Round up

The Oxford Mathematics Newsletter • Spring 2018

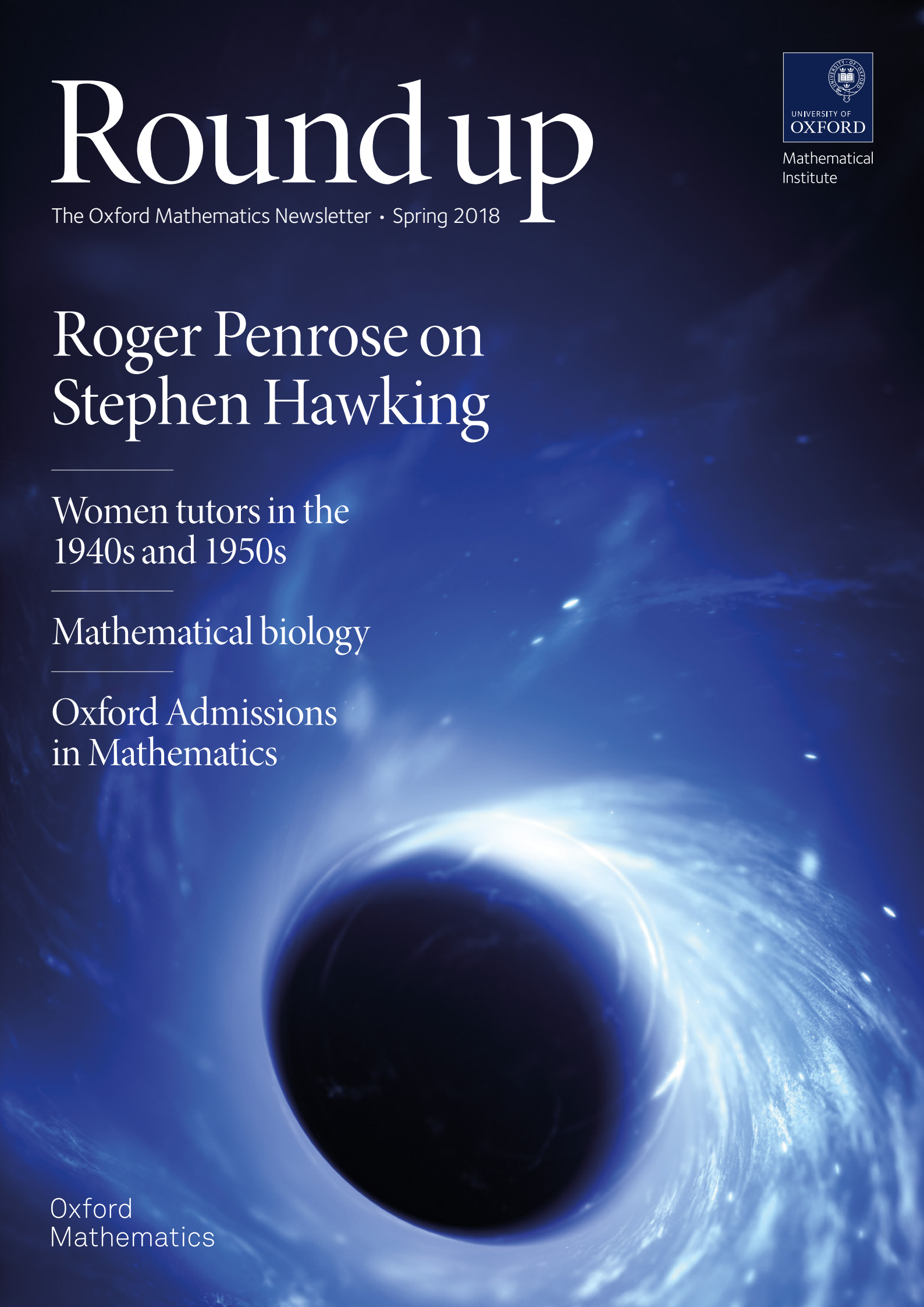
UNIVERSITY OF OXFORD
Mathematical Institute

Roger Penrose on Stephen Hawking

Women tutors in the 1940s and 1950s

Mathematical biology

Oxford Admissions in Mathematics



Oxford Mathematics

Head of Department's letter

Martin Bridson FRS

There is much to celebrate this year in the continued development of Oxford Mathematics, but I want to concentrate on a single new term in our lexicon – OMMS, the Oxford Masters in Mathematical Sciences.

The dictionary on my desk records OMS as the plural of a "mantra used in contemplation of ultimate reality". OMMS offers more specific pathways to enlightenment.

Working with our colleagues in Statistics and Computer Science, we will bring fifty of the most talented students from across the globe to Oxford each year to study on this new one-year MSc degree. Students will choose from a broad array of courses, ranging from the core of fundamental mathematics to new frontiers of application in genomics and data science. OMMS will equip students for careers in research and innovation across academia and beyond. Roger Bacon will smile on them across the centuries:

"He who knows not mathematics cannot know the other sciences nor the things of this world... A knowledge of this science prepares the mind and raises it up to a well-authenticated knowledge of all things."

Our ability to deliver OMMS is rooted in the fact that our permanent faculty has doubled in size over the last twenty years: it now stands at just over one hundred. This enables us to offer advanced courses by world-leading researchers across the full spectrum of mathematics. Our advanced undergraduates already benefit enormously from this rich offering, and now we are able to extend the same opportunities to the best masters-level students from elsewhere.

The introduction of OMMS is a landmark in the history of the Mathematical Institute. The fee income from this programme will enable us to provide stable funding for more doctoral students – a priority that I wrote to you about last year. It will also fund research fellowships, providing postdoctoral opportunities that bring the best early career researchers to Oxford and sustain the pipeline of talent into mathematics.

Thus OMMS will bolster our research while enabling us to share the excitement of modern mathematics with new cohorts of talented young people.

Welcome, OMMS!

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Get in touch

We hope that you will enjoy this annual newsletter. We are interested to receive your comments, and also contributions for future newsletters. Please contact the editor, Robin Wilson, c/o lumbard@maths.ox.ac.uk

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Departmental News

Frances Kirwan elected Savilian Professor

Frances Kirwan FRS has been elected to Oxford University's Savilian Chair of Geometry (founded in 1619). She will be the 20th occupant of this position, and is the first woman to hold a historic Oxford Mathematics Chair: previous Savilian professors have included Henry Briggs, John Wallis, Edmond Halley and G. H. Hardy.

Frances has received many honours. She was elected a Fellow of the Royal Society in 2001 and President of the London Mathematical Society from 2003 to 2005. She was created a Dame Commander of the British Empire (DBE) in 2014. Her research interests lie in algebraic and symplectic geometry – notably moduli spaces in algebraic geometry, geometric invariant theory, and their connections with moment maps in symplectic geometry.

Andrew Wiles awarded Copley Medal

Oxford mathematician Sir Andrew Wiles FRS has been awarded the Copley Medal, the Royal Society's oldest and most prestigious award. This medal is given annually for outstanding achievements in research in any branch of science. Previous winners have included Gauss, Darwin and Einstein, and Oxford mathematicians Michael Atiyah and Roger Penrose.

Since 2011 Andrew has been a Royal Society Anniversary Professor at Oxford, and in 2016 he won the Abel Prize. An active member of Oxford's eminent number theory research group, he is currently developing new ideas for the Langlands Program, a set of far-reaching conjectures connecting number theory to algebraic geometry and the theory of automorphic forms.

John Ball awarded King Faisal Prize

Oxford's Sedleian Professor of Natural Philosophy, Sir John Ball FRS, has been awarded the King Faisal Prize for Science. Launched by the King Faisal Foundation and granted for the first time in 1979, the King Faisal Prize recognises the outstanding works of individuals and institutions in five major categories, one of which is Science.

John Ball is Director of the Oxford Centre for Nonlinear Partial Differential Equations and Fellow of The Queen's College. His main research areas lie in the calculus of variations, nonlinear partial differential equations, infinite-dimensional dynamical systems and their applications to nonlinear mechanics.

Landon Clay 1926–2017

With the death of Landon T. Clay last July, Oxford Mathematics lost a treasured friend whose committed support and generosity were key factors in the recent development of the Mathematical Institute. The support of Landon and his wife Lavinia was the indispensable mainstay of the project to create the magnificent new home for Oxford Mathematics: the Andrew Wiles Building symbolises the enduring legacy of their insightful and incisive support for mathematics and science.

In 1998 Landon Clay founded the Clay Mathematics Institute, whose scientific arrangements are now run from Oxford: this has had a profoundly beneficial effect on the progress and appreciation of research into fundamental mathematics. He may be best remembered for his inspired creation of the Millennium Mathematics Prizes, which drew the public's attention to the fundamental importance of the prize problems themselves, rather than to the prizewinners.

Landon Clay and Andrew Wiles

New Professor of Mathematical Finance

Rama Cont has been appointed to the Oxford Professorship of Mathematical Finance. Currently Professor of Mathematics and Chair in Mathematical Finance at Imperial College London, he has held teaching and research positions in Paris and New York. His research interests focus on stochastic analysis, stochastic processes, and mathematical modelling in finance. He will take up the post in July 2018.

Experiences with Stephen Hawking

In recognition of a lifetime's contribution across the mathematical sciences, Oxford Mathematics has initiated a series of annual Public Lectures in honour of Sir Roger Penrose. The inaugural lecture was given last November by his long-term collaborator and friend Stephen Hawking. The lecture was one of Stephen's final public appearances. Roger Penrose writes:

It was a huge pleasure and a great honour for me when Stephen Hawking agreed to deliver the first of this series of lectures. His talk provided an excellent overview of the development of modern ideas about black holes, showing in particular how some early work we did together established that, under very general circumstances, what we now call 'black holes' could arise when material collapses under its own gravitational attraction.

In 1939 Robert Oppenheimer and Hartland Snyder showed how a cloud of spherically symmetrical dust could collapse into a region from which light could not escape. Their assumption of exact spherical symmetry led to the picture that all the dust particles would focus exactly onto a central point (a singularity) where one might expect the density of the material to become infinite. In 1964 I wondered whether such singularities would be a general feature of gravitational collapse.

Because I like to think of things geometrically, I began to consider them in terms of space-time geometry, to see whether they might be generic or something that happened only under special circumstances. I'd been thinking about such matters in a different context where topological issues were important, and had developed techniques from differential topology rather than trying to solve Einstein's equations in any detailed way.

I later realised that I could characterize where the predicted collapse reached a point of no return (a 'trapped surface') and that my earlier techniques could be used to demonstrate that a gravitational collapse which had passed this point must result in a singularity. With these techniques there was no requirement for Oppenheimer and Snyder's spherical symmetry, or for the collapsing material to be dust. Developing these ideas I showed, under some other natural assumptions (such as Einstein's general theory of relativity holding true), that such a singularity must develop.

In 1965 I lectured on my findings in Cambridge to an audience that included the young Stephen Hawking who was beginning research at Cambridge. After my talk I described the general techniques to Stephen, and to George Ellis, whose work required some symmetry assumptions that would not hold in general. Stephen latched onto these ideas very quickly and showed how to use my result for a local gravitational collapse, but in the context of cosmology, where my 'trapped-surface' condition could be applied at infinity when the universe was spatially open. He later realised that he could get a more general cosmological result, and he generalised my techniques to obtain a theory adaptable to space-time. Later we collaborated on a more general result that included most of our previous work.

Stephen subsequently began to worry about black holes in other contexts, and produced several very significant results, such as that information must be destroyed in black holes! There are fundamental issues about the seeming destruction of information in the black hole singularity, and this led to controversy among physicists about whether Stephen was right.

The destruction of information is considered most unlikely, particularly because it violates a general principle of quantum mechanics known as 'unitarity', which we may describe as the universal applicability of Schrödinger's equation of quantum mechanics. Indeed, Stephen later believed that his earlier conclusion was incorrect, and that the information must somehow escape to the outside world. Most physicists seem to agree with Stephen's later conclusion that information must somehow be restored outside the black hole rather than be destroyed at the singularity, so as not to violate unitarity. My own view is different: I believe that Stephen's original analysis was more correct, and that he should have stuck to his guns.

Stephen was the most determined person I have ever met, as he continued to do his original research against the greatest physical obstructions.

I think that our disagreements on this issue reflect the difference in our views about the overarching nature of current quantum mechanics. For me, quantum mechanics will need to be modified in a gravitational context. Stephen's different view required that unitarity must be preserved at all costs. This divergence of opinions is probably responsible for our taking different routes in our subsequent work in theoretical physics.

Stephen and I were once at a conference in Brussels and a local resident had offered to drive us to the airport. This was generous and we both agreed, but the poor chap had no idea of how to get there and we took numerous wrong turnings. It soon became so late that we thought we would surely miss the plane. But he eventually discovered the right route and we arrived at the airport with very little time to spare. I remember rushing Stephen's wheelchair up and down various ramps at great speed, and being nervous that he'd be scared about this violent activity – but the expression on his face showed how he was really rather enjoying the whole thing. Perhaps this is representative of his obvious enjoyment of situations that many of us would find too nervous to undergo, such as when he experienced weightlessness in an aeroplane in freefall.

Stephen was the most determined person I have ever met, as he continued to do his original research against the greatest physical obstructions. So let me end by saluting this remarkable man, with his enormous skills in mathematics and physics, with his great enjoyment of life (despite so many appalling difficulties), and with his profound statements on his worries about where the human race may be heading. He achieved much of great originality and scientific insight under hugely difficult circumstances, and I am profoundly grateful that he found the time and energy to come to Oxford to deliver this lecture which was the first in a series to which I'm very proud to have had my name attached.

Below: Stephen Hawking with Andrew Wiles, Martin Bridson and Roger Penrose

Women tutors in the 1940s and 1950s

Margaret E Rayner

In this note, Margaret Rayner, Emeritus Fellow of St Hilda's College, recalls the teaching of mathematics to women undergraduates during and after the Second World War.

In 1939 Dorothy Wrinch, the director of mathematical studies for women undergraduates from the early 1920s, left Oxford. All of her tutorial responsibilities were handed on to her assistant, a lecturer at St Hugh's, Ida Busbridge.

Dorothy Wrinch had conformed to the usual Oxford tutorial style: undergraduates taught themselves from books, lectures and their contemporaries, and bothered a tutor about details only when it was absolutely necessary. Ida Busbridge, a graduate of Royal Holloway College in the University of London, believed that this system was inappropriate for women undergraduates who had not experienced the rigorous preparation for Oxford available in many boys' schools. She set weekly problems for students and required written solutions to be handed in before the next tutorial, so that she could read and comment upon them. In tutorials she taught basic material, normally to two students, and at the end handed over the meticulous notes she had written during the hour. Not all students found this routine agreeable or stimulating, but students became less likely to give up on mathematics, and examination results improved.

There were thirty-one Finalists in mathematics in 1940; all were men. In 1941 the numbers were eleven men and four women, and in 1943 and 1944 eight women took Finals but there were no men. At that time a woman mathematician could spend three years at Oxford if she undertook to teach after graduation, while the others were allowed only two years. Undergraduates arrived in Oxford at any time of year to fit in with the call-up regulations. These comings and goings complicated arrangements for teaching in pairs.

Unlike William Ferrar, who taught the entire syllabus to Hertford men, Ida Busbridge sought outside teaching at a time when very few tutors were left in Oxford: in particular, U. S. Haslam-Jones at Queen's and H. O. Newboult at Merton were frequently enlisted.

In the immediate post-war years the number of women undergraduate mathematics continued to rise. The teaching situation eased when Somerville appointed as a lecturer Kathleen Sarginson (another Royal Holloway College graduate), who took over the teaching of applied mathematics. In 1947 LMH appointed as a lecturer Anne Cobbe, who had been a student of Ida Busbridge while at Somerville and had gained a First in 1942, and Ida Busbridge and Kathleen Sarginson were elected to Fellowships in their colleges.

In 1941 the numbers were eleven men and four women, and in 1943 and 1944 eight women took Finals but there were no men.

By the early 1950s Ida Busbridge was again overloaded with tutorial responsibilities and she rebelled (so it was said). St Hilda's and St Anne's were persuaded to create a joint lectureship which was taken by myself, a graduate of Westfield College in the University of London. By the end of the decade Mary Kearsley (another of Ida Busbridge's Somerville students) was a Fellow of St Anne's and I was a Fellow of St Hilda's. Anne Cobbe moved to Somerville as a Fellow when Kathleen Sarginson left Oxford, and Mary O'Brien, a physicist, directed the studies in mathematics at LMH.

Throughout the 1940s and 1950s Ida Busbridge was the spokeswoman for the teaching of women undergraduate mathematicians at Oxford, both in the University and in schools, and completely changed how things were done. She maintained good relations with schools and took an active part in the Mathematical Association. (Both Ida Busbridge and Margaret Rayner were Mathematical Association presidents.) The entrance papers set by the women's colleges were easier than those set by the Cambridge women's colleges, and the news spread that a woman admitted to read mathematics had a good chance of reaching Finals. Schools began to enter sixth-formers who had not yet taken Higher School Certificate (later A level), and those admitted were as successful as their contemporaries a year older.

From left to right: Ida Busbridge, Margaret Rayner, Anne Cobbe and Mary Kearsley.

Mathematical biology

Ruth Baker and Philip Maini FRS

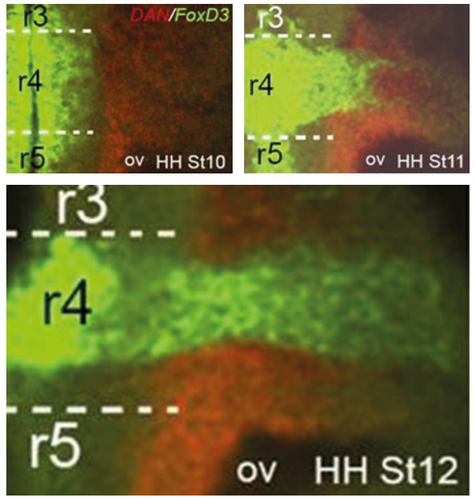
Once seen as a niche and esoteric research area, mathematical biology is now a discipline in its own right, with vast impact across the life and biomedical sciences, and generates a wealth of open mathematical questions.

When the Centre for Mathematical Biology – now the Wolfson Centre for Mathematical Biology (WCMB) – was established in 1983 by Professor J.D. Murray FRS, the subject was in its infancy. Indeed, the main reason for funding this centre was to foster the area's growth in the UK, and the fact that the UK is now arguably the world leader in mathematical biology is due in no small part to him. In those days mathematical biologists were typically mathematicians and physicists who moved from more traditional areas of applied mathematics into this new field. As such, the models were of ordinary/partial differential equation (ODE/PDE) type or discrete in time, and everyone pretty well knew what everyone else was doing.

Thirty-five years on and the landscape could not be more different. The enormous advances we have witnessed in biotechnology led first to massive growth in bioinformatics. Now, with more quantitative spatiotemporal data becoming available through novel technologies, we are seeing a sustained growth in mathematical biology.

These advances, coupled with greater focus on the scientific problem at hand, call for a completely different theoretical approach. For a start, one has to become familiar in greater depth with the scientific problem at hand (be it medical, biological, ecological, etc.) as the focus has changed from simply being able to replicate phenomena to designing actual experiments to validate the model: this is typically achieved by tighter inter-disciplinary collaborations. There is then the importance of intradisciplinary collaboration, as one problem may require approaches from stochastic analysis, ODEs, PDEs, individual-based models, numerical analysis, image analysis, statistical analysis, model reduction, parameter identifiability, group theory and network theory.

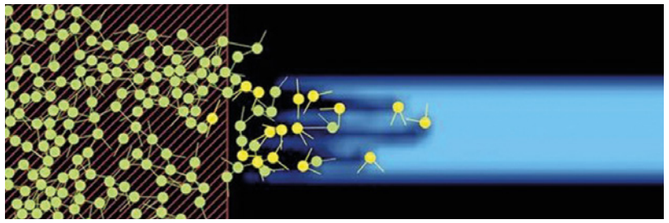
Right: In collaboration with colleagues at the Stowers Medical Research Center (USA), Oxford mathematicians have developed novel cell-based mathematical models for collective cell invasion. These have led to the discovery of new biology and insights into how to treat melanoma, and have generated open questions in applied analysis and the development of new computational approaches.



The result is a huge increase in the numbers of people working in the field, ranging from mathematicians carrying out laboratory experiments to test their models to theoreticians working on the novel, challenging and abstract mathematical problems that arise – for example, how to model across scales and how to deal with cell heterogeneity.

This means that the results of mathematical biology research now appear in journals for pure mathematics as well as for biology and medicine. Indeed, it is not uncommon for the cover article of a major biomedical journal (a highly coveted and sought-after honour in biology and medicine) to feature mathematical modelling that was instrumental in a study leading to new biological insights. At the same time, pharmaceutical companies are appealing more and more to mathematical modelling as a potential way to boost drug discovery, an area that had been stagnating.

Below: A mathematical model used to test and generate hypotheses on how this invasion is controlled. [Figure modified from R. McLennan et al., *J. Cell Biology* 216(10), (2017), 3339–54.]



Appointments…

We welcome the following new Faculty members.

Heather Harrington (Oxford)
Royal Society University Research Fellow.
Research interests:
applied algebra, chemical reaction network theory, mathematical modelling, topological data analysis, systems biology.

Renaud Lambiotte (Namur)
Associate Professor of Networks and Nonlinear Systems and Fellow of Somerville College.
Research interests:
modelling dynamical processes on large-scale networks, and the design of methods to extract information from their structure.

Gunnar Martinsson (Colorado)
Professor of Mathematics and Official Student (tutorial fellow) of Christ Church.
Research interests:
computational mathematics, large data sets and simulations of physical phenomena.

James Maynard (Oxford)
Research Professor in Mathematics.
Research interests:
number theory, especially the distribution of prime numbers.

Vidit Nanda (Princeton)
Associate Professor of the Mathematics of Data Science, and associated with Pembroke College.
Research interests:
applied algebraic topology, analysis of nonlinear data and complex systems arising in scientific contexts.

…and Achievements

This has been another excellent year for awards and achievements, with a diverse range of prizes and recipients.

Mike Giles, **Richard Haydon**, **Peter Keevash**, **Jochen Koenigsmann**, **James Maynard** and **Miguel Walsh** have been invited to speak at the International Congress of Mathematicians in Rio de Janeiro in 2018.

Ruth Baker has been awarded a Leverhulme Research Fellowship to work in mathematical biology.

Graham Benham and **Jessica Williams** have been awarded the British Applied Mathematics Colloquium talk prizes for 2017; **Ian Roper** won the poster prize.

Andrew Dancer has been elected to the Council of the London Mathematical Society.

Michael Duff FRS (Visiting Professor) has been awarded the Paul Dirac Medal and Prize for 2017.

Alison Etheridge FRS has been appointed an OBE in the Queen's Birthday Honours List for services to science, and awarded the London Mathematical Society's Senior Anne Bennett Prize for her work on measure-valued stochastic processes and their applications to population biology.

James Grogan won Gold for Mathematics at STEM for Britain, a poster competition and exhibition for early career researchers.

Kristian Kiradjiev has won the IMA Early Career Mathematicians Catherine Richards Prize for 2017 for an article on Steiner chains and Möbius transformations.

Jakub Konieczny has been awarded the Polish Mathematical Society Prize for Young Mathematicians.

Philip Maini FRS has been elected to the Academy of Medical Sciences, and was awarded the Arthur T. Winfree Prize by the Society of Mathematical Biology. He has also been elected a Foreign Fellow of the Indian National Science Academy.

Ursula Martin CBE has been elected a Fellow of both the Royal Society of Edinburgh and the Royal Academy of Engineering. She has also been awarded an honorary Doctor of Science degree by the University of London.

Gunnar Martinsson has won the 2017 Germund Dahlquist Prize, awarded by the Society for Industrial and Applied Mathematics.

Andreea Marzoca (undergraduate) was joint winner of the Worshipful Company of Information technology Charity University IT Awards for 2017.

James Maynard has been awarded a Royal Society Wolfson Merit Award to work on prime numbers.

Doireann O'Kiely has been awarded the IMA's Lighthill–Thwaites Prize for her work on the production of thin glass sheets.

Alex Scott has been awarded a Leverhulme Research Fellowship to work in combinatorics.

Ulrike Tillmann FRS has been elected to the Council of the Royal Society and has also been elected a member of the German National Academy of Sciences.

Nick Trefethen FRS has been awarded SIAM's George Pólya Prize for 'the exceptionally well-expressed accumulated insights found in his books, papers, essays, and talks'.

Dominic Vella has won a Philip Leverhulme Prize for his work on thin elastic objects and surface tension effects.

Sarah Waters has been awarded a Royal Society Leverhulme Trust Senior Research Fellowship for work in applied mathematics.

Alex Wilkie FRS has been awarded the London Mathematical Society's Pólya Prize.

Robin Wilson has been awarded the Stanton Medal given every two years by the Institute of Combinatorics and its Applications for outreach in combinatorics.

Recognition of distinction awards
The following have been promoted to Professor:
Konstantin Ardakov, Dan Ciubotaru, András Juhász, Alan Lauder, Kevin McGerty, Christoph Reisinger

Teaching awards
These have been awarded as follows:
MPLS Award:
Dan Ciubotaru
Departmental awards:
Derek Goldrei, Alex Scott, David Seifert, Phil Trinh, Andy Wathen
Departmental Tutor/TA Awards:
Jamie Beacom, James Kweicinski, Chris Nicholls, Lindon Roberts

Other news
In May 2017, the Mathematical Institute was awarded a silver Athena SWAN award, progressing from the bronze award received in 2013.
The Athena SWAN charter was established in 2005 to encourage and recognise commitment to advancing the careers of women in science.

Oxford Admissions in Mathematics

Peter M Neumann

When did Oxford stop offering scholarships and exhibitions at undergraduate entrance? And was it the same for all subjects? Is it true that colleges could poach applicants from other colleges by offering them scholarships? And if so, did the applicant have no choice but to accept?

The short answers are: 1983; Yes; Yes; and No – but the only other choice would have been to give up the idea of coming to Oxford to study.

Oxford College Tutors have the right and the duty to choose their undergraduate students. If those students have adequate matriculation requirements (another long and interesting story) the University is obliged to accept them onto its roll. Within living memory (just) the Colleges operated pretty independently, though in groups. Then, in 1962, the Oxford Colleges' Admissions Office was established to oversee the process. There still were groups, though only three of them, which did not affect Mathematics, in which the Tutors operated as one group. But the Entrance and Scholarship Examination was the same for all groups, and it was sat on the same day. Most sixth-formers sat the examinations post-A-Level in their seventh school term.

Oxford College Tutors have the right and the duty to choose their undergraduate students.

Gradually the world changed, gradually unfairness grew, gradually unfairness was perceived, and Oxford (with Cambridge) was the butt of critical stories in the Press. The so-called Dover Commission report of 1983 recommended the abolition of entrance awards and of the post-A Level examination in order to make entrance to Oxford fairer and more accessible. There was outrage from the Independent School sector, and huge Press interest.

Some ten years later, the same question, 'How can entrance to Oxford be made fairer and more accessible?', was addressed by another commission. This time the recommendation was that 3-hour entrance examinations be abolished. Mathematics did abolish the 3-hour entrance examination. Tests, however, had not been banned, and mathematics, ably led by Dr Martin Edwards, introduced a 2½ hour Mathematics Aptitude test (MAT). We were not alone. Modern Languages, Medicine, Law … – many subjects introduced tests.

So that, much condensed, is the story of how we got to where we are now. And where is that? Sixth-formers, parents, teachers, journalists, hardly see a collection of 30 Colleges offering places. It is now seen as a matter of gaining entrance to Oxford University. Nevertheless, it is College tutors who select. Tutors selecting their students, looking for potential and teachability and commitment, have much formal information on each candidate from the UCAS form and from the MAT. They also have reports on three or four interviews. And they have detailed statistics and measures of each candidate's school background.

Is it fairer than ever it was before? Probably. But equally probably that is not recognised: fairness is not relevant to journalistic reporting about universities. Ignore the Press. Oxford Tutors make huge efforts to be fair. The guarantee that those efforts are sincere is self-interest: every Tutor naturally wants the most promising students to teach.

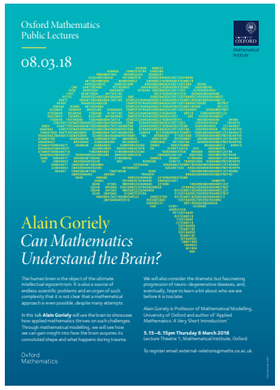
Public Lectures

The audiences for our Oxford Mathematics Public Lectures are full of aspiring mathematicians still in their teens, and a healthy cohort from the 'I was useless at maths at school' crew.

Mathematics is an entry to learning about science and technology today, and our lectures cover as much maths and life as possible – from tackling influenza via the mathematics of architecture to the enduring mystery of prime numbers.

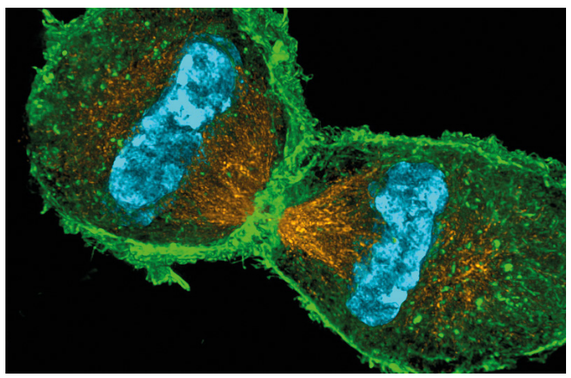
One highlight took place last November when Andrew Wiles delivered our inaugural London Lecture at the Science Museum, in discussion with mathematician and broadcaster Hannah Fry. In his lecture he talked candidly about the need to struggle and to make mistakes. Ultimately he was talking about what it means to be a mathematician and to be human.

All of our lectures are broadcast live and you can watch them any time on our Oxford Mathematics YouTube Channel.



This year's Oxford Mathematics Christmas Public Lecture, entitled 'Can Yule solve my problems?', was given by the author and journalist Alex Bellos.

More research



From *L*-functions to tracking disease via data security and why your cup of coffee sloshes, our researchers continue to expand the boundaries of mathematics. In a funding environment where impact is ever more important, spreading the word about our important and intellectually challenging work is crucial. A full range of our case studies can be found in the Research section of our website at: maths.ox.ac.uk/research/case-studies

Leslie Fox plaque

Last July a plaque was unveiled in Dewsbury, West Yorkshire, to honour Leslie Fox (1918–92), who set up Oxford University's first computing laboratory and became Oxford's first Professor of Numerical Analysis. He was a Fellow of Balliol College.

Alumni Garden Party and tours

In response to your feedback, the Annual Garden Party lecture in September focused on our latest research. Researchers at all levels gave short presentations of their work followed by questions.

In that spirit the 2018 Garden Party lecture on 15 September will convene a panel of leading Oxford Mathematicians to debate where the subject is heading and to invite discussion from the audience. Please come along. Attendance is free. Email external-relations@maths.ox.ac.uk

If you can't make the Alumni Weekend but are in Oxford any time, we would be happy to show you round the beautiful Andrew Wiles building. Just email Dyrol (lumbard@maths.ox.ac.uk).

And should you ever need a room or even a lecture theatre to host a meeting or conference please get in touch as we would be delighted to host you at discount rates – events@maths.ox.ac.uk. Also, don't forget you can sponsor a lecture theatre seat for a binary bargain of only £1,024. Other sponsorship opportunities including rooms and lecture theatres are also available.

Outreach

Our Mathematical Institute Outreach team visits and hosts schools from across the country, especially those from under-represented groups and areas.

In 2016/17 we spent more than 500 hours on outreach activities, interacting with over 15,000 students. Over 300 of these individual students would be the first in their family to go to higher education, over 600 came from neighbourhoods where the fewest number of people have historically entered higher education, and over 700 came from high deprivation neighbourhoods. Over 1500 different schools attended our events, or were visited across the UK, and we interacted with students from nearly every local authority.

The 2017 UNIQ, PROMYS Europe and Sutton Trust summer schools were all very successful, with 64 students applying and 20 students being made admissions offers.

Oxford Mathematical Alphabet

The Oxford Mathematics Alphabet posters are proving a popular way of promoting our research and introducing potential students to our work. They can all be viewed on, or downloaded from, the Mathematical Institute website.

Obituaries

We regret to announce the deaths in March of two long-term friends of the Mathematical Institute: John Roe (aged 58) and Lily Atiyah (aged 90).

John Roe received his D.Phil degree from Oxford under the supervision of Michael Atiyah, and was a fellow and tutor at Jesus College from 1986–98, after which he migrated to Penn State University in the USA. His research centred around many areas including index theorems, and operator algebras and he was awarded a Whitehead Prize by the London Mathematical Society in 1996.

Lily Atiyah studied in Edinburgh and Cambridge, receiving her doctorate in 1955 under the supervision of Dame Mary Cartwright. In the same year she became a lecturer at Bedford College, London, and married Michael Atiyah. After his retirement Lily and Michael moved to Edinburgh, where they established the Michael and Lily Atiyah Portrait Gallery of Mathematicians in 2013.

Some 2017 highlights and 2018 resolutions from Institute members

My mathematical highlight of 2017 was...

To discover a strange attractor

To learn about D-modules and the Bernstein–Sato theorem

To contribute to the efforts that have been made by several experimental groups to reproduce the dynamo instability in the laboratory using liquid metals

To follow failure in a maths competition by discovering the wonders of 'advanced' maths (undergraduate)

My mathematical resolution for 2018 is...

To understand the dynamics of stratified flows at large scales using statistical mechanical methods

To keep discovering new maths such as abstract algebra and gain a deeper understanding of mathematics (undergraduate)

To publish my first paper

To finish a paper started 15 years ago

Writing for the public

"Go forth, my little book!
Pursue thy way!
Go forth, and please the gentle
and the good."
– William Wordsworth

Oxford authors have been writing mathematics books for the general public ever since 1520 when the *Compotus Manualis ad usum Oxoniensum*, published by the newly founded Oxford University Press (OUP), included rules for calculating the date of Easter on one's fingers.

This past year has seen a mathematical crop of popular books by Oxford mathematicians. Here is a selection:

David Acheson
The Calculus Story: A Mathematical Adventure (OUP)

Richard Earl
Towards Higher Mathematics: A Companion (CUP)

Alain Goriely
Applied Mathematics: A Very Short Introduction (OUP)

Christopher Hollings, Ursula Martin and Adrian Rice
Ada Lovelace: The Making Of A Computer Scientist (Clay Mathematics Institute / Bodleian Library)

Vicky Neale
Closing The Gap: The Quest To Understand Prime Numbers (OUP)

Robin Wilson
Euler's Pioneering Equation (OUP)

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