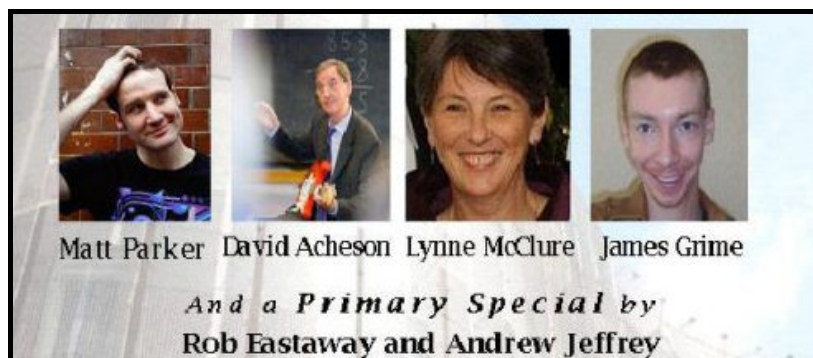


The Mathematical Association Annual Conference 2011

Mathematics: The Big Picture

Loughborough University 14th-16th April 2011



MA Annual Conference, Loughborough 2011

Mathematics: The Big Picture

PROGRAMME

Thursday 14 April

12.00-2.00	Registration/lunch
2.00-3.15	Opening lecture: Matt Parker <i>28 Reasons to Ignore the Textbook</i>
3.15-3.45	Refreshments
3.45-4.30	Session 1
4.35-5.20	Session 2
5.30-6.30	Open meeting of Teaching Committee
6.45	Dinner
8.00	Bar competition to find <i>'The Best Piece of Maths Ever'</i>

Friday 15 April

9.15-10.10	Session 3 (Including Rob Eastaway/Andrew Jeffrey Primary Special)
10.10-10.40	Refreshments
10.45-11.30	Session 4
11.35-12.20	Session 5
12.20-1.30	Lunch
1.30-2.45	Presidential Address: David Acheson <i>What's the Problem with Maths?</i>
2.45-3.15	Refreshments
3.15-4.00	Session 6
4.05-4.50	Session 7
4.55-6.00	AGM
7.30	President's reception
8.00	Annual Dinner (After-dinner speaker: James Grime)

Saturday 16 April

9.15-10.00	Session 8
10.05-10.50	Session 9
10.50-11.15	Refreshments
11.20-12.30	Closing Lecture: Lynne McClure <i>The Big Picture: Does it Matter Where You're Standing?</i>
12.30	Lunch

After the conference, at 1.00pm, there will be a meeting of Branches Committee, and any interested delegate is welcome to attend.

About the Sessions

Primary(P), Secondary(S), Post-16(P-16), Tertiary(T), General(G)

Session 1 Thursday 3.45-4.30pm

1.1 Paul Andrews

Linking cubes and the development of conceptual understanding P S G

Linking cubes, when used judiciously, have the potential to unlock many mathematical concepts. In this session we shall examine a range of linking cube-related activities - focused on learners of all ages - that highlight the power of this ubiquitous but insufficiently used resource.

1.2 Steve Chinn

31 signs of dyscalculia (Double session continued in 2.2) G

31 typical signs of dyscalculia and maths learning difficulties are discussed and their impact on learning explained. The list acts as a screener and as an initial diagnostic tool.

1.3 Steve Hewson

NRICH research: Key moments in mathematics for exceptionally able students P S P-16 G

With funding from the Templeton Foundation, NRICH has undertaken research into factors affecting the success of highly able mathematics students. Over 700 Cambridge undergraduates provided detailed information on the key mathematical influences in their development from primary school to university. In this session we shall describe and discuss the common themes and mathematical stories which were revealed.

1.4 Cyril Isenberg

The mathematics of bubble demonstrations revisited P S P-16 T G

How can soap films help with mathematics? Some problems, such as the shortest road network linking a number of towns, can be amazingly difficult, yet a simple apparatus and a bowl of soapy water can point the way to a solution.

1.5 Bill Richardson

First Timers forum All

A chance to discuss matters concerning the conference; how things work and what to do if they don't.

1.6 Andrew Taylor

Developments in mathematics assessment and qualifications (14-19) S P-16

This session will look at the range of mathematics qualifications currently available and likely to be available in the future. It will concentrate on changes in the last 12 months and look at how government education policy may shape the way mathematics is taught and assessed now and in the future.

1.7 Vinay Kathotia

Practical Mathematics All

The Nuffield Foundation has a range of resources and websites for 'practical' education in science – Practical Biology, Practical Chemistry, Practical Physics. What would be meaningful examples and good support for Practical Mathematics? Come and share your thoughts (and experiences!) and engage with some of the practical ideas we have been gathering.

1.8 Adam McBride

Some favourite results involving polynomials S P-16 T G

The humble polynomial plays a crucial role in many interesting problems. We shall go hunting for prime number generators, try in vain to trisect an angle and along the way marvel at such beautiful results as the Fundamental Theorem of Algebra.

1.9 Douglas Butler

Autograph for KS3 and 4 (Double session continued in 2.9) S P-16 T G

How Autograph 3.3 can help students at KS3 and 4. Some well tried and successful lesson plans for helping students get to the bottom of some tricky topics, including frequency density, scatter plots, the 2D-3D interface and practical applications of the parabola! www.autograph-maths.com

1.10 Caitriona Byrne and Daniel Evans

National Curriculum Review workshop

This workshop will outline the approach being taken to the current Government review of the National Curriculum in mathematics, will present some initial findings from the Department for Education, and will provide an opportunity for delegates to input views.

Session 2 Thursday 4.35-5.20pm

2.1 David Crawford

Running a primary Team Maths competition P S

For the last couple of years, I have run a Team Maths event for Year 6 pupils from primary schools who send pupils to my secondary school. In this session I will present some of the materials I have used and encourage delegates to have a go at the different types of questions.

2.2 Steve Chinn

31 signs of dyscalculia (Continued from session 1.2) G

2.3 Nina Attridge, co-presenters Camilla Gilmore, Matthew Inglis

The Approximate Number System: What is it? And what is its role in mathematics education? P

The innate Approximate Number System (ANS) allows humans to rapidly compare nonsymbolic numerosities, for example, packs of prey. In this session we review evidence that supports the existence of the ANS, report some experiments that suggest it influences school-level mathematics achievement, and draw some tentative implications for mathematics education practice.

2.4 Michael de Villiers

Some reflections on the Van Hiele theory for geometry education P S P-16 G

This paper reviews research on the Van Hiele Theory over the past 30 years, and highlights some important issues regarding theoretical implications for designing learning activities in dynamic geometry contexts, as well as problematic issues for further research such as hierarchical class inclusion.

2.5 Charlie Gilderdale

Developing mathematical thinking through "low threshold – high ceiling" tasks S G

The NRICH website initially published problems for highly-achieving students. Now we cater for a wider range of students by creating "low threshold - high ceiling" tasks. In this session we will work on one task and discuss how such activities allow all students to engage with key mathematical processes, regardless of prior achievement levels.

(Liz Woodham will give a similar, but primary-focussed, talk in Session 7.)

2.6 Sidney Tyrell

Big picture from small sample – that's stats! S P-16 T G

A look at the big picture in teaching statistics at all levels - thoughts, ideas and resources with an emphasis on delivering concepts, especially sampling, rather than proofs and detail, especially to those who are not mathematicians. With data, stories and resources to take away.

2.7 Chris Budd

Inspiring teaching by linking to industry P-16 T G

In this session I will show how we can use industrial examples to inspire the way that we teach and also how industrial problem solving workshops can motivate the learning of students of all ages.

2.8 Danny Brown

Prime numbers, proof and Gödel's Incompleteness Theorem P-16

What makes a good proof? Are there any truths we can't prove? This session gives a brief insight into how Gödel used prime numbers and logic to show that there are true statements we can't prove. We will also consider the possible implications of his theorem for maths, philosophy, physics, computing and beyond.

2.9 Douglas Butler

Autograph for KS3 and 4 (Continued from session 1.9) S P-16 T G

2.10 Caitriona Byrne and Daniel Evans

National Curriculum Review workshop (Repeat of session 1.10)

Session 3 Friday 9.15-10.10am

3.1 Rob Eastaway, Andrew Jeffrey

In praise of Martin Gardner P G

It was said of Martin Gardner that he turned children into mathematicians and mathematicians into children. For many years Gardner wrote a column for Scientific American, which was avidly followed across the world. He is best known among academics and secondary teachers, but much of his material is just as engaging for primary teachers and their pupils. Rob Eastaway and Andrew Jeffrey will pick out some of their favourite Gardner examples, tricks and puzzles, to demonstrate that Martin Gardner is part of the solution to enriching the primary curriculum.

3.2 Farzana Aslam

***Enriching environments for maths students* S P-16**

This session will showcase enrichment activities for secondary and post-16 students. I will highlight the learning outcomes achieved and collaborations between Coventry University and different institutions.

3.3 Mark Shackleton

***A snakes and ladders representation of stock prices and returns* P-16**

Games offer useful and fun ways of conveying ideas as well as solution techniques, and some have considerable mathematical tractability. This talk shows how snakes and ladders can be used to represent the ups and downs of share ownership and solve for fair values of a multistage project that pays fixed dividends at uncertain completion times and has random returns.

3.4 Michael de Villiers

***From the Fermat points to the De Villiers points of a triangle* S P-16 T**

This paper describes the discovery and proof of the so-called De Villiers points of a triangle and traces its origin from the Fermat points of a triangle, via the centroid of a triangle, Ceva's theorem and a useful generalization of the Fermat points of a triangle.

3.5 Lara Alcock

***Reasoning skills for university mathematics* S P-16 T**

This interactive session is for teachers whose high-achieving students will go on to university mathematics. Participants will solve problems involving sets of numbers, then watch an annotated video of a student attempting the same problems and discuss the skills he needs to develop in order to make his reasoning more effective.

Session 4 Friday 10.45-11.30am

4.1 Emma Low

***Mathematical scavenger hunts* P**

In this practical workshop we explore the possibilities of using ICT and learning outside the classroom to develop mathematical understanding, reasoning and explanation. It will include ideas and resources to discuss and take back to the classroom.

4.2 Caroline Clissold

***Maths across the curriculum* P**

Do you teach mathematics discretely? Would you like to find out how to effectively use and apply mathematics across the curriculum? If so, this workshop is for you. We will be exploring ways to develop linking objectives to each other and the wider curriculum, integrating using and applying and speaking and listening skills in a meaningful, engaging way.

4.3 Mike Price and Mary Walmsley

***The Mathematical Association Library of Surprises* G**

This presentation will advertise the Library's distinctive features: the Special Collection of books from the 16th century; the Hersee manuscript exercise book collection; the Library up to recent times; and the Wittgenstein papers. Some illustrative examples will be displayed for closer examination after the talk.

4.4 Catherine Ogden

***Implementing PLTS in the mathematics curriculum – one school's experience* S P-16**

PLTS (Personal Learning and Thinking Skills) are among the latest buzz-words in schools, and the pressure is on to incorporate these ideas into our schemes of work. I will *not* be telling you how to go about this, but I will show you what has been done in my department – across KS3, 4 and 5 – to make this happen for us. Feel free to 'borrow' any ideas you like.

4.5 Tadashi Tokieda (Moved to session 9.9)

4.6 Tony Gardiner

***Regular polyhedra in 3D and 4D (Double session continues in 5.6)* S P-16 T G**

The construction of regular polygons in 2D and regular polyhedra in 3D should be a standard ingredient in pupils' experience of elementary mathematics at KS3/4. We provide background via a uniform combinatorial treatment of regular polyhedra, shedding light on 3D polyhedra and de-mystifying the regular polyhedra in 4D (and higher dimensions).

4.7 John Rigby Cancelled (A written version is obtainable from: rigbycathedralcourt@tiscali.co.uk)

***Slicing an equilateral triangular cylinder* P-16 T G**

A recent Problem on this three-dimensional topic in the Gazette has revealed unexpected connections with other more familiar aspects of two-dimensional triangle geometry. The number of triangle centres in Kimberling's valuable list is now more than 3,500, and two of the more recent additions to the list will feature in our investigations.

4.8 Elena Nardi

***Conveying mathematical meaning through symbols, words and diagrams as learning to participate in the practices of the mathematics community* P-16 T**

Learning to communicate mathematically is often described as learning how to convey mathematical meaning through symbols, words and diagrams. In this session I will draw on interviews with university mathematicians in order to discuss five issues that encapsulate their views on newly arriving students' communicative behaviour in mathematics.

4.9 Douglas Butler

***What's new and exciting on the web for mathematics* (Double session continues in 5.9) S P-16 T G**

I make a point of keeping up to date with web resources through my TSM website. This description is being written 8 months before the event – so who knows what will turn up in the meantime to help teachers to bring a sparkle to their teaching. Come and see!

4.10 Tom Roper (Moved from session 9.8)

***Measuring the space in which we live* S P-16 T**

The way we measure the space in which we live fixes the shapes that we see around us. Thus if we change the way we measure we may well change many other things. This session looks at what happens when we measure using the taxi cab metric and is very practically based, with as much serious mathematics emerging as participants wish to indulge in. Come along and look at a different world.

Session 5 Friday 11.35am-12.20pm

5.1 Judy Sayers

***Practice makes perfect?* P**

Is all the routine practice we expect of our children necessary? In this session we will consider the answer to this question and look at ways of making practice part of a more meaningful learning experience.

5.2 Liz Meenan

***Escher-type tessellations and pull-up polyhedra* P S**

In this practical workshop participants will gain an appreciation of how Dutch artist M.C. Escher created his intriguing tessellations through the distortion of simple shapes and the application of geometric transformations. Participants will be guided through the creation of their own Escher-type tessellations and these ideas will be extended into 3-D with pull-up Platonic solids patterned with Escher's designs.

5.3 Jenni Back

***Big ideas, small children* P S**

This will be an interactive workshop based on ideas that we have been using and developing with teachers and children in various schools around the country. We will try out some tasks that we have developed to use with young children to help them access the big ideas in mathematics.

5.4 John Baylis

***Teaching mathematics in the University of the Third Age* G**

This talk is aimed at those members who are retired (or planning for it) and would like to continue to have a mathematically stimulating life and, more importantly, to share it with others. The U3A has branches in most parts of the UK and exists to enable those no longer in full time employment to maintain both physical and mental activity, with groups doing anything from knitting to physics. It relies on the interests, expertise and experience of its members, with virtually no dependence on external tutors. My experience has been with the Pembrokeshire branch (miles from anywhere, so no easy access to what universities may offer), leading two maths groups, one basic and one advanced. Exactly what these terms mean in the context of U3A will be explained in the talk. We'll look at ideas that have worked – and some that haven't – and how to organise things to satisfy the vast range of ages (early 60s to late 80s) and of experience (matric 60 years ago to maths degree). An interesting challenge!

5.5 Lydia Showan

***Introduction to the National STEM Centre* G**

The National STEM Centre is home to the UK's largest resource collections for STEM subjects ages 5-19. Come along to investigate: a treasure chest of inspirational resources, including hands-on kit, how our online community can support your school/college, and where to look for wider STEM support.

5.6 Tony Gardiner

Regular polyhedra in 3D and 4D (Continued from session 4.6) S P-16 T G

5.7 Richard Lissaman

Making mathematics relevant to today's teenagers S P-16

It's an exciting challenge to present mathematics in a meaningful and relevant way to today's teenagers. This session will focus on modern applications such as the use of mathematics in films, video games and in internet search engines. These applications will be linked to GCSE and A-level Mathematics and Further Mathematics curricula.

5.8 Christopher Sangwin

Models: mathematical and physical S P-16 T

Models are central to applied mathematics. They are mathematical formulations which encapsulate the essence of a practical problem. A 'model' is also a physical artefact which can be used to illustrate some mathematics. This talk will contrast these two meanings of the word 'model', with some surprises and counter-intuitive results.

5.9 Douglas Butler

What's new and exciting on the web for mathematics (Continued from session 4.9) S P-16 T G

Session 6 Friday 3.15-4.00pm

6.1 Andrew Jeffrey

An introduction to Cuisenaire – theory and practice P S

This hands-on session will consider the origins of (and thinking behind) the use of Cuisenaire in the classroom, and delegates will then try around a dozen activities for use in the primary classroom. It is designed for those with little or no previous experience of using Cuisenaire rods.

6.2 Jane Gabb

Not 'more of the basics' P S

Strategies for supporting pupils with additional learning needs. What pupils who struggle with mathematics need, and what they don't need, with practical suggestions.

6.3 Mike Ollerton

Teaching in mixed ability groups (Double session continued in 7.3) S P-16

I believe setting by ability is iniquitous and is one of the reasons why many children fail to engage with mathematics. In this session I offer a range of accessible starting points and extension tasks to embrace the key issue of differentiation and to help consign setting to the dustbin of educational 'theory'.

6.4 Sara Santos

Royal Institution Mathematics Masterclasses S P-16 T

The Royal Institution is celebrating the 30th anniversary of the Ri Mathematics Masterclasses programme. The masterclasses started in 1981, three years after the great success of Professor Sir Christopher Zeeman's Ri Christmas Lectures entitled 'Mathematics into Pictures'. The session is an opportunity to try masterclass activities, often taken into classrooms and suitable for a wide range of pupils.

6.5 Richard Earl

Caught between dimensions P-16 T G

You might know a fractal when you see one, but just what are they, and what is the maths behind them? This is an introductory talk about dimension theory and Hausdorff dimension which can take fractional values. Examples include Julia sets, the Cantor set, Weierstrass functions, random fractals, the logistic map and of course the most famous of fractals named after the sadly departed Benoit Mandelbrot.

6.6 Steve Hewson

Using NRICH to support exceptionally able students and their teachers at Key Stages 4 and 5 P S P-16 T G

In this interactive session we will explore recent innovations and developments on the NRICH website designed to help the development of exceptionally able students. We will discuss the special needs of exceptionally able students, the difficulties facing their teachers and, of course, have a go at some problems for ourselves. The session will be aimed at the Y11/12 content level but may be of wider interest given that exceptionally able students often work well beyond their age. Mathematically less confident teachers very welcome.

6.7 James Nicholson

Reasoning from evidence – using mathematics across the curriculum S P-16 T G

We are developing resources for students in social sciences to work with real data involving multiple explanatory variables to enhance their understanding of complex contexts in their course such as inequalities in health or education.

6.8 Michael Fox

Drawing curves on your computer (Double session continues in 7.8) G

With programs such as Geogebra, Cabri or Sketchpad we can draw classic curves, some with exotic names like the Cissoid of Diocles, the Lemniscate of Bernoulli, as well as conics, etc. This session shows how. Bring a laptop and software and join in, or sit back and watch the pictures.

6.9 Douglas Butler

My favourite topics in Autograph: vectors and differential equations (Double session continues in 7.9) S P-16 T G

The vectors topic stretches from simple translations and mechanics applications in 2D to lines and planes in 3D. The visualisations possible in Autograph will be explored. Differential equations also lend themselves nicely to a dynamic approach, especially when the input can be implicit, making it easier to understand about the complementary function and particular integral. www.autograph-maths.com.

6.10 Loughborough University Department of Mathematical Sciences

An elementary look at some recent mathematical research G

This session, which continues in 7.10, consists of two short 20-minute talks on some recent developments.

Alexander Veselov

Markov's equation and the most irrational numbers

Hurwitz's theorem tells us that the Golden Ratio is, in a certain sense, the most irrational number. Less well-known is what the second number in this list is, while the third is known only to experts in Diophantine analysis. Surprisingly this order can be described by a simple Diophantine equation called the Markov equation. This remarkable equation was discovered recently to be related to various problems of modern geometry and mathematical physics.

Thomas Bartsch

Transition states: gateways of chemical reactions

In many chemical reactions, how fast the reaction will happen is determined by a 'bottleneck' through which it must proceed. If we can find that bottleneck, we have understood the most important features of the reaction dynamics. We can describe them efficiently in geometrical terms using circles and cylinders.

Session 7 Friday 4.05-4.50pm

7.1 Liz Woodham, Lynne McClure

Developing mathematical thinking through "low threshold - high ceiling" tasks P

The NRICH website initially published problems for high-attaining pupils. Now we cater for a wider range of children by creating "low threshold - high ceiling" tasks. In this session we will work on an activity and discuss how such tasks allow all learners to engage with key mathematical processes, regardless of prior achievement levels.

(This complements Charlie Gilderdale's secondary-focussed talk in Session 2.)

7.2 Amanda Simpson

Conceptual growth, transfer and abstraction: what role did Father Christmas play in beginning to learn about negative numbers? P

Transfer and abstraction are problematic concepts. A widely held view is that abstraction is a pre-requisite for transfer. I will describe my PhD research, which considered the way that children's thinking develops as they experience a new concept and found that abstract knowledge of a concept is not necessary for transfer, once we understand that transfer occurs at different levels.

7.3 Mike Ollerton

Teaching in mixed ability groups (Continues from session 6.3) S P-16

7.4 Liz Russell

These have worked for us! S

My passion is finding different ways of involving students with their learning. In this session I will share some ideas that have worked in my school and am happy for you to bring a memory stick to copy the resources.

7.5 Stan Dolan

Teaching the new Certificate in Use of Mathematics S P-16 T

This new certificate is a level 2 qualification, designed to be equivalent to a GCSE in mathematics. It is available for both pre-16 and post-16 students. The session will concentrate on why this course is suitable for students who are struggling (or have previously failed) to achieve a GCSE grade C.

7.6 Andy Kemp for Texas Instruments

(Michelle Moore has withdrawn)

The role of Technology in the Mathematics Classroom

This session will explore a wide range of ways in which technology can be used in the Mathematics classroom to support learning. This will involve demonstrations and practical examples from KS3, GCSE, A-level and IB. Andy will also

talk about the differing attitudes towards the use of technology between A-levels and the IB, as well as touching on how technology is radically impacting the teaching of Mathematics in some other countries.

7.7 Ben Sparks

***Rumours of other worlds* S P-16 G**

How mathematics acts as a consciousness-raiser, enabling us to imagine and work with ideas beyond what we can see/touch. We'll use 'Flatland' (Edwin Abbott - 1884) to explore extra dimensions, 4D cubes, complex numbers, and the central theme of humility (or lack thereof) in the development of science and mathematics.

7.8 Michael Fox

***Drawing curves on your computer* (Continued from session 6.8) G**

7.9 Douglas Butler

***My favourite topics in Autograph: vectors and differential equations* (Continued from Session 6.9) S P-16 T G**

7.10 Loughborough University Department of Mathematical Sciences

***An elementary look at some recent mathematical research* G**

This session, which continues from 6.10, consists of a short 20-minute talk on some recent developments.

Ian Thompson

Surprises in computing

Special functions (e.g. Bessel functions) are ubiquitous in applied mathematics and theoretical physics. Therefore we need to be able to compute their values accurately and efficiently. There are many functions for which effective computational methods remain unknown. In this presentation, the difficulties surrounding this will be discussed, with a particular focus on situations in which exact formulae yield incorrect results when used on a computer.

Session 8 Saturday 9.15-10.00am

8.1 Maria McArdle

***Introduction to Numicon* P**

Numicon is a multi-sensory maths teaching programme. The Maths Shapes used give learners insight into number values and relationships in a way not provided by written numerals. Come and develop your mental imagery as you combine and compare the shapes to do arithmetic in a series of practical activities.

8.2 Ray Huntley

***Classroom mathematical examples – open or closed case?* P S G**

Mathematical examples taken from textbooks or teacher-generated worksheets can often limit effective learning of mathematical concepts. Drawing on material from doctoral research, this session will offer participants the opportunity to evaluate some examples and explore how they can be re-designed to provide a more challenging and stimulating task for pupils.

8.3 James Grime

***Enigma and the secret world of codebreaking* P S P-16 T G**

I travel the UK and the world with a talk on the history and mathematics of codes and code breaking. I will show you some of the things I use during those talks and explain why it's such a fascinating and exciting topic, including a chance to see a genuine WWII Enigma Machine!

8.4 Francesca Lyon

***Parce the Parcel* G**

Using Simon Katan's Parce the Parcel game can be a starting point for teaching everything from basic properties of shape, order, and listing outcomes, to higher level probability and combinatorics. You can come and learn things or just come to play pass the parcel as a team game. There might even be prizes!

8.5 John Mason

***Gattegno's definition of awareness* (Double session continued in 9.5) P S**

This double session will be based on Gattegno's definition of awareness as 'that which enables action' whether conscious or not, and on the view that mathematics is the study of actions on objects and of relations between those actions. The reason for the double session is that in order to become aware of awareness (and so find relevant actions coming to mind in the future) it is essential to participate in mathematical thinking, which takes time. Participants will be invited to work on three or four tasks that highlight some of the big ideas and core awarenesses in school mathematics. Suitable for anyone willing to use their own powers to think mathematically, and particularly relevant to upper-primary and secondary curricula.

8.6 Charlie Stripp

Curriculum development 14 – 19 S P-16 T G

This session will review curriculum changes in Mathematics at GCSE and A level in recent years and suggest ways forward for 14 – 19 mathematics.

8.7 Paul Harris

Mathematics in biology: modelling deformations of the spinal cord G

One of the speaker's current areas of research is in the application of mathematics to problems in medicine and biology. In particular he is interested in modelling the formation and growth of the cavities in the spinal cord which are characteristic of the condition syringomyelia. This talk will explain how the current mathematical model was developed, and how the model will be improved in the future.

8.8 John Silvester

Pendula and polygons P-16 T G

In its simplest form, Poncelet's Porism says that given any triangle, there are infinitely many other triangles with the same inscribed and circumscribed circles. I shall outline a simple and surprising proof of this famous theorem by dynamics, and investigate a few corollaries. All will be illustrated with Geometer's Sketchpad.

Session 9 Saturday 10.05-10.50am

9.1 Peter McOwan

The magic of maths G

Magic helps make maths exciting and drives student curiosity. Come along and learn some fascinating tricks you can easily perform, and discover the maths behind them.

9.2 Bob Burn

Escher's horses P S P-16 G

We will look at Escher's horse tessellation and perhaps some others, and search for other tiles which might be used to make the same tessellation. What shapes might they be? Might they be long and thin? Might the area vary from tile to tile?

9.3 David Bedford

The Tuesday Boy Problem S P-16 T G

At the ninth "Gathering 4 Gardner", held in March 2010, Gary Foshee posed the following question: I have two children. One is a boy born on a Tuesday. What is the probability I have two boys? I shall be discussing this, and some related questions, in a way that should, I hope, be accessible to all.

9.4 Jane Imrie

What have I learnt today? G

There is much research into effective professional development, but, as with all teaching and learning, there is no 'one size that fits all', and responses to professional development activity are personal. This active session explores mathematics PD activities and offers opportunities for discussion to try to identify factors which constitute effective professional development activity.

9.5 John Mason

Gattegno's definition of awareness (Continued from session 8.5) P S

9.6 Tony Robin

Lissajous figures, spirograph patterns, and pouring problems S G

We shall look at the connection between these curves and the fractions that produce them. We shall see how to solve a general pouring problem, and how an upper bound for the number of pourings required can be found very quickly. We also see how a procedure which would be complicated to describe in text, can be easily demonstrated on a simple diagram. (Knowledge required: sine and cosine of the general angle, and fractions.)

9.7 Chris Pritchard

More pegs in holes S P-16 G

A further tour around elementary shapes and how they fit inside each other — an abundance of ideas for embedded enrichment.

9.8 Tom Roper (Moved to session 4.10)

9.9 Tadashi Tokieda (Moved from session 4.5)

The mathematics of toys S P-16 T G

I will show in this session that toys can behave in surprising ways — if we play with them imaginatively. And 'toy models' may even offer mathematical insights into some of the deepest problems of mechanics.

About the Speakers

David Acheson is a Fellow of Jesus College, Oxford. After a teaching and research career in applied mathematics, he now writes and lectures on maths for the general public, and is the author of *1089 and All That*. He is MA President for 2010-11.

Lara Alcock is a lecturer in the Mathematics Education Centre at Loughborough University, and has taught undergraduate mathematics in the USA and in the UK. She conducts research on students' learning in early undergraduate mathematics, with a particular focus on the skills needed to understand mathematical proofs.

Paul Andrews works in the Faculty of Education at the University of Cambridge. His research focuses primarily on how mathematics is taught in different European countries although he retains a particular interest in mathematical problems and their integration into mainstream mathematics teaching. He will be MA President for 2011-12.

Farzana Aslam is currently working as Senior Lecturer at Coventry University. Prior to this she worked in More Maths Grads as subject coordinator at Coventry University. Prior to that she worked as research associate in the Widening Participation and Outreach Programme of the Faculty of Engineering and Physical Sciences at the University of Manchester. She is also an active researcher in physics and applied mathematics.

Nina Attridge is a PhD student in the Mathematics Education Centre at Loughborough University. She previously studied psychology at the University of Kent and researched mathematical cognition at the University of Nottingham.

Jenni Back works with teachers and children from 3 to 18 years, but has a special interest in encouraging the development of mathematical thinking and reasoning through talking about mathematics. She is part of the team at the Centre for Innovation in Mathematics Teaching at Plymouth University.

John Baylis is a retired university maths lecturer with some school teaching, teacher-training and Open University experience. He is lucky enough to still love mathematics and teaching, and is now doing voluntary teaching in local primary school and U3A groups.

David Bedford has been a university lecturer in mathematics for nearly 20 years, but has maintained an interest in mathematics education. He spends most of his time wondering why not everyone shares his interest and passion for the subject.

Danny Brown has been a maths teacher at a secondary school in South-East London for 5 years, and is currently Curriculum Leader for KS5. Danny's aim is to make maths interesting to learn and teach, and to show students there is more to maths than the national curriculum.

Chris Budd is Professor of Applied Maths at the University of Bath, Chair of Maths at the Royal Institution and Education Secretary of the LMS. He is also a National Teaching Fellow. His day job involves solving mathematical problems which arise in industry, from microwave cooking to weather forecasting. He is a passionate populariser of mathematics, and has made various chaotic appearances on TV.

Bob Burn is working on a step by step progress through plane symmetry. Symmetries with a point have already been published by ATM. Symmetries along a line (friezes) are freely available on the ATM website. His session will be the first step with wallpaper.

Douglas Butler has taught secondary mathematics for 30 years, but now concentrates on organising TSM workshops for mathematics teachers in the UK and abroad, as well as on running the Autograph development team.

Caitriona Byrne is Senior Research Manager at the Department for Education.

Steve Chinn was Founder and Head of a specialist school for dyslexic boys. The school was awarded Beacon school status and other awards for its work on maths and dyslexia. Steve has written several books. 'The Trouble with Maths' won the NASEN/TES award in 2004. He lectures and trains teachers worldwide.

Caroline Clissold is an experienced KS1 and 2 teacher. She was mathematics consultant for a London LA implementing the national numeracy strategy and the renewed framework. She is currently a freelance consultant and regional co-ordinator for the NCETM. She delivers INSET for BEAM, supports teaching and learning in various schools, lectures and has had articles and books published.

David Crawford is Head of Maths at Leicester Grammar School, an independent school in the Midlands. As well as his involvement with the MA, he is also involved with the UKMT, marking Olympiads and writing some material for the Senior Team Maths Challenge.

Michael de Villiers is a lecturer/researcher in geometry and geometry education at the University of KwaZulu-Natal, South Africa with special interest in the teaching and learning of proof within a dynamic geometry context.

Stan Dolan is the Chair of Examiners for the new Certificate in Use of Mathematics.

Richard Earl is a mathematics lecturer, and also schools liaison officer, at the Mathematical Institute in Oxford.

Rob Eastaway has written several books on the maths of everyday life, and was co-author of the bestselling 'Why do Buses Come in Threes?' and 'Maths for Mums & Dads'. He is director of www.mathsinspiration.com and often appears on BBC radio. He was President of the MA in 2007/8.

Dan Evans is in the Flexible Resource Unit (National Curriculum Review) at the Department for Education.

Michael Fox is a retired maths teacher with an abiding interest in geometry and producing geometric diagrams on computers. He is a regular speaker at the MA annual conference.

Jane Gabb retired recently from being the Mathematics Adviser in Windsor and Maidenhead. Her career has included extensive work with children of all ages having a range of SEN, including ESD and learning difficulties. She is currently doing 1-1 tuition in her local secondary school. Jane is an editor of Equals.

Tony Gardiner has struggled for 40+ years (with mixed success) to bridge the divide between elementary and higher mathematics.

Charlie Gilderdale has taught mathematics in three schools and worked with trainee teachers at the Faculty of Education in Cambridge. Now Charlie is a member of the NRICH team, contributing to the website and working with students and teachers. His recent work has focussed on problem solving and creating opportunities for learning mathematics through exploration and discussion.

Camilla Gilmore is a British Academy Research Fellow working at the Learning Sciences Research Institute at the University of Nottingham. She has previously worked and studied at Harvard and Oxford. Her research interests lie at the intersection of developmental psychology and mathematics education.

James Grime is a lecturer and public speaker working for the Millennium Mathematics Project from Cambridge University. He can be mostly found travelling the world with his trusty Enigma Machine. The machine's name is Gunther.

Paul Harris has worked as a lecturer at the University of Brighton for over 18 years. His research interests are in the use of numerical methods in applied mathematics and solving real problems in science and engineering. He is the current treasurer of The Mathematical Association.

Steve Hewson develops Key Stage 5 problems and resources for NRICH. Prior to that, he was a secondary mathematics teacher, worked in the city as a financial modeller and researched string theory and black holes. Steve is particularly interested in helping to provide a rich and stimulating mathematical experience for 6th formers.

Ray Huntley taught in and led primary schools in Essex and Melbourne, Australia for 20 years before moving into initial teacher education. He now leads a support department in mathematics and academic writing skills. He belongs to MA and ATM, serving on the MA Teaching Committee and Primary Subcommittee.

Jane Imrie is Deputy Director of the National Centre for Excellence in the Teaching of Mathematics. Before this, following a career as a teacher and manager in schools and FE, she was National Mathematics Lead in the (then) DfES Standards Unit, where she led the development of 'Improving learning in mathematics'. She has been a member of the MA throughout her career, serving on Council, committees and working groups, as well as on other advisory groups on mathematics education. She was MA President in 2009-10.

Matthew Inglis is a lecturer in the Mathematics Education Centre at Loughborough University. From 2010-16 he is working as a Royal Society Worshipful Company of Actuaries Research Fellow. Prior to coming to Loughborough he worked at the University of Nottingham, and completed his PhD at the University of Warwick.

Cyril Isenberg is a retired lecturer in theoretical physics at the University of Kent. His lectures on soap films have been popular throughout his teaching career.

Andrew Jeffrey taught maths for 20 years before embarking on a career to promote the joy of maths. He runs teacher workshops and gives motivational talks for all age groups across Europe. He has written several books including 'Be a Wizard with Numbers'. Andrew also writes a free monthly newsletter for teachers which can be found at <http://www.magicmessage.co.uk>. He is also a professional magician.

Vinay Kathotia works at the Nuffield Foundation, where past and present mathematics projects include primary and secondary curriculum development, GAIM, a maths A-level with art, music and history modules, support for Free Standing Maths Qualifications (FSMQs), interactive STEM resources, education research, teacher fellowships, student summer-research bursaries and more.

Richard Lissaman is the Student Support Leader of the Further Mathematics Support Programme which is managed by Mathematics in Education and Industry. Richard has a PhD in algebra and lectured mathematics at the University of Warwick for 6 years. He is a presenter for the acclaimed Maths Inspiration lecture series attended by over 20,000 students per year and an author of maths textbooks and revision guides.

Emma Low is a freelance consultant, writer and teacher of mathematics, with experience from EYFS to KS3.

Francesca Lyon loves games, almost as much as she loves maths, and in her opinion any lesson that involves playing a game is always a good lesson. Learning from that lesson is an optional extra!

John Mason is interested in promoting mathematical thinking, and supporting those who are concerned about promoting it in others. He has been teaching for 50 years, and spent 40 years at the Open University writing distance-learning materials in mathematics and mathematics education. John has published over 50 papers and perhaps some 20 books or booklets about teaching and learning mathematics.

Maria McArdle is an experienced Primary Practitioner and Local Authority Consultant who has worked within EYFS, KS1, KS2 and in a secure unit with adults on the autistic spectrum. She is passionate about developing enjoyment and understanding in mathematics, leading to greater confidence for all learners and teachers.

Adam McBride is Professor of Mathematics at the University of Strathclyde, having joined the department in 1971. Over the years he has been, among other things, Chairman of the Scottish Mathematical Council, Chairman of the British Mathematical Olympiad Committee and (last but not least) President of the Mathematical Association. He has given countless lectures and masterclasses to pupils from P6 upwards. In 1999 he was elected a Fellow of the Royal Society of Edinburgh and was awarded an OBE for services to the understanding of mathematics in schools. Adam is currently the Chair of Council for The Mathematical Association.

Lynne McClure is Project Director of NRICH, and has for many years been a leading expert on mathematics education, in a variety of different settings from primary school to university, both here and abroad.

Peter McOwan is currently a Professor of Computer Science at the School of Electronic Engineering and Computer Science at Queen Mary, University of London. He researches in visual perception and biologically inspired hardware and software. He is also active in science outreach through various projects such as cs4fn (www.cs4fn.org) and Sodarace (www.sodarace.net).

Liz Meenan has been a maths advisory teacher, head of department, class teacher and formerly was an Education Officer for 4Learning – the education arm for Channel 4. She is now a part-time maths PGCE tutor and maths support tutor at Leeds University with a special interest in shape and space and multicultural maths. She loves anything mathematical and is a bit of a mathemagician where paper is concerned.

Elena Nardi is Reader in Mathematics Education at the University of East Anglia. The learning and teaching of mathematics at upper secondary and university levels is her main research area. 'Amongst Mathematicians' was published by Springer in 2008. She is Editor of Research in Mathematics Education, the official journal of BSRLM, published by Routledge.

James Nicholson taught at secondary school level for 25 + years and now works with a data visualisation group at the SMART Centre in Durham University.

Catherine Ogden has 13 years experience of secondary mathematics teaching, seven of them as head of department. She is currently Head of Mathematics at Heckmondwike Grammar School, responsible for 10 members of staff and the mathematics education of over 1,000 students.

Mike Ollerton taught for 25 years in schools and 10 years in teacher training. He is now a freelance consultant.

Matt Parker describes himself as a stand-up mathematician, and is already well-known for the way he combines mathematics with comedy, most notably perhaps on YouTube and at the Edinburgh Fringe.

Mike Price is the MA Librarian.

Chris Pritchard is one of the editors of *Mathematics in School* and the author of about 100 articles for mathematics teachers. He also chairs the Mathematical Association's Teaching Committee.

Bill Richardson is a long time member of the MA and regular attendee at MA conferences.

John Rigby retired more than ten years ago, after many years of mathematics lecturing at Cardiff University and elsewhere. He continues to be fascinated by geometry.

Tony Robin was Head of Mathematics at a local secondary school, and has been marking both KS3 and some A level papers for quite a few years now.

Tom Roper is currently Head of the School of Education at the University of Leeds and Senior Lecturer in Mathematics Education, but due to retire soon. He is often asked to give presentations and lectures on mechanics (but this is not one of them).

Liz Russell teaches in an 11-18 comprehensive school, and for the last 8 years she has been an AST working with the South Hunsley Partnership, which consists of 7 primary schools and a secondary school with over 2000 pupils. Liz has led a teacher enquiry project with funding from the NCETM and last year was an ambassador for them.

Chris Sangwin is a Senior Lecturer in the School of Mathematics at the University of Birmingham. Since 2000 he has been seconded half time to the UK Higher Education Academy 'Maths Stats and OR Network' to promote learning and teaching of university mathematics. His learning and teaching interests include (i) automatic assessment of mathematics using computer algebra, and (ii) problem solving using the Moore method and similar student-centred approaches. He is the author of a number of books, including 'How Round is Your Circle?', which is an attempt to promote the links between mathematics and engineering using physical models.

Sara Santos is the Clothworkers' Fellow in Mathematics at the Royal Institution, and coordinates the UK-wide network of volunteers running Ri Secondary Mathematics Masterclasses for young people. Sara regularly travels around the UK with special 3d kaleidoscopes. In her spare time Sara runs her new project Maths Busking.

Judy Sayers has been working at the University of Northampton with primary teachers, trainee teachers and teaching assistants in developing mathematics pedagogy. Alongside this, she has researched mathematics teaching in European and local primary schools.

Mark Shackleton is Professor of Finance at Lancaster University Management School. He researches options and market volatility but enjoys finding new ways to communicate and use mathematical methods.

Lydia Showan is the mathematics specialist at the National STEM Centre. Her background is secondary mathematics education, as a subject leader and assistant headteacher, and mathematics consultancy.

John Silvester is retired, but retains an honorary post as Visiting Senior Lecturer at King's College London, where he taught for 39 years, and was admissions tutor for 21 of these. His mathematical interests are in geometry and algebra, and he is an enthusiastic user of computers in teaching.

Amanda Simpson has been a class teacher and primary deputy head. In more recent years she has been a researcher and tutor in ITE. She has always been fascinated with children's cognitive development in mathematics, and Amanda's PhD focused on the way that children learn new concepts. She is now Director of Policy and Quality at the National Centre for Excellence in the Teaching of Mathematics.

Ben Sparks teaches part-time at Canford School, Dorset. Recently he has tried to redeem the image of street performers by busking his way round the country on his guitar. The semi-respectable part of his life is divided between teaching at school, giving maths enrichment lectures, and the occasional circus-skills workshop.

Charlie Stripp has mathematics teaching experience which includes 11 – 18 schools, FE, PGCE students and CPD for practising teachers. Since 2000 he has worked for MEI, developing and running the government-funded Further Mathematics Support Programme. He has been actively involved with the MA throughout his career. In 2010 he became Chief Executive of MEI.

Andrew Taylor is Head of GCSE Mathematics at AQA, based in Manchester. He is responsible for the development, operation and support of GCSE mathematics, GCSE Statistics, entry level mathematics and functional skills qualifications. He has also worked on the curriculum pathways project which included development of pilot A level qualifications. Before joining AQA in 2001, Andrew taught mathematics for seventeen years and was head of department of large comprehensive schools in Cambridgeshire and north Manchester.

Tadashi Tokieda is a former classical linguist, has a Ph.D. in mathematics from Princeton, and is Fellow and Director of Studies at Trinity Hall, Cambridge. His research is in symplectic geometry and fluid dynamics. He gives frequent public lectures in the UK and elsewhere, and is active in the development of mathematics in Africa and Asia.

Sidney Tyrell is a National Teaching Fellow with 20 years experience of teaching stats to those who are not always interested, at Coventry University, and is a regular presenter at MA, ATM, MEI and Oundle events.

Mary Walmsley is the MA archivist.

Liz Woodham was a primary school teacher before joining NRICH. Her role involves working as part of a team to develop primary-level materials for the website and to run associated teacher professional development and pupil workshops. Liz is a member of the joint MA-ATM Primary Subcommittee.

Changes to the speakers and sessions may occur, and the MA cannot be held responsible if speakers withdraw their sessions.

Notes

