**The London Mathematical Society**

**Dorothy Buck**
Imperial College, London

***Modelling the Circle of Life: How Maths Untangles Knotty DNA Questions***

Come and see how mathematically understanding knots, like the kind in your shoelaces, has helped us understand DNA better.
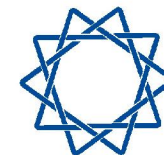
*Matt Parker*
*QMUL*

***Clutching at Random Straws***

Did aliens help prehistoric Britons found the ancient Woolworths civilization? Matt will look at how seemingly incredible results can actually be meaningless random patterns.

# London Mathematical Society

# Popular Lectures

# DVD Catalogue

## 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.

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**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.

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## *Review of the 2008 Popular Lectures*
**(From issue 374 of the LMS *Newsletter*)**

- **KNOW YOUR ENEMY – VIRUSES UNDER THE MATHEMATICAL MICROSCOPE** *(Professor Reidun Twarock, University of York)*

- **TOY MODELS** *(Dr Tadashi Tokieda, Trinity Hall, Cambridge)*

On a warm but inevitably wet summer's evening on Wednesday 9 July, a large and enthusiastic crowd gathered at the Institute of Education for this year's LMS Popular Lectures.

Reidun Twarock's talk united mathematics and biology as she explained her research into the geometry of viruses, and how this work enabled new antiviral strategies to be produced. As someone that had very happily dropped biology after GCSEs, I was slightly apprehensive as to how interesting the lecture would be. Well, I need not have worried; the audience received a clear, coherent talk which both enlightened our knowledge of viruses and demonstrated that mathematics alone is an incredible weapon in the battle to restrain them. She explained how the geometry of a virus can be studied to identify symmetries in terms of their construction from the rotations and translations of different shaped faces (most prominently triangles and pentagons). These geometric constructions can be then exploited and the information used in other areas of study, such as linking mutations to a change in geometric construction. It was fascinating to see how such a simple idea in mathematics (namely the study of shape) could be used with such devastating effects in the study of viruses. Truly a triumph for mathematics over the other sciences!

The second lecture, given by Tadashi Tokieda, used mathematics in a decidedly more recreational environment: toys that spin. He began by demonstrating how cylinders, filled with different amounts of rice, took different times to roll down a hill, and that some did not even move; he linked this to filling objects with a viscous or viscous-less liquid. From angular dynamics, he moved onto linear momentum, impressing the audience still further as he demonstrated a magnetic Newton's cradle, which, rather than mirroring the number of ball bearings colliding with the number of ball bearings being launched off from the centre, actually adds one ball bearing onto the number being launched off! It is fair to say that the audience were very much enthralled by the demonstrations he was giving (incidentally made very accessible by the use of a video camera and projector). He then combined these two ideas, and proceeded to talk about angular momentum, in the form of his favourite toy, the 'tippy top'. He showed that if it is spun, the toy tries to raise its centre of gravity, causing it to tip over onto its thinner end, and that the time taken for it to tip over can be calculated via quite a simple calculation. Finally, he moved onto a new area of research, known as chiral dynamics, which is the study of objects that spin one way but not the other! His entertaining demonstrations and fascinating results created an excellent lecture thoroughly enjoyed by everyone.

*Josh Bernstein*
*Sixth-Former, Trinity School, Croydon*

## Titles available to purchase

**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.

**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?
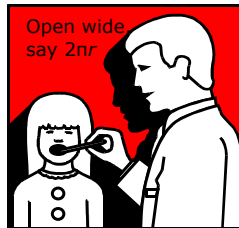
**TANGENT CIRCLES, PATTERNS & PACKINGS** *(C.M. Series)*
Patterns of tangent circles have led to geometrical problems from ancient Greece to old Japan. Classical geometry has much to say about this, but the full solution is a wonderful 20th century idea.
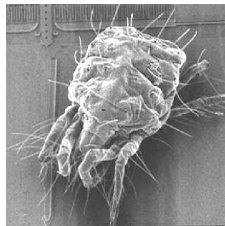
**THE SCALE OF THINGS** *(M. Miodownik)*
Fleas can jump over 100 times their own height, flies can walk on water and a hamster can survive falling from aircraft without a parachute. Find out about the maths behind *The Scale of Things*.

**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. **[Available from November 2010]**

**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.

# Titles available to purchase (continued)

**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.

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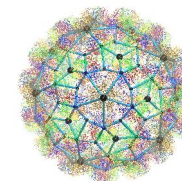
**MARRYING, VOTING, CHOOSING** *(T.W. Körner)*
Mathematics cannot tell us how to marry, vote or choose, but it can cast an
interesting light on these problems.

**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.
**[Available from November 2010]**

**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.

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Society*

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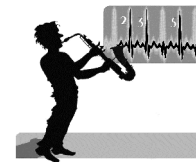
## LMS Questionnaire

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)*

   ☐ A. By letter
   ☐ B. By email
   ☐ C. LMS website
   ☐ D. Other – (please state):

   ……………………………………………………………………………………………………….

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.

*The London Mathematical Society*

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## LMS Popular Lectures DVD Order Form

☐  BIG MONEY MATHEMATICS

☐  CHAOS & CROCHET

☐  CLUTCHING AT RANDOM STRAWS (Available from November 2010)

☐  CODES

☐  FLOATING, SPINNING, TUMBLING

☐  FRACTALS – THE NEW GEOMETRY

☐  FROM MAGIC SQUARES TO SUDOKU

☐  GEOMETRY ANCIENT AND MODERN

☐  GIRAFFE BLOOD FLOW & PATTERN-FORMING BACTERIA

☐  HOLLYWOOD'S HIPPEST MATHEMATICS: RANDOM MATRICES AND RIEMANN ZEROES

☐  HOW LIKELY IS THAT?

☐  KNOTS

☐  KNOW YOUR ENEMY – VIRUSES UNDER THE MATHEMATICAL MICROSCOPE

☐  MARRYING, VOTING, CHOOSING

☐  MATHEMATICS OF SHREK

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- ☐ MATHEMATICS, MAGIC AND THE ELECTRIC GUITAR
- ☐ MODELLING THE CIRCLE OF LIFE (Available from November 2010)
- ☐ MUSIC OF THE PRIMES
- ☐ OUR DYNAMIC SUN
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- ☐ THE SCALE OF THINGS
- ☐ TOY MODELS
- ☐ WHAT COMPUTERS CANNOT DO

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

*All prices include VAT*

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

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**Total** £ _____

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**De Morgan House**
**57-58 Russell Square**
**London WC1B 4HS**
**UK**

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