

Issue no. 1

Contents

- 2. *Introducing the committee*
- 3. *The Chair's Commentary*
- 4. *Opinion piece – Biological Physics in the USA*
- 7. *Conference Calendar*
- 9. *Conference reports*
- 11. *Committee nominations*

Items for the newsletter should be e-mailed to
Jamie.hobbs@sheffield.ac.uk

Editorial

The Biological Physics group was formed three years ago and has grown from strength to strength. We now have 322 members and a growing programme of conferences and events run by and for our community. Now seems to be a good time to start a Newsletter as a vehicle to keep our membership in touch with what has happened and is going to happen in our area. It will be published biannually both on-line on our website, and e-mailed to our membership. This is the Biological Physics Group members' newsletter, so if there is something you would like to see here please let me know.

*Dr Jamie Hobbs
Newsletter editor*

Introducing the Committee



Chair.
Prof. Athene Donald,
 I work on macromolecules of biological origin, and cellular biophysics, concentrating on structure-property relationships with an emphasis on microscopy.



Secretary.
Dr Sarah Harris,
 I use state of the art computational methods to model the physical behaviour of biological macromolecules with the ultimate aim of addressing biological questions.



Treasurer.
Prof Martin Howard,
 My group focuses on pattern formation and stochastic effects in cell and developmental biology, with a special emphasis on morphogens, cell division and epigenetic dynamics.



Dr Beppe Battaglia.
 I'm interested in tackling clinical challenges via the development of new physical tools. We study the specific design rules behind inter/intra molecular interactions and self-assembly of soft matter systems.



Dr Andrea Jimenez Dalmaroni,
 My work investigates how living cells regulate their polarity and reorganise their cytoskeleton in response to constraints in cell geometry.



Prof Ray Goldstein.
 My research focuses primarily on physical aspects of evolutionary and developmental biology, with specific emphasis on the origins and workings of multicellularity.



Dr Jamie Hobbs.
 I develop new scanning probe microscopy tools and use them to study molecular and cellular processes in biological systems.



Dr Mark Leake.
 My interests involve the development of single molecule optical microscopy applied to living cells.



Prof Rod Smallwood
 My research is in the area of computational systems biology.



Prof Andrew Turberfield.
 My research interests are in DNA nanostructures and photonic crystals.



Dr Tom Waigh.
 I am an experimental physicist and study the structure and dynamics of biological systems and molecules.



Prof Peter Winlove.
 I work on the physical properties of extracellular matrix and the cell membrane, biosensors and biophotonics.



Prof Athene Donald, Chair

The Chair's commentary

Welcome to the first issue of the Biological Physics Group newsletter. The group has been in existence for a little over 3 years, having been instigated by the IOP in the wake of the EPSRC International Review of Physics in 2005

<http://www.epsrc.ac.uk/pubs/reports/Documents/PhysicsInternationalReview.pdf> , which

commented on the absence of any grouping within the IOP reflecting our community. During the succeeding period it has become clear that there is a very strong – if reasonably disparate – community within the UK, and a great enthusiasm for our subject: our activities have

got off to a flying start. We look forward to building on this and reaching out to a broader range of physicists who aren't yet converted to the excitement of our sub-discipline.

Both the EPSRC Review referred to above, and the 2008 Wakeham Review <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/reviews/physics/review.pdf> identified the importance of ensuring undergraduates are exposed to the broader aspects of physics through their courses, including biological physics. Consequently members of the group are working with the IOP and IOP Publishing to produce some course material which can be adapted to slot into core courses. This material is intended for departments without faculty familiar with the topic so that they are still able to ensure that students have some awareness of the nature of the field and its excitement and potential. This is a project that will take some time to come to fruition, so watch this space.

Of more immediate effect is the outcome of discussions with Andrew Bourne and Kedar Pandya of the EPSRC held in December (with David MacAllister from the BBSRC also present) regarding interactions of researchers in our community with the research councils and funding opportunities. Following on from the Physics-LSI signposting that the EPSRC had been running it was agreed (and now actioned) that the Physics Panel remit would be expanded to include Biological Physics explicitly as a heading, recognizing the importance of the sub-discipline and sending a clear message out to the Panels about its status as a core part of the Physics remit. We were delighted by the positive outcomes of the discussions.

Meetings are of course the bread and butter of any group. We have run several extremely successful ones. Our inaugural meeting 'Physics Meets Biology' was held in Oxford in 2008, and attracted over 120 delegates, with a

stellar list of international speakers. We are looking forward to the next in the series, to be held once again in Oxford on September 1-3rd this year <http://pmb10.iopconfs.org/index.html> . These meetings aim to cover as much as possible of the extremely broad field that we represent, ranging from single molecular machines to organisms and even ecosystems, so there should be something for everyone as well as an opportunity to forge new contacts from amongst both physicists and biologists. We have also been working with other groups to organize meetings large and small. Last year we held a joint meeting in Warwick with the Liquids and Complex Fluids and Polymer Physics Groups of the IOP on the topic of Biological and Soft Matter, and this is something we aim to repeat, probably in 2012. We are planning on running a symposium as part of the annual CMMP meeting in December, to broaden the theme of the meeting away from conventional condensed matter physics, and we are in discussion with the Institute of Physics and Engineering and Medicine about a joint symposium.

It has been a busy and rewarding period for me as Chair of this new and evolving group. I look forward to watch it grow and mature into a solid voice for our community, and a focus for our activities.

Opinion Piece



Prof Raymond Goldstein

Biological Physics in the US and in the UK

If, as George Bernard Shaw wrote, “England and America are two countries separated by a common language,” then perhaps the following thoughts might be of interest to those in the Biological Physics (BP) community who wonder how best to see our burgeoning field grow. As a relatively recent arrival in the UK (late 2006), I am often asked about how the field is supported in the US and what the UK (and especially the EPSRC) might do differently. In the following I will highlight two areas of comparison between the systems and offer some thoughts. *Caveat emptor*. having spent my entire previous academic life in the US I have a fairly deep understanding of its strengths and weaknesses. Less than four years in the UK system leaves

me still very much on the learning curve.

Biological Physics in academic departments: Physics departments in the US were at first rather slow to move into this area, the problem being that without

strong voices from within departments had a hard time gaining a consensus to move forward. Broad searches that included both condensed matter and biological physics frequently failed to converge on a biological physicist for this same reason. This lack of recognition drove many young people to friendlier departments, ranging from chemical engineering to materials science and applied mathematics. While there still is a hard core group of very narrow-minded physicists who stand in the way, the tide has turned and the field is now becoming mainstream. Indeed, for the past decade or so Biological Physics has consistently been among the fastest growing Divisions within the US American Physical Society, and the March meeting (the premier one for condensed matter physics) is now overflowing with sessions in this area. Perhaps one of the most important developments helping this along is the incorporation of undergraduate courses on biological physics into the standard curriculum, alongside solid state physics, nuclear physics, and astrophysics as electives taken in the third or fourth year. We need to make sure the same happens here in the UK. We also need to do a better job in general of crossing disciplines within universities, not so much at the research level (we all know how to do that), but in the teaching of undergraduates and graduate students. Department heads need to have a clear sense of the broad scope of the field and the need for a critical mass of staff in the area. Even within the IoP there is room for improvement in the recognition that interdisciplinary efforts often occur outside conventional physics departments. My own department (DAMTP) is not even counted among physics departments in the IoP survey!

Biological physics within funding agencies: For many years biological physics in the US was supported at a modest level within the Division of Materials Research, the home of Condensed Matter theory and experiment. About a decade ago the Physics Division, which primarily deals with high energy and mathematical physics, began to support a few proposals in this area, taking the pressure off DMR. Just last year a new Program was created entitled Physics of Living Systems. The review process for grants in this area often involves two panels, one on the physics side and one in an appropriate life science area. While this can cause problems (we all know what they are), it is important to realize that the proposals are *not* competing against physics projects in other areas (e.g., solid state physics, atomic physics). This is one of the most important differences between the NSF and EPSRC formats, and in my opinion a great advantage of the NSF system. We on the BPG have been involved in lengthy discussions with the EPSRC about a separate panel structure, and I still believe that this is one of the most important changes that could be implemented to give Biological Physics the boost it needs in the UK. The way I have tried to frame the debate is to imagine the outcry there would be if a panel composed mostly of biological physicists were to sit in judgement of atomic physics proposals. Thanks to the program officers at the EPSRC, important progress has been made recently, such as the explicit

inclusion of “Biological Physics” within the remit of the Physics panel and the recent Signposting of this area. We all hope the new Cross-Disciplinary panel structure will help assure good reviewing of proposals.

One aspect of the EPSRC proposal process we should all be grateful for is the ability to submit short rebuttals to referee reports prior to the panel meeting. Absolutely no such mechanism exists within the NSF (although it does within NIH), and this is a serious problem in the US. For those who have not experienced all the wonders of the US system, it is important to note that nearly all academic scientists are paid on a 9-month (at most!) salary by their universities, leaving the remaining 3 months to be obtained from grants. This means (literally) that the ability to handle one’s mortgage payments is tied to one’s grant success. Moreover, nearly all students are funded on grants to the PI, rather than through any sort of doctoral training account. Thus there is no *a priori* linkage between the grant period and the student’s Ph.D. duration, leaving the Ph.D. supervisor responsible for finding sometimes multiple avenues of support. In an era of 10-15% success rates on grants this creates a level of pressure for grant support that far exceeds anything I have seen in the UK. We should be grateful for the funding arrangements we have here! For a growing field like Biological Physics it presents many fewer systemic hurdles to cross than the US model. I should also add that the mix of funding agencies available to UK researchers (EPSRC, BBSRC, MRC, Wellcome Trust, Leverhulme, ESF, ERC, HFSP, Marie Curie) is really very broad.

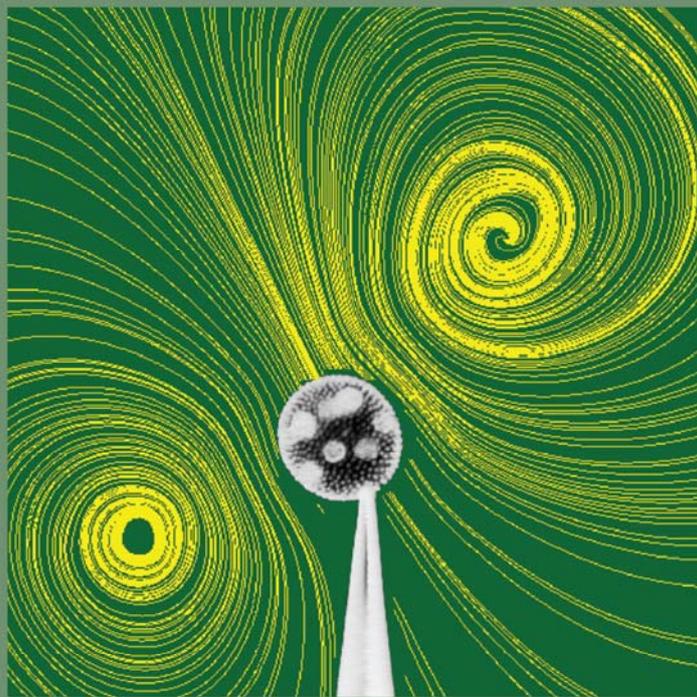
I hope it is clear from my comments above that both the US and UK systems have their good points and their loathsome ones. We need to work to improve the overall support for and recognition of Biological Physics in the UK, but not to believe reflexively that the US model is to be copied. A key driving force behind the future growth of biological physics will surely be the undergraduate students who come to realize that the area is exciting, and come knocking on our doors to get involved.

Raymond E. Goldstein
Schlumberger Professor of Complex Physical Systems
Department of Applied Mathematics and Theoretical Physics
University of Cambridge

Conference Calendar

Abstract deadline for PMB 2010 is Friday 28th May

First announcement



Physics Meets Biology 2010

1–3 September 2010
St. Catherine's College, Oxford, UK

Invited Speakers

Confirmed speakers to date include:

Bob Austin, Princeton University, USA
 Rob Cross, Warwick University, UK
 Marileen Dogterom, AMOLF, The Netherlands
 Brian Enquist, University of Arizona, USA
 Hermann Gaub, Ludwig Maximilians University,
 Germany
 Jamie Hobbs, Sheffield University, UK

Frank Julicher, MPI Physics of Complex Systems,
 Germany

Simon Laughlin, Cambridge University, UK
 Cait MacPhee, Edinburgh University, UK
 Phil Nelson, University of Pennsylvania USA
 Bela Novak, Oxford University, UK
 Daniel Robert, Bristol University, UK
 Peter Swain, Edinburgh University, UK
 Sander Tans, AMOLF, The Netherlands
 Pete Vukusic, Exeter University, UK

<http://pmb10.iopconfs.org/>

Organised by the IOP Biological Physics Group

Image: Fluid flow around the colonial alga *Volvox carteri* held by a micropipette, imaged with tracer particles.
 Courtesy of Sujoy Ganguly and Raymond E. Goldstein, DAMTP, University of Cambridge

IOP Institute of Physics

Medical Physics and Engineering Conference (MPEC), Nottingham. 14th-16th September, 2010.

This one day meeting is an IOP session on Computational Biomedical Physics being organised jointly between the Medical Physics Group (contact Martin Robinson, York) and the Biological Physics Group (contact Sarah Harris, Leeds). It is an extension to the Institute of Physics and Engineering in Medicine (IPEM) annual Medical Physics and Engineering Conference (MPEC) which will be held in Nottingham. The aim of the computational section of the conference is to bring together researchers in Biological Physics and Medical Physics modelling to inspire new collaborations between the two fields. The meeting aims to cover all time and length scales from atomistic simulation to models of the whole body, and will feature invited speakers from both of the two fields. We will shortly be issuing a call for abstracts for contributed talks, so please watch this space!

Condensed Matter and Materials Physics (CMMP) 2010. 14th-16th December, 2010.

This year's CMMP will have a soft matter/biological physics theme including two Biological Physics symposia:

Biological Physics at the cellular scale.

Invited Speakers *Prof Ray Goldstein, University of Cambridge*
 Prof Ramin Golestanian, University of Oxford.

Biological Physics at the nanoscale

Invited Speakers *Prof Suzi Jarvis, University College Dublin*
 Dr Mark Leake, University of Oxford.

Also this year there are two Plenary Lectures that are relevant to Biological Physics:

Prof Athene Donald, University of Cambridge, "Mott Lecture - Self Assembly of Proteins".

Prof Marshall Stoneham, UCL, "Where quantum physics meets biology".

For more details contact Jamie Hobbs (Jamie.hobbs@sheffield.ac.uk) or go to <http://www.cmmp.org.uk/>.

Student Conference Fund reports

The Institute of Physics provides financial support to research students to attend international meetings and national meetings. For further details see: http://www.iop.org/activity/grants/Research_Student_Conference_Fund/page_26535.html. After the conference you will need to submit a report to the Biological Physics group. Below are the two most recent reports, and all future reports will be published in this newsletter.

Aleksandar Ivanov, Imperial College London

Report on Biophysical Society 54th Annual Meeting, 20-24 Feb, 2010, San Francisco, USA

The Annual Meeting of the Biophysical Society is arguably the largest biophysics in the world. This year it took place in San Francisco, California and attracted more than 6000 attendees from over the world. The meeting is sectioned into several scientific platforms which are held simultaneously and represent the interest of different communities within the field of biophysics.

I was fortunate enough to be selected to present a talk in the platform AI: Micro & Nanotechnology, Nanopores, which resulted in auditorium with 350-400 scientists with focused interest in the area my research is conducted. Since there were only eight talks in total in the platform session, I believe that there is no other big international conference that is more suited for presenting my work or provide higher scientific impact. In that respect I consider the conference as a success. As any other big conference, however, the Biophysical Society 54th Annual Meeting was a time intense event with short talks and limited Q& A sessions. It is in general a difficult environment for receiving feedback or for quality discussions.

I think that the conference highlight was a very exciting talk by Rogier Tsien (2008 Nobel Prize winner in chemistry). His recent work is rather different from what got him the Nobel Prize and truly spans several research fields. By some clever chemistry and molecular biophysics he and his collaborators are able to solve fundamental problems faced in the surgery of patients with cancer. I believe that truly transdisciplinary research is always inspiring to see.

Apart from update of the recent trends in my research field, I was exposed to what are some of the exciting trends in the whole field of biophysics. This conference is also a good event for networking and meeting potential partners for collaborations. There is a fair number of workshops organised by BPS on transferable skills and jobs outside academia that may be interesting for many. Additionally, there is a large exposition area presenting the latest products from providers of scientific instrumentations.

There is some criticism that goes toward the choice of venue, which is not ideal for such event, the very poor scheduling, overcrowding during sessions and in some sub-groups the evident lack of any control of how experienced is(are) the session chair(s). It is surprising how much the latter can influence the quality of the sessions. Many of these flaws are quite surprising considering that this conference takes place for 54th time.

All in all I believe that this is an important conference and should be attended by anyone interested in the field of biophysics. I am glad that I was able to attend and very grateful for the support provided me by the IOP.

In addition to my views, here is additional coverage provided by blogs selected by the BPS:

<http://news.haverford.edu/blogs/biophysicalsociety/>

<http://insingulo.blogspot.com/>

<http://sukriti-dewan.blogspot.com/>

<http://czerwinski.blogs.ku.dk/tag/biophysicalsocietymeeting2010/>

**Laura Lane, PhD Student, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, UK
3rd Protein Misfolding and Neurological Disorders conference, Port Douglas, Australia.**

As populations age around the world neurodegenerative diseases have become more prevalent. This conference brought together academics from around the world who seek to understand the proteins implicated in diseases such as Alzheimer's, Parkinson's and Huntington's, as well as other familial diseases arising from point mutations in particular disease-associate proteins. One of the major highlights of the conference was its success in bringing together investigators from a broad number of disciplines who use a range of techniques, such as: molecular and cell biology; biophysical characterisation; structural studies; animal models as well as clinical studies. Much of the work being carried out focused on identifying molecular mechanism which contribute to many neurodegenerative disorders especially protein misfolding and aggregation both of which are heavily associated with neurodegenerative diseases. Additionally, efforts to understand the body's own quality control systems, including the role of chaperone proteins, were also discussed.

The role of metal ions in many of the diseases I mentioned above was a heavily discussed topic and a recurring theme throughout the entire conference. Perhaps the climax to these discussions and presentations was the final talk of the conference given by Ashley Bush of the Mental Health Research Institute at The University of Melbourne. In his talk he shared his work on the impact of metal ions including copper and zinc on amyloid beta (A β), the peptide which is found to characteristically accumulate in the brains of Alzheimer's patients. Ashley also talked about collaborative work with Craig Ritchie at Imperial College, London on PBT2 an orally administered quinoline compound for which successful phase II clinical trials have been completed, and for which phase III clinical trials are being pursued. PBT2 is a compound which alters the interaction between A β and metal ions without lowering their concentration. In the phase II trial, it was found that there were no adverse effects in patients with Alzheimer's disease who received the compound, with positive effects noted even after 12 weeks, further trials are to be conducted to establish more fully the safety of the compound and its clinical efficacy. Further details of the phase II trials can be found in *Lancet Neurology* 2008, volume 7, page 779.

I was also grateful to the conference organisers who provided me with the opportunity to present my work using non-denaturing mass spectrometry, from the laboratory of Professor Carol Robinson, to study the higher-order oligomers of the protein transthyretin. The wild type protein is implicated in senile systemic amyloidosis, a degenerative geriatric disease and the many variant forms cause the lethal familial amyloidotic polyneuropathy; the only treatment to date being liver transplantation for the familial form. So far we have found that only the least virulent (WT and T119M) forms of transthyretin can form higher-order oligomers while disease associate variants (L55P and V30M) show an inability to do so. Currently we think that the propensity to form these higher-order oligomers may guard the WT and T119M species against the formation of amyloid and the smaller cytotoxic intermediates which are created *en route* to amyloid deposition. It was invaluable to present this work to experts in the field and I receive much helpful feedback to guide my future studies.

Biological Physics Group Nominations

Nominations are required for Ordinary Members of the committee to serve for a three-year period from September 2010. The Group constitution requires that the persons elected as Ordinary Members must be Biological Physics Group members. Nominations should be signed by the proposer and seconder (both of whom must be members of Biological Physics Group) and also by the nominee and should be made using the form below to the Group Secretary, Sarah Harris, no later than Monday 2nd August 2010.

A short biographical outline of the experience, knowledge and skills that the nominee would bring to the committee is also required and should be attached to the nomination.

Nominations for Biological Physics Group Committee

Send to Dr Sarah Harris, School of Physics and Astronomy, University of Leeds, Leeds, UK. LS2 9JT.

Deadline for receipt Monday 2nd August 2010.

We hereby nominate: _____ (print name)
for the post of Ordinary Member on the IOP Biological Physics Group Committee

Proposer: _____ (print name) _____ (signature)

Secunder: _____ (print name) _____ (signature)

Nominee:

I _____ (print name)
confirm that I am a member of the Biological Physics Group and agree to serve on the
Biological Physics Group Committee if elected

_____ (signature)

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

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