Welcome to the fourth issue of our Newsletter – 2018 in Review

People

2018 has been a very important year for us. The most auspicious event of the year has been the appointment of our CEO, **Dr Katie Chicot**, who began working for MathsWorldUK at the beginning of June. Katie was appointed to spearhead the development of interactive touring exhibitions devoted entirely to mathematics by establishing the necessary conditions, research proposals, business plan and contacts to attract donations and grants for our project. We hope Katie will lead MWUK to the establishment of our ultimate goal – the National Museum of Mathematics – the UK Discovery Centre for Mathematics.

Sadly, we have had to say farewell to **Sue Clarke**. Sue joined MathsWorldUK in January 2012 and since then has been one of the core members of the group leading our work. She has been a Trustee of the Charity, a Director of the Company, and the Minutes Secretary of the Executive Committee.

She contributed many creative ideas, a strong strategic sense, very competent management ability, and many hours of hard and focused work to the project. Unfortunately, due to family commitments she has felt it necessary to resign from August 2018.

Sue Clarke (left) and Anne Sinkinson, at Matrix II

Sue contributed enormous enthusiasm and energy to the Executive Committee, and a valuable 'can do' attitude. She was the prime driver to organize the 2nd International MATRIX Conference in 2016 at, and with the support of, the University of Leeds, and along with Ruth Holland personally took on the considerable administration involved for over 100 delegates from 19 countries. Everyone attending, from famous international mathematicians and museum directors to local PhD students, agreed it had been a huge success, mainly thanks to Sue's planning and ability to cope calmly with all eventualities. We will greatly miss Sue's inputs, but hope to continue to build on her vision and wise judgement.

We also say goodbye to our long-standing Treasurer, **Dr Anne Sinkinson** (pictured above) and welcome her replacement, **Jason Davison**. Jason has had experience as the Senior Educator at the National Museum of Mathematics in New York (MoMath), is a qualified mathematics teacher with a Masters degree in Mathematics from the University of Warwick, a qualified accountant and a specialist in mathematical magic performance.

We also say goodbye to **Simon Game**, our student member of the Executive Committee and our website manager, who has been responsible for our website from the very start. Simon has

done a fantastic job in bringing MWUK to our web-based followers. We wish him well, and congratulate him on recently being awarded his PhD in fluid dynamics from Imperial College.

We also have two important new recruits. **Dr Catherine Griffiths** joins the Executive Committee. Catherine is the Programme and Research Development Manager in the School of Business, Economics and Informatics at Birkbeck College, University of London. Catherine has recently been in charge of a collaborative group that has been awarded a huge government grant of many millions of pounds to pioneer work in Coding.
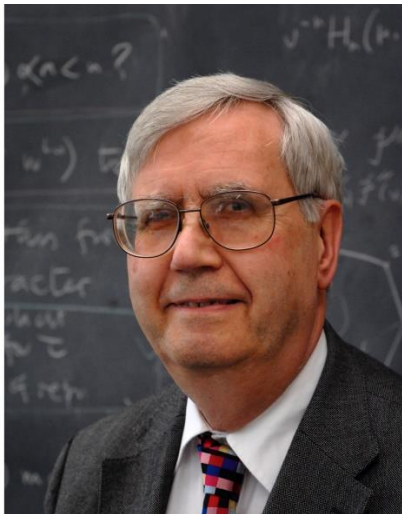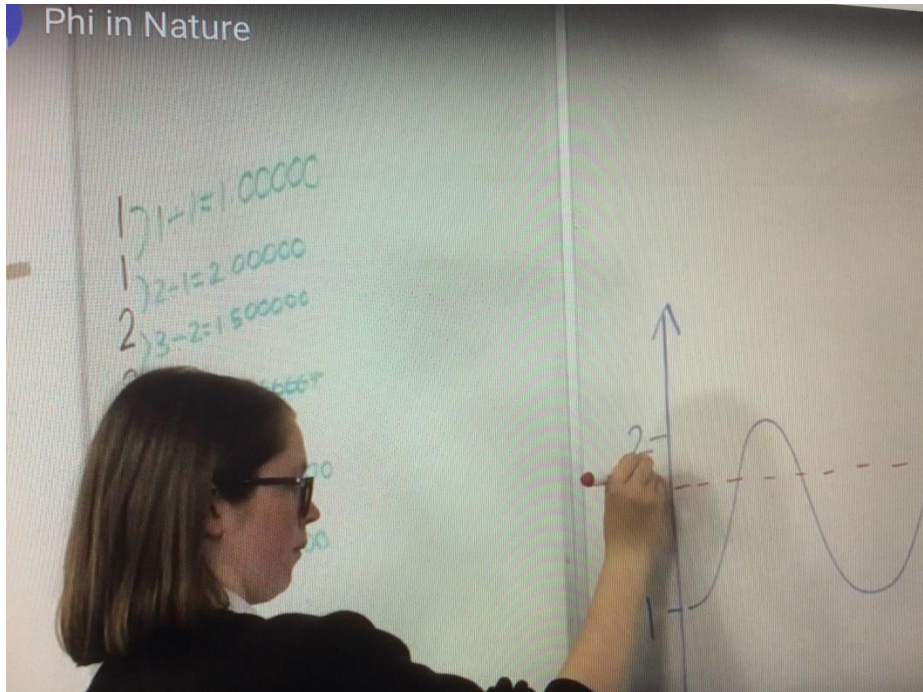
Photo credit: Cliff Moore, IoAS, Princeton, USA

We are also delighted to welcome **Professor Peter Goddard CBE FRS** to our Advisory Panel. Peter is an Emeritus Professor at the Institute for Advanced Study, Princeton. He was its Director from 2004 to 2012, and a Fellow of St John's College, Cambridge. A mathematical physicist, he has made pioneering contributions to string theory and quantum field theory, which were recognized by the award in 1997 of the Dirac Medal of the International Centre for Theoretical Physics, shared with David Olive. He was Master of St. John's College, Cambridge from 1994 to 2004, Professor of Theoretical Physics in the University of Cambridge, and was a key figure in the establishment of the Isaac Newton Institute for Mathematical Sciences, becoming its first Deputy Director.

Peter led the planning and fund-raising for the University of Cambridge Centre for Mathematical Sciences, which re-housed the University's departments of mathematics and theoretical physics alongside the Isaac Newton Institute, creating one of the world's largest centres for research and teaching in the mathematical sciences. Peter was involved in developing and initiating outreach projects, including the Millennium Mathematics Project. He has served as chair at Hills Road Sixth Form College, Cambridge, and of institutes for advanced study around the world. He was chair of the University of Cambridge Local Examination Syndicate, the parent body of OCR, from 1998 to 2003, and President of the London Mathematical Society.

Schools Video Competition: Maths Miniatures 2018

This was the third annual film competition for schools and colleges across the UK, organized collaboratively by MathsWorldUK, UK Mathematics Trust, and the University of Leeds.

Over the summer term talented young mathematicians and film makers from 75 schools in England and Wales accepted the challenge to make a film about mathematics in the natural world. Students aged 11 to 18 were required to work in teams to produce a 3-minute video about a feature in the natural world and the mathematics behind it.

A still from the winning video *Phi in Nature*

There was an exciting range of topics from epidemiology to gravity, and from bubbles to chickens. A team of judges had a difficult job to whittle down the entries to the finalists, and then an even harder job to decide the eventual winners.

The two winning entries were:

➢ *Phi in Nature* by Devonport High School for Girls in Plymouth [https://youtu.be/IeoPU7321BM]

➢ *Fractals* by Thetford Grammar School in Thetford, Norfolk [https://youtu.be/bReUlD8xNlw]

The following finalists were also highly commended:

➢ *Metallic Ratios* by Ashlawn School in Rugby [https://youtu.be/h1MtQ3mZLSo]

➢ *Geometry of Beehives* by Swanshurst School In Birmingham [https://youtu.be/5NmCuNapbXg]

➢ *Fractals - Maths in Nature* by St Michaels Catholic Grammar School in Barnet, London [https://www.youtube.com/watch?v=3bjMXvtF6Yw]

We thank all the participants for their efforts in producing a series of excellent films and also the teachers and schools for all their support.

Touring Exhibitions

MWUK has submitted a number of grant applications to develop a range of themed exhibits to tour around the UK. These include Maths for Under-8s; Optical Illusions; Medical Mathematics; Waves, Fluids and Bubbles; Art and Symmetry.

We would welcome commercial partners to fund and help develop themed interactive exhibits in specific areas of mathematics and its applications, for example in Chance and Risk, on Planet Earth, and Digital Applications including Coding and Robotics.

New Exhibits

We have two exciting new exhibits. The first of these, the Wave Pendulum was commissioned by MWUK and made for us by Science Projects in Acton. It was partially paid for by the money raised by crowd funding explicitly for this exhibit. This exhibit was successfully shown for the first time at the MA/ATM Maths Festival at the University of York in September.

The second exhibit was purchased from Stand-Up Maths Ltd. The Mirror Pillar, which demonstrates anamorphic projection, is a new mathematical public engagement project, organized by mathematicians Matt Parker and Katie Steckles, the team behind MegaMenger. The Mirror was made by Richard Ellam of LM Interactive.

The Mirror Pillar

The Wave Pendulum with our co-chair Geoff Wain (right)

Participation in Mathematics and Science Fairs

In 2018, MWUK participated in the following events:

➢ The Leeds Literary and Philosophical Society Science Fair (March 2018)
➢ The British Congress of Mathematical Education at the University of Warwick (April 2018)
➢ Winchester Science Centre, Mathematics Weekend (May 2018)
➢ The Mathematical Association and the Association of Teachers of Mathematics first mathematics festival, at York University STEM Centre (September 2018)
➢ Gledhow Primary School, Leeds, open mathematics days for children and parents (November 2018)

MWUK is pleased to be present at these events, many of which are becoming annual events. They provide a valuable opportunity to try out ideas for new interactive exhibits. They are also important for us in working with other groups that are concerned with the popularisation of Mathematics and have led to continuing partnerships which we value. We have increased the number of exhibits that we are able to use and we now have many activities for all ages. There are a lot of people who help us at these festivals and fairs and we would like to thank them for giving us their time and expertise.

We value our presence at these events particularly in being able to spread the word about MWUK and to get the views of visitors about our ambitions.

Our Supporters

MWUK has a growing list of national and international supporters. In addition to numerous famous Fellows of the Royal Society and two Fields Medallists, we now have strong support from the Institute of Physics and the Royal Society of Chemistry, as well as from all the professional associations for Mathematics. We reprint below the letter received from the IoP and the RSC acting in unison together.

1 August 2018

Dear Dr. Chicott,

As presidents of the Institute of Physics and The Royal Society of Chemistry, we are writing to support the MathsWorld initiative to set up a UK discovery centre for mathematics. Mathematics forms an essential foundation to the physical sciences, and at present there is no place in the UK solely dedicated to publically celebrating this important discipline.

The aspirations of the MathsWorld initiative are admirable and immense—to develop a space to engage young people and adults with mathematics in the same way that the Science Museum and Natural History Museum do for the physical and biological sciences. And in both physics and chemistry, where a solid foundation for mathematics is essential for further study, wider appreciation for the beauty of mathematics and the ways in which it impacts on our daily lives will benefit the future these disciplines, as well as that of our society and planet.

MathsWorld seeks to create a destination for all those who seek to learn more about maths through engaging exhibits showcasing the men and women who have helped to develop modern discipline of mathematics and 'zones' featuring interactive and electronic displays targeted at adults and children alike showcasing a range of mathematical ideas and principles. Through role models and exhibits that shine a light on the beauty and relevance of mathematics, there is potential to capture the imagination of adults and children alike with representations of elegant mathematical structures and applications in fields ranging from economics to climate change.

We also expect that many from the physics and chemistry communities will be attracted to MathsWorld. Through a conference centre, the initiative seeks to create a 'maths milieu' by hosting mathematical conferences, high profile ceremonies and prizes, and simply becoming a destination of choice where researchers may simply meet for a coffee surrounded by the beauty of mathematics. To this end, the Institute of Physics and Royal Society of Chemistry wish the MathsWorld initiative every success and we look forward to watching it closely as it develops.

Yours sincerely,

Dame Julia Higgins

Sir John Holman

We have also received similar strong endorsements separately from the National Museum of Mathematics in New York (MoMath); from the Mathematikum in Giessen and from IMAGINARY in Berlin, and from the Museum of Mathematics of Catalonia (MMACA) in Barcelona in Spain.

Fund-Raising

Fund-raising is our main priority. We would remind friends of MWUK and readers of this Newsletter of our **appeal** to raise at least **£125,000** by June 2019 in order to benefit completely

from the matched-funding pledge by our 'anonymous' donor from the United States. Please can you spread this appeal, via social media or otherwise, to as wide a circle as possible, including financiers, entrepreneurs, philanthropists, captains of industry, teachers, other professionals and even just your friends and colleagues. Donations and gifts can be made through our website

http://www.mathsworlduk.com

We are planning a major fund-raising event to take place in May or June of next year. So far we have a number of eminent celebrities who have expressed a desire to participate in such an event and these include the actor Jeremy Irons, who memorably played the Cambridge mathematician G H Hardy in the excellent film *The Man who Knew Infinity* about the Indian mathematical genius Srinivasa Ramanujan.

MoMath from New York has made the fantastic offer to loan us their famous square-wheeled tricycle as part of our fund-raising push.

Meetings

We have established a strong connection with the senior management team of the Association of Science Discovery Centres and hope that in due course we will be able to cooperate with the ASDC to promote mathematics events around the UK using individual science discovery centres as bases for our touring exhibitions and other activities.

Important discussions have also taken place in the North Yorkshire area for promoting mathematics events in that region and in Leeds itself. We continue to work closely with the School of Mathematics at the University of Leeds, with the University itself and with key members of the Leeds City Council.

There have also been meetings with The Department of Digital, Culture, Media and Sport, the Department for Education and the Department for Business, Energy & Industrial Strategy.

There are ongoing meetings to discuss sponsorships and collaborations, and we have had several exploratory meetings about possible locations for our Discovery Centre.

Matrix III - Mathematics Awareness, Training, Resource and Information Exchange Third International Conference

Katie Chicot, our CEO, and Committee member Ruth Holland attended this international conference for folk from mathematics museums and dissemination centres held in Barcelona in October 2018.
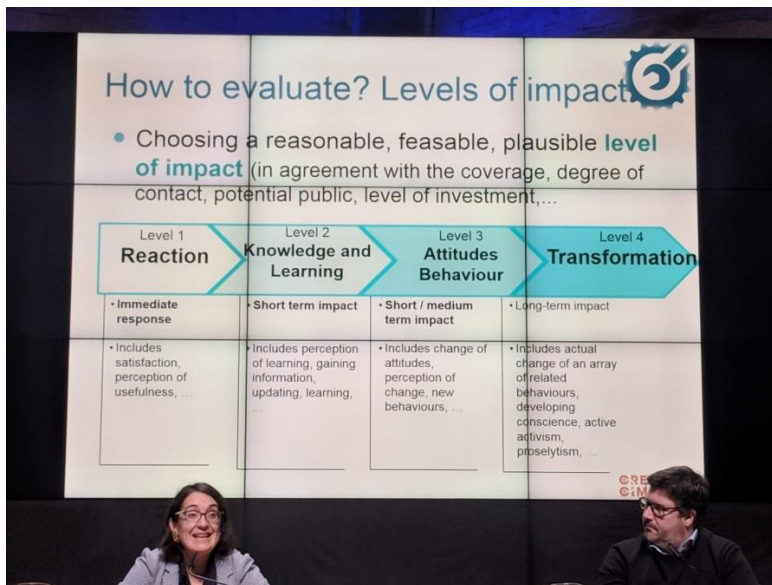
One highlight was Rinus Roelofs' public lecture **Art about Mathematics**. Over the last few decades Rinus has been exploring this theme. Taking Escher as his starting point, he investigated metamorphosis and began to look at duality. The lecture was a stunning unfolding journey with shapes woven through shapes. Over the course of his work Rinus has discovered a new class of polygons and is completing a PhD thesis on them. All the objects were beautifully animated with many weavings revealing they were made of a surface reminiscent of a Mobius strip.

The second day featured a visit to the Museum of Mathematics of Catalonia (MMACA), which was inspirational. MMACA is not a large museum but the well-designed and tested activities give the visitor a really satisfying experience.

There were many discussion groups where delegates shared their experience of engaging audiences and also of fundraising strategies. A really excellent talk was given by a team of researchers into the effects of informal learning on one's future engagement with STEM. As well as setting the background and developing a strong methodology for assessing the impact they gave advice on the sorts of evaluation that can be illustrative in an informal setting.

Delegates were rewarded with a visit to Cosmo Caixa, a stunning science museum on the outskirts of Barcelona, where cliff faces, dinosaurs, flooded forests, gyroscopes and card-playing robots were on display.

The conference provided further inspiration to the evolution of our ideas for the development of the UK's first national Mathematics Discovery Centre.