

OCIAM NEWSLETTER

May 2008

EDITORIAL

The major news of the year must undoubtedly be the award of \$25M to Oxford to support the creation of OCCAM, the Oxford Centre for Collaborative Applied Mathematics. This editor thinks fondly back to the creation of OCIAM twenty years ago, and the question of its name. OCIM was adumbrated, the Oxford Centre for Industrial Mathematics, with the possible implication that all applied mathematics was industrial. Another suggestion at the time was for OCCAM, partly on account of its acronymic razor, and also with the idea that the central theme in modern applied mathematics is its collaborative nature, and this transcends the particular area of application. History continues to bear this out, with the development of applications in finance and biology as well as industry. Other applications are beginning to follow suit as well: medicine, physiology, geoscience, food science, social science. As the traditional boundaries melt away, we hope that both OCIAM and OCCAM will be major leaders in these endeavours in the 21st century.

FUTURE EVENTS

2008 Brooke Benjamin Lecture

This annual lecture on fluid mechanics will be given by Howard Stone (Harvard), in room L2 of the Mathematical Institute at 5pm on May 22. The title is 'Manipulating thin-film flows: from patterned substrates to evaporating systems'.

MPI study group

The 24th Annual Workshop on Mathematical Problems in Industry will be held at Worcester Polytechnic Institute, Mass., USA, from 16-20 June 2008. Contact Joseph D. Fehribach (Bach@Math.WPI.edu).

ECMI 2008

The Biennial ECMI meeting will be held in London from June 30 – July 4 this year. There is already an impressive list of plenary speakers and minisymposia which can be found on the web pages at www.ecmi2008.org.

The minisymposium on Computational Finance organised by Mike Giles and the one on Global System Dynamics and Policies organised by Stephen Bishop will be held in the Lloyds Building and delegates who attend them will get a guided tour of the Market Room at Lloyds thrown in!

Wednesday afternoon will be devoted to posters – it's not too late to submit a poster even now! – and in the evening there will be a discussion panel with industrialists on 'Where are all the industrial mathematicians' chaired by Professor Alistair Fitt.

The legacy of John Crank

Brunel University, July 10-11, 2008.

<http://people.brunel.ac.uk/~icsrsss/bicom/johncrank2008/>

Workshop on the Theory of Magnetic Confinement for Fusion in Commemoration of Les Woods

22 September 2008, Balliol College, Oxford.

Information from john.allen@eng.ox.ac.uk.

12th PIMS Industrial Problem-Solving Workshop

University of Regina, 16-20 June 2008.

www.pims.math.ca/ipsw/index.html.

66th ESGI

Technical University of Denmark, 18-22 August

2008. <http://www2.mat.dtu.dk/ESGI/66>

Alan Tayler lecture

The 2008 Alan Tayler lecture will be given by Alfio Quarteroni. Details to follow in the Autumn Newsletter.

British Applied Mathematics Colloquium

Nottingham University, 7-9 April 2009.

www.bamc2009.org.uk.

Calling all former MSc students

On September 5 we are holding a reunion to celebrate 30 years of the MSc in Mathematical Modelling and Scientific Computing (previously called the MSc in Mathematical Modelling and Numerical Analysis and also including the MSc in Applied and Computational Mathematics). The event will consist of some general talks about the course followed by a reception and a dinner.

We hope to attract a large number of students and that we can make contact with even more. Over 30 years nearly 500 students have completed the course and they are now spread all over the globe. However our records, especially of the earlier years, are very incomplete and we have contact addresses for less than half of the graduates of the course. If you did the course or know anyone else who did please send contact details to Helen Lowe on loweh@maths.ox.ac.uk. We hope you can all come to the party on September 5, but even if you can't we would very much like to hear your news.

Hilary Ockendon

COMINGS AND GOINGS

Paul Dellar (PhD Cambridge) has been appointed to a University Lectureship in Applied Mathematics, in association with a tutorial fellowship at Corpus Christi College, until September 2012. His research focuses on lattice Boltzmann methods, and he is currently holder of an EPSRC Advanced Fellowship.

Andrew Fowler has been appointed to a Stokes Professorship at the University of Limerick, while on five years' leave of absence from Oxford. He retains a vestigial role and elusive presence in Oxford, and spends most of his life in airports. He relishes the bliss of not teaching, and can no longer remember what university terms are.

Jim Oliver has been appointed to a University Lectureship in Applied Mathematics in association with Jesus College. Jim did his doctoral work at Oxford with John Ockendon on water-entry problems, and has since diversified into problems of cell motility and other biological applications.

Mason Porter (PhD Cornell), formerly at the California Institute of Technology, has been appointed to a University Lectureship in Applied Mathematics, in association with a tutorial fellowship at Somerville College, until September 2012. His research focuses on nonlinear Schrödinger equations and their application to Bose-Einstein condensation and optics. Other areas of interest include 'community detection techniques', nonlinearity management in optics, and spatio-temporal chaos in the complex Ginzburg-Landau equation. He also writes a popular blog – see later.

Sarah Waters (PhD Leeds), formerly at the University of Nottingham, has been appointed to a University Lectureship in Applied Mathematics, in association with a tutorial fellowship at St Anne's College, until September 2012. Her research is in physiological fluid mechanics (cardio-vascular, respiratory and urological flows) and the application of mathematics to medicine (for example, in tissue engineering and theoretical immunology).

Tom Witelski joined OCIAM in 2007; technically he was hired to replace John Ockendon upon his future retirement, although some think that Ock is truly irreplaceable. Tom received his PhD in Applied Mathematics from Caltech in 1991 and was a postdoc at MIT and a faculty member at Duke University in the US before coming to Oxford. Tom's expertise is in numerical and analytical techniques for solving problems in differential equations, particularly for applications in fluid dynamics and diffusive transport. Tom lectured B5a Techniques of Applied Maths

(MT2007) and Part A Fluid Dynamics (HT2008); he recommends these highly for anyone seeking a stimulating and strenuous mental and physical workout (Tom lost 20 lbs). For personal reasons, Tom will be returning to the US in 2008, but he plans to return to Oxford regularly to continue contributing to the dynamic and vibrant environments of OCIAM/OCCAM.

Ian Griffiths has completed his DPhil thesis on *Mathematical modelling of nonaxisymmetric glass tube manufacture* and is now working on reactive kinetics in surfactant systems under the joint supervision of Colin Bain (Chemistry, Durham), Chris Breward and Peter Howell.

Chris Bell has handed in his DPhil thesis on *Mathematical modelling of polymer/surfactant systems*. He currently holds an EPSRC post-doctoral position in OCIAM to work on solar energy collection.

Rosemary Dyson handed in her DPhil thesis on *The mathematical modelling of curtain coating* in 2007 and has now moved to Nottingham where she has a postdoctoral position.

Richard Booth has been awarded a David Crighton Fellowship to work with John Hinch in Cambridge. After that he has a research position with Schlumberger Clamart in France.

Andrejs Novikovs has just handed in his DPhil thesis entitled *Some problems in gas dynamics and shallow water flow*. He will be starting work as an intern with Lehman Brothers in June.

Rachel Zammett has completed her DPhil on *Gravity currents on Earth and Mars* and is now looking for a job.

Reason Machete completed his DPhil last year and has now returned to lecture at the University of Botswana at the same time as doing research at LSE on nonlinear chaotic systems.

Rebecca Shipley (née Carter – see below) has been awarded a Junior Research Fellowship at Christ Church starting in October 2008. She will continue to work on homogenisation models for vascular tissues.

VISITORS

Yoshihisa Fujimoto visited OCIAM, 1 September 2007 - 31 March 2008.

Moises Santillion Zeron visited Andrew Fowler, 5 January-5 February 2008.

Tony Ware visited OCIAM, 28 January-9 February 2008.

William Parnell visited Jon Chapman, 26 April-24 May 2008.

Owen Jones visited Ben Hambly, 12-16 May 2008.

Graeme Wake will be visiting Sam Howison, 6 June-16 July 2008.

Frank Dehoog will be visiting John Ockendon, 16 June-19 June 2008.

Guo Shuli will be paying an extended visit to Irene Moroz from 1 September.

Michael Mackey has been on an extended visit to Oxford since early January. Here is Michael's own account of his stay.

'Since arriving at OCIAM 2 January, it has been a busy but happy time for me as I blissfully take care of Andrew Fowler's office, keep his plants from dying (mostly) and guard his prodigious supply of liquor (honestly, Andrew, I haven't touched a drop of it). The other happy part about being here is that Montréal has had the mother of all winters, with a record snowfall of over four metres. Could not have picked a better time to decamp.

The busy part is related (mostly) to having (virtually) unlimited time to do my research without being bothered. Which is still continuing more or less. When I first arrived Moises Santillan was here for six weeks from Monterrey, and we got a lot of stuff done as well as starting some new things. Also had a wonderful time going to listen to great music.

A number of papers have appeared in the last 4 months, namely:

C. Foley & M.C. Mackey. "Dynamic hematological disease: A review", *J. Math. Biol.* (2008, in press), DOI: 10.1007/s00285-008-0165-3. [pdf file](#)

M. Santillan, E. S. Zeron, M. C. Mackey. "Systems biology of the tryptophan operon", in *Mathematical biology research trends* (ed: Lachlan B. Wilson), pp. 1-19. [pdf file](#)

M.J. Piotrowska, H. Enderling, U. an der Heiden & M.C. Mackey. "Mathematical modeling of stem cells related to cancer", *Focus on Cancer and Stem Cells* (eds. T. Dittmar & K. S. Zänker), Nova Science Publisher, Hauppauge, NY (2008, in press). [pdf file](#)

C. Beck & M.C. Mackey. "Electromagnetic dark energy", *International Journal of Modern Physics D* (2008), 17(1), 71–80. [pdf file](#)

M.C. Mackey & M. Tyran-Kaminska. "Central limit theorems for non-invertible measure preserving maps", *Colloquium Mathematicum* (2008), 110, 167-191. [pdf file](#)

R. Apostu & M.C. Mackey. "Understanding Cyclical Thrombocytopenia: A mathematical modeling approach", *J. Theor. Biol.* (2008), 251, 297–316. [pdf file](#)

M. Santillan, M. C. Mackey. "Quantitative approaches to the study of bistability in the lac operon of *Escherichia coli*", *J. R. Soc. Interface* (2008) doi:10.1098/rsif.2008.0086.focus [pdf file](#)

Additionally another has been submitted:

M.C. Mackey & M. Tyran-Kaminska. "Dynamics and density evolution in piecewise deterministic growth processes", *Annales Polonici Mathematici* (2008, submitted) [pdf file](#)

This last paper was dedicated to my long time friend and colleague Andy Lasota, with whom I worked for almost 30 years before his death in December, 2006. If anyone is interested you can read about my long standing collaboration with Andy in

M. C. Mackey. "Adventures in Poland: Having fun and doing research with Andrzej Lasota", *Matematyka Stosowana* 8 (2007), 8, 5-32. [pdf file](#)

In addition to hanging out at Dartington House (and the Gibson Building when Andrew shows up and reclaims his office, ha ha) there have been several excursions out of Oxford. The first was to Paris where I gave a series of lectures at an INRIA meeting on mathematical modeling of gene regulation. Then, the following week I was back to Paris (boy is the Eurostar ever great—no Heathrow) for a second meeting where I talked about hematopoietic cell regulation and dynamic hematological diseases. The second meeting just preceded Easter, and our daughter Linda took the occasion to present us with our fifth grandchild, a little girl Chloe, on 21 March. Later in April a week was spent at the Hamilton Institute (just west of Dublin at the National University of Ireland, Maynooth) where I gave a talk on "Dark energy, vacuum fluctuations, and microscopic irreversibility". Philip Maini very kindly invited me to talk in the Math Biology seminar series First Week and I talked (again, I'm afraid) about modeling gene regulation. Next I went to Corsica during the week of 5 May for a meeting on "Chaos and dynamics in biological networks" – a welcome change from the April showers! Finally I will be going back to Montréal for the last two weeks of May to participate in the CND bi-annual summer school before returning to Oxford to finish off my time until the end of June when I return to Montréal.

It has been a wonderful time so far, much of it made so great by the incredibly warm and hospitable OCIAM atmosphere that allows one to do as much or little as you like in terms of being a daily participant. Thank you everyone.'

NEWS

KTN News

http://maths.globalwatchonline.com/epicentric_portal/site/IMS/home/

The internship scheme recently launched by the KTN for Industrial Mathematics has been so successful that all the first tranche of six have now been allocated. However it is likely that more internships will be advertised soon and maybe some OCIAM students might like to participate.

OCCAM

The recent creation of the Oxford Centre for Collaborative Applied Mathematics (OCCAM), funded by a \$25M grant over 5 years by the King Abdullah University of Science and Technology's Global Research Programme, has received wide publicity. There will be a launch event on May 16, and we hope there will be a strong symbiosis between OCCAM and OCIAM. But remember OCCAM's razor – the principle on which OCCAM is based led to William of Occam being accused of heresy by the Chancellor of Oxford University in 1387.

<http://www.maths.ox.ac.uk/node/6862>

<http://www.kaust.edu.sa/news-releases/centers-08.aspx>

Mason Porter has been awarded the **Young Investigator Award in the Physical Sciences and Engineering** by Sigma Xi, the Scientific Research Society. The award is to be accepted at the 2008 Sigma Xi Annual Meeting and Student Research Conference that will take place November 20-23, 2008 in Washington, D.C. The Award includes an honorarium of \$5,000, a Certificate of Recognition, and the opportunity to present the 2008 Young Investigator Award Lecture at the Society's Annual Meeting to an audience of distinguished scientists and engineers as well as 200-250 undergraduate and graduate students participating in the Student Research Conference. This selection marks the eleventh presentation of the Young Investigator Award. The Society's Board of Directors established the Award in 1996 "to recognize researchers in the early stages of their careers whose outstanding contributions best exemplify the ideals of Sigma Xi." The Award recognizes individuals within 10 years of earning their highest graduate degree for their scientific achievements, interdisciplinary research, and the ability to communicate the

significance of their achievements to the public. The Award recognizes the physical sciences and engineering in even numbered years and the life and social sciences in odd numbered years.

Edinburgh Study Group

This year, Heriot-Watt University was chosen as the venue for the annual UK study group, and so it was that a strong OCIAM contingent made the long trip up to Edinburgh, followed by the even longer trip from there to the Heriot-Watt "Edinburgh" campus. The real journey, however, didn't start until the Monday morning, when we were faced with the task of finding our way to our working quarters through Heriot-Watt's interminable web of corridors - that's unless you're the Motorola representative, in which case you were still stuck at Heathrow Terminal 5.

Once this non-trivial topological task was solved, everyone could finally settle down to working on the industrial problems, which were of a very diverse nature, ranging from the avoidance of water freezing in gas holders to the correlation of wind farm outputs, with even a spot of finance thrown in the mix as well. As usual, many of the more rigorous academic discussions were left to the bar, including the traditional Thursday night talk-writing session, which, just to make things interesting, was held directly after the workshop dinner. This didn't stop there being a good OCIAM presence during the talks on Friday, although most outsiders probably wouldn't have realised - our Research Director had left a day early.

Oxford University SIAM Student Conference 2008

On 25th April 2008 the newly-formed Oxford University SIAM Student Chapter held its inaugural event, the 2008 Oxford University SIAM Student Conference. This one-day conference for young applied mathematicians was held at the Oxford University Computing Laboratory and was sponsored by Schlumberger.

The day began with a welcome speech by the Student Chapter President, our own very special Dave Hewett. Participants then enjoyed two talks during the morning session. Dr Christoph Ortner (Oxford) presented some aspects of his work on non-conforming finite element methods, before Rebecca Shipley (Oxford) explained how multiscale modelling techniques can be used to study fluid and drug transport in vascular tumours.

During the lunchtime break, Eliana Hetcher from eBourbaki gave a short presentation promoting the mathematical modelling competition that eBourbaki are currently running, which concerns the optimal design of a low-cost bicycle rental network proposed to reduce pollution and congestion in the city of London.

After lunch Dr Chris Farmer (Schlumberger) gave participants a fascinating insight into the role that mathematics has to play in the hydrocarbon industry. Ian Griffiths (Oxford) then gave an entertaining presentation of his work on producing glass tubing of different cross-sectional shapes, and the afternoon session was concluded by a talk by Margaret Beck (University of Surrey) on snaking in the bifurcation diagrams for the formation of certain localised patterns.

The plenary lecture was given by Professor Sir Michael Berry, FRS (Bristol University), and was entitled “Polarization fingerprints in the clear blue sky”. The talk concerned the study of the pattern of polarization of light across the sky, a phenomenon which is invisible to the naked eye. As well as eloquently describing the historical development of the problem, quoting results by renowned scientists such as Brewster and Lord Rayleigh, Professor Berry showed how a modern mathematical approach can predict properties of the polarization field with surprising accuracy. He also became embroiled in an unexpected discussion of the unfolding of caustics with various senior and junior members of OCIAM (including Chris Bell).

The conference was attended by around 40 participants, including a good number of undergraduates, and was considered by all who attended to have been a great success. It is planned that in future years the event will be more widely publicised so that participants can be attracted from across the UK.

The Oxford University SIAM Student Chapter is the first of its kind in the UK, and was formed in January 2008 with the aim of promoting interaction between undergraduate and graduate students, postdoctoral researchers and faculty with an interest in industrial and applied mathematics. The Chapter is jointly supported by the Oxford Centre for Industrial and Applied Mathematics (OCIAM) and the Numerical Analysis Group at the Oxford University Computing Laboratory, and the Chapter’s Faculty Advisor is Dr Mason Porter.

Further details of Student Chapter activities (and how to join the Chapter) can be found at www.maths.ox.ac.uk/~siamstudentchapter. Graduate students with an interest in becoming involved in the running of the Chapter are encouraged to contact siamsc@maths.ox.ac.uk to find out more.

Mason Porter writes...

Since joining OCIAM in October 2007, apparently my blog (<http://masonporter.blogspot.com>) has become a popular read in OCIAM. There people can read my snarky views on mathematics and life. [Editor’s note: ‘snarky’ means a combination of

‘sarcastic’ and ‘snide’. Readers should also recall that snark-hunting is a dangerous pursuit...]

News from the Danube

In view of the upcoming 30th anniversary of the MSc in Mathematical Modelling and Scientific Computing, I thought it would be of interest to the OCIAM newsletter to say what happened to one of its former MSc students. My name is Andrea Schnepf, I am from Vienna where I had obtained a PhD degree in Environmental Engineering. I took part in the MSc course in Applied and Computational Mathematics in the year 2004/05; Dr. Tiina Roose supervised my thesis on the effect of mycorrhizal symbiosis on plant nutrition. After my return to Vienna, I became a Hertha-Firnberg Research Fellow (which is similar to the UK Dorothy Hodgkin Fellowship scheme) at BOKU University of Natural Resources and Applied Life Sciences, Vienna, funded by the Austrian Science Fund. My research topics continued to include mycorrhizal symbiosis and plant nutrition. This enabled us to publish part of the research from my MSc thesis in 3 journal papers. Recently, together with my colleagues from Vienna and Tiina Roose from Oxford, we received a grant from the Vienna Science and Technology Fund on multiscale modelling of plant and soil interactions. This project is based on a multi-disciplinary approach that combines mathematical and experimental methods. This grant supports the still ongoing cooperation with OCIAM. I am looking forward to the reunion celebration on Sept. 5th.

Links: <http://www.boku.ac.at/rootmodel>;
<http://www.wftf.at>

Andrea Schnepf

FAMILY NEWS

Tim Myers, erstwhile of OCIAM and now at Cape Town University, has become a father. Anna Emily Myers was born on 25 October 2007.



SOCIAL NEWS

The 9th of February was the sunniest, warmest day of the winter. On this beautiful summery day, **Becky Carter** married Kieran Shipley at Stoke Park Club in Buckinghamshire. Becky's mum glowed as she walked her daughter down the aisle. Becky and Kieran were all smiles as they danced the night away before heading off on honeymoon to the Canadian Rockies.



Outside OCIAM, last December **Chris Breward** was awarded the "Commandant Air Cadets Certificate for Meritorious Service", for sterling work with his Air Cadet Squadron in Bicester. In April the Squadron was named as the best in the South West of England, and will represent the region in the competition to find the best squadron in the country.

BEYOND THE PALE

A Viennese whirl

Scared, perhaps, that their work was literally getting on top of them when snow descended on Oxford at the beginning of April, third floor glaciologists Andrew, Heike and Ian waltzed off to the supposedly warmer climes of Vienna for the general assembly of the European Geoscience Union (EGU).

This is a large conference - around 10,000 geoscientists from all over the world. The range of subjects is enormous and those of us with an (un)healthy interest in everything under the sun are spoilt for choice. I knew we were in for a busy week when at 8.30 on Monday morning I bumped into Andrew who, seemingly succeeding in his mission to be everywhere at once, announced that he had 10 talks to see in the next hour and a half! The large number of concurrent presentations meant we probably missed half the things we really should have seen, but there was nevertheless much stimulating and thought provoking research on display. Andrew gave a talk on the shape of jökulhlaup hydrographs and Ian gave one on magma flow in the mantle. Either the organisers had something against OCIAM or we were just unlucky - Andrew being scheduled at 8.30am when most people were still in

bed, and Ian on Friday afternoon when they were already on their way to the airport. Outside the lecture theatres and poster halls there was much scientific and idle chatter, the exciting hint of political unrest in EGU's cryosphere division, and the not too occasional trip into Vienna to sample the Wiener schnitzel and Heuriger wine.

Ian Hewitt

Antipodean ascents

In February, Andrew Fowler took advantage of his new found freedom (term, what term?) to travel for the first time in his life to Australia and New Zealand. First he went to Wollongong for the annual Oz/NZ mathematical study group for industry, where he gave an invited talk; indeed, the same one he gave at the Limerick study group the previous week. During the meeting, he encountered the bronzed **Jeff Dewynne**, whose *alma mater* this is.



Mark McGuinness at the Franz Josef Glacier

The following week, he stayed with ex-OCIAM visitor **Mark McGuinness** in Wellington, writing a talk on respiration for a meeting in Auckland. Before the meeting, however, he spent a torrid six days with Mark visiting the glaciers (Fox and Franz Josef) on the South Island, and then the Tongariro volcanic province on the North Island.



Fox Glacier, South Island



Bruce van Brunt at the summit of Ruapehu

Three days waiting for the clouds to lift in Tongariro were spent walking, followed by beer guzzling in the jacuzzi. Finally, the clouds parted to allow us memorably to ascend Mount Ruapehu, New Zealand's highest volcano, in the expert company of former OCIAM graduate student **Bruce van Brunt**, now an associate professor at Massey University.

Andrew Fowler