



No. 5  
October  
2012

## 20th Anniversary Celebration Day

Over 100 guests were invited to attend a special Celebration Day at the Institute on Wednesday 11 July 2012. Staff, former staff, past Directors and Deputy Directors together with supporters and friends of the Institute gathered for an afternoon of talks and exhibitions to mark the 20th Anniversary of the inauguration of the Institute.

The afternoon began with a talk by former Deputy Director Professor Peter Goddard who spoke on the early history of the Institute including a special video message given by Sir Michael Atiyah, the Institute's first Scientific Director. The talk was followed by refreshments and 20th Anniversary cake which featured a portrait of Isaac Newton.

The Institute was delighted to welcome Professor Wendelin Werner to the Celebration Day. The Fields Medallist and former Leibniz Fellow at the Institute gave a talk suitable for a

general scientific audience entitled *Randomness, the Continuum and Reality*.

Lord Martin Rees was awarded an Honorary Fellowship in recognition of his exceptional service to the Institute. Throughout the afternoon guests were able to view a number of exhibitions and presentations about the architecture of the building, the history of the Institute and the current scientific work taking place on our programmes. 🍌



SI Wilkinson



Peter Goddard introduces the special recorded message from Michael Atiyah



Lord Martin Rees

N Luckhurst



Wendelin Werner

N Luckhurst

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# Update on our current scientific programmes

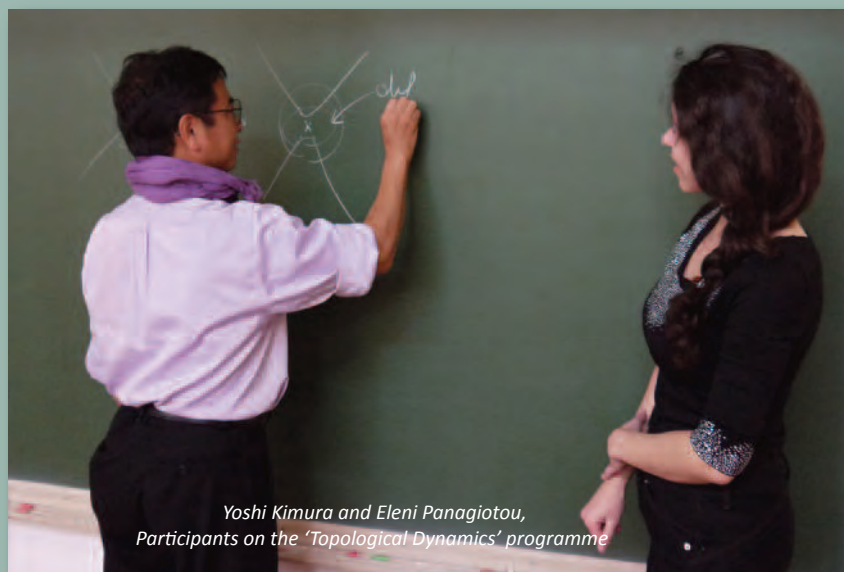
## Topological Dynamics in the Physical and Biological Sciences

Two workshops have been held so far in this programme, and a satellite workshop on tangled magnetic fields in astro- and plasma physics is currently underway (15–20 Oct) at ICMS, Edinburgh. A good balance has been maintained between the Physical and Biological Sciences, with tight knots providing the bonding theme! The first workshop (23–27 Jul) on Topological Fluid Dynamics, doubled as an IUTAM Symposium and the Proceedings will be published online in *Procedia IUTAM*. Highlights included a proof by Enciso and Peralta-Salas (Madrid) of the existence of Beltrami flows containing an arbitrarily knotted vortex line. The second workshop (3–7 Sep) was on Topological Aspects of DNA Function and Protein Folding. This was followed by an *Open for Business* event (16 Sep) entitled *Maths meets Molecular Biology at the Newton Institute* (see opposite page for more information). A regular series of two or three seminars per week has been maintained between workshops, leading to lively interchange among participants. First among these (19 Jul)

was the seminar of Phil Boyland (Florida) on the exploitation of Thurston–Nielsen theory in the context of two-dimensional stirring. Striking among later seminars was that of William Irvine (Chicago), *Knots in Light and Fluids* (11 Sep), who demonstrated his production of a trefoil-knotted vortex and its spontaneous reconnection to a pair of vortex rings.

As regards the final months of the programme, November will see a focus

on problems of surface topology (e.g. soap-film dynamics); and a final workshop on quantised flux in tightly knotted and linked systems (3–7 Dec) will cover universality aspects of such systems, from knotted flux tubes in superfluids and superconductors to glueballs in QCD; it will include also a general scientific lecture by the Rothschild Distinguished Visiting Fellow Sir Michael Berry (4 Dec) on *Superscillations and Weak Measurement*. ☺



Yoshi Kimura and Eleni Panagiotou, Participants on the 'Topological Dynamics' programme

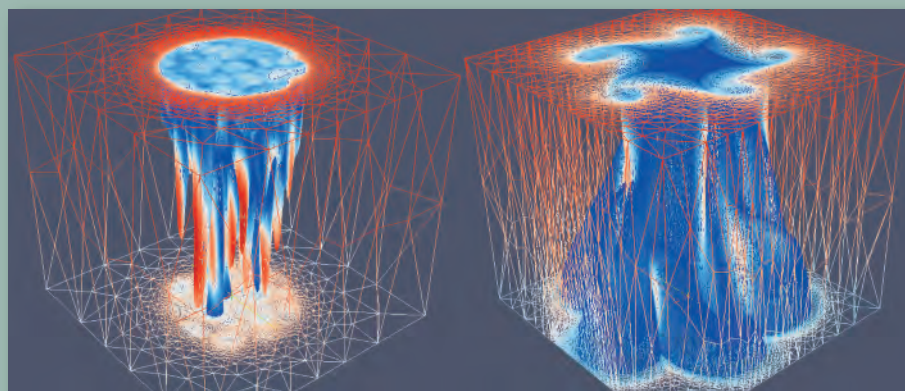
## Multiscale Numerics for the Atmosphere and Ocean

Numerical models of the atmosphere and ocean are immensely valuable forecasting tools for short time-scale weather and longer time-scale seasonal and climate prediction and this programme is developing the scientific and mathematical understanding necessary in order to

design future weather, ocean and climate prediction models suitable for next generation computer hardware, possibly with adaptive meshing.

The programme came out of a 2009 scoping meeting with the same name that was held in Reading University and was funded jointly by the Isaac Newton Institute, the National Centre for Atmospheric Science, the Royal

Meteorological Society, the Grantham Institute for Climate Change, and Fujitsu. The programme has brought together leading developers of ocean and atmosphere models with numericists and computer scientists to explore radical new formulations in order to address the limitations of current models and enable the most effective use of the computing platforms of the future.



In addition to daily seminars given by participants (8 per week on average) there have been three workshops to date including *Adaptive Multiscale Methods for the Atmosphere and Ocean*, *Solution of Partial Differential Equations on the Sphere (PDEs on the sphere)*, and the *Satellite Meeting Weather and Climate Prediction on Next Generation Supercomputers: Numerical and Computational Aspects* held at the Met Office, Exeter. ☺

## Funding Update

The Institute has recently submitted to EPSRC a proposal for continued Research Council funding from March 2014 when the current grant expires. Following guidance from EPSRC, the proposal is to be to the Research Councils collectively (not just EPSRC) and if granted in full would correspond to a reduction in Research Council funding of approximately 15%.

## EPSRC Council Visit

Between 3–4 December 2012 EPSRC is holding its December Council Meeting at the Institute. Members of the Council will have the chance to tour the Institute and meet senior members of the University including Pro-Vice-Chancellor Professor Lynn Gladden. There will also be the opportunity to meet participants from the workshop on *Quantised Flux in Tightly Knotted and Linked Systems* which will be taking place that week and is part of the *Topological Dynamics in the Physical and Biological Sciences* programme. 🟡

## EPSRC funds available

EPSRC funds are currently available to support mathematicians or theoretical physicists working in France who wish to visit British mathematical research centres or departments.

For several years, the Engineering and Physical Sciences Research Council (EPSRC) has been fostering closer links between British and French mathematical research centres through the award of a grant to the Institut des Hautes Études Scientifiques (IHÉS) in Bures-sur-Yvette. Some of the money was earmarked for scientists from IHÉS or visiting IHÉS, who wished to visit a British centre. Over the years, this special fund has not been fully spent and it was put aside until an appropriate use for it could be found. When the EPSRC grant to IHÉS was reviewed in May 2012, the Director of IHÉS suggested that the special fund be extended to mathematicians and theoretical physicists working in any institution in France wishing to visit UK mathematical research centres or departments. EPSRC approved this move. The fund can cover only living and travel expenses (but not honoraria). Receipts for all expenses have to be provided.

For further information, please contact:  
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email: [jasserand@ihes.fr](mailto:jasserand@ihes.fr) tel: +33 1 60 92 66 04

# Interdisciplinarity at the Newton Institute

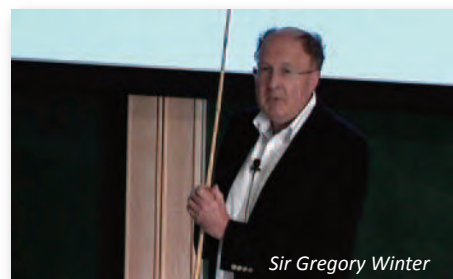
## Maths meets Molecular Biology at the Newton Institute

This event, organised by Professor Keith Moffatt (Cambridge), took place on 18 September 2012 and was connected with the *Topological Dynamics in the Physical and Biological Sciences* programme.

The event followed on naturally from the recently completed workshop *Topological Aspects of DNA Function and Protein Folding*, which focussed on the topology of DNA strands and polypeptide chains, and the mechanisms by which the topology can change through the action of site-specific recombinases and topoisomerases.

Keynote lectures were given by Professor Chris Dobson, Master of St John's College, Cambridge, on *New Approaches to Understanding and Treating Neurodegenerative Diseases*, and by Sir Gregory Winter, newly installed Master of Trinity College, Cambridge, on *The Business of Science; Building Therapeutic Drugs Based on Proteins*. Also noteworthy was the lecture of Lynn Zechiedrich (Baylor College of Medicine, Houston, Texas) on how basic DNA topology research has opened doors for gene therapy.

A short talk was given by Professor Sir Michael Berridge entitled *Calcium Hypothesis of Alzheimer's Disease*



which explained that Alzheimer's is caused by an increase in amyloid metabolism and that the calcium hypothesis explores how activation of the amyloidogenic pathway may function to remodel the signaling pathways responsible for cognition. 🟡



# 20 Years of Science at the Institute

In  
Pictures

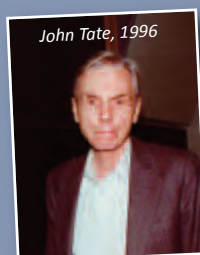
There have been many scientific highlights at the Institute over the last 20 years including...



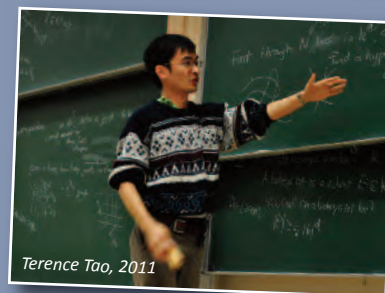
Stephen Hawking and Roger Penrose, 1994



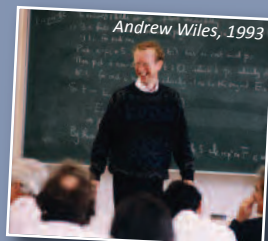
Shafi Goldwasser, 2012



John Tate, 1996



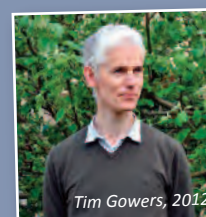
Terence Tao, 2011



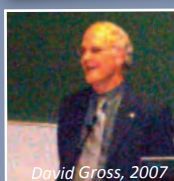
Andrew Wiles, 1993



Vladimir Arnold, 2000



Tim Gowers, 2012



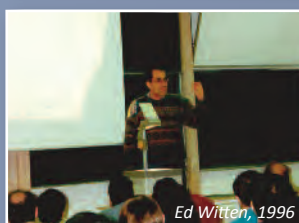
David Gross, 2007



Simon Donaldson, 2002



Cédric Villani, 2010



Ed Witten, 1996



Jean-Pierre Serre, 1997

## Follow us on Facebook and Twitter

Users of social media can now keep updated with Institute activities using Facebook and Twitter. This development is in response to requests at the 2012 Annual Meeting of Correspondents that we should engage with the mathematical sciences community

through social networking sites. The Institute can be found on Facebook at [www.facebook.com/newton.institute](http://www.facebook.com/newton.institute) and has 489 'likes' to date. On Twitter you can find us as @newtoninstitute and we currently have 524 followers and counting! Followers will receive

information on events and activities at the Institute and also special announcements. ●

 newton.institute

 @newtoninstitute

## Upcoming events and activities

4 December 2012

The Rothschild Distinguished Visiting Fellow **Professor Sir Michael Berry** (Bristol) will deliver a lecture suitable for a general scientific audience on *Superscillations and Weak Measurement*.

25–28 March, 2013

**Gateway to Mathematics Colloquia:** This event will provide opportunities, especially for early-career (postgraduate and postdoctoral) researchers, from across a spectrum of disciplines but working on projects with significant mathematical content to interact with industrial, commercial and government organizations and individuals, through a series meetings on specific topics.

22–26 April 2013

**Energy Systems Week**

For all scientific events at the Institute please visit [www.newton.ac.uk/events](http://www.newton.ac.uk/events).

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