

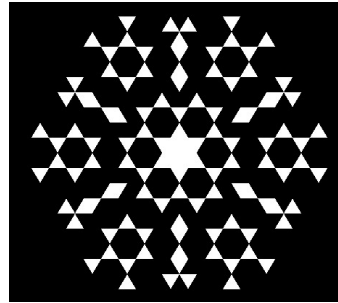


POPULAR LECTURES 2011

Dr Colva Roney-Dougal
St. Andrews University

Symmetry, Chance & Determinism.

By playing some games with symmetries, we'll discover the surprising fact that choosing randomly can give the same answer (almost) every time!

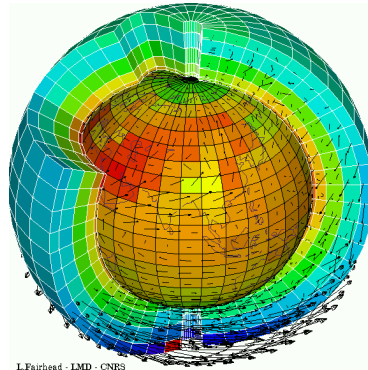


Dr Hilary Weller
University of Reading

How Climate Models Work and Could They Be Better?

Hilary Weller will describe some of the physics behind how the real climate works, some of the mathematics involved in creating a computer model of the climate to make climate predictions and how climate data is gathered in order to test the models.

We will see that, although climate models are far from perfect, some predictions can be made with confidence.



L.Fairhead - LMD - CNRS

London Mathematical Society

Popular Lectures

DVD Catalogue



From *Mathematics, Magic and the Electric Guitar* by David Acheson



From *Toy Models* by Tadashi Tokieda



The London Mathematical Society

The London Mathematical Society was founded in 1865 by mathematician and logician Augustus De Morgan with a group of his students at University College London. It is now the major British learned society for mathematics and its aims are the advancement, dissemination and promotion of mathematical knowledge. The Society publishes journals and books and holds regular meetings, conferences and symposia. It has over 2000 UK members and several hundred more overseas.

London Mathematical Society Popular Lectures

The LMS Popular Lectures present stimulating topics in mathematics and its applications to a broad audience. They are designed to be intelligible to a non-specialist audience, although A-levels are useful. The lecturers are always chosen for their mathematical distinction and their ability to communicate. There are two lectures and the event is held annually, given at two venues in the UK.

THE DVDs

The Popular Lectures are recorded each year for release on DVD. The DVDs contain extra material which includes, for example, copies of the graphics and suggestions for further reading. Details on the titles available and an order form can be found in this leaflet.

NOTE ON DVD FORMAT

DVDs are recorded on a computer in the DVD-R format. Not all set-top boxes will play computer DVDs satisfactorily, although DVD-R format has been chosen because currently it offers the greatest degree of compatibility. All computers should be able to read the DVDs. However, the software used for replay may not recognise the menu structure and may simply play the video thereon as a continuous stream. DVD player software is therefore recommended.

Review of the 2010 Popular Lectures (From issue 398 of the LMS Newsletter)

- **MODELLING THE CIRCLE OF LIFE: HOW MATHS UNTANGLES KNOTTY DNA QUESTIONS** (*Dr Dorothy Buck, Imperial College London*)
- **CLUTCHING AT RANDOM STRAWS** (*Matt Parker, QMUL*)

On Wednesday 29th September, Birmingham University kindly welcomed Dr Dorothy Buck and Matt Parker to give exciting lectures to mathematical students and teachers from the whole area.

Dr Dorothy Buck's lecture, 'Modelling the Circle of Life: How Maths Untangles Knotty Questions of DNA' introduced us to the fascinating subject of knot theory. She discussed the 'big questions' which still needed to be answered including a particular invariant which could apply to all knot when distinguishing between them. She also revealed the fantastic applications knot theory has to medicine, by explaining circular bacterial DNA strands (which are knots) need an enzyme called topoisomerase II to break the knot formed when bacterial DNA multiplies. She explained how this may replace antibiotics in the future since if you kill Topoisomerase II then bacterial will not be able to multiply. Finally a question was raised as to how the Topoisomerase II knows how to unknot the DNA. Overall the talk really emphasised the application of maths to the real world in a fascinating manner and showed how there is much yet to be discovered.



Mr Matt Parker's lecture titled 'Clutching at Random Straws' enlightened the theatre to the wonder of ubiquitous patterns and the dangers of human pattern seeking. Mr Parker initiated his talk by discussing an archaeological sites graph, where the arcs joining the historical sites seemed to form perfect equilateral triangles. However he then highlighted the inaccuracies of finding such patterns by comparing it with a Woolworth stores graph which also had perfect equilateral triangles with each Woolworths as a vertex. It became apparent that if one has enough data any pattern can be discovered. Next Mr Parker questioned the audience as to how many people would be needed in a room so that the probability of two of them sharing a birthday was over 50%. He proved our natural assumptions wrong because the number of people, 23, was much lower than expected. Throughout the talk, Mr Parker kept the content relevant to the audience by even involving pop culture. He demonstrated how if you played some songs backwards (one from Lady Gaga's Paparazzi and Freddie Mercury's Another One Bites the Dust) and indicating that if one was looking for certain words that were shown on the projector, then the brain would interpret the lyrics as a message whereas otherwise it would just sound like incoherent noise. Overall the talk was riveting and engaging through the use of comical references and excellent examples.

The talks were very much enjoyed by all those who attended and we would like to thank the LMS, the organisers, Birmingham University and the speakers: Dr Dorothy Buck and Mr Matt Parker for entralling the audience with the wonders of mathematics.

Aman Ubhi and Masarat Jilani
King Edwards VI Camp Hill Grammar school for Girls, Birmingham



Titles available to purchase

SIMPLICITY & COMPLEXITY (*J. Barrow*)

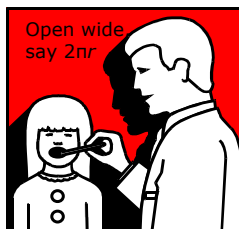
Physicists say that the world is simple, but biologists disagree. Superstrings, chaos and the theory of complexity all help to resolve this contradiction.

SIMULATING THE WORLD (*C.J. Budd*)

How maths helps us to: drive a supersonic racing car, make dinosaurs live again, or leave the solar system, without moving from our desks.

A SPOONFUL OF MATHS HELPS THE MEDICINE GO DOWN (*H. Byrne*)

What role should mathematics play in the field of medicine? Could it be the new tonic that doctors need to cure our ills?



SYMMETRY, CHANCE & DETERMINISIM (*C. Roney-Dougal*)

Available from November 2011.

By playing some games with symmetries, we'll discover the surprising fact that choosing randomly can give the same answer (almost) every time!

TANGENT CIRCLES, PATTERNS & PACKINGS (*C.M. Series*)

Patterns of tangent circles have led to geometrical problems from ancient Greece to old Japan. Classical geometry has much to say about this, but the full solution is a wonderful 20th century idea.

THE SCALE OF THINGS (*M. Miodownik*)

Fleas can jump over 100 times their own height, flies can walk on water and a hamster can survive falling from aircraft without a parachute. Find out about the maths behind *The Scale of Things*.



TOY MODELS (*T. Tokieda*)

Come and see many toys that can be made in 10 minutes but, if played with imaginatively, can inspire research for 10 months and pose problems in mathematics and mechanics, some still unsolved.

WHAT COMPUTERS CANNOT DO (*A. Slomson*)

Computers can solve many mathematical problems. But, no matter how powerful they become, mathematics tells us there are limits to their problem-solving ability.

Other LMS Educational Events

The LMS Education Committee organises a range of activities throughout the year as part of its aim to present mathematics to a wide audience.

In addition to the Popular Lectures, these include:

The Holgate Lecture Scheme for Schools and Colleges



The Holgate Lecture Scheme enables schools to host a mathematical talk or workshop given by a high quality lecturer. The LMS provides the lecturer while the local organiser provides the venue and the audience.

The LMS-Gresham College Lecture

This popular free annual lecture is held at the historic Gresham College in London and delivered by an eminent member of the Society. Aimed at the general public, the lectures usually take place in May.



If you would like further information about these events, please contact:

*The Administrative Officer (Education),
London Mathematical Society,
De Morgan House,
57-58 Russell Square,
London WC1B 4HS*

E-mail: education@lms.ac.uk

Website: www.lms.ac.uk



Titles available to purchase

BIG MONEY MATHEMATICS (*K. Binmore*)
Can mathematics raise billions of pounds? Find out what happens when the mathematics of game theory is applied to economics.

$$\sqrt{2\pi n} \left(\frac{n}{e}\right)^n =$$



CHAOS & CROCHET (*H. Osinga*)
Maths predicts things – so why is the weather forecast often wrong? The intricacies of chaos theory can be explained with a surface that you can make by crochet.

CLUTCHING AT RANDOM STRAWS (*M. Parker*)
Did aliens help prehistoric Britons found the ancient Woolworths civilization? We look at how seemingly incredible results can actually be meaningless random patterns.

CODES (*P. Cameron*)
From catching out a liar, to sequencing the human genome, or designing a quantum computer – there's a code that does the job.



FLOATING, SPINNING, TUMBLING (*F. Berkshire*)
How do objects like to float, tennis racquets spin and polyhedral dice come to rest? Order and chaos in action!

FRACTALS – THE NEW GEOMETRY (*K.J. Falconer*)
How can mathematics model highly irregular phenomena such as trees, mountain skylines and stock market prices? Fractal geometry provides an answer!

FROM MAGIC SQUARES TO SUDOKU (*E. McCoy*)
This talk looks at the properties of Magic Squares, Latin Squares and Sudoku, showing that they are more than just a recreational pastime!

GEOMETRY ANCIENT & MODERN (*J.R. Silvester*)
Euclid found many curious properties of circles – this talk describes a theorem he could have proved but didn't, and gives some more modern approaches.

GIRAFFE BLOOD FLOW & PATTERN-FORMING BACTERIA (*T.J. Pedley*)
Why is a giraffe's heart so huge, and why do swimming bacteria form patterns? Biological fluid dynamics has the answers.

HOLLYWOOD'S HIPPEST MATHEMATICS: RANDOM MATRICES AND RIEMANN ZEROES (*N. Snaith*)
Come and see how physicists helped answer a hundred year old question about prime numbers and how this features in a major Hollywood movie.



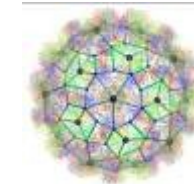
Titles available to purchase (continued)

HOW CLIMATE MODELS WORK AND COULD THEY BE BETTER? (*H. Weller*)
Available from November 2011
We will see that, although climate models are far from perfect, some predictions can be made with confidence.

HOW LIKELY IS THAT? (*J. Haigh*)
Answers to questions about probability are often surprising, and may even seem paradoxical. But a logical approach shows why these answers arise.

KNOTS (*S. Huggett*)
The mathematical theory of knots is a weird and wonderful world. It is easy to enter, but surprisingly hard to answer some of its most obvious questions.

KNOW YOUR ENEMY – VIRUSES UNDER THE MATHEMATICAL MICROSCOPE (*R. Twarock*)
Mathematics can help us understand the structure of viruses and the principles responsible for their formation. Can this knowledge be used to find their Achilles' heel and develop new strategies for anti-viral drug design?



MARRYING, VOTING, CHOOSING (*T.W. Körner*)
Mathematics cannot tell us how to marry, vote or choose, but it can cast an interesting light on these problems.

MATHEMATICS, MAGIC & THE ELECTRIC GUITAR (*D. Acheson*)
Maths is sometimes magical. But can it explain the legendary Indian Rope Trick? And what has it got to do with playing the guitar?

THE MATHEMATICS OF SHREK (*J. Lasenby*)
How does mathematics, coupled with immense computational power, produce the stunning visual effects in movies like Shrek and Toy Story?

MODELLING THE CIRCLE OF LIFE: HOW MATHS UNTANGLES KNOTTY DNA QUESTIONS (*D. Buck*)
Come and see how mathematically understanding knots, like the kind in your shoelaces, has helped us to understand DNA better.

THE MUSIC OF THE PRIMES (*M. du Sautoy*)
A million dollars awaits the person who can unravel the mystery of the hidden music that explains the cacophony of the prime numbers.



OUR DYNAMIC SUN (*H. Mason*)
Mathematics helps to unravel the mysteries of the sun, by looking beyond visible light to amazing ultra-violet and X-ray observations.



LMS Questionnaire

We would be grateful if you could spend a few minutes filling in our short survey.

1. How did you hear about the Popular Lectures DVDs? *(please tick)*

- A. From this leaflet
- B. By attending a Popular Lecture.
- C. LMS website
- D. Other – (please state):

.....

2. If you have attended a Popular Lecture event, please could you tell us how you heard about the event? *(please tick)*

- | | |
|---|--|
| <input type="checkbox"/> A. By letter | <input type="checkbox"/> E. Recommended by family/friend |
| <input type="checkbox"/> B. By email | <input type="checkbox"/> F. Poster |
| <input type="checkbox"/> C. LMS website | <input type="checkbox"/> G. Other (please state): |
| <input type="checkbox"/> D. Word of Mouth | |

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3. Would you be interested in hearing about future Popular Lectures?

- Yes No

If so, please complete your details below:

Name:

Address:

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Email:

We may contact you by email to tell you about activities and events that may be of interest to you. If you DO NOT wish to receive this information, please tick this box The London Mathematical Society will NOT pass your details on to third parties.

Thank you for completing our questionnaire.

If you have any queries related to the Popular Lectures or other educational activities, please email education@lms.ac.uk.



LMS Popular Lectures DVD Order Form

- BIG MONEY MATHEMATICS
- CHAOS & CROCHET
- CLUTCHING AT RANDOM STRAWS
- CODES
- FLOATING, SPINNING, TUMBLING
- FRACTALS – THE NEW GEOMETRY
- FROM MAGIC SQUARES TO SUDOKU
- GEOMETRY ANCIENT AND MODERN
- GIRAFFE BLOOD FLOW & PATTERN-FORMING BACTERIA
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- HOW LIKELY IS THAT?
- KNOTS
- KNOW YOUR ENEMY – VIRUSES UNDER THE MATHEMATICAL MICROSCOPE
- MARRYING, VOTING, CHOOSING
- MATHEMATICS OF SHREK



- MATHEMATICS, MAGIC AND THE ELECTRIC GUITAR
- MODELLING THE CIRCLE OF LIFE
- MUSIC OF THE PRIMES
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- THE SCALE OF THINGS
- TOY MODELS
- WHAT COMPUTERS CANNOT DO



Prices: (correct at time of printing) DVDs £12.50 for one, £10.00 each for two or more
All prices include VAT

Postage & packing:	<u>UK</u>	Items	Cost
		1-4	free
		5-9	50p each
		10 or more	£5.00
	<u>Europe</u>	1 to 9	£1.00 each
		10 or more	£10.00
	<u>Rest of the world</u>	1-9	£1.50 each
		10 or more	£15.00

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