we have a much larger space available to us, we hope these new exhibits can serve a two-fold purpose. They will enable us to present new exhibits in MathsCity, and we will arrange for the remaining exhibits to temporarily tour around the country to Science Discovery Centres, or to local museums and other venues.

Of interest here is that we will be collaborating with the Design Museum in London to promote an exhibition on the Mathematics of Design and Engineering within the next two years. In this connection, we would like to gratefully acknowledge a large donation from Shirley Conran OBE. Shirley formed The Maths

Anxiety Trust in 2018 to ask questions, get answers, and press for action. She has been a maths researcher and writer since 2004; and was the Founder of Maths Action 2009. Shirley's son, Sebastian Conran, is a trustee of the Design Museum in London.

## Major New Grants and Donations

Other major grants in recent months have included further donations from CIVA, from a Foundation in the United States, from the International Centre for Mathematical Studies, including the Woongjin sponsorship, and from the Open University.

As always, we are always seeking potential benefactors and supporters, and we would also welcome people to leave us legacies in their wills.

## The Best Name for the Maths Museum

There are differing opinions about naming our maths centre. There are those who think **Mathematics**, or some variation of the name of our subject, should be boldly part of the name. Hence the name **MATHSWORLD** as the logical global step-up from MathsCity.

After all, Mathematics and its cultural role and importance throughout humankind's history is what we actually want to celebrate. And if attitudes about mathematics need to become more positive towards the subject, then Mathematics is done a disservice by sweeping its name under the carpet.

On the other hand, others say that having any variant of the word Mathematics in the museum name will turn off many potential visitors. There are other suggestions that embed something about mathematics or mathematicians in the name, and which might be catchier for the general public.

Here are a few to start with:

The MANIFOLD

The INTEGRAL

The SUMMATION

The METRIC SPACE

The INFINITARIUM

The MATRIX

The CHI SQUARE

The CONIC SECTION

The DOUBLE HELIX

The HAMILTONIAN

We would love to receive thoughts and suggestions from our readers about naming the maths museum when it finally comes into existence. You can contact us though the MathsWorldUK website: <https://www.mathsworlduk.com/contact-us/>



< Multiple perspectives: inside the giant Kaleidoscope in MathsCity



^ Volunteer Danielle Bullamore demonstrating conic sections

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