Contents
1. Chair’s welcome
2. Featured article: Complexity and Energy
3. Reports from previous events
4. Forthcoming events supported by the NCPG
5. Items of interest
6. Group committee
7. Contributions from members

http://www.iop.org/activity/groups/subject/Nonlinear_and_Complex_Physics/index.html
1. Chair's Welcome

Welcome to this Newsletter for our Nonlinear and Complex Physics Group (NCPG). Our group keeps growing steadily, we now have more than 145 members, and we hope to grow even larger over the few next months and years. Complexity, Nonlinearity and related themes remain timely and exciting research topics, at the heart of the interests of the EPSRC and other funding bodies. Topics in nonlinear physics and in complexity continue to attract students from early on. Most first year students, and many pupils know about chaos, fractals and the Mandelbrot set.

The aim of our group is to foster these interests, to attract undergraduate and graduate students into nonlinear and complex physics, and to bring together researchers in this area. Last but not least, the public has a great interest in nonlinear dynamics and complexity. Enhancing the public understanding of these issues and enthusing the next generation of scientists is one of the key objectives of our group. Just recently we organised an evening talk entitled ‘2011 and all that: the case for treating society as a complex system’, given by renowned science writer Philip Ball. Jean Boulton reports in more detail on this event in this newsletter.

I am pleased to introduce a new group committee, and to welcome new members Emma Suckling, Mark Naylor, Martine Barons, Gareth Alexander, Yong Mao and Mark Hardman. Jean Boulton has been elected to serve as the group’s secretary for the next three years, and Alain Nogaret to handle the group’s finances as the new treasurer.

Special thanks go to Nick Watkins and Bill Nuttall, two of the founding members of this group. Nick and Bill have been on the committee for more than 3 years now, and we are all happy that they continue to stay on. We also thank those who have served the group so well over the last few years, but who have now decided to move on: Giampaolo D'Alessandro, Mark Frommhold and former student member Daphne Klotsa who left the UK to take up a Fellowship in the US. The group would not exist and be in such good shape without the outgoing Chair, Tom Mullin and the outgoing Treasurer, Jonathan Kobine.

As for the last three months of 2012, several events are being planned, we will announce details as soon as possible. At the same time there is an opportunity for members to get involved: we do have funds available to support events in Nonlinear and Complex Physics and we are always happy to hear suggestions how we can better serve the interests of our members. So please get in touch and get involved.

Tobias Galla
(Chair: NCPG)
2. Featured article: Complexity and Energy

In recent months one of the Group’s committee members has been part of a team of researchers considering the overlaps between complexity science and energy policy. Bill Nuttall, now based at the Open University and colleagues from Politecnico di Torino in Italy, MIT in the United States and the Joint Research Centre of the EU have been considering the future of energy supply in a complex world.

Many scholars are interested in complexity within the future energy system, especially electricity where smart grids are on the horizon. However this new grouping, led by Professor Ettore Bompard from Turin, is most interested in complexity around the energy system. Such complexity will come from many directions including climate change, social effects, and security threats. Social changes could include demographic shifts, lifestyle alterations, and evolving aspects of social inclusion.

Following some initial discussions, Bompard proposed a workshop to spur thinking on such matters, which was held at the EU Joint Research Centre’s Institute for Energy at Petten on the Dutch coast on 24 June 2012. Several speakers presented, including Bill Nuttall. The organisers concluded that there was indeed merit in the emerging ideas and the workshop was followed by the production of a Position Paper soon to be issued by the Joint Research Centre. The aim of the document is to propose a research agenda going forward. That agenda has four core elements: formalisation of the research framework (including boundaries and internal interactions); definition of a formalised environment for studying future smart energy systems; integrative research involving theoretical and practical methodological development and finally application to case studies including aspects of model verification.

All concerned believe that research of this type is best performed by those with the broadest range of perspectives, especially national perspectives. Hence it is hoped that research can proceed with European Union support. It is still relatively early days for this thinking and if any NCPG members have insights to offer, or case studies to suggest, then Bill and his colleagues would be delighted to hear from you. Bill can be reached by email william.nuttall ‘At’ open.ac.uk.

Do you have an article you'd like to share? If so please get in touch.
3. Reports from previous events

Public evening talk by Philip Ball: '2011 and all that; the case for considering society as a complex system', London, 28th May 2012.

by Jean Boulton

Following the AGM of the Nonlinear and Complex Physics Group we were privileged to have a talk by Dr Philip Ball. Philip is one of those people who is skilled at writing science books for a popular audience without losing anything in terms of scholarship and integrity. His book, Critical Mass (2004) is of particular relevance to this group.

His chosen topic at our meeting, attended by over 40 people, was: '2011 and all that; the case for considering society as a complex system'.

Fig. 2: 2011 and all that: the case for considering society as a complex system. Slides courtesy of Philip Ball.
Ball did not concede anything to accepted ideologies. Indeed he started by questioning the very basis of democracy. Fukiyama, in The End of History (1990) suggested that liberal democracy was the culmination, the pinnacle of political ideology. ‘But is it?’ asked Ball. ‘Does democracy always deliver ‘the good’, do we not have to recognise that other options are in play (look at how successfully China is embracing capitalism), and is there at least a need for other forms of democracy, with a new balance between market and government, as Stiglitz keeps saying.’

Ball’s contention is that complexity theory provides a useful perspective on the emergence of society and culture. He feels it can help us to explore how particular and local events (like the self-immolation of someone in Tunis) work together with emerging cultural shifts, including increasing social unrest and the role of new social media. He believes that complexity can help us understand the factors which shaped the UK riots and the Arab Spring, that ‘data mining’ grounded in complexity thinking might have uncovered patterns, might have led to prediction of some of these discontinuous societal shifts.

Ball gave examples of issues where complex models coupled with social research have been helpful. Does segregation promote or reduce conflict? Is the ‘broken windows’ hypothesis for real – that is, do people indeed infer the behaviour of others through cues given by the environment?

Ball discussed key themes from complexity thinking: the effects of social and technological connectivity, the impact of random and specific events, the ‘guiding trajectories’ that shape the context, the need for adaptability and flexibility.

Ball’s talk led to a lively discussion. What is the role of modelling? How does the attitude of the public and of politicians towards science constrain the debate? Is it modellers who think their models provide definitive answers; or is it that policy makers and indeed the public expect certainty, expect science to be unequivocal? The attitude towards climate change modelling was raised as a prime example of how any variation in outcomes can be adopted as evidence that climate change is not necessarily happening, that scientists don’t know what they are doing. The need for a better public understanding of the nature of science - particular the science of complex problems – was well made.

A copy of the slides from his talk can be found at:

http://www.theory.physics.manchester.ac.uk/~qalla/Ball_IoPComplexityTalk.pdf
4. Forthcoming events supported by the NCPG

Christmas Lecture

Professor Julia Yeomans
"Nature's engines: Powering life"

11th December 2012, 5.30pm-8.30pm*

Phillips Room,
Institute of Physics, 76 Portland Place,
London W1B 1NT

Active systems, from cells and bacteria to flocks of birds, create their own energy that they use to move and to control the complex processes needed for life. A goal of biophysicists is to construct the new theories needed to understand these living systems, which operate far from equilibrium. To this end we are asking questions like: How do biomolecules find their way across crowded cells? How do birds, bacteria and cells self-organise into similar patterns? Do tiny marine creatures stir the ocean?

Julia Yeomans is Professor of Physics at the University of Oxford and Pauline Chan Fellow, St. Hilda’s College. She is interested in the applications of statistical physics to soft and biological matter.

* Tea and coffee will be available before the talk, from 5.30pm and there will be a reception with mulled wine and mince pies afterwards, ending around 8.30pm.

Membership of the IOP is not required and there is no registration fee.

If you would like to attend then please contact Emma Suckling before 4th December at: e.suckling@lse.ac.uk
One day meeting: Manchester, 12th December 2012

Topic: Modelling complex systems in biology, medicine and physiology

Keynote: Delayed bifurcations in gene regulatory networks
Alexey Zaikin (UCL)

Speakers: Richard Clayton (University of Sheffield)
Magnus Rattray (University of Manchester)

Venue: Niels Bohr Common Room
School of Physics and Astronomy
University of Manchester

Time: 10.30-16.00

Contact: Tobias Galla (tobias.galla@manchester.ac.uk)

www.theory.physics.manchester.ac.uk/~galla/ncpmeeting2012/ncpmeeting.html

One day meeting: Bath, 19th December 2012 (date TBC)

Speaker: Professor Michael Rosenblum (University of Potsdam)

Title: TBC

Venue: University of Bath

Contact: Alain Nogaret (pysarn@bath.ac.uk)

5. Items of interest

Call for student essays on Complexity and Nonlinear Physics

The NCPG are pleased to announce that its first Student Essay Competition is now open for entries. Essays are invited on any topics related to nonlinear and complex physics. Prizes will be awarded for the best original, unpublished essay, to be judged by the members of the NCPG committee.

The competition is open to undergraduate and post-graduate students across all disciplines in full or part-time education. The winner will be awarded a prize of £100 and prizes of £50 will be awarded to two runners up. The winning articles will also be featured in the next edition of the NCPG newsletter.

Articles should be no more that 1000 words in length (two sides of A4) and should be submitted to Mark Hardman at mark.hardman@canterbury.ac.uk. The deadline for submission is: 15th December 2012.
6. Group Committee

Chair: Dr Tobias Galla MInstP

Tobias Galla is a Senior Lecturer in the Complex Systems and Statistical Physics Group at the University of Manchester (UK). He holds a Diplom (Physik) from the University of Muenster/Germany (1999), and a DPhil (PhD) in theoretical physics from the University of Oxford/UK (2004). He works on the statistical mechanics of complex systems, in particular stochastic dynamics of agent-based models, with applications in biology, pattern formation, economics, game theory and social dynamics. Galla has (co-) organized two three-day meetings on complexity for UK and international postgraduate students, as well as five one-day mini-symposia during the spring of 2012 on different topics in complexity science (e.g. stochastic pattern formation, noise in biochemical systems, mathematical modelling in finance), and a three-day retreat for students and researchers at the University of Manchester. He has given public engagement talks to more than 3,000 Sixth Form pupils.

Secretary: Dr Jean Boulton CPhys FInstP

Jean Boulton is a Visiting Senior Research Fellow in the Department of Social and Policy Sciences at the University of Bath and a Visiting Fellow at the Cranfield School of Management. She is also a Fellow of the Institute of Physics. Her research interests and teaching focus around complexity theory and its application to the social sciences, policy and strategy. Jean is currently in the process of completing a book titled 'Embracing Complexity' with her colleagues from Cranfield, for the Oxford University Press and maintains a website and blog on the topic at www.embracingcomplexity.com.

Treasurer: Dr Alain Nogaret CPhys MInstP

Dr Alain Nogaret is a senior lecturer at the University of Bath, where he develops artificial neurons and neural network hardware. His current research focuses on the dynamic properties of neurons that compete within networks, stochastic dynamics, the homotopic programming of neural hardware and the development of artificial central pattern generators as new medical therapies to artificially control biological rhythms e.g. respiratory sinus arrhythmia in rats.
Ordinary Members:

Dr Gareth Alexander MInstP

Gareth Alexander is an Assistant Professor in Physics and Complexity at the University of Warwick. He obtained his DPhil in theoretical physics from Oxford, where he worked with Julia Yeomans on problems in liquid crystals and low Reynolds number swimmers. Gareth was then a post-doc with Randy Kamien at the University of Pennsylvania where he studied the topology of liquid crystals, and also looked at aspects of self-diffusiophoresis applied to biological motility with Andrea Liu, before moving to Warwick in 2011. Gareth's interests are predominantly in soft matter theory, particularly in the application of topology to the description and control of ordered media and novel materials, and in the collective behaviour of active media and active liquid crystals.

Mrs Martine Barons MSc AMLnstP

At school, Martine was told she couldn't take A-level Maths, as she 'wouldn't cope'. When the ambition persisted, she took Maths as a mature student. She then pursued a Maths degree with the ambition of becoming a school teacher. The degree was inspiring and 3 years wasn't enough, so Martine took up a place at Warwick's Complexity Science doctoral training centre, where she was introduced to Boltzmann et al. Martine is now in the final weeks of a PhD in Complexity Science and Health Sciences, and hopes to do a postdoc in socio-physics. Martine met Tobias at the Complexity summer school in Ambleside in 2008 and, along with some of the other students, they have become partners in crime in setting up and running young researchers meetings at ECCS!

Mr Mark Hardman MInstP

Mark Hardman runs programmes at Imperial College and Canterbury Christ Church University training physics teachers, particularly those with a research background. He is writing up his thesis on how classrooms can be described as complex systems, trying to add some rigour to the truisms that classrooms are complex and often chaotic. He also has a pet tortoise.

Dr Yong Mao MInstP

Yong Mao is currently a lecturer in the Condensed Matter Group, at the School of Physics and Astronomy, University of Nottingham. His research interests revolve around the statistical modelling of physical systems. Over the last 15 years, his research activities ranged from colloidal interactions to polymer structures, liquid crystals, biological evolution, genetic data, and structural optimization. His expertise lies in the theoretical and computational modelling of complex systems. His most recent work on structural optimization is a collaboration with Unilever Research and Development.
Dr William Nuttall CPhys FInstP

Bill Nuttall is Professor of Energy at the Open University. He has previously been a Senior Lecturer in Technology Policy at the University of Cambridge, where he was also the Director of the Management of Technology and Innovation (MoTI) Programme and Assistant Director of the Electricity Policy Research Group. Bill’s research centres upon issues concerning energy technologies and public policy. A major area of activity relates to nuclear energy, the nuclear fuel cycle and possibilities for advanced nuclear energy technologies. His research includes the application of System Dynamics especially to issues of resource depletion. He has also undertaken research using techniques of spatial agent-based simulation.

Dr Emma Suckling MInstP

Emma Suckling is a Research Assistant within the Centre for the Analysis of Time Series (CATS) at the London School of Economics. Her research interests include developing informative forecast systems for the EQUIP project, which brings together climate modelling, statistical modelling and impacts communities to deliver risk-based prediction for decision making in the face of climate variability and change. She is a physicist by training, having pursued both her undergraduate degree and a PhD in theoretical nuclear physics at the University of Surrey, before joining CATS in 2010.

Dr Nicholas Watkins MInstP

Nick Watkins is a complexity analyst, and is currently with the Environmental Change and Evolution Programme at NERC’s British Antarctic Survey (BAS), Cambridge, UK. He is also a visitor to LSE CATS and the Centre for Fusion Space and Astrophysics at the University of Warwick. Nick currently co-supervises a doctoral student with Cambridge University’s Stats Lab. Nick’s career has included space plasma data analysis & instrument modelling at Sussex, for the USAF/NASA CRRES and ESA’s Cluster missions; analysis of radio noise measurements from Antarctica for BAS; and most recently, the establishment of a team that both develops and applies complexity science across BAS’s remit, from heavy tails in the Earth’s fluctuating aurora to long range dependence in temperature, and complex networks in biology. The common threads through this diverse range of topics have been random fluctuations and time series analysis.
7. Contributions from members

The Nonlinear and Complex Physics Group are interested to receive comments and material for future editions of the newsletter. The committee also welcomes suggestions of topics for scientific meetings and other activities that may be of interest to its members. Anyone interested in organising a meeting or who would like to suggest a topic suitable for a meeting are invited to contact the NCPG Secretary at j.g.boulton@bath.ac.uk.