

Professor Martin Alan Bees – Curriculum Vitae

Home address	On request	Work address	Department of Mathematics University of York York YO10 5DD UK
Tel. home	On request	Tel. work	+44 1904 322038
Nationality	British	Date of birth	On request
Email	martin.bees@york.ac.uk	Marital status	Married
WWW	maths.york.ac.uk/mab555		

Employment

Sept 2012 -	50th Anniversary Professor of Mathematics , <i>Department of Mathematics, University of York</i>
Mar 2002 - Aug 2012	Reader in Applied Mathematics (2007-) & Advanced Research Fellow (EPSRC; 5 yr; 2006-Jan 2012); (Senior Lecturer 2004-06; Lecturer 2002-04) <i>Mathematical Biology Group, School of Mathematics & Statistics, University of Glasgow</i>
Nov 1998 - Mar 2002	Lecturer in Mathematics (permanent) , <i>Mathematics Research Group, Department of Mathematics & Statistics, University of Surrey</i>
April 1997 - Oct 1998	Assistant Research Professor , with Prof E. Mosekilde, <i>Chaos and Turbulence Studies Group (CATS), Physics, Danish Technical University & Niels Bohr Institute, University of Copenhagen</i> (funded by Danish Research Academy & European Network on Nonlinear Dynamics and Statistical Physics of Spatially Extended Systems)
Nov 1996 - April 1997	PDRA , with Profs J. McGlade & D. Rand, <i>Ecosystems Analysis and Management Group, Biological Sciences & Mathematics, University of Warwick</i>

Education

Oct 1992 - July 1996	PhD in Applied Mathematics, University of Leeds
Oct 1989 - June 1992	BA (hons) & MA in Mathematics 2.1, Balliol College, Oxford University
Sept 1987 - June 1989	4 'A' levels & 3 'S' levels: Maths (A; Merit S), Further Maths (A; Merit S), Physics (A; Distinction S), Electronics (A); New College, Swindon

Visiting Positions

Sept 2010 -	Visiting Professor of Mathematics , <i>Department of Mathematics, University of Botswana (Gaborone)</i> .
Sept 2012 -	Visiting Senior Research Fellow , <i>School of Mathematics & Statistics, University of Glasgow</i> .
Mar 2002 - 2004	Visiting Researcher , <i>Department of Mathematics & Statistics, University of Surrey</i> .

Summary of research plus highlights

My research falls into 6 main areas, all within mathematical biology, fluid dynamics and/or pattern formation.

Bioconvection: I have been instrumental in the development of the theory of gyrotactic bioconvection, a hydrodynamic instability induced by the biased swimming motions of microorganisms in suspensions. Research highlights include the very first quantitative experiments, generalized Taylor dispersion theory of gyrotactic swimming microorganisms, exact results for dispersion in tubes, quantification and analysis of photo-gyro-gravitactic bioconvection, and numerical simulations of biased swimming biflagellate algae. I also research the potential for biofuels and other products from algae, with an emphasis on knowledge transfer, and manage the Algae Biofuels and Biofluids Laboratory (ABBL).

Plankton patchiness: I investigate novel mechanisms for the generation and dynamics of plankton patches. Highlights have been the prediction of plankton patchiness length scales from abstract models of interacting patches employing synchronisation theory, and the discovery of a new mechanism for plankton bloom formation involving inertial segregation in complex flows.

Chemoconvection: "Chemoconvection" is a term that I coined to describe a class of chemically induced hydrodynamic instabilities. Highlights include the experimental and theoretical discovery of instability mechanisms and explorations of linear and weakly non-linear behaviour, and recent numerical simulations.

Bacterial swarming: I developed a new approach to modelling biofilms incorporating thin-film hydrodynamics, complete wetting problems and variable viscosity fluids and initiated and performed essential quantitative experiments. Analytical and computational techniques were employed to simplify and understand the dynamics, with the research linking up genetically probing laboratory experiments with theory. Important developments have been the measurement of the flowfield around a constrained bacterium using PIV and associated numerical computations, which demonstrate the importance of boundary-flagella interactions.

Ecology and biocontrol: I am interested in the dynamics of host-parasitoid systems (particularly the optimal biocontrol of slugs using parasitic nematodes - a huge problem in agriculture) and bifurcation models of speciation. Highlights have been the construction of the first rational models of slug-nematode dynamics, and the numerical exploration of complex mass structured systems.

Physiology: I investigated the luminance-response function of the human photopic electroretinogram, and helped formulate the “Glasgow” model of electrical response associated with light adaptation of the retina, which may help diagnose ocular disorders.

General I employ and develop a wide range of mathematical analyses to aid my research, such as asymptotic, non-linear, numerical, geometric, topological, statistical and symbolic manipulation methods. I am not shy of managerial responsibility, and am happy to make informed decisions in a given timeframe. Moreover, I have the capacity to make research and financial plans and ensure that targets are met. I hope that my interpersonal skills help to inspire and motivate others.

Laboratory

Unusually for a mathematician, I have a track record of setting up and running biofluid dynamics laboratories: Univ. Leeds (1992-96; experiments on bioconvection and pattern formation, including systems for culturing micro-organisms, image capture and analysis, and parameter measurement and control); Microbiology, Danish Technical University (1997-98; experiments on bacterial swarming and cell differentiation); University of Copenhagen (1999-02; collaboration on designing experiments to investigate chemically driven hydrodynamic instabilities).

I was the **Director** of the **Algae Biofuels and Biofluids Laboratory (ABBL)** which **I established in 2007** for experiments on bioenergy and bioconvection within the **School of Mathematics & Statistics**, University of Glasgow. I am setting up a new laboratory within the **Department of Biology**, University of York.

Staff and students:

Current postdoctoral research assistant: Dr O. A. Croze (2009-2011, EPSRC; 2011-2012, Carnegie Trust; 2012-2013, EPSRC Mobility, based in Life Sciences, Cambridge) - algae, bioconvection and bioenergy.

Previous postdoctoral research assistants: Dr D. Schley (2000-2001, EPSRC) - slug-nematode biocontrol (currently Research Leader at the Institute for Animal Health, Pirbright); Dr O. A. Croze (Winton Advanced Research Fellow; 2013-).

Current research students: Ms Laila Alsharief (2013-) – Bioconvection and evolution; Ms Siti Malik (2012 -) – Biofuel from algae; Mr Bilal Usmani (2011 -) – Immunology; Ms Reem Almahmud (2011 -) – Wavelet analysis of bioconvection.

Previous students:

Sqn Ldr Dr E. Ashraf (PhD 2011) – Biofluid dynamics of swimming micro-organisms (currently Associate Professor, College of Aeronautical Engineering, PAF Academy Risalpur, Pakistan)

Dr S. O’Malley (PhD 2011) – Bi-flagellate swimming dynamics (currently in IT industry)

Dr C. R. Williams (PhD 2009) – Pattern formation and hydrogen production in suspensions of swimming green algae (currently a PDRA at British Antarctic Survey, Cambridge)

Dr E. J. Guirey (PhD 2007) – Application of synchronisation theory to plankton patchiness (currently researcher at FRS, Aberdeen)

Dr R. M. Hillary (PhD 2003) – Effects of turbulence and a patchy environment on the dynamics of plankton populations (currently Senior Research Scientist at CSIRO Marine and Atmospheric Research, Tasmania, Australia)

Examination: PhD external examiner: Barcelona (2004); Birmingham (2005); Nottingham (2006); Nottingham (2007); Edinburgh (2010); Nottingham (2011). **UG external examiner:** Mathematics, University of Stirling (2012-).

Recent grants

EU TMR 2 wk study visit grant to Barcelona, “Access to supercomputing facilities” PI (1999).

EPSRC earmarked studentship in Mathematical Biology. “The effects of turbulence and a patchy environment on the dynamics of plankton populations,” PI (1999).

EPSRC: “Mathematical modelling of beetle-nematode slug-biocontrol” – postdoctoral RA (18 months), computing & travel. Links with: Microbio Ltd. and Long Ashton Research Station, Bristol; PI (£52.7k; 2000/01).

EU TMR 2 wk study visit grant to Barcelona, “Access to supercomputing facilities” PI (2000).

EPSRC studentship: “Blood pressure regulation in the nephron,” PI (2000).

Surrey University Vice-Chancellor’s grants for computing equipment and for travel PI (£1.4k; 2000/01).

EU TMR 2 wk study visit grant to Barcelona, “Access to supercomputing facilities” PI (2001).

Royal Society Research Visit grant to Halifax, Canada PI (£1.3; Apr 2001; 3 weeks).

Grants for Euromech 422, “Pattern formation by motile micro-organisms and cells”, Univ. Leeds (co-chair with Prof N. Hill); LMS, Newton Inst., EPSRC (Dec. 2001),

EU TMR 2 wk study visit grant to Barcelona, “Access to supercomputing facilities” PI (2002).

EMS (Environmental Mathematics and Statistics) EPSRC-NERC studentship; joint with Southampton Oceanographic Centre (now NOC; 2003).

EMS (Edinburgh Mathematical Society) for The Burn Postgraduate Event (£2k; 2006).

EPSRC Advanced Research Fellowship, “Bioconvection: hydrogen production and high concentrations” (£661.5k; five years; 2006).

EMS (Edinburgh Mathematical Society) for The Burn Postgraduate Event (£2k; 2007).

EMS (Edinburgh Mathematical Society) Research Visitor grant (£1k; 2007)

LMS (London Mathematical Society) Conference grant (£4k; 2009)

EMS (Edinburgh Mathematical Society) Conference grant (£1k; 2009)
 IMA (Institute of Mathematics and its Applications) Conference grant (£0.6k; 2010)
 Funding from University of Botswana for 3 month research visit (~£10k; 2010)
 College Research Fund grant for PDRA (Glasgow; £14k; 2011)
 Carnegie Trust Large Grant for PDRA “Towards economical biofuel production: models of swimming microalgae as engineering design tools” (£40k; 2011)
 EPSRC Mobility award for PDRA (CI; based with Prof A. Smith, Plant Sciences, Cambridge; 2012-13)
 EMS funding for International Conference in Botswana on Fluid Dynamics (£1k; 2012); LMS travel funds (£1.3k; 2012)

Selected Collaborations

Prof P. G. Sørensen, Chemistry Department, Copenhagen University - chemically driven hydrodynamic instabilities.
 Prof F. Sagués, Prof J. M. Sancho & Dr R. Reigada, Química Física & Física, Universitat de Barcelona - modelling plankton transport, excitable dynamics and their interaction in synthetic turbulent flows & chemoconvection
 Dr A. Edwards, Bedford Inst. Oceanog./Pacific Biol. Station, Canada - plankton ecosystem and patchiness models.
 Dr A. Martin, Dr M. Srokosz & Prof M. Fasham, National Oceanographic Centre - plankton patchiness.
 Prof E. Mosekilde & Dr M. Givskov, Physics & Microbiology, DTU, Denmark - bacterial swarming.
 Prof E. Spiegel, Astronomy, Columbia University, USA – speciation and the bifurcation of species.
 Prof. D. Glen, IACR-Long Ashton, University of Bristol - modelling slug-nematode-beetle dynamics.
 Dr O. Angulo & Prof J.C. López-Marcos, Matemática Aplicada, Universidad de Valladolid, Spain – structured populations.
 Dr D. Schley, Institute of Animal Health, Pirbright, UK – slug biocontrol.
 Prof L. Brandt, Associate Professor, KTH Mechanics, Stockholm, Sweden – biased swimming in turbulent flow.
 Dr A. M. Nedelcu. Biology, New Brunswick, Canada – algal products/harvesting.
 Prof J. O. Kessler, Physics, University Arizona, US – biased swimming micro-organisms/bioconvection.
 Prof R. Cortez, Mathematics, Tulane, New Orleans, US – the method of regularized stokeslets.
 Dr M. Britton, Chemistry, University of Birmingham, UK – MRI experiments on bioconvection.
 Dr R. Bearon, Mathematics, University of Liverpool – analysis of Taylor-Aris dispersion of swimming cells.
 Prof W. Poon, Physics, University of Edinburgh, UK – domain decomposition method (DDM)/scattering/cell tracking.
 Dr M. A. Camargo Valero, Engineering, University of Leeds, UK – products from algae.
 Several groups in Biology, Mathematics, Chemistry and Engineering, University of Botswana & National Food Technology Research Centre, Botswana – products of green algae; mathematical ecology.
 Prof A. Smith, Plant Sciences, Cambridge – algae and biofuel.

Teaching experience:

External examiner: Mathematics, University of Stirling (2012).

Graduate teaching: Invited lecturer for Danish PhD Schools on non-linear dynamics at DTU and Copenhagen University (1997; 1998).

Undergraduate project supervision: numerous MMath/BSc projects. Industrial placement tutor (students had 3 visits/year; 1999, 2000, 2001, 2002).

Undergraduate teaching: Mathematical Biology (level 3 mathematics; University of Surrey; 1999-2002); Techniques in Calculus I (level 1 mathematics; University of Surrey; 1999-2001); Techniques in Calculus II (level 1 mathematics; University of Surrey; 2000, 2001); Mechanical Modelling (level 2 mathematics; University of Glasgow; 2002); 1R Calculus (level 1 mathematics; University of Glasgow; 2002-2003); Fluid Dynamics (level 4 mathematics; University of Glasgow; 2002-2005); Partial Differential Equations/Differential Equations II (level 3 mathematics; University of Glasgow; 2003-2005); Mechanics of Rigid and Deformable Bodies (level 3 mathematics; University of Glasgow; 2012); Mathematical Modelling III (level 4 mathematics; University of Glasgow; 2012). Biological Fluid Dynamics (year 3/4 mathematics; University of York; 2013-). Introduction to Applied Mathematics (year 1; University of York; 2014-). I have consistently obtained some of the best student feedback scores for my lectures; generally the students also rate my courses as moderate to hard.

School outreach: National Science and Mathematics Taster Conference, University of Surrey (1999; 2000; 2001).

I completed an ILT accredited staff development programme at the University of Surrey (2001).

Programme development: MSc in Advanced Mathematical Biology, University of York (2014-), including 3-month industrial/academic placement.

Management:

- **Initiator and organiser for 3 one-day workshops** “Current Research in Biological and Medical Dynamics” (CRIBMED I, II & III; Surrey; 1999-02);
- **Co-chairman of EUROMECH #422:** “Pattern Formation By Motile Micro-Organisms and Cells”, Leeds (2001);
- **Head of Level 4 teaching** (Glasgow, 2003-04);
- **Head of IT** (incl. management of the Departmental IT budget; Glasgow, 2004-06).
- **Current responsibility for managing and planning the School IT budget** (2011-).

- **Organiser for THE BURN** postgraduate events, for PhD students in Mathematics from Universities in Scotland (EMS; three 3-day events in 2005, 2006 & 2007).
- **Organiser for the international conference** “Individual and Collective Fluid Mechanics of Swimming Microorganisms” (LMS/EMS/IMA; Glasgow, 6-8th July 2010).
- **Deputy Director** of the Centre for Mathematics Applied to the Life Sciences (CMALS), a joint centre between the Universities of Glasgow and Strathclyde (2011-). (**Founding Executive Member** of CMALS in 2004).
- **Director** of the Algae Biofuels and Biofluids Laboratory, University of Glasgow (ABBL; 2007-12).

Organiser for group meetings (Physics, DTU; 1998-99); Informal Seminars (Surrey; 1999-2001); Admissions Team (Maths. & Stats, Surrey; 2000-02); Editor of the Student Handbook (Surrey); Designer of Departmental Undergraduate Brochure (2001; Surrey); Introduction Week organizer (Surrey); International / ERASMUS student advisor (Glasgow; 2002-06); Schools Liaison Committee (Glasgow; 2002-06); Faculty Ethics Committee (Glasgow; 2004-present); Co-organiser of several CMALS research workshops at the University of Glasgow (2002-10); IT Committee (Glasgow; 2002-06 & 2011-12); Research Committee (Glasgow 2011-12); Research Committee (York 2012-).

Professional Membership: I am currently a member of the London Mathematical Society (LMS) and the Edinburgh Mathematical Society (EMS), and have at different times been a member of the American Physical Society, the Society of Mathematical Biology and the European Society of Mathematical and Theoretical Biology.

Peer Review Activities: I review numerous articles for many different journals across the full spectrum of my research interests, from the Journals of Fluid Mechanics to the Journal of Experimental Biology. I also review grant applications for the EPSRC, BBSRC, and NERC as well as the Newton Institute and international grant awarding bodies, such as Canada’s NSERC. I was a member of the EPSRC College from 2006-2010.

Recent invited seminars: Warwick, 1996; Copenhagen 1996, 1997, 1998 (3 times); Corsica 1998; Cambridge 1999; Barcelona 1999 (twice), 2000; Surrey 1999, 2000; Sheffield 2000; Oxford 2000; Bedford Institute of Oceanography, Nova Scotia, Canada 2000; Leeds 2001 (twice); Southampton 2001 (twice); Birmingham 2002; Bristol 2002; Barcelona 2002; Stirling 2002; Loughborough 2002; SOC, Southampton 2003; Dundee 2003; Strathclyde 2003, 2004; Imperial 2004; Nottingham 2005; Valladolid 2005; Dundee 2005; Manchester 2005; Southampton NOC 2006; Heriot-Watt 2006; Cambridge 2007; Barcelona 2008; Leicester 2008; Birmingham 2008; Tulane 2009; Liverpool 2009; Oxford 2009; Stirling 2009; Edinburgh 2010; Mathematics, Botswana 2010 (twice); Chem. Eng., Cape Town, SA 2010; Biology, Essex 2011; Scottish Association for Marine Science, Oban 2011; Engineering, Leeds 2011; Mechanics, KTH 2011; Nottingham 2012; Grenoble 2013; Nice 2013; Sweden 2014.

Invited research visits: Physical Chemistry, Barcelona (2 wks 1999, 2000, 2001, 2002, 2007); Oceanography, Nova Scotia, Canada (2000); Physics, University of Arizona (3 months 2006; 6 wks Nov/Dec 2007; 6 wks Nov/Dec 2008; 2 wks Mar 2009); Valladolid, Spain (2005); Mathematics, Tulane University, New Orleans (2 wks Apr 2009); Engineering/Mathematics, MIT (2 wks Apr 2009); Mathematics, Botswana (3 months Sept-Dec 2010; 2 wks Apr 2011; 2 wks Sept 2012); Physics, Grenoble (1 wk Apr 2013).

Keynote Seminar at “Chemo-hydrodynamic patterns and instabilities,” Solvay Inst., Brussels 2009.

Faculty Lecture, Glasgow FIMS 2009.

Keynote Seminar, “International workshop on living organisms in flows: from small-scale turbulence to geophysical flows (ORFLOW),” Mallorca 2010.

Keynote Seminar, “Individual and Collective Fluid Mechanics of Swimming Microorganisms,” Glasgow 2010.

Plenary Seminar, “Physical microenvironments modulating biological interactions in the ocean,” Aspen, Colorado 2011.

Opening Plenary Seminar, “International Conference on Applications of Fluid Dynamics”, University of Botswana 2012.

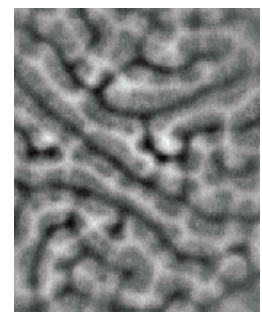
Plenary Seminar, “Collective motion of active swimmers”, Université de Nice Sophia Antipolis, Nice 2013.

Industrial employment: R&D teams in Raychem Ltd. (summers of 1989 & 1991); & Halcrow Ltd., (summer of 1992).

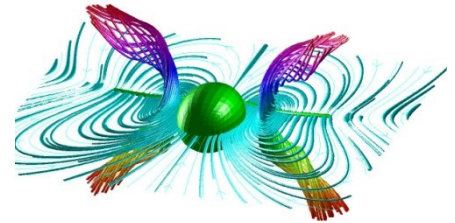
External activities: qualified sub-aqua diver (BSAC); proficient rock climber and mountaineer.

BIOCONVECTION (theory & experiments)

- 1) **M. A. Bees.** Non-linear pattern generation by swimming micro-organisms. PhD thesis, University of Leeds, 1996.
- 2) **M. A. Bees** and N. A. Hill. Wavelengths of bioconvection patterns. *Journal of Experimental Biology*, 200(10):1515-1526, 1997.
- 3) **M. A. Bees**, N. A. Hill and T. J. Pedley. Analytical approximations for the orientation distribution of small dipolar particles in steady shear flows. *Journal of Mathematical Biology*, 36:269-298, 1998.

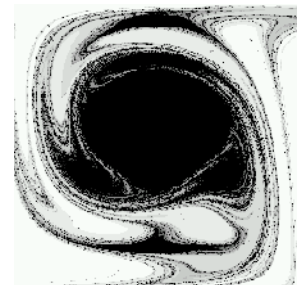


- 4) **M. A. Bees** and N. A. Hill. Linear bioconvection in a suspension of randomly swimming, gyrotactic micro-organisms. *Physics of Fluids*, 10(8):1864-1881, 1998.
- 5) **M. A. Bees** and N. A. Hill. Non-linear bioconvection in a deep suspension of gyrotactic swimming micro-organisms. *Journal of Mathematical Biology*, 38(2):135-168, 1999.
- 6) N. A. Hill and **M. A. Bees**. Taylor dispersion of gyrotactic swimming micro-organisms in a linear flow. *Physics of Fluids*, 14(8):2598-2605, 2002.
- 7) N. A. Hill and **M. A. Bees**. Above *Physics of Fluids* article also selected for the *Virtual Journal of Biological Physics Research*, 3(12), 2002.
- 8) **M. A. Bees** and O. A. Croze. Dispersion of biased swimming microorganisms in a fluid flowing through a tube. *Proceedings of the Royal Society A*, doi:10.1098/rspa.2009.0606, 2010.
- 9) O. A. Croze, E. E. Ashraf, and **M. A. Bees**. Sheared bioconvection in a horizontal tube. *Journal of Physical Biology* 7(4), doi:10.1088/1478-3975/7/4/046001, 2010.
- 10) C. R. Williams and **M. A. Bees**. Photo-gyrotactic bioconvection. *Journal of Fluid Mechanics* doi:10.1017/jfm.2011.100, 1-46, 2011a.
- 11) C. R. Williams and **M. A. Bees**. A tale of three taxes: photo-gyro-gravitactic bioconvection. *Journal of Experimental Biology* 214:2398-2408, 2011b.
 - Inside JEB article: *Journal of Experimental Biology*, June 2011, published by The Company of Biologists Ltd.;
 - Nature Research Highlights article: *Nature*, 30th June 2011.
- 12) S. O. Malley and **M. A. Bees**. The effective eccentricity of a swimming biflagellate in a shear flow. *Bulletin of Mathematical Biology*, 74:232-255, 2012.
- 13) V. A. Martinez, R. Besseling, O. A. Croze, **M. A., Bees** & W. C. K. Poon. Differential Dynamic Microscopy: a high-throughput method for characterizing the motility of micro-organisms. *Biophysical Journal* 103:1637-1647, 2012.
- 14) R. Bearon, **M. A. Bees**, O. A. Croze. Biased swimming cells do not disperse in pipes as tracers: a population model based on microscale behaviour. *Physics of Fluids* 24:121902, 2012.
- 15) C. R. Williams and **M. A. Bees**. Hydrogen Mechanistic modelling of sulfur-deprived photosynthesis and hydrogen production in suspensions of *Chlamydomonas reinhardtii*. *Biotechnology and Bioengineering (in press)* 2013a.
- 16) C. R. Williams and **M. A. Bees**. Hydrogen production in suspensions of green algae: a practical optimal method. (*sub judice*) 2013b.
- 17) O. A. Croze, G. Sardina, M. Ahmed, **M. A. Bees**, L. Brandt. 2012. Dispersion of swimming algae in laminar and turbulent channel flows. *J. Roy. Soc. Interface* 10:20121041, 14 pages, 2013.
- 18) O. A. Croze, R. N. Bearon and M. A. Bees. Taylor-Aris dispersion of swimming algae in pipe flow: experimental test of competing theories 2013.



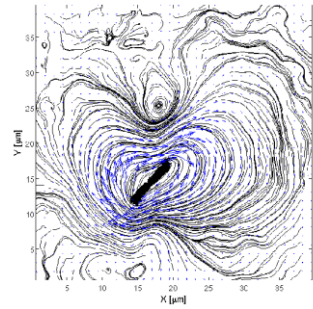
PLANKTON DYNAMICS & PATCHINESS

- 19) **M. A. Bees**, I. Mezic and J. McGlade. Planktonic interactions and chaotic advection in Langmuir circulation. *IMACS Mathematics and Computers in Simulation*, 44(6):527-544, 1998.
- 20) **M. A. Bees**. Planktonic communities and chaotic advection in dynamic models of Langmuir circulation. *Applied Scientific Research*, 59:141-158, 1998.
- 21) A. M. Edwards and **M. A. Bees**. Generic dynamics of a simple plankton model with a non-integer exponent of closure. *Chaos, Solitons and Fractals* (invited special edition on Chaos in Ecology), 12(2):289-300, 2001.
- 22) R. Reigada, R. Hillary, **M. A. Bees**, J. M. Sancho and F. Sagués. Plankton blooms induced by turbulent flows. *Proceedings of the Royal Society B*, 270:875-880, 2003.
- 23) F. Sagués, R. Reigada, J. M. Sancho, R. M. Hillary and **M. A. Bees**. Synthesizing Hydrodynamic Turbulence from Noise: Formalism and Applications to Plankton Dynamics. In *Unsolved problems of Noise and Fluctuations*; Bezrukov, S. M. (edt.) AIP Proc. **665**, 531, 2003.
- 24) R. M. Hillary and **M. A. Bees**. Plankton lattices and the role of chaos in plankton patchiness. *Physical Review E* 69:031913, 2004.
- 25) R. M. Hillary and **M. A. Bees**. Above *Physical Review E* article also selected for the *Virtual Journal of Biological Physics Research*, 7(7), 2004.
- 26) R. M. Hillary and **M. A. Bees**. Synchrony and chaos in patchy ecosystems. *Bulletin of Mathematical Biology* 66(6):1909-1931, 2004.
- 27) E. J. Guirey, **M. A. Bees**, A. P. Martin, M. A. Srokosz and M. J. R. Fasham. Emergent features due to grid-cell biology: synchronisation in biophysical models. *Bulletin of Mathematical Biology* DOI:10.1007/s11538-006-9180-y, 2007.
- 28) E. J. Guirey, A. P. Martin, M. A. Srokosz and **M. A. Bees**. Cluster synchronisation: a mechanism for plankton patchiness and a simulation pitfall. *Ocean Modelling* 29(4):223-233. 2009.
- 29) E. J. Guirey, **M. A. Bees**, A. P. Martin and M. A. Srokosz. Persistence of cluster synchronisation under the influence of advection. *Physical Review E* 81(5) DOI: 10.1103/PhysRevE.81.051902, 2010.

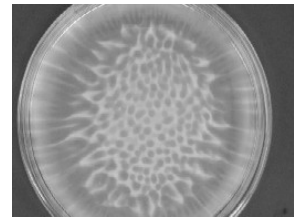


BACTERIAL SWARMING IN THIN FILMS (theory & experiments)

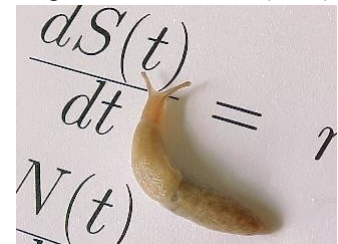
- 30) **M. A. Bees**, P. Andresén, E. Mosekilde and M. Giskov. The interaction of thin-film flow, bacterial swarming and cell differentiation in colonies of *Serratia liquefaciens*. *Journal of Mathematical Biology* 40(1):27-63, 2000.
- 31) **M. A. Bees**, P. Andresén, E. Mosekilde and M. Givskov. Quantitative effects of medium hardness and nutrient availability on the swarming motility of *Serratia liquefaciens*. *Bulletin of Mathematical Biology*, 64(3):565-587, 2002.
- 32) L. H. Cisneros, R. Ortiz, R. Cortez, J. O. Kessler and **M. A. Bees**, Unexpected bipolar flagellar arrangements and long-range flows driven by bacteria near solid boundaries. *Physical Review Letters* 101(16):168102-1, 2008.

**CHEMICAL SYSTEMS & CHEMOCONVECTION (theory & experiments)**

- 33) A. J. Pons, P. G. Sørensen, **M. A. Bees** and F. Sagués. Pattern formation in the Methylene-Blue Glucose system. *Journal of Physical Chemistry*, 104B:2251-2259, 2000.
- 34) **M. A. Bees**, A. J. Pons, P. G. Sørensen and F. Sagués. "Chemoconvection": a chemically driven hydrodynamic instability. *Journal of Chemical Physics* 114(4):1-12, 2001.
- 35) A. J. Pons, F. Sagués, **M. A. Bees** and P. G. Sørensen. Quantitative analysis of chemoconvection patterns in the Methylene-Blue-Glucose system. *Journal of Physical Chemistry*, 106B:7252-7259, 2002.
- 36) A. J. Pons, F. Sagués and **M. A. Bees**. Chemoconvection patterns in the methylene-blue-glucose system: weakly non-linear analysis. *Physical Review E* 70:066304, 2004.
- 37) A. J. Pons, O. Batiste and **M. A. Bees**. Nonlinear chemoconvection in the Methylene-Blue-Glucose system: 2D shallow layers. *Physical Review E* 78:016316, 2008.

**ECOLOGY & BIOCONTROL**

- 38) **M. A. Bees**. A mathematical model of speciation. In *Bio-physical Models of Oceanic Population Dynamics*, 1994 Program in Geophysical Fluid Dynamics. Woods Hole Oceanographic Institute Technical Report: WHOI-97-18 (1997). Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, U.S.A.
- 39) D. Schley and **M. A. Bees**. A discrete slug population model determined by egg production. *Journal of Biological Systems* 10(3):243-264, 2002.
- 40) D. Schley and **M. A. Bees**. Delay dynamics of the slug *Deroceras reticulatum*, an agricultural pest. *Ecological Modelling* 162:177-198, 2003.
- 41) D. Schley and **M. A. Bees**. The role of time delays in a non-autonomous host-parasitoid model of slug biocontrol with nematodes. *Ecological Modelling* 193:543-559, 2006.
- 42) *Media articles* (2000/2001) on "Mathematical modelling of beetle-nematode slug-biocontrol": approx. 15 articles in a wide range of newspapers, magazines, brochures, websites (such as EPSRC), radio and TV, with which I had either some input or ultimate editorial control. Highly commended in the EPSRC grant review, under Public Understanding of Science. For example, see *Daily Mail* Apr 17th, 2000, pg. 35; *Organic Living*, Harrogate, Yorks, Jun 2001; EPSRC "Mathematics Underpinning the Life Sciences" programme advertisement, 2001.
- 43) **M. A. Bees**, O. Angulo, J. C. Lopez-Marcos and D. Schley. Dynamics of a structured slug population model in the absence of seasonal variation. *Mathematical Models & Methods in Applied Sciences* 12(16):1961-1985, 2006.
- 44) **M. A. Bees**, P. H. Coullet and E. A. Spiegel. On the bifurcation of species. *CHAOS* 18,043114:1-12, 2008.
- 45) **M. A. Bees**, P. H. Coullet and E. A. Spiegel. *CHAOS* article also available in the *Virtual Journal of Biological Physics Research*, 16(10), 2008.
- 46) O. Angulo, J. C. Lopez-Marcos and **M. A. Bees**. Mass structured systems with boundary delay: oscillations and the effect of selective predation. *Journal of Nonlinear Science* 22: DOI 10.1007/s00332-012-9133-6, 2012.

**PHYSIOLOGY**

- 47) R. Hamilton, **M. A. Bees**, C. A. Chaplin and D. L. McCulloch. The luminance-response function of the human photopic electroretinogram: a mathematical model. *Vision Research*, 47:2968-2972, 2007.