

*Transire suum pectus mundoque
potiri*

The Newsletter

Editor:
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HUMBLE π

If you thought π jokes were only a feature of the last edition, you were very much mistaken! For mathematicians, they are evergreen. On a different note, we at the Newsletter must acknowledge that mistakes occasionally creep in. For instance, there was a typo in the name of *Rachael Boyd* in the last edition, apologies Rachael! If you spot any errors in editions of the Newsletter, please let the Editor know and we can publish errata.

A CHANGE OF SEASON

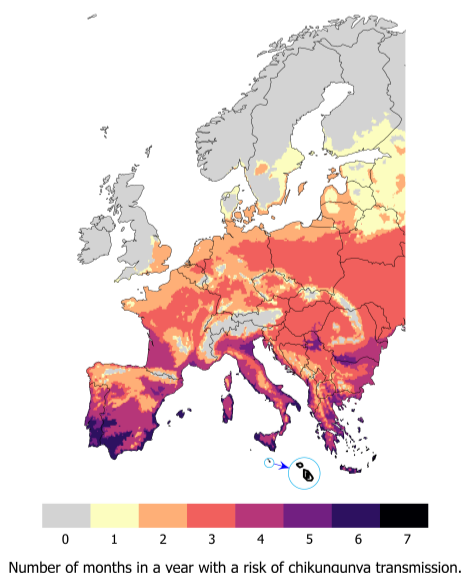
There are four editions of the Newsletter per year based on the seasons. Previously, a particular edition described the activity during that season, but would appear in another season. As this causes some confusion, we will now publish editions in the seasons in which they appear. It is for this reason why this edition is the Spring Edition rather than the Winter Edition.

PHD SUCCESS

Many congratulations to *Haolin Yang*, *Leo Kaminski*, *Yizhu Wang*, *Atrayee Bhattacharya* and *Pietro Colombo*, who recently passed their vivas. If I've missed any names, please let us know and they will be included in the next edition.

THE CHIKUNGUNYA VIRUS

BY CHRISTINA COBBOLD



The Chikungunya virus, a debilitating tropical disease caused by infected mosquito bites, poses a greater health threat in Europe than previously thought because it can be spread when air temperatures are as low as 13 degrees Celsius.

That is the finding of researchers at the UK Centre for Ecology & Hydrology and the University of Glasgow, in par-

ticular *Sandeep Tegar* and *Christina Cobbold*. They have investigated the ability of the Asian tiger mosquito to spread the virus, which is rarely fatal but can cause long-term chronic joint pain.

They have drawn up a map (see above) showing the extent of the risk of Chikungunya for 10km square areas across Europe including the UK. This risk map shows that the threat of virus transmission may last several months of the year in warmer parts of the continent where the tiger mosquito is already established.

There were record numbers of local outbreaks of Chikungunya in France and Italy in 2025, and the tiger mosquito has also been responsible for increasing numbers of cases of dengue fever in these countries in recent years. This mosquito species is only occasionally detected in south-east England and is not yet established so the current risk of local transmission in the UK remains very low.

However, the researchers warn that warming temperatures could result in the tiger mosquito becoming established in the UK in coming years, posing a disease risk, particularly in south-east England.

Their work, as well as being published in *Royal Society Interface* (see [here](#)), has generated a lot of interest in the mainstream press including articles in the Guardian, the Express and the Sun (and now, the Newsletter).

UNIFYING ARITHMETIC STATISTICS

Alex Bartel has partnered with Dan Loughran at Bath, Adam Morgan at Cambridge, and Rachel Newton at KCL. The four will lead a group in Arithmetic Statistics, funded by an EPSRC Programme Grant, and will investigate how arithmetic objects behave "on average." Alex explains: "In biology, physics, and other natural sciences, it is well understood that deterministic processes can be fruitfully studied by treating them as though they were random. In number theory and arithmetic geometry, this paradigm is still relatively recent. We will create a new unified framework for the major open problems in the area by exhibiting deep geometric structure behind seemingly purely algebraic counting problems, and will exploit it to vastly expand our understanding of classical number theoretic objects, some of which have been studied since Gauss. We are also partner-

ing with some of the internationally leading cryptographers to unlock new applications of Arithmetic Statistics to Cryptography."

The grant will run for 5 years, and will create a vibrant group connecting the four institutions. It will fund a total of 20 years of PDRA time, and will enable regular mutual visits, joint events, visits by international eminent mathematicians, and more. Alex says: "We are all extremely excited about the work that we will do together and the activities that we will organise. We want all of the UK number theory, algebraic geometry, and other communities to benefit from this grant. There will also be numerous training and outreach activities, and we will use the platform that this grant offers us to make future generations excited about this area and about mathematics in general."

MICAD 2025

BY XIAOCHEN YANG

PhD student Fangqi Cheng has been awarded the Best Paper Award at the 6th International Conference on Medical Imaging and Computer-Aided Diagnosis for her work "Data-Efficient Fine-Tuning of Vision-Language Models for Diagnosis of Alzheimer's Disease." The paper can be found [here](#). Congratulations Fangqi!



Fangqi with the other prizewinners.

NEW MOOC ON GENERATIVE AI FOR DATA SCIENCE

BY VINNY DAVIES

Vinny Davies, Jenn Gaskell and Craig Alexander have launched a new MOOC on Generative AI for Data Science, with help from PhD student Matthew Parker and Jake Lever in the School of Computing Science. The course takes a practical approach to using generative AI in statistics and data science, focusing on good practice, critical engagement, and integrating these tools thoughtfully into everyday workflows. It is aimed at students, researchers, and practitioners who want to make effective and re-

sponsible use of AI in their work.

The course is available on Coursera, and University staff and students can access it for free by logging in with their University account.

You can find our more [here](#).

CECIL KING TRAVEL SCHOLARSHIP

Congratulations to PhD student *Gabriel Corrigan*, who has been awarded the Cecil King Travel Scholarship by the London Mathematical Society. Gabriel, who is supervised by *Rachael Boyd* and *Tara Brendle*, will visit Corey Bregman at Tufts University, USA, for three months, to work on the recently constructed "Outer space" of right-angled Artin groups (RAAGs). RAAGs are a class of groups which simultaneously generalise free groups and free abelian groups and are therefore a wide-ranging and important class to understand, often arising in disparate contexts throughout group theory and topology. We wish Gabriel a fruitful visit!

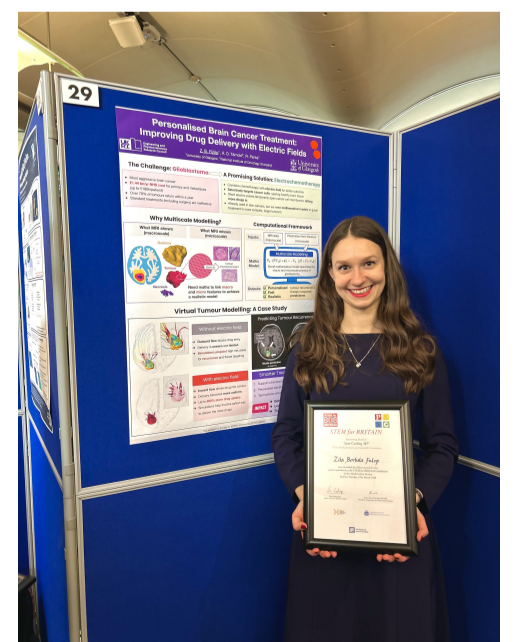
A quick look at the list of previous winners [here](#) shows that this is becoming a Glasgow tradition. Long may it continue!

GALLANT

We don't normally sponsor other newsletters, but in this case not doing so would not be very gallant (*Ed. note: if you think your puns are better, write in!*).

Statisticians from Glasgow lead the Data and Data Analytics workstream of the GALLANT programme. For more details, please consult their newsletter [here](#).

STEM FOR BRITAIN



Zita Fülöp at STEM for Britain.

Congratulations to *Zita Fülöp* for the silver medal at this year's STEM from Britain! Zita presented a poster based on work, carried out with *Raimondo Penta*, entitled "Personalised Brain Cancer Treatment: Improving Drug Delivery with Electric Fields."

THE π BALL

BY LUCY SYKES

The Maclaurin Society has had a brilliant year, ending the semester with almost 200 members - the highest membership we've seen in recent years. Throughout the year, we hosted a variety of events, most notably our Freshers' Week pub quiz at the Record Factory, Christmas dinner at the Old Schoolhouse, a Burns Ceilidh at the GUU, and our annual Pi Ball. For the Pi Ball, we chose a theme based around the teaching staff, with each table dedicated to a member of staff - an idea that was very well received! Before the semester ends, we look forward to hosting Oxbridge lecturer Dr. Tom Crawford, or "Tom Rocks Maths" as better known on social media. This promises to be a fun way to end the semester, by learning about some interesting applications of mathematics!

None of this would have been possible without the generous support of the School and the Tommy Whitelaw Bequest, both of which we are incredibly grateful for. The society now looks forward to the next academic year, where we hope to continue growing and building on this year's success.



The Pi Ball in full swing.

GLASGOW SCIENCE FESTIVAL

BY ELLA GILCHRIST

Save the dates - it's a special one! Celebrate two decades of the Glasgow Science Festival as we say 'Cheers for 20 Years'. Coming to venues across Glasgow from the 4th to 14th June.

MATHS AT THE MOVIES

In the last edition, we looked at Professor Nash's problem on the board from *A Beautiful Mind*. Below is an outline of the solution.

Restricting to two dimensions, our spaces can be written as

$$V = \left\{ \mathbf{F} = (P, Q) : \mathbb{R}^2 \setminus X \rightarrow \mathbb{R}^2 \mid \frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x} \right\},$$

and

$$W = \{ \mathbf{F} \in V \mid \mathbf{F} = \nabla f \} \subset V.$$

We want to find X such that $\dim(V/W) = 1$. It is known from basic calculus that a vector field is conservative everywhere on \mathbb{R}^2 if and only if $\partial P/\partial y = \partial Q/\partial x$. Choosing $X = \emptyset$ will not work, so the next simplest guess would be $X = \{(0, 0)\}$. Now consider the "work done" by \mathbf{F} around the unit circle C with centre $(0, 0)$, i.e.

$$T(\mathbf{F}) = \int_C \mathbf{F} \cdot d\mathbf{x}$$

We can prove that $T : V \rightarrow \mathbb{R}$ is surjective by taking

$$\mathbf{G} = \left(\frac{-y}{x^2 + y^2}, \frac{x}{x^2 + y^2} \right)$$

and showing that $T(\mathbf{G}) = 2\pi$ (we could then add a scaling factor to cover \mathbb{R}). From linear algebra, it may be shown that $\ker T = W$ and the isomorphism theorem tells us that $V/\ker T \cong \text{im } T$. This is equivalent to saying that $V/W \cong \mathbb{R}$, i.e. V/W is one-dimensional. Therefore, the difference between V and W is a vector field contained in V but not in W . The vector field \mathbf{G} is such an example. We may then state that, for $\mathbf{F} \in V$,

$$\mathbf{F} = c\mathbf{G} + \nabla f,$$

for some scalar $c \in \mathbb{R}$ and scalar function f .

The vector field \mathbf{F} is no longer just a simple gradient because the topology of the domain has changed, i.e. we cut out a hole at the origin. This is a simple example of the effect of domain topology on vector fields, the theory of which is developed in Hodge decompositions (a different Hodge to our resident chess maestro!) and de Rham cohomology. Interestingly, the origin of this kind of problem goes back to Helmholtz's work on fluid mechanics (hence the *Helmholtz decomposition*). He was interested in characterizing vortex motion in ideal fluids, splitting the fluid into a part with non-zero curl (vorticity) and a potential part (the rest of the ideal fluid without vorticity).

Thanks to *Daniele Valeri* for originally setting this problem up.

ALUMNI NEWS

Now that the Newsletter is sent to many of our alumni, we are keen to find out what people have been getting up to. Two Glasgow-trained mathematicians who have had success in non-mathematical environments are *Arthur Smith*, a very talented rugby player (see *here* for a BBC article about him) and *Ally Shaw*, head of drinks at Scoop Restaurant Group (see *here* for details about Michelin success). If you are an alumnus and have some interesting stories, please get in touch with us.

FOR SHE'S A JOLLY GOOD FELLOW!

Very many congratulations to *Claire Miller*, who has been elected to the Royal Society of Edinburgh (RSE). The RSE is Scotland's National Academy, and Fellows are elected in recognition of excellence in their disciplines, and an ongoing commitment to advancing knowledge for the benefit of society as a whole. This certainly describes Claire's work well, but maybe hides the fact that Claire has also been one of our most collegiate members of staff, and many people, past and present, have benefited hugely from Claire's advice (including the Editor) and mentorship. Many thanks and congratulations to Claire.

WRITING ON THE WALL

Our building has become a bit of a tourist attraction, with many photos being taken by passers-by of the equations written on the walls. How much of these equations do people understand however? A new poster has been produced that describes not only the writing on the walls but also shapes found in other parts of the building. A copy of the poster is now available on the School's webpage *here*.

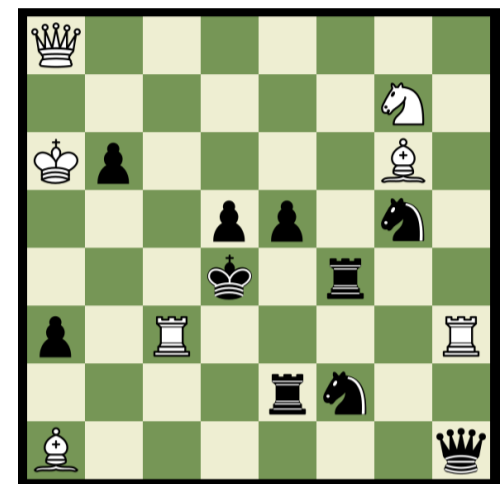
HODGE THEORY

BY DAVID HODGE

First some chess problem-solving news. I narrowly missed out on the British Chess Solving title in February, as I ran out of time writing the final line of my solution to the final problem! Nevertheless, I came second, so not bad. In mid-March I popped over to the Dutch championship and also finished second, this time to the reigning European Champion (who gained his revenge after I beat him at the British event). We'll do battle again in the European Championships in Skopje, in May! These good performances leave me currently second in the 2026 World Cup, and I've snuck up to 15 in the world by rating. I'm happy to discuss chess problems any time, but you may know that

already!

For today's puzzle we return to a traditional Mate in 2 problem. This one, composed by Murray Marble in 1908, achieves a 'task' as they're known to Problemists. This one achieves seven self-blocks on the same square by Black. See if you can solve it, if only to uncover what all that terminology means. Remember for a Mate in 2 it's White-Black-White checkmate, and the more beautiful the better!



Last issue's solution:

So where is the checkmated Black king hiding? Three options are perhaps possible: e4, the bank rank (a8/c8/e8/g8) or surprisingly d4! The bank rank option is quickly eliminated. Notice the checkmate is from the h8-rook, so the last move must have been pawn g7xh8=Q mate. But white already has eight pawns, so no! The harder options involve the king on e4. Now white might have played pawn d2-d3 mate, or pawn e2xd3 mate. Both are impossible! First, d2-d3 isn't possible since how did the Bishop on f4 get out before now? Second, e2xd3 isn't possible since then what happened to the original f1-Bishop. Notice it was captured on h5, else how did that pawn get there? The only other option is the tricky d4, how can this work? White played Qf6+ with a black pawn on e7 and the white e6-pawn still on d5. Black played e7-e5 and white captured d5xe6 en passant, for a double check and mate!

HEAD OF SCHOOL'S CORNER

BY NIGEL MOTTRAM

Many thanks to David for collating another great Newsletter. It's great to hear about all the activity in the School, particularly the grants and prizes our staff and PhD students are receiving. Thank you to everyone in the School, for all your efforts over the last few months - it seems to have been a particularly long semester!

This time it's just a short piece from me, picking up on a couple of short pieces in the Newsletter.



As I sit in my office at the front of the building, gazing out the window when I should be replying to emails about risk assessments, broken coffee machines and projected student numbers (that's the life of a Head of School), I see so many people taking photos of the building, and the equations that decorate it. They look up, point to a symbol they might recognise, talk to the people they are with, shake their heads and move off – I can imagine the conversation about how baffling it all is.

In some ways that's fine – the equations, diagrams and datasets on the building are complicated, it's the research we do inside the building, which is definitely at the very cutting edge of the mathematical sciences. Should we expect to be able to explain our research to everyone? Many famous scientists* suggest that simple explanations should always be possible. While that is true to some extent, we shouldn't expect years of dedicated research to fit neatly into a few short sentences. The new poster that we've produced (see *here*) tries to tread this line, providing some technical details about the decorations and making links to areas of knowledge that passers-by will be more familiar with. The building is now one of our greatest pieces of outreach, which will hopefully have even more impact now that the new poster has been installed in the front window for people to read.

There is also mention of our alumni in the Newsletter. It's always great to read about where maths and stats have taken our graduates – I'll certainly be mentioning mixology as a possible destination profession at our next Open Day. Over the last couple of years we have welcomed many ex-students back to the School, to talk to current students, to help with outreach and widening participation and as members of our Business, Industry and Government advisory board. In fact, this Friday I'll be attending the 1451 Society lunch and meeting a few more alumni there. We love to hear from our graduates, and we're always delighted when they reconnect with the School. Please do get in touch, either through David (address at the end of the Newsletter) or through the University Alumni Team (www.gla.ac.uk/alumni or alumni@glasgow.ac.uk).

Finally, as some of you will know,

I'm a fan of cryptic crosswords, and so I thought I'd complement David Hodge's chess puzzle with three crossword clues that I thought were particularly good:

Piece of mathematics old geometers worked out – hard to penetrate it (6,7)

From the Financial Times, Cryptic Crossword No. 14803, 12th December 2014, compiled by Bradman

China, in general, is getting transformed after taking the lead in modern AI (7,8)

From The Hindu, Cryptic Crossword No. 13380, 19th Oct 2021, compiled by Gussalufz

Bodies in motion in lively callisthenics came with added energy (9,9)

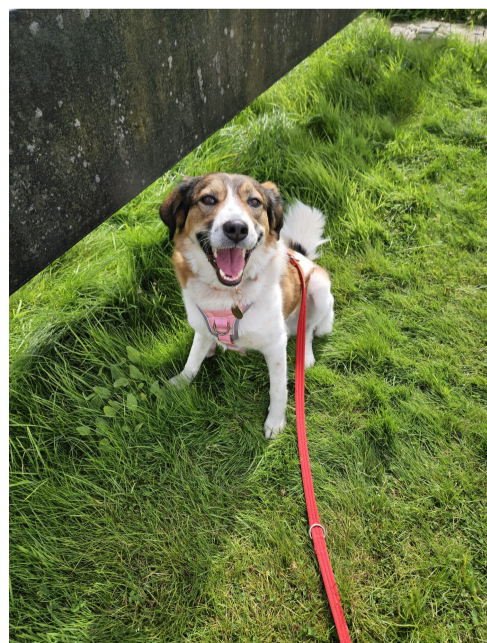
From the Independent, Cryptic Crossword No. 10797, 21st May 2021, compiled by Phi

Thanks again for everyone's hard work this semester. I hope you enjoy the newsletter, and I look forward to seeing many of you around the building – whether you're creating new equations, solving crosswords, or fixing the coffee machine.

* Quotes from Feynman, Einstein and Rutherford spring to mind – and looking for the Rutherford quote led me to a webpage full of his quips, many of which are not too complimentary to other scientific disciplines. One of these did seem apt to the current financial crisis affecting most UK universities – "...we have run out of money. It's time to start thinking" – a call to invest in the theoretical sciences? (Apologies to my fellow Heads of School in the College of Science and Engineering.)

PET THERAPY

You can now relax, it's time for pet therapy. For this edition, we have Vinny Davies' dog Pipa, posing nicely for the camera.



LET US KNOW

Thank you to all who contributed to this quarter's Newsletter. If you would like to contribute to future editions, we would be delighted to hear from you. Please contact the Editor at

david.mactaggart@glasgow.ac.uk

