Oxford Mathematical Institute **Spring 2013, Number 11**

Newsletter

We hope that you enjoy receiving this annual *Newsletter*. We are interested to receive your comments, and also contributions for future *Newsletters*.

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Design & production by Baseline Arts

Nearly there...

The last lap, the home straight, the final push – however you describe it, we're nearly there. The extraordinary transformation of a huge hole in the ground into a seven-floor Mathematical Institute is virtually complete. The Chairman of the Department is finalising the room plan; the events team is working on the official opening ceremony; meanwhile, the contractors have completed the skin of the building and are fitting it out, from the basement car park to the topmost office and the roof terraces.

Now that we can see the building itself, we realise what a fabulous space it will be. Each of the two stunning central atria features a 'crystal' – a light-well into the below-ground teaching space – incorporating mathematics into its design. As you walk along Woodstock Road at night, you'll see lights through the glass roofs of the atria and the office windows.

The building is coming to life. We start to move in at the end of June, and by this year's alumni garden party, which will be held in September (please note the new time – see page 8), we shall be fully at work in our new home. Do come and visit us!

Clay Mathematics Institute

Nick Woodhouse, CMI President

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In July 2012 the Clay Mathematics Institute moved the organisation of its mathematical activities to a new 'President's Office' in the Mathematical Institute at Oxford.

For the moment it is housed in temporary quarters in the Gibson Building, but in the summer of 2013 it will join the general migration to the stunning new mathematics building in the Radcliffe Observatory Quarter. The CMI remains an American charitable foundation, but Oxford will provide administrative support and a location for many of the activities that it supports.

The CMI was founded with a very generous endowment by Landon T. Clay in 1998. It grew out of his belief in the value of mathematical knowledge and its centrality to human progress, culture, and intellectual life. Its objectives are

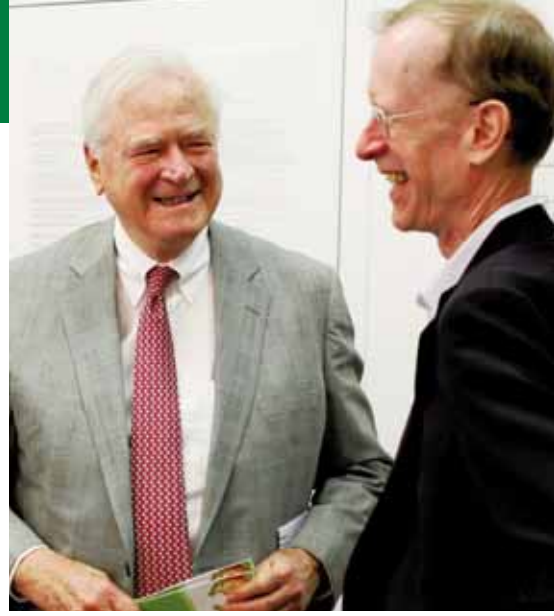
- to increase and disseminate mathematical knowledge;
- to educate mathematicians and other scientists about new discoveries in the field of mathematics;
- to encourage gifted students to pursue mathematical careers;
- to recognize extraordinary achievements and advances in mathematical research.

It is perhaps best known for the establishment of the Clay Millennium Prizes – $1,000,000 prizes offered for the solution of each of seven deep unsolved problems in mathematics. These have had a huge impact: first, in raising awareness of mathematics amongst young students and in encouraging them to enter the discipline; second, in conveying a message to professional mathematicians about the importance of working on really hard long-standing problems. The prizes have also entered the general consciousness and drawn attention to the seven problems in a way that is unusual in our sometimes invisible discipline. So far only one prize has been awarded, to Gregoriy Perelman for the proof of the Poincaré conjecture. (Perelman declined the prize, as he had earlier declined the Fields Medal; those who came to the Mathematical Institute Garden Party in 2008 will have heard some of this history, in the lecture by Sir John Ball.)

CMI supports mathematics in many other ways. It supports individuals through Research Awards and Research Fellowships, and other shorter-term funding: the high standard set is perhaps indicated by the fact that three of the four Fields Medals awarded at the last International Congress of Mathematicians went to former recipients of research support from CMI. It also supports conferences and workshops for outstanding mathematicians at all levels.

One particularly successful partnership is with the PROMYS summer programme for high-school students at Boston University. Over 24 years, 1332 students have participated. Of those who are old enough, more than half now have doctorates, and half of those are from the top six mathematics graduate schools in the USA – a record unrivalled by any other mathematics educational programme. The CMI is currently seeking to extend the benefit to students from outside the USA.

Because it is able to respond quickly and is not bound by the constraints under which national funding bodies must operate, CMI can also support mathematics in other less conventional but equally inspiring ways. For example, in 2004 it funded the digitisation of the Bodleian Library's Euclid manuscript, the oldest surviving manuscript of Euclid's *Elements*, transcribed in Constantinople by Stephen the Clerk in AD 888. It can be seen on the CMI website (www.claymath.org).



Landon Clay with Sir Andrew Wiles

The move of the office to Oxford offers a wonderful opportunity for CMI to build on its success and to extend the international reach of its support for mathematics. It is also a wonderful opportunity for Oxford to benefit from CMI activities in the new building, for which we all also owe an enormous debt of gratitude to the Clay family. ■

New Waynflete Professor appointed

The Waynflete Chair of Pure Mathematics is named after William Waynflete, Bishop of Winchester from 1447 to 1486 and founder of Magdalen College. Following the departure of Raphaël Rouquier, the appointment has been announced of Professor Ben Green FRS (University of Cambridge) to the Waynflete Chair. Ben Green is well known for his work in combinatorial mathematics and number theory, and in particular the Green–Tao theorem which concerns the appearance of arithmetic progressions in the list of prime numbers. He wrote his PhD thesis under the supervision of Fields Medallist Tim Gowers, and he has been a Research Fellow of the Clay Mathematics Institute. ■

Chairman's letter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Sam Howison

As the new building approaches completion, we can lift our eyes from the details of planning to look at the wider world.

Oxford Mathematics doesn't exist in a vacuum: far from it. Our members play a full part in the life of the world-wide mathematical community. They edit journals (several are run from Oxford); they sit on national and international boards and committees; they lead national mathematics societies (Nick Trefethen in the US and Graeme Segal, to be followed by Terry Lyons, in the UK – see below and page 7); Alison Etheridge is 'maths buddy' to the Chief Scientist at the Treasury; and Frances Kirwan is Chair of the UK Mathematics Trust. Marcus du Sautoy sells mathematics to the world: he recently donated a group of symmetries to the Queen as a Diamond Jubilee present (see page 7), and on page 8 you can find details of how to buy your own.

Recently we've been writing 'impact case studies' for the upcoming Research Excellence Framework assessment of the quality of research in UK universities. Our work has had major impact in a whole range of non-academic sectors, ranging from aero-engineering to defence and national security, and from finance to glass manufacture.

Of course, we aren't the only impactful mathematicians in the UK. I was recently a member of a working group contributing to an EPSRC-commissioned study on the value of research in the mathematical sciences to the UK economy. The report, written by Deloitte and available on EPSRC's website, concludes:

The quantified contribution of mathematical science research to the UK economy in 2010 is estimated to be approximately 2.8 million in employment terms (around 10 per cent of all jobs in the UK) and £208 billion in terms of Gross Value Added contribution (around 16 per cent of total UK GVA).

These extraordinary figures can be set against the government's annual investment in funding for doctorates in mathematics in all of the UK: just £9M. Our Prime Minister likes to tell us that Britain is competing in a global race. He might do well to recall that the sports in which Britain excelled in last summer's Olympics were those that had been properly funded. ■

Terry Lyons to be LMS President

Professor Terry Lyons FRS, Wallis Professor of Mathematics since 1999, and Director of the Oxford-Man Institute of Quantitative Finance (above left), is the latest Oxford mathematician to be appointed President of the London Mathematical Society; he takes up his two-year post in November. The current President is also an Oxford mathematician: Dr Graeme Segal FRS, Senior Research Fellow at All Souls College (above right).

Before settling in Oxford Terry Lyons held appointments at Imperial College, London, and the University of Edinburgh. Later he became Director of the Wales Institute of Mathematical and Computational Science. According to the LMS Newsletter of October 2012, *'Professor Lyons researches in stochastic analysis, the area of mathematics which focuses on providing tools for describing high dimensional and interacting random systems. His research has contributed to the pure mathematical foundations, and to applications, for example: providing efficient new methods for numerical calculation and novel ways to summarise vast data sets effectively.'*


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In fact, since the LMS was founded in 1865, more than a dozen mathematicians have held this prestigious position while occupying Chairs at Oxford; all of them have been Fellows of the Royal Society. These include the following (with asterisks denoting current members of the Mathematical Institute):

Savilian Professors of Geometry: **Henry Smith** (appointed 1874), **G. H. Hardy** (1926), **E. C. Titchmarsh** (1945), **Sir Michael Atiyah** (1974), **Ioan James*** (1984) and **Nigel Hitchin*** (1994).

Sedleian Professors of Natural Philosophy: **A. E. H. Love** (1912), **E. A. Milne** (1937) and **Sir John Ball*** (1996 and 2007).

Waynflete Professors of Pure Mathematics: **E. B. Elliott** (1896), **A. L. Dixon** (1924), **Henry Whitehead** (1953) and **Graham Higman** (1965).

Other Oxford professors: **Frances Kirwan*** (2003).

In addition, several Oxford mathematicians have been LMS President at other stages of their careers. The earliest was **James Joseph Sylvester** (1866), while recent ones have included **Sir Christopher Zeeman***, Principal of Hertford College (1986), Wallis Professor **Sir John Kingman** (1990), **Sir Martin Taylor***, Warden of Merton College (1998), **Brian Davies** (2007) and **Angus Macintyre** (2009). ■

Oxford-Man Institute comes of age

Terry Lyons FRS, OMI Director

The Oxford-Man Institute for Quantitative Finance (OMI) has moved from the initial phase of establishing its disciplinary excellence to creating truly interdisciplinary collaboration.

Left: OMI Director Terry Lyons in Shanghai
Above: An OMI seminar;
Below: Marek Musiela

It's half past midday on a Monday afternoon in November, and students and academics stream into the Seminar Room on the top floor of Eagle House in Jericho, the home of the Oxford-Man Institute since 2009. The building is just a stone's throw away from the Radcliffe Observatory Quarter in convenient proximity to the new Maths building.

On the agenda there's one of the so-called 'sandwich seminars', where people are invited to grab a lunch tray and eat while listening to a lecture capturing the wide interests of the Institute (the menu of the day varies, and for the last four weeks has been: 'On the dark side of the market – identifying and analysing hidden order placements', 'Some new results on second order BSDE', 'Failure and rescue in an interbank network', and 'Particle Markov chain Monte Carlo methods for calibration and estimation of multifactor commodity models'). This will be followed by one or two of our Stochastic Analysis Group seminars and will go on into late afternoon. Tomorrow's seminars will be exclusively finance based. If you are a mathematics postgrad interested in theory and applications, life can't get better than this.

OMI does not have its own students, but affiliates a number of DPhil students from Mathematics, Computer Science, Engineering, Economics, Law and the Saïd Business School, and rewards them with a modest research grant, an individual work pod, and – above all – an environment inviting them to step outside their disciplinary silos. The interdisciplinarity, a part of OMI raison d'être from the outset, has really flourished in recent times. We continue to offer membership to mathematics students, but at the same time we have boosted the graduate recruitment from a number of other fields, ranging from economics to law. The spectrum of students mirrors the research horizons of their supervisors, who are based in, or associated with, the Institute.

What makes OMI unique is the relationship with our core funder, Man Group plc, a world-leading alternative investment management business. Not only has Man provided us with generous funding, for which we are very grateful, but it has also co-located its research laboratory in the same building. This industrial connection has created, within the OMI, the passion for research to have outcomes, and we are increasingly engaged in channelling this passion into projects.

As examples, we are working on the development and software implementation of modern non-commutative mathematical methods for thinking about complex sequential time series with a view of enhancing our ability to model slippage in order books; exploiting GPUs (graphical processing units) for high performance computing in a variety of application areas; and exploring the noisy and complex poorly structured information streams from the WWW and exploring their potential application to financial indicators for investment funds.

The collaboration between mathematical sciences and the financial industry can be a win-win situation and OMI has engaged in reshaping research to be an effective and constructive collaboration among academic and industrial experts; and we are presenting the case for this proactive interaction both in the UK and abroad – for example, during my recent visits to Chinese stock exchanges.

In this respect OMI was also greatly strengthened last September by the arrival of its first Deputy Director, Marek Musiela, an outstanding scientist and academic whose contributions to the modelling and hedging of interest rate products are known across the world's universities and within the industry, and who for the last eleven years has worked at a senior level managing a large research group within the banking sector.

Mathematical biology in Oxford

Philip Maini and **Alain Goriely**

Mathematical biology is a generic name which encompasses the application of mathematical and statistical techniques to problems in biology, ecology, epidemiology and medicine. With the development of quantitative biology in the last 20 years, mathematical biology has become one of the most exciting and rapidly growing fields of applied mathematics. As such it has become very fashionable, and it is now difficult to throw a stone in a mathematics department without hitting somebody declaring an interest in some aspects of biology.

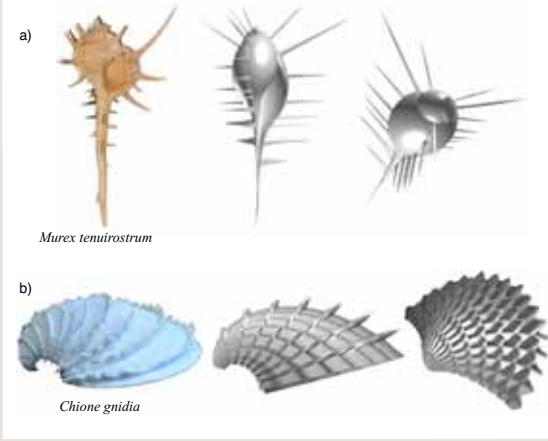
The situation was quite different in 1983 when Professor James D. Murray FRS founded Oxford's Centre for Mathematical Biology (CMB) with a grant from the SERC. In those early days the field was rather small and one needed a strength of conviction and 'faith' to withstand the lack of respectability and the general scepticism from those working in the more established fields. But there was no lack of enthusiasm on the part of Prof. Murray, and the world-renowned success that the UK currently enjoys in mathematical biology is due in no small measure to his work and that of the CMB team, which is now a bubbling centre of activity with three faculty members and around 20 graduate students and post docs.

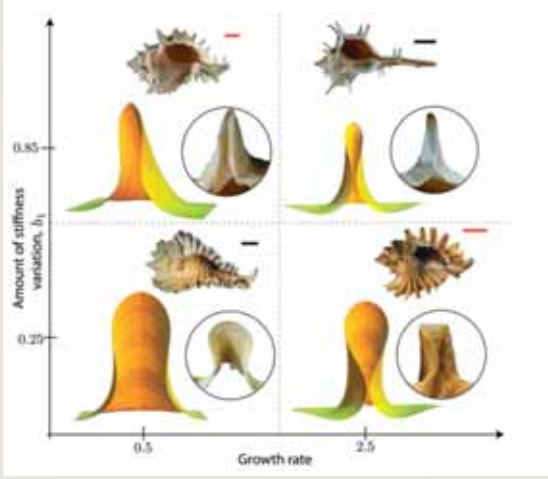
The field has also rapidly evolved from the early seminal work on the theory of pattern formation mediated by reaction–diffusion equations to new discrete, stochastic and hybrid modelling. Integral to this work are the development of computational methods, and close collaboration with experimentalists to understand how macroscopic tissue level behaviour arises from the cell-level response to, and generation of, physical and chemical cues, with applications to a vast array of subjects, such as pattern formation in development, progression of tumour growth, biofilms, and modelling normal and abnormal (for example in diabetics) wound healing. The CMB has collaborations with virtually all the experimental departments and institutes within Oxford, as well as with major experimental groups worldwide, and has been a key partner in establishing a number of interdisciplinary doctoral training centres with Computational Biology.

More than any other field of applied mathematics, mathematical biology is naturally infectious and could not be contained in just one research centre or one department. New scientific problems grow into mathematical modelling problems which feed into new challenges in mathematical and computational methods, and many faculty from the Computer Science Department (previously Comlab) and OCIAM (Oxford's Centre for Industrial Applied Mathematics) quickly joined the feeding frenzy. More recently the creation of OCCAM (Oxford's Centre for Collaborative Applied Mathematics) and the arrival of Professor Helen Byrne created a new impetus by expanding our overall research portfolio to new problems in mechanical biology such as growth, morphogenesis, and problems at the interface between mechanics, biology and mathematics.

The Mathematical Institute has now about 15 Faculty, 16 post docs and research fellows, and 31 DPhil students involved in mathematical biology. But the community of mathematical biologists in Oxford is not limited to our Institute. Among many others, the thriving Statistics department is the home of a world-leading group in statistical genetics and bioinformatics; for example, the group led by Professor Peter Donnelly FRS has made seminal discoveries concerning the links between genetics and cancer. In the department of Zoology, Lord Robert May (Baron May of Oxford) is a world leader in mathematical ecology, who developed models to study the spread of disease, such as HIV, as well as understanding species diversity. In the department of Physiology, Professor Angela McLean FRS is a world leader in the mathematical modelling of the evolution and spread of infectious diseases, while Professor Denis Noble FRS is renowned worldwide for his ground-breaking work on modelling the electrical activity of heart muscle cells, and with Professor Peter Hunter FRS (now at the University of Auckland) developed the first whole organ computational model of the heart.

It is no exaggeration to say that much of the present landscape of mathematical biology worldwide was shaped by the aforementioned Oxford figures. Today, Oxford continues to play its part in shaping the landscape. At the centre of this effort is a group of faculty, post docs and students in the Mathematical Institute who build new collaborations with life scientists and keep pushing the boundaries of applied mathematics. The future of mathematical biology in Oxford is indeed very bright. ■





Spine morphologies predicted from a biomechanical model and compared with four seashells in the Muricidae family. The two parameters of the model are the shell growth rate and the degree of mantle stiffness variation. (Courtesy of R. Chirat, D. Moulton and A. Goriely.)

Appointments...

We are delighted to welcome the following new members of the Mathematical Institute.

Sam Cohen *(Adelaide)*: University Research Lecturer. *Research interests:* decision making through time in the presence of risk and uncertainty, as described by backward stochastic differential equations.

Doyne Farmer *(Santa Fe Institute)*: Professor of Mathematics and Co-director of Complexity Economics for the Institute for New Economic Thinking. *Research interests:* complex systems, systemic risk and financial stability, evolution of technology, economic growth, sustainability.

Ian Hewitt *(University of British Columbia)*: University Lecturer in Mathematical Geoscience and Fellow of Trinity College. *Research interests:* mathematical modelling, fluid and solid mechanics, with applications to glaciology and volcanology.

Derek Moulton *(Oxford)*: University Lecturer in Mathematical Biology and Fellow of Balliol College. *Research interests:* mathematical modelling of physical systems, especially mechanobiology, growth and pattern formation, and morphoelasticity.

Nikolay Nikolov *(Imperial College London)*: University Lecturer in Pure Mathematics and Fellow of University College. *Research interests:* group theory, in particular, asymptotic properties of finite and infinite groups.

Colin Please *(Southampton)*: Professor of Applied Mathematics, University Lecturer in Industrial and Interdisciplinary Applied Mathematics, and Tutorial Fellow of Mansfield College. *Research interests:* the development, analysis and solution of continuum mathematical models of industrial problems, particularly related to energy and tissue growth.

Alexander Ritter *(Cambridge)*: University Lecturer in Geometry and Fellow of Wadham College. *Research interests:* symplectic geometry (an interplay between geometry, analysis, and physics).

Jared Tanner *(Edinburgh)*: Professor of the Mathematics of Information. *Research interests:* signal/image processing, numerical analysis, matrix analysis and stochastic geometry.

Qian Wang *(Max Planck Institute, Germany)*: University Lecturer in Analysis of Nonlinear Partial Differential Equations and Tutorial Fellow of Lincoln College. *Research interests:* partial differential equations and harmonic analysis, with a focus on the study of nonlinear hyperbolic equations.

Retirements and departures

'Retirement' has become a hazy concept. Academics have never taken it very seriously, regarding it more as an asymptotic state. Nevertheless, while the formal stage exists we mark it, and this year we saw the 'retirement' of two long-standing members of the department, **Michael Collins**, Professor of Mathematics and Fellow of University College, and **Keith Hannabuss**, Billmeir Fellow of Balliol College, with over 80 years of service between them.

Raphaël Rouquier (Waynflete Professor of Mathematics) has left to take up a position at UCLA, California, **Bernd Kirchheim** has taken up a Chair in Leipzig, **Barbara Niethammer** has taken up a Chair in Bonn, and **Thaleia Zariphopoulou** has taken up a Chair at the University of Texas in Austin.

Achievements

Sir John Ball FRS, **Bryan Birch** FRS, **Marcus du Sautoy**, **Roger Heath-Brown** FRS, **Nigel Hitchin** FRS, **Frances Kirwan** FRS, **Ulrike Tillmann** FRS and **Nick Trefethen** FRS have all been elected to the inaugural class of fellows of the American Mathematical Society.

Jon Chapman, **Kathryn Gillow** and **Martin Griffiths** received Teaching Awards in the University's Mathematics, Physical and Life Sciences Division.

Gui-Qiang Chen, **Philip Maini** and **Thaleia Zariphopoulou** have become Fellows of SIAM, the Society for Industrial and Applied Mathematics.

Andrew Dancer, **Anne Henke** and **Jan Kristensen** were awarded the title of Professor in the University's latest Recognition of Distinction exercise.

Marcus du Sautoy, Simonyi Professor for the Public Understanding of Science, was awarded an honorary DSc degree by Queen Mary University of London for services to mathematics and science.

Dominic Joyce has been elected a Fellow of the Royal Society for his contributions to differential geometry.

Richard Earl has received an OUSU Teaching Award for lecturing.

Terry Lyons FRS is President-Designate of the London Mathematical Society *(see page 3)*.

Apala Majumdar was awarded the British Liquid Crystal Society Young Scientist Prize for 2012.

Sergey Nadtochiy (Oxford-Man Institute) was awarded the 2012 SIAM Financial Mathematics and Engineering Junior Scientist Prize for his contributions to mathematical finance.

Peter Neumann OBE was awarded the 2012 IMA/LMS David Crighton Medal for services to mathematics and the mathematics community.

Jen Pestana was awarded the prize for the best paper at the 12th Copper Mountain Conference on Iterative Methods.

Tom Sanders received one of the ten European Mathematical Society prizes, awarded every four years to outstanding young mathematicians, for his fundamental results in additive combinatorics and harmonic analysis.

Dan Segal was awarded the London Mathematical Society's Pólya Prize for his major contributions to group theory.

Jared Tanner is one of the Founding Editors of the new IMA journal *Information and Inference.*

Sarah Waters was awarded a London Mathematical Society Whitehead Prize for her contributions to physiological fluid mechanics and the biomechanics of artificially engineered tissues.

Nick Woodhouse has become President of the Clay Mathematics Institute *(see page 2)*.

Student achievements

Josephine French of Keble College won both the Mathematics category award at the 2012 SET (Science, Engineering and Technology) Awards ceremony, and the overall Student of the Year award, for her project on *Differential operators on base affine space (see below).* Her project supervisor **Kobi Kremnitzer** was thereby named Best Lecturer. There were more than 500 entries from 100 universities.

Stephanie Crampin of St Hugh's College was joint winner of the 2012 Undergraduate Essay Prize of the British Society for the History of Mathematics for an essay on *The contribution of Évariste Galois to the founding of group theory.*

A present for the Queen

I could be bounded in a nutshell, and count myself a Queen of infinite space.

To celebrate Her Majesty the Queen's Diamond Jubilee, Oxford mathematician Marcus du Sautoy, Simonyi Professor for the Public Understanding of Science, presented her with an unusual object that encodes three key dates of her reign, 1952 (accession), 2012, and the 60 years of her reign. As he observed: *She should be really excited. I think it's the first thing ever made in her honour which, unlike bell towers, ocean liners and Olympic Parks, will last for ever.*

However the Queen won't be able to take a stroll around her new mathematical domain as this symmetrical object lives beyond our three-dimensional universe:

Called the Diamond Jubilee group, it was recorded on a framed certificate describing in mathematical language the contours of her strange new dominion, and explaining that the new shape 'corresponds to an elliptic curve of conductor 20,779,051,082,713,382,720'.

Oxford University has a very strong research team exploring the world of symmetry, and Marcus's new symmetrical object forges a link with one of the great mysteries in mathematics: elliptic curves. The Queen's new object is one of a seam of such shapes that he has uncovered. In a drive to involve the public in Oxford's fundamental research, and in exchange for a donation to an educational charity that he supports, he will allow anyone to name one of these as yet unidentified symmetrical objects floating in hyperspace (see page 8). As he said:

I hope this initiative will give the public a chance to get involved in mathematics and also to join the Queen in hyperspace to celebrate her Diamond Jubilee. ■

M^3 in China

Irving Shark, Chloe Martindale and **Tobias Teo** (pictured below)

Marcus's Marvellous Mathemagicians (M^3, for short) is an outreach group championed by Professor Marcus du Sautoy. Our activities primarily include workshops at UK schools and science festivals, but this winter three of us had the chance to spread the joy of maths much further from home, at Dulwich College in Beijing and Shanghai. Over four days we engaged over 1200 students and teachers, and the experience was amazing. The week was very intense, but the students were great: they loved the maths and described our activities as 'so ninja' (we didn't even know it was an adjective!). This was the biggest adventure that M^3 had yet seen, but definitely opens the doors for more international activities. Brazil, anyone? ■

A note from the President of SIAM

Nick Trefethen FRS

Last December I completed a two-year term as President of SIAM, the Society for Industrial and Applied Mathematics. Founded in the USA, SIAM is now an international society with around 14,000 members, 500 of them in the UK.

What does a scholarly society like this do? In SIAM's case the biggest activities are journals, books and conferences. We publish fifteen journals in areas such as dynamical systems, financial mathematics, and optimisation, and most of them are leaders in their fields. There's also a successful textbook/monograph series, and we run a dozen or so conferences each year.

We're especially proud of the student side of SIAM, featuring generous grants for conference attendance and more than 100 student chapters around the world, one of the liveliest being in Oxford. We aim to help undergraduates and (especially) graduate students take the step from the classroom to engagement with applied mathematical research in science, engineering and industry.

And what does the President do? Much of my attention related to journals, for which I initiated a reform designed to speed up the process of refereeing manuscripts for publication. The unexpected side of the job was the unending stream of matters to attend to concerning people, people, people ... it seemed that there was always another committee needing to be staffed, often in connection with choosing the recipient for one of SIAM's well-known prizes. Experience shows that individuals identified for a committee are more likely to serve if they are contacted personally by the President, so I found myself in touch with people all around the world, every morning and every afternoon. I enjoyed the job thoroughly, but I'm glad it's behind me!

I also wrote a monthly 'President's column' in our newspaper, SIAM News. The topics ranged over many subjects, including mathematics (my twelve favourite eigenvalue problems), philosophy (the interplay between discrete and continuous), politics (should pure and applied maths be separate?), and personal (the role of writing in my life). If you're interested, take a look at it on http://people.maths.ox.ac.uk/trefethen/essays.html. ■

Institute Garden Parties

Last year's Mathematical Institute Garden Party was held at St Anne's, and was preceded by lectures given by Prof. Alain Goriely on *The mathematical mind of Professor Moriarty: all the mathematics you didn't see in the movie* and Dr Derek Moulton on *Seashell growth and morphology*. There was also an update on the new building by Sam Howison, Chairman of the Mathematical Institute.

This year's event will take place at the new Mathematical Institute on **21 September**. There will be tours of the building and Marcus du Sautoy will give a lecture on *The secret mathematicians*.

Dame Kathleen Ollerenshaw at 100

© James King-Holmes

A lunch was organised at Somerville College last October to celebrate the 100th birthday of Dame Kathleen Ollerenshaw, former Somerville undergraduate and distinguished President of the Institute of Mathematics and its Applications. A number of Oxford mathematicians and members of Somerville attended this delightful event. The College was bathed in sunshine and looked at its glorious best. Toasts were made to Dame Kathleen by Dr Alice Prochaska (Principal of Somerville), and Sir Martin Taylor (Warden of Merton College). Dame Kathleen is still actively engaged with her mathematics and was described as a huge inspiration to one and all.

Dame Kathleen then responded in her own distinctive style, full of energy and enthusiasm. Reminiscing about her admissions interview, she recalled how no mathematics Fellows had been present, and recalled following the questions by lip reading because of her deafness. Expressing her gratitude for all that the College had done for her, she added her thanks to W. L. Ferrar, who tutored her in much of her mathematics. She amusingly contrasted the wonderful Oxford weather with the tumultuous downpour that had accompanied the Manchester festivities a few days previously.

Lunch concluded quite abruptly when she was led away for an interview for the College archive.

Food for thought

Nick Trefethen FRS, Professor of Numerical Analysis, hit the newspaper headlines this year with his discovery that the Belgian statistician Adolphe Quetelet's 1830s formula for calculating body fat is an overestimate for tall people, but an underestimate for short ones.

Terror Fermat

A terrible thing happened over the Christmas break. Audacious cat burglars scaled the roof and broke into Sir Andrew Wiles's office, but fortunately nothing was taken; it appears that they didn't look hard enough in the margins of the room.

Orthogonal sudoku

Fill in the empty cells in the puzzle below, so that each cell contains one of the numbers 1, 2, . . . , 9 and one of the letters a, b, . . . , i. Each number and each letter must appear exactly once in each row, column and 3×3 block, and each of the 81 possible number–letter pairs must appear somewhere in the grid. (The numbers and letters are said to form a pair of orthogonal Latin squares.)

1	2		4	a	5	3		
3				b		4	6c	
		5b	e	d	c		2	
8		f	2	3			d	4
e	h	c	8	9				b
2		g			4			
5	7					e	b	8g
	4g	8	c			h	1f	
			6	e		5i		c

***Solution to last year's puzzle*:**

1a	4f	3g	6i	5b	8h	7c	2d	9e
6b	5h	8i	7d	2e	9c	1f	4g	3a
7e	2c	9d	1g	4a	3f	6h	5i	8b
4i	1e	7f	9b	8c	5g	2a	3h	6d
9h	8d	5a	2f	3i	6e	4b	1c	7g
2g	3b	6c	4h	1d	7a	9i	8e	5f
3c	6g	1b	8a	7h	4d	5e	9f	2i
8f	7i	4e	5c	9g	2e	3d	6a	1h
5d	9a	2h	3e	6f	1i	8g	7b	4c