



# **STAAR: St Anne's Academic Review**

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## About the Contributors

## STAAR 2009

**Dr Nina Alphey** recently completed a DPhil in mathematical biology at St Anne's and the Department of Zoology, modelling new genetics-based strategies for controlling pest insects, such as mosquitoes, that transmit human diseases. She is also a Fellow of the Institute of Chartered Accountants in England and Wales. From these facts you can guess that she has wide interests, which motivated her to set up the Sciences Discussion Group at St Anne's. They also explain her appreciation of the benefits of finding your own funding for conference travel.



**Dr Alberto Behar** is an ESRC Post-doctoral Research Fellow, Centre for the Study of African Economies and Biegun Warburg JRF, St Anne's College. Broadly, his interests are in the fields of trade, labour and development. His research interests include growth spillovers in Africa, gravity models of trade, the interactions between skilled and unskilled labour, skill biased technical change in developing countries and labour demand.



**Dr Martin J. Bishop** is a Drapers' Company Junior Research Fellow, St Anne's College, Oxford, and Sir Henry Wellcome Postdoctoral Fellow. His current research goal is to develop a novel technological framework to facilitate the incorporation of highly detailed cardiac structure-function information at unprecedented resolution into computational simulations. This will allow the precise relationship between cardiac structure and function on the microscopic and macroscopic level to be probed.



**Christopher Brown** is a DPhil student in American History who is researching the Republican Party and the issue of isolationism in the early Cold War. He holds degrees from the Universities of Edinburgh and Oxford and will be spending much of this academic year at the John W. Kluge Center at the Library of Congress in Washington DC.



**Dr Ling Ge** is a Leverhulme Research Fellow having completed her DPhil at St Anne's College and the Materials Department in 2008. Prior to this she held the Clarendon Scholarship of Oxford University from 2005 to 2008 and Domus Scholarship of St Anne's College. Her research interests are in the use and development of computer modelling techniques to aid the optimisation of materials performance and the design of new materials. Current projects include: ionic liquids, nanomaterials for quantum computing and solar cells.



**Hannah Greene** finished her undergraduate degree in Biology earlier this summer, and is currently preparing to leave for Senegal to spend two months as a Research Assistant for Dr William Hawthorn from the Department of Plant Sciences. The team will be carrying out the botanical component of an Environmental Impact Assessment for a mining company looking to extract gold from the area. Her research interests include plant systematics and taxonomy and forest ecology.



**Sarah Hegenbart** is a graduate student in Philosophy at St Anne's. She is particularly interested in virtue ethics and is therefore delighted that Roger Crisp supervises her work. She believes that ancient thoughts may be employed to solve problems in contemporary philosophy. Accordingly, she has argued in her Master's thesis that contemporary virtue ethics would profit from a reconsideration of Plato's philosophy.



**Rhianedd Jewell** is a second year DPhil candidate in Italian at St Anne's. She has completed a BA in French and Italian and an MSt in Italian. Under the supervision of Dr Emanuela Tanello, her research focuses on modernism in the works of the Sardinian author Grazia Deledda (1871-1936). She is particularly interested in the representation of language, identity and subjectivity in Deledda's works.



**Daria Luchinskaya** is a second year MPhil student in Russian and East European Studies. Her current research is on comparative higher education systems in an international context, with a focus on the Bologna Process in Russia, Ukraine and the UK. She completed her BA in Economics and Management at St Anne's in 2007 and was on the St Anne's Year in Japan scholarship prior to starting her postgraduate studies.



**Christina Mayer** is studying for a DPhil in Structural Biology. She uses different biophysical techniques to look at malarial proteins. Her aim is to understand molecular mechanisms of the disease, starting by determining the three-dimensional structure of the proteins and how they interact with other molecules.



**Sacha Nandlall** holds a BEng degree in Electrical Engineering from McGill University (Montreal, Canada). He started his DPhil with the Oxford Institute of Biomedical Engineering in October 2007. His research focuses on control and signal processing for High Intensity Focused Ultrasound (HIFU) treatment.



**Zim Nwokora** has recently submitted his doctoral thesis in Politics, under the supervision of Dr Nigel Bowles. His thesis is titled 'Do the Candidates Matter? A Theory of Agency in American Presidential Nominations'. He intends to continue writing and researching nomination politics, but has also developed research interests in campaign finance and candidate debates.



**Emefa Takyi-Amoako** holds a BA degree in English Literature & Language, a Diploma in Education, Master's Degrees in Women Studies, Educational Research Methodology and Literature. She is completing a doctorate in International Education at St Anne's. Her research interests include education policy, aid and development, gender studies, feminist theory, and literary and post-colonial theories.



**Dr David V. Williams** is a Professor of Law at the University of Auckland, New Zealand. He has university qualifications in law, history and theology. The primary focus of his research is colonial legal history, especially the impact of British colonial rule on indigenous peoples and their responses. Professor Williams was a Visiting Fellow at Exeter College when he delivered his talk at St Anne's College.



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**STAAR Editorial Welcome**

On behalf of all of us on the Editorial Board, here's a very warm welcome to the brand new St Anne's Academic Review – STAAR. This first issue is crammed full of the research, conferences and events that you, the members of St Anne's College, investigated, ran and attended. You'll find a wide selection of articles, long and short, covering lots of subjects, so we hope you enjoy the show.

The journal is organised into three sections – first the **St Anne's Seminars** which includes a summary of the talks at the Discussion Groups, with a special focus on the Arts and Humanities Discussion Group. In the **St Anne's Conferences** section you will find reports on conferences and travel as well as advice on how to write successful applications for conference funds. Next, **St Anne's Research** contains in-depth, accessible articles about the research interests of the members of the College – MCR, SCR and JCR. Most of the articles in this section are based on presentations given at the termly St Anne's Subject Family Events that are open to all. Details of past Discussion Group and Subject Family Event Speakers can be found in the **Appendix**.

STAAR includes a lot more than just research. It attempts to capture the essence of the spirit of the College, to bring its members together and to build a profile of what life here is like. We hope that you enjoy the first issue of STAAR, and that we have established something that will go on to grow and become a part of the College tradition. Long may it continue!

**Daria Luchinskaya**  
**Editor-in-Chief**

**Thanks and Acknowledgements**

We would like to thank the Principal, Tim Gardam, and the Senior Tutor, Dr Anne Mullen, for their invaluable insight and advice; the SCR for providing the financial means to print some copies of the journal to keep in public locations; Isabella McIntyre for her technological expertise for making STAAR accessible on the Internet; the contributors for writing in; the lovely people in the Academic Affairs committee meetings and in the Development Office, and to all those who helped the STAAR along its way. I would also like to thank the Editorial Board for their hard work and help in putting the STAAR together.



## **St Anne's Seminars**

Welcome to the St Anne's Discussion Groups!

These seminars are run by the MCR, and speakers are invited to talk about current issues in the Arts, Humanities, Social Sciences, and Life, Physical and Mathematical Sciences.

This issue of STAAR has a special focus on the Arts and Humanities Discussion Group and the following reports provide a taste of what one can find there.



## The Lunchtime Discussion Groups – a *raison d'être*

**Dr Nina Alphey, originator of the Sciences Discussion Group and Daria Luchinskaya**

The Lunchtime Discussion Groups are a unique feature of intellectual life at St Anne's. Run by the MCR, they are open to all members of College. The original idea behind the Sciences Discussion Group was to get graduate students away from the lab/computer/library to think and talk about wider issues surrounding the life and mathematical sciences, very broadly defined. The Principal and several Fellows are very supportive. We limit the numbers and meet in a comfortable room over sandwiches, to encourage informality and active involvement. This is not a seminar series, where an audience sits and listens, it is a *discussion* group.

Our guests can engage us in their topic however they choose, as long as it is interactive – most have given a short slide and/or or video presentation, and all have answered (and often asked us) numerous questions and generated a lively discussion. Participants generally rate the sessions as 'excellent' and sign up with comments like 'last week was brilliant' and 'count me in!' The group is talked-about inside and outside College, it has increased contacts between SCR, MCR and JCR, and we have attracted and impressed high-calibre guests such as Professor Dame Louise N. Johnson FRS, Lord May of Oxford OM AC Kt FRS and the editor-in-chief of Nature, Dr Phillip Campbell (who faced a lively audience interrogation).

The more recent Arts and Humanities Discussion Group does a similar thing for topics of interest mainly to arts, humanities and social science students and Fellows, and it too has secured eminent guest speakers (see Appendix). The labels are nominal; topics of broad appeal could equally well feature on either Thursday or Friday, it depends which team of organisers issued the invitation. Watch for details in email and paper notices and come along, whether you are a regular or dip in and out as the topics tempt you.

The discussions are enjoyed by scientists and non-scientists alike. The speakers address current and important issues, and the talks are accessible and interesting. The most challenging part is finding the time to go to them all!

Our guests have been very pleased with the attention and interest of the audience. Some of their positive responses can be seen below:

'In general, I do not think the University does enough by way of addressing the larger aspects of postgraduate education. Questions of ethics and responsible behaviour, when and where to publish, teaching responsibilities, handling bureaucratic demands (both reasonable and unreasonable) and much else beyond research will loom large in the lives of those who remain academic researchers. Equally, many will pursue highly important and productive careers outside academe (a fact often overlooked in graduate training). I think the "Science Discussion Group" at St Anne's is simply excellent, and more generally points the way to the need for larger such activities within Oxford University.'

*Professor Lord (Robert) May of Oxford OM AC Kt FRS, President of The Royal Society (2000-2005), Chief Scientific Adviser to the UK Government and Head of the UK Office of Science and Technology (1995-2000).*

'I had a very interesting time speaking to the St Anne's graduate discussion group ... It was a wonderfully informal, interdisciplinary group ... The (human) chemistry was great.'

*Frank Kelly, Professor of the Mathematics of Systems, University of Cambridge, and former Chief Scientific Adviser to the UK Department of Transport.*

As for what the students thought, reviews of the Arts and Humanities Discussion Group delights can be read in the next few articles.



## Philip Pullman at the Arts and Humanities Discussion Group: What are stories made of? Rhianedd Jewell

The discussion group held with guest speaker Philip Pullman on the 28<sup>th</sup> of May was undoubtedly our most popular event to date. Despite doubling capacity, the talk was nonetheless oversubscribed, but those who were lucky enough to attend were far from disappointed. Chairing the discussion group myself, I introduced Mr Pullman as having been educated in various countries before reading English at Exeter College, Oxford. He has spent many years teaching and is now a full-time author, having achieved international renown, been awarded numerous prestigious awards, and published nearly twenty books.

Mr Pullman stressed that the topic of his seminar 'What are stories made of?' is a work in progress, though it is something which has intrigued him for some time. The idea explores the relationship between words and images, surface and structure. It was inspired by his interaction with a project conducted by *Microsoft Research* where an attempt was made to represent his stories in the form of graphic images. Although stories can be viewed as being made up of both words and images, for Pullman, the basis of every story is its events.



*Philip Pullman on how stories are made*  
Photo: Karen Heath

One event was chosen as a focal point for this talk, that of pouring something (perhaps a liquid) from one container to another. It is an abstract 'event', with no feeling immediately attached to it. What possibilities, the discussion group was encouraged to consider, does this event therefore hold?

We were presented with a series of images that illustrated different versions of this event, and their varying implications. The significance of the act of pouring ranged greatly across the pictures. The first image showed a woman in an historic setting pouring water. The lighting and setting of the painting were its focal point, according to Pullman, whilst the event of pouring was a merely decorative feature. Similarly, the subsequent image taken from a cartoon in *The New Yorker* illustrated a scene from a bar in 1926 in which a man is dispensing bootleg hooch in secret. In this picture, the pouring was a detail furnishing the scenery and background of the image.

The following [cartoon](#), also from *The New Yorker*, placed greater importance on the event of pouring, for here it was the subject of the story. Standing on top of an enormous tower, the Addams family are about to tip a heavy cauldron of some concoction on the innocent carol singers below. The scene portrays the precise moment before the liquid gushes forth. Pullman explained that it is our graphic understanding which allows us to comprehend the action which will follow imminently. When one depicts a story in a single scene or picture, one has to pick the moment which best conveys the story, as was caught here in the moment just prior to the pouring. Pullman claimed that for this reason, photography marked a pivotal moment in the history of storytelling: the reliance on a sequence of pictures both allows one to see time passing without the intervention of language or tense and equally permits freedom from reliance on the implicit nature of an image.

The next image was a Rembrandt painting entitled [\*Belshazzar's Feast\*](#), a painting which depicts a king distracted by words written on the wall. Turning to see the words, he spills water and this metaphorical discharge represents the chaos that has ensued following the prophetic revelation. Similarly, Piero della Francesca's portrayal of the [\*Baptism of Christ\*](#) presents the synecdochical image of John pouring water on Jesus's brow. The act of pouring represents the monumental meaning behind the baptism of Jesus, who subsequently brought salvation through the baptism of all Christians that followed him.

There are many everyday sayings which incorporate the act of pouring whose imagery we no longer ponder. Among the examples Pullman suggested were: 'he's feeling absolutely drained', 'spilt milk', 'she poured her heart out'; and 'a drop in the ocean'. We can relate the images to things we know and can thus deduce their meaning, but at this point the process is completed so naturally that the imagery itself is incidental.

Pullman posed the question: 'What does 'a spring' mean?' It is something valuable; a source; a need coming out of something else. We witnessed this life-giving liquid in a painting of baby Jesus at Mary's breast, as well as in Raphael's depiction of angels catching blood flowing from Jesus as he hangs on the cross. In the same way, the 'spring' of a narrative, or the pouring out of a story, is something of great value. Pullman's next project will hinge on the idea that the fundamental particles of stories are their events, and not words. He drew attention to the fact that, in *His Dark Materials*, simultaneous (or 'split') events are led along interweaving threads, though tied together in the narrative. Although reluctant to reveal too much, Pullman described how this new project will be a re-telling of the story of Jesus in the form of a fairy tale. He intends to construct the narrative without exploring the characters' psychology in depth, by inserting just the right amount of imagery and focusing on the events themselves.

The seminar closed with a discussion of the nature of story-telling from an author's point of view. Pullman described the difficulty inherent in choosing the perspective of a proposed narrator. In terms of images, he aptly questioned: 'Where do you put the camera?', and 'How much do you tell the reader about the characters' inner thoughts?' Upon being questioned further about the necessity of an event in any given story, Pullman elaborated on the nature of the thing which he has dubbed so crucial to the telling of a story. An 'event' can be an action, such as giving somebody a gift; a phrase, such as a sentence proclaimed by a judge; or even something as simple as a look expressed by a character. It has to be a change of state in the physical world. Pullman described how the overall arc of a story should be shaped by something going wrong. It has often been said that there are only eleven stories in the world, but Pullman claims that these are in fact all variations on a single story: that is, the quest for the Holy Grail. Something is missing or wrong and needs finding or fixing. Either the problem is righted or not, and this is the crux of every story.

But what of the ending? Pullman argues that one cannot write a novel knowing what's going to happen. For him, writing is discovering, not inventing. He is always intrigued by something which will serve as a starting point for his writing. It can be something quite simple, a single event. Indeed, for *His Dark Materials*, it was the idea of a girl going into a room where she wasn't meant to be. From that point, he knew the mood that he wanted to reach in the last pages but he did not know how he would get there and what adventures he would come across along the way. We are left to wonder, therefore, what event will next inspire Philip Pullman along a path he will find and share with his avid readers.

★

## Professor Virginia Berridge at the Arts and Humanities Discussion Group: Why do policymakers ignore history? Chris Jones



*Professor Virginia Berridge.  
Photo: Anne Koerber/LSHTM*

In recent years the role of history has been much in the minds of high-level policy makers. Whether in the shape of hands on Prime Ministerial shoulders, or the profound assessment of the 43rd President of the United States its judgement is self-evidently unknowable as "We'll all be dead".

Less well publicised has been the growing discussion within the Academy about broad historical trends in public policy and also the remit of professional

historical involvement in its formation and operation. It was on these themes that Professor Virginia Berridge of the London School of Hygiene and Tropical Medicine spoke at St Anne's during Trinity Term. Her own area of expertise is in public health policy and she is a leading figure in the History and Policy network which works for better public policy through an understanding of history.

By primarily using the example of smoking and health education policy, she admirably outlined the means by which historians have attempted to reframe and influence this issue. In highlighting the limited successes, she emphasised that whilst it is seldom possible to insulate policy judgements from political ones, complicated historical truths have also been overlooked as the attention of policy makers inevitably moves from issue to issue. The subsequent discussion focused on the perspective of historians as public intellectuals and the relative paucity of comparative research in meeting a bureaucratic and governmental need for knowledge. An immediate theme was the reluctance of historians to engage wholeheartedly with political parties for fear of compromising their future research and academic positions.

Tangential to this was the contrast between the success of historians in redefining their role in a professional context with the relative lack of impact in established policy communities. One suggested solution involved an extensive comparison of historical analogues to current policy topics. However, this did seem somewhat retrograde and at odds with developing analytical approaches within the scholarship. Nevertheless, 'real-world' problems rarely break down into the neat disciplinary boundaries so enamoured in academia. Without indulging in navel gazing solipsism, the consensus appeared to be that the onus remained on historians themselves to develop and adopt the methodology necessary for providing meaningful contributions to current and future policy debates.



## Professor David V. Williams at the Arts and Humanities Discussion Group: History wars – lawyers, historians and their myths

Professor David V. Williams, University of Auckland, New Zealand



Professor David V. Williams  
Photo: University of Auckland

It was my pleasure to speak at the St Anne's Thursday Discussion Group in Trinity term this year. My topic was 'History wars – lawyers, historians and their myths'.

The talk noted the rather different approaches of historians and lawyers to the past. Historians prefer to write about the past in ways that explain what happened as understood by the participants in the historical events. Lawyers tend to draw on the past to find precedents to apply to the present and future.

For lawyers, myths provide a version of the past that may or may not be 'true' as history, but express a truth that people hold to be important. Historians are more likely to point out the historical errors in a myth.

I discussed three myths:

**The myth believed by 17<sup>th</sup> century English lawyers that there was an ancient constitution dating back to Saxon times.** Under this ancient constitution, Englishmen were obliged to obey a king only if the king protected the rights and liberties of his subjects. None of the documents relied on as evidence of this ancient constitution were, in fact, Saxon in their provenance. Lawyers were not concerned about that. They sought arguments that could be used to hold despotic Stuart kings to account. By the end of the 16<sup>th</sup> century Parliament and the courts had upheld the rights and liberties claimed.

**The myth that Australia was an empty, desert land when the first fleet arrived at Botany Bay in 1788.** Until the Mabo case in 1992, lawyers assumed that Australia was a *terra nullius*. This meant that English law always applied to the whole country. There were aboriginal peoples on the continent, but they had no law and no polity that counted in the eyes of European international law. Therefore, aboriginal peoples and any rights they claimed could be ignored. When the High Court rejected the *terra nullius* myth in Mabo, and recognised that there had always been aboriginal title rights, they adopted the views of an historian, Henry Reynolds. His views of history became the target of abuse from other historians and from political leaders upset by the 'black armband' view of history. This led to what came to be known as the 'history wars' in political and academic journals.

**The Treaty of Waitangi is now viewed by judges and lawyers in New Zealand as part of the fabric of New Zealand society and a foundation stone of the nation.** This too is a myth. Historians can point out the minor role that the Treaty played in the actual events of 1840 when New Zealand was annexed to the British Empire. Historians also express dismay about the retrospective reconstruction of history that appears in reports of the Waitangi Tribunal. The reports assume that the Crown's actions in the past can be judged by contemporary understandings of the principles of the Treaty of Waitangi.

In the lively and interesting discussion that followed my talk, St Anne's students contributed a range of insights drawn from the various disciplines of their own study. ★



## **St Anne's Conferences**

This section is dedicated to reports on conferences and travel funded by College undertaken by St Anne's members. In this issue of STAAR, we also have advice on applying for conference funding and organising conferences.

## **How to obtain funding to attend an academic conference**

### **Dr Nina Alphey and Christina Mayer**

Attending a conference (meeting, workshop, seminar, etc) is one of the great learning and development opportunities available to a DPhil student. A carefully chosen event can provide access to the latest research in your field, often before it is published, and the chance to meet influential people who might become a future supervisor, collaborator or reviewer of your job or grant applications, or even be your external examiner. If you are able to present your work (by displaying a poster or giving a talk) you can raise your profile and talk to interested parties in person.

To do this, someone must provide financial support. Even if you are lucky enough to have a well-funded and supportive supervisor, or money within your specific funding that is earmarked for this purpose, raising your own funds shows initiative and could enable you to attend more conferences than you might otherwise have done. This article contains some practical suggestions and examples.

Broadly, you can look for sources related to who you are, what research you are doing, and/or which conference you want to attend. A key point to bear in mind when applying is that your chances will be highest when you best meet the funder's objectives, so it is worth spending time considering that and presenting your case in a way that clearly shows how it fits the purpose of the scheme. You should also check your eligibility. Do not make any assumptions; for example, some schemes forbid another application within a set period, while others do not restrict this and might even look more favourably on an application if your visit report from a previous occasion showed that you made the most of the opportunity and so you would be likely to get a significant benefit again. Preference is often given to students who are presenting their work and not simply attending.

As a St Anne's student, you can apply to the College's graduate student conference and travel funding scheme; details are on the [College website](#). A panel, including the Senior Tutor, meets twice a term to review applications and award funds. There is a standard form to complete and your supervisor must send a reference supporting your application. Although you should try to find matching funds where you can (e.g. from your or your supervisor's grant, your Department or your Research Council), it is acceptable to show that you made some effort. You might indicate that you have a concurrent application in, show you have tried for competitive funds but not obtained them, or explain that you have investigated but are not eligible for other relevant sources. The aim of this fund is to support the development of St Anne's graduate students, so it is a good idea to stress the networking and personal development opportunities as well as the academic content of the event. After the event you should submit a brief report to your Graduate Adviser and the Senior Tutor.

Other sources could include funds that support students of particular nationalities, or from minority groups. For example, the UK Resource Centre for Women in Science, Engineering and Technology (UKRC for Women in SET) operates a [travel bursary scheme](#). At the time of writing, the scheme is closed; the previous round's deadline was 15 May 2009. You can check the timing on their website, and download the application form and guidance notes. For convenience, you could extract the guidance about letters of support to send to your supervisor. You might also approach your College Graduate Adviser if appropriate. Awards are conditional on adding yourself to the UKRC database and submitting a short report afterwards with your receipts.

If you belong to a professional society or organisation, you should check whether it has a small grants scheme that members can apply for. These schemes sometimes fund visits to other conferences, to present research work related to the society's remit, as well as attendance at meetings organised by the society itself.

It can be useful to gather funding from several sources and to look for ways to reduce the cost or to get some elements waived. Even a small amount can help you meet your costs overall. The website for the conference that you wish to attend can be a good source of information. For example, registration is usually cheaper for students (with some verification or support from the supervisor and/or Head of Department). Members of the organising society will often get reduced registration rates, so it is worth looking into the costs and benefits of membership and weighing those against the saving in fees (but note that some conference funding schemes will not cover personal membership subscriptions, or only if you explicitly make the case that the subscription plus reduced attendance fee is lower than non-member registration).

The conference organisers might have a limited number of student scholarships or awards for participants from developing countries available on application. Some societies want student volunteers to help operate registration desks, the presentation upload desk, the careers centre, etc at the annual meeting; some will offer to waive or refund registration fees in return for a doing a shift as helper. One society runs a small participation award scheme to encourage students and junior postdocs to participate actively in its annual meeting, paying a modest amount that increased with the level of participation. Some conferences run student web pages where you can get in touch with others attending and organise room sharing. Try to plan ahead; book early to get 'early bird' rates and have more chance of finding a cheap flight. Officers or members of committees might have some of their costs waived or refunded, so consider volunteering or getting elected (also good for the CV if you can afford the time). These are just some examples – there are many more possibilities.

For other sources, look at [ResearchResearch](#), a general source of information about grants for various research purposes. While you are on the University of Oxford network you can use the 'campus login' button on the right-hand side, you do not need to register (although you can, for example, to save searches or register for alerts). You can search for particular types of grant – use key words like 'travel' or 'conference' - and follow links to the relevant websites.

Some kind of letter of support is typically required for student applicants. You could offer to draft something for your supervisor to save them time. In any case, your supervisor will be a good source of advice about which conferences are relevant and help you prepare your poster or oral presentation. They may also recommend sources of funding.

Below is an example, concocted from several real-life successful applications. It is intended as an illustration to show example wording for several of the aspects discussed above. It would be unusual to be able to mention all of these points in one application, so do not be put off by the content! Good luck with your hunt for funding.



**Links:**

<http://www.st-annes.ox.ac.uk/study/graduate/financial-matters/help00.html>

<http://www.ukrc4setwomen.org/html/women-and-girls/bursaries/ukrc-travel-bursaries/>

<http://new.researchresearch.com/>



**Example: extracts from application form**

<b>Details of the research trip or conference including:</b> <ul style="list-style-type: none"> <li>• where you expect to travel/name of conference</li> <li>• exact dates for which the funding is requested</li> <li>• reason for attending/relevance to your work</li> </ul>	Annual meeting of the Entomological Society of America 16-19 November 2008 in Reno, Nevada, USA (plus 2 travel days). Objectives: 1. Present recent research work in a short talk (abstract in preparation). Enter student presentation competition. 2. Update on key developments and discuss my work. 3. Professional networking. Please see justification below.
<b>Application for research council funding enclosed</b>	<del>YES</del> /NO (ineligible)
<b>Result of application enclosed</b>	<del>YES</del> /NO Other funding obtained, see attached
<b>Reasons for attending and relevance to my work</b> My research is on novel genetics-based methods of controlling pest insects. These methods are applicable to agricultural pest insects and to insects, such as mosquitoes, that transmit human or animal diseases. Scientists and others working in both these broad fields will be present at this meeting. Last year I presented a short talk on my research on managing insect resistance to Bt crops, obtained important and up-to-date information directly relevant to my work and discussed it with some high-profile research scientists from academia and researchers and regulators from the US Department of Agriculture and Environmental Protection Agency. I have extended that work and have a complete story to tell at this year's meeting, which has not yet been presented at any national or international conference (a manuscript is in preparation). I will have similar opportunities to gather information and discuss the medically important insects, which will assist with the remaining chapters of my DPhil thesis and raise my profile to help me towards my goal of doing postdoctoral work in that field. I was co-opted onto the ESA's Student Affairs Committee following a Student Network session last year. My suggestions and contacts have since contributed to some sessions planned for students and I would like to be present to benefit from them. I have been asked to judge one session of the Student Debate competition.	
<b>Other funding or reduced/waived costs</b> Registration is at a reduced rate because I am already a student member of the ESA (subscription paid). I have been awarded a travel bursary of £750 from the UK Resource Centre for Women in Science, Engineering and Technology. See award letter attached.	

**Example support reference from supervisor**

Nina wishes to attend the 2009 annual meeting of the Entomological Society of America which will be held in Reno, Nevada, USA from the 16<sup>th</sup> to the 19<sup>th</sup> of November 2008. This conference brings together people working on various aspects of entomology, including insect biotechnology and resistance management, from theoretical, lab-based, applied, field and regulatory perspectives. Very few conferences have this scope and focus, so this represents a rare opportunity to discuss her work with lab-based scientists working on resistance management, with those with more of a field focus, and the government regulators who need and wish to understand the type of approach that Nina is developing. Nina has submitted an abstract and will present her work as a talk. The conference will be valuable for her, providing exposure to international scientists in and around her field, the opportunity to understand better the real-world context of her theoretical work and to present her work to a high-level audience. I am happy to support her application. ★

## **Report: 2009 Annual Meeting of the UK American Politics Group**

### **Zim Nwokora**

Between January 3 and 5, 2009, the University of Oxford's Rothermere American Institute (RAI) and St Anne's College jointly hosted the annual meeting of the UK American Politics Group (APG). APG is the leading forum connecting scholars throughout the United Kingdom who work on American politics. To mark the bicentennial of the birth of Abraham Lincoln, the conference opened at the RAI with a fascinating lecture by Oxford's Rhodes Professor of American History, Richard Carwardine, that probed the unique pressures on Lincoln's presidency. As in previous years, the 2009 conference featured a broad range of papers that examined American foreign policy, change and continuity in governing institutions and processes, and the political aspects of American culture. Additionally, a number of contributions examined closely both the subtle and striking characteristics of Barack Obama's 2008 election victory.

Early in the conference a roundtable session featured general reflections on the 2008 election by Alan Gitelson, Stephen Medvic and Philip Davies. Carl Pedersen's conference paper focused on the complexities of Barack Obama's identity, and how it framed his strategy and the tactics of his opponents. In his paper entitled 'Barack Obama and the South', Charles Bullock used extensive exit poll data to look at the sources of Barack Obama's impressive performances in the South, a region traditionally associated with prejudice against black candidates. Obama won more electors than any Democratic nominee since 1976. Bullock found that race probably played some role in dampening Obama's support in white-dominated states, but increased participation of black voters provided the backbone of his Southern support.

While the 2008 election was the focus of much of the discussion at the conference and some of the papers, earlier American elections also featured in a panel on electoral politics. Keith Nottle looked at the dimensions of James Baker's involvement in the 1992 election; and both Joe Merton and Zim Nwokora looked at the 1976 election. Merton's paper examined the growth and decline of different forms of 'white ethnicity' in the period immediately prior to the election. Nwokora's research looked at the sources of Reagan's surprisingly strong challenge of President Gerald Ford in the 1976 Republican primary contest.

Three papers examined public policy themes. Tom Lubbock tested for the relationships between direct democracy institutions, and especially the initiative and changes in abortion policy in states. Lubbock found that legislators are more responsive to their constituents than the threat of an initiative. Using public opinion data and a series of recent Supreme Court cases, Andrew Moran considered whether the United States was changing its position on the death penalty. He found that, although there has been a gradual decline in its use, it remains popular and the Supreme Court does not view it to be 'cruel or unusual punishment' for some crimes. Edward Ashbee and Alex Waddan presented a paper entitled 'The Democrats and the Politics of Trade', which focused on role of issue framing as a supplementary explanation to established economic interest arguments in order to explain Democrat votes on trade policy.

Religion and politics was another prominent theme in the conference. Martin Durham's paper 'Evangelicals and the 2008 election' looked at the attempts by Republican candidates to woo the party's evangelical bloc. Corina Petronela Untea looked at the more general connections between religion and American political institutions.

A number of papers focused on American political institutions. In 'The Economic Presidency: Past and Present' Iwan Morgan examined presidential leadership in economic policy, and offered thoughts on the likely patterns of presidential involvement in economic policy-making during the Obama presidency. Gunnar Grendstadt rigorously examined some of the hypotheses posited by Stephen Skowronek in his classic text *The Politics Presidents Make*. The panel on bureaucratic politics featured papers that considered the relationships between the military and its civilian leadership (Brian Waddell) and the modern FBI (Adam Svendsen). In his paper 'Dual Insurance Regulation', also part of the bureaucratic politics panel, Joseph Zimmerman examined the effects of different models of state regulation of the insurance industry.

Other themes that were considered by conference participants included San Francisco Politics (Bill Issel); America's Vietnam Intelligence Operation (Yukiko Ochiai); the National Endowment for Arts (Karen Heath); and a number of prominent American politicians: Charles Brannan, Secretary of Agriculture (1948-53) (Daniel Wood); Spiro Agnew, Vice President (1969-73) (Robert Mason), and current Vermont senator Bernie Sanders (Rhodri Jeffrys-Jones). For some of the papers that were presented at the conference please see [the APG website](#).

A programme structured by two parallel sessions ensured both a limited choice to participants and healthy attendance at each panel. Participants benefited from some of the unique character and facilities that St Anne's can provide for such events. The new Ruth Deech Building comfortably housed the main programme of paper presentations. Conference participants were treated to delicious food throughout their stay, and the formal dinner on the first evening was excellent even by the high standards of the College catering staff. With most conferees choosing to stay in a College room, they experienced a dose of the communality that is familiar to the regular residents of Rayne, Wolfson, and Claire Palley buildings.

The APG conference has a strong tradition of encouraging participation by graduate students from History, Politics and American Studies departments. And for ten students from a number of European universities, APG offered opportunities for them to present parts of their research in a constructive and supportive environment. Joe Merton, a DPhil History student from Balliol College, presented an especially promising paper entitled 'The 1976 Presidential Election and Ethnicity', and was awarded the Richard Neustadt prize for best paper by a graduate student presented at the conference.

There was also plenty of action behind the scenes. Dr Nigel Bowles, Director of the Rothermere American Institute and Balfour Fellow in Politics at St Anne's, played the lead role in pulling together the academic and logistical dimensions of the conference. Dr Bowles had selected the papers and presenters, compiled the conference programme and liaised with College to secure rooms for the conference and accommodation for attendees. I supported Dr Bowles's efforts by working with individual participants and the St Anne's conference staff to ensure that the small number of potential knots in communication, administration and accommodation were anticipated and managed. The professionalism of the St Anne's conference team made these tasks much more straightforward than they would otherwise have been. During the conference itself, Dr Bowles and I benefited greatly from the energy of Eleanor Thompson who helped us to deal with minor tasks as the conference proceeded.

It seems that the conferees enjoyed their stay in College – by unanimous vote at its General Meeting the APG resolved to return to Oxford and St Anne's in 2010!



## **Report: 2009 Annual Meeting of the Society for Thermal Medicine (STM)**

### **Sacha Nandlall**

At the beginning of April, I hit the road for two weeks' attendance at the 2009 annual meeting of the Society for Thermal Medicine (STM) in Tucson, Arizona, USA. This was my second opportunity as a DPhil student to present a paper at an international conference, and I was fortunate to be supported in this endeavour by a St Anne's travel grant of £300.

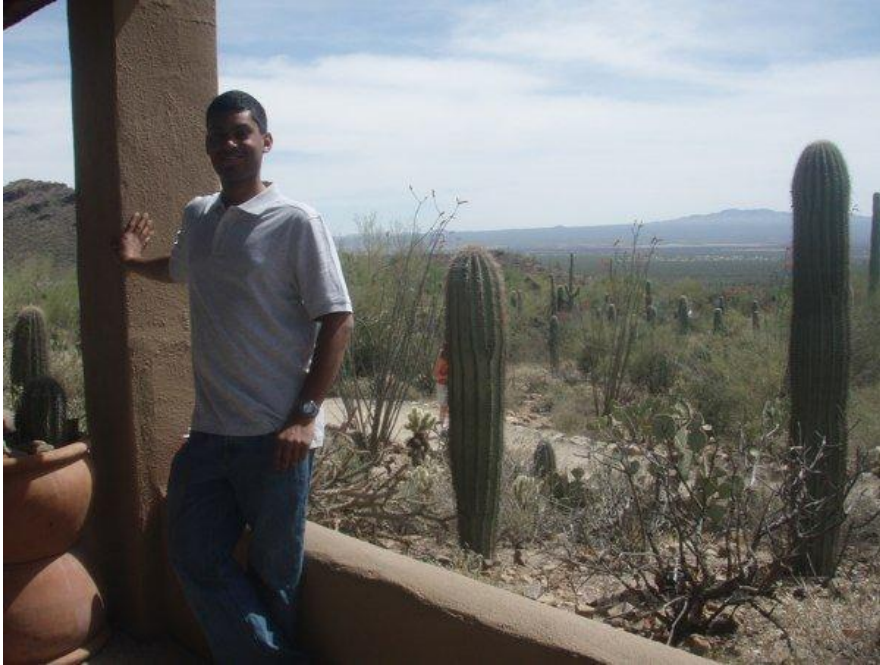
My group's work involves killing cancerous tumours using High Intensity Focussed Ultrasound, or HIFU for short. This is the same ultrasound that can be used to see a foetus in the womb, but of much higher energy and focussed into a small region. Using HIFU, it is possible to heat and kill an area of cancerous tissue no larger than a grain of rice while leaving the surrounding, healthy tissue unharmed. This therapy is completely non-invasive and promises to improve the lives of many cancer sufferers. The work I presented at STM focused on a method of quantifying and assessing the effectiveness of a HIFU treatment in a laboratory setting by using a transparent, tissue-mimicking gel with an easily observed indicator of heat delivery.

The theme of the 2009 STM meeting was 'Expanding the Frontiers of Thermal Medicine, Biology and Physics', which encompassed a vast array of interesting and current topics besides the work of my group. On the scientific front, the conference covered advances in areas such as physiology, immunology, biology, and thermal physics, all of which deepened the current knowledge of the mechanisms that underlie thermal therapy. Many clinicians and keynote speakers also presented firsthand experience of the positive effects thermal medicine had on patients, including one instance where a professional American football player was spared a life of quadriplegia thanks to medically induced hypothermia. Finally, the STM meeting linked the clinical and scientific spheres by including presentations on advanced equipment design as well as new treatment monitoring techniques, both of which accelerate the application of scientific knowledge in clinics. More information can be found on the [STM website](#).

The STM conference also included highly useful refresher courses preceding each of the symposia. These 20-minute talks were designed to bring everyone up to speed on the important terminology and concepts associated with that symposium's topic. The refresher courses greatly enhanced most of the subsequent talks by explaining the technical terminology as well as situating the research within the context of a broader topic. Moreover, all presenters took great care to make their topic accessible while also providing a thorough overview of it. Slides from all of the review talks were uploaded online for later viewing, thus allowing these talks to be disseminated within each attendee's research group after the meeting. All told, even without the rest of the conference, the refresher courses alone would have been worth the registration fee.

Another aspect of the STM conference I found especially impressive was that it maintained a clear focus on its theme of advanced thermal medicine but simultaneously managed to cover a wide spectrum of topics within this area and span multiple subject areas. Like most academic research these days, my work is highly interdisciplinary: I'm an electrical engineer by trade, but much of what I do involves biology, medicine, and other branches of engineering science. Hence, the most valuable aspect of the STM conference for me was the ample opportunity I had to meet and interact with specialists in all of these areas. I particularly liked chatting with doctors and clinicians to find out what makes them tick, because ultimately they'll be the ones

who apply what we begin creating in the lab, and often they think about biomedical problems in a completely different way than I do. The STM conference was excellent at facilitating this exchange of ideas: there was even a special session of open discussion between engineers and clinicians, and some of the points arising from this helped me put my research into perspective and sharpened my project's focus.



*Soaking up the desert sun at a group trip organised by the conference to the delightful Sonora Desert Museum, on the outskirts of Tucson, Arizona. Much of the museum consists of living outdoor exhibits of desert fauna and flora.  
Photo: Sacha Nandlall*

The STM meeting also provided ample networking opportunities, which for me is one of the most important reasons for attending a conference to begin with.

Some people approach networking in a strategic way, but personally I just like chatting people up and seeing if I can share a laugh with them. Whether I'm talking to a fellow PhD student, a recent graduate working at a company, or the head of a leading research laboratory, it's nice to connect with people when they're free from the typical demands on their time.

Interestingly, the most memorable and useful experiences I've had at conferences have come from this seemingly random banter rather than the talks themselves. I find that it's easy to miss the finer points of a ten-minute scientific presentation, but talking to someone over lunch usually produces much more candid and memorable discussion. The STM organisers clearly recognised the importance of networking by planning multiple 'meet-and-greet' sessions, including a general networking reception at the start of the conference as well as a lunch specifically for students and young investigators.

In summary, the STM 2009 conference provided me with considerable insight into my research area and ranks among the highlights of my second year as a DPhil student. Travelling to events like these is easily one of my favourite perks of an academic career, and, in this instance, I owe a great deal to St Anne's for making this experience happen.

★

## Report: Kyokusui no En (曲水の庭) – a Heian Poetry Festival

### Daria Luchinskaya

The 45<sup>th</sup> Dazaifu Tenmangu Heian poetry festival took place on the first Sunday of March 2008, and that was about the extent of the spoken Japanese that we understood during our visit.

The Heian period (AD 794-1185) is often seen as the most culturally significant time in Japanese history for the aristocratic class. The Imperial family and those favoured by the Empress and the Emperor, resided in the palace in Kyoto, attending festivals, playing *go*, writing out Chinese poems in their best calligraphy and partaking in philosophical discussions accompanied by moonlight and the strumming of the *koto* (Japanese harp). So tells us Sei Shonagon, author of the Pillow Book, a classical text full of her biting observations. Sei also mentions a poetry game, where aristocrats compose a *waka* (sung Japanese poem) in the time that it takes a lacquered sake cup to float down a stream to reach them. When this happens, the court noble would stop writing and drink from it, thus spending hours of carefree amusement.



The procession in the Dazaifu Tenmangu Shrine  
Photo: Daria Luchinskaya

This custom has been revived in Dazaifu Tenmangu shrine on the island of Kyushu, one of the most important shrines in Japan. Inspired by recommendations from the locals, we went along to see what this entailed. Arriving just after noon, we managed to see the parade of richly dressed noblewomen, guards, priests, *Mikko* (shrine maidens), servants and very cute, dressed-up children progress to the shrine proper. A service was performed and prayers were said in the *haiden* (hall of worship) by the Heian group, while the crowd, we among them, threw coins into the collection box, over the heads of walkie-talkie carrying organisers who were trying to control the enthusiasm.

The party then moved over to the nearby garden, where we were entertained by dances with a *koto* accompaniment – first a person in a white costume, then the *Mikko* troupe, pink as the plum blossoms. After the *Mikko* dance, the nobles sat themselves down on the grass and the poetry game started. It was a fitting location for such a re-enactment to take place, but the beautiful plum trees and the crowds of visitors prevented us from seeing most of the action.

It was at this point that we decided to pose as newspaper reporters to gain access to the large tiered seating area, and, quoting an Oxford student newspaper, we were let in without any problem and without any tickets. However, while watching the sake cups float downstream from a better viewpoint, we decided that we would actually write about this festival.



The junihitoe, Heian kimono  
Photo: Daria Luchinskaya

We could see the Empress and the other nobles write on a vertical strip of special paper using ink and brush. The Heian style kimono are called the *junihitoe*, meaning twelve-layer robes. These ones were reproductions, but very colourful and probably about as heavy as the real thing. Guards in blue dress, armed with *nihontou* (Japanese sword) and Japanese bow and arrows, paced the small garden space trying not to step on the children or the *junihitoe*. A singer in the pavilion was singing the previous *waka* as the sake cup floated down the stream. Another dance was performed at the interlude, this time by a person wearing an orange *hakama* (long pleated skirt) and sporting a long braided wig. He was replaced by Heian-style children with beautifully arranged hair, being led by their mothers to take the poetry to the singer.



Writing waka poetry  
Photo: Daria Luchinskaya

After the children fulfilled a few rounds of deliveries the loudspeaker announced that the game was over and that ticket holders could have their photographs taken with the party on the grass. Feeling that we would overstep our tolerated presence, we escaped the seating, only to be stopped by a camera crew and asked to present our opinions on the event. We said, of course, that it was very interesting. However, we could not feel that we were really back in tenth century Japan, as there were many camera crews, signs, wires, jeans and modern kimonos alongside the Heian-costumed stars, as well as the frequent loudspeaker announcements.

Although the garden banquet was over, there was more than enough going on in and around the Dazaifu Tenmangu shrine complex. Stalls of souvenirs, festive food, sake, goldfish and games

were crammed in where possible and performing monkeys entertained children, adults and tiny handbag-carried pedigree dogs. Despite not having understood any of the fine poetry composed under the falling plum petals, it was a very enjoyable experience nevertheless.

★

Daria Luchinskaya was fortunate enough to be one of the five St Anne's students to receive a Year in Japan scholarship, 2007-2008. She would like to thank fellow former Stanner Tara Beaney for her collaboration in securing access to the seated area for the 45<sup>th</sup> Dazaifu Tenmangu Heian poetry festival.

## **St Anne's Research**

In this section we have a selection of the research interests and achievements of St Anne's members across the JCR, MCR and SCR.

Most of the articles collected here were first presented during 2008-09 St Anne's Subject Family Events. The Events are held twice per term, for Sciences and Social Sciences/Humanities, to encourage integration between the members of the College at different levels and across different fields. At each event, three papers are presented by doctoral students, Junior Research Fellows and members of the SCR, which put forward current research findings to an audience from different disciplines. All are welcome to attend.

The article on the Daffodil Corona by Hannah Greene was carried out as a research project in the summer of 2008.



## Using computational modelling to combat sudden cardiac death

Dr Martin J. Bishop, Drapers' Company JRF, St Anne's College

### Introduction

Sudden cardiac death, resulting from an abrupt loss of heart function, is the biggest killer in Western society. For example, in the year 2002, death as a direct result of cardiac-related illness was responsible for over 39% of all non-accidental deaths in the UK, totally just over 238,000 individuals (source: [www.bhf.org](http://www.bhf.org)). Aside from mortality, treating and caring for people with heart-related illnesses imposes a huge financial burden on the UK health service of over £1.7 billion each year.

As a result, there exists a large and very important area of research, both academic and in the medical and pharmaceutical industries, motivated directly towards gaining a better understanding of how the heart functions, and more importantly, how and why it fails when it does. Gaining such an understanding is currently leading the way in the clinical development of better preventative measures, and more effective therapies, against such potentially lethal heart conditions.

One of the leading causes of sudden cardiac death is due to *cardiac arrhythmia*. Cardiac arrhythmias occur when the heart's normal rhythmic electrical activation sequence which stimulates it to beat and contract is disrupted into chaotic and highly unsynchronised patterns of electrical activation. These highly disorganised electrical activation sequences cause isolated regions of the heart to independently contract, causing the heart to flutter, or *fibrillate*. These arrhythmic contractions severely limit the heart's ability to pump blood around the body and, if intervention is not sought, death rapidly ensues. The only effective therapy against ventricular fibrillation (the most lethal type of arrhythmia affecting the heart's major pumping chambers, the ventricles) is via a strong electrical *defibrillation* shock, applied either via paddles on the torso, or from an internally implanted cardioverter defibrillation unit. However, despite the importance of arrhythmias in society, the specific mechanisms by which they are initiated, maintained and potentially terminated, still remain poorly understood, which compromises the development of effective therapies.

### Use of Computational Modelling

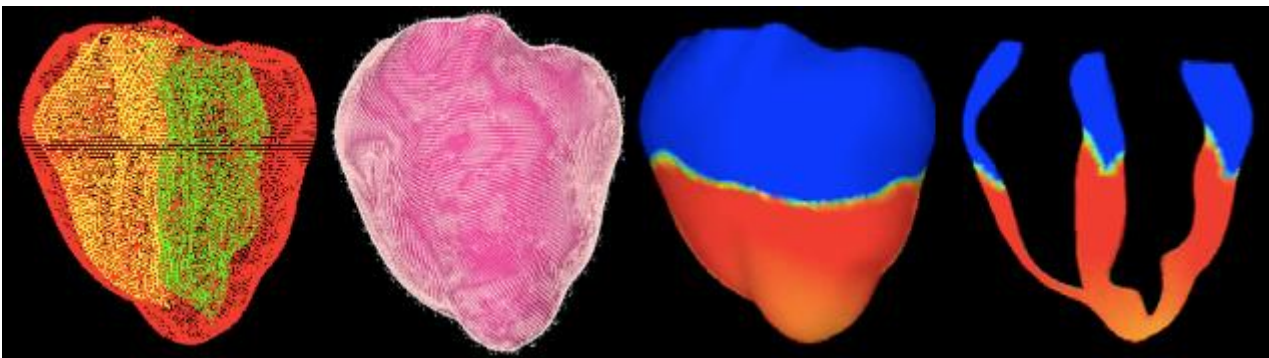
In recent years, 'traditional' experimental physiological investigations have been combined with highly detailed mathematical and computational simulations which model the electrical behaviour within realistic whole heart models, to more successfully and accurately elucidate the mechanisms responsible for cardiac arrhythmias. Such models accurately represent the structure and anatomy of the heart, and include detailed information regarding the electrical behaviour of individual cardiac cells which make up the model.

The simulations provide a wealth of information about individual ion currents/concentrations in every cell throughout the 3D volume of the tissue, which cannot be provided by experiments alone. For example, the widely used optical mapping experimental technique uses fluorescent electrically-sensitive dyes to measure changes in the electrical state of cardiac tissue. However, such a technique is restricted to measuring a single parameter (in this case transmembrane voltage across cardiac cells) from a narrow field-of-view from the surface of the heart. In contrast, simulations can provide information regarding multiple parameters throughout the entire volume of the tissue, which can complement the experimentally obtained data. Simulations thus act not only as an important means of

elucidating more information from an experimental protocol, but also as vitally important predictive tools which can guide further experimental investigation.

### **Requirement for More Detailed Computational Models**

The current state-of-the-art computational model of the rabbit ventricles is shown in Figure 1. The model has been used with great success in numerous computational modelling studies in the past decade or so to help further insight into arrhythmia and defibrillation mechanisms. As can be seen, the model faithfully represents the overall structural geometry of the ventricles and, in addition, contains a representation of the preferential alignment of cardiac cells (commonly referred to as cardiac 'fibre orientation') which 'guide' conduction of electrical wavefronts throughout the volume of the ventricles. Other models of a similar complexity also exist for the other species, notably the pig and dog.



*Figure 1 – Current state-of-the-art computational model of the rabbit ventricles showing the unstructured finite element grid (left), incorporation of realistic cardiac 'fibre orientation' (centre-left) and snap-shots of a simulation of electrical wavefront propagation throughout the ventricular model (right), (Bishop, 2008)*

Although these models have proved sufficiently realistic to answer important general questions regarding the relationship between global cardiac structure and function, they share a number of limitations. Firstly, they follow a 'one heart fits all' approach, lacking representation of intra-population variations in structure and anatomy, which will have important implications when comparing experimental measurements from a particular preparation with computational simulation results from a model constructed from an entirely different sample. Secondly, these models are highly simplified, limited in the level of anatomical complexity, by-and-large lacking the presence of fine-scale structural details such as blood vessels, papillary muscles, coronary valves, endocardial trabeculations, etc. The inclusion of such individualised detail is essential both in providing an accurate like-for-like comparison between simulations and experiments, as well as providing an improved understanding of the role played by these fine-scale anatomical heterogeneities in cardiac function.

### **Development of the Next Generation of Cardiac Computational Models**

In order to be able to probe the specific role of fine-scale anatomical structures, such as the coronary vasculature or endocardial structures, in cardiac function, it is first necessary to include a matching level of structural detail in computational cardiac models. Recently, efforts have been focussed towards developing techniques to construct 3D computational cardiac models directly from magnetic resonance (MR) data, due to the non-destructive nature of that technique. In the last few years, the advent of stronger magnets and refined scanning protocols has significantly increased the resolution of anatomical MR scans, such that smaller mammalian hearts now can have MR voxel dimensions of 20-25  $\mu\text{m}$ .

MR data acquired at such an exceptional high resolution has been the focus of a large inter-departmental collaborative project (funded by the BBSRC) held between teams in the Computing Laboratory (led by Prof. David Gavaghan), the Department of Physiology, Anatomy and Genetics (led by Dr Peter Kohl) and the Department of Cardiovascular Medicine (led by Dr Jürgen Schneider). Figure 2 (left) shows MR data obtained from a fixed and embedded rabbit heart, scanned on an 11.7 T anatomical MR scanner obtained through the *Oxford 3D Heart Project*. As can be seen in the image, the exceptionally high resolution of the data-set ( $26.5 \times 26.5 \times 24.5 \mu\text{m}$ ) allows a wealth of anatomical detail to be elucidated. One of the main goals of the *Oxford 3D Heart Project* has been concerned with developing the technological pipeline to facilitate the generation of fine-scale structure-function computational models directly from high resolution MR data containing an unprecedented level of anatomical detail. The computational pipeline for generating these 'next generation' of cardiac models is summarised in Figure 2 and described below.

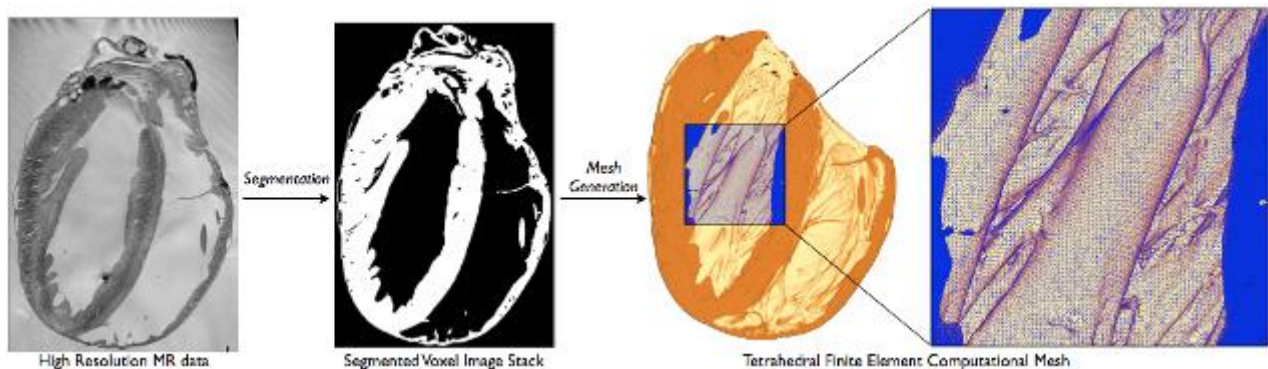


Figure 2 – Computational MR-to-model pipeline to translate high resolution MR data ( $\sim 25 \mu\text{m}$  resolution) into an unstructured finite element computational ventricular model over which cardiac electrical activation dynamics can be simulated (Burton et al., 2006; Plank et al., 2009).

Briefly, the model generation pipeline involves the processes of segmentation of the MR data set, finite element mesh generation of the segmented voxel image stack, incorporation of functional electrical properties (anisotropic conduction) into the model, and finally simulation of electrical activation. The processes of segmentation and mesh generation convert the grey-scale geometrical information contained within the MR images into an anatomically detailed computational model. The finite element computational model allows the governing equations which represent the electrical activation of cardiac tissue to be solved numerically to simulate the propagation of electrical waves throughout the heart.

Information regarding cardiac fibre orientation (which results in anisotropic conduction within the heart) is most reliably obtained from either histological analysis, where the heart is sectioned, stained and imaged in a microscope, or diffusion-tensor MR imaging (DTMRI), where measurement of the preferential direction of water molecule diffusion can be related to the underlying fibre architecture of the sample. However, in certain instances where such data sets are unavailable for a particular heart preparation, fibre architecture can be embellished into the model through the use of rule-based approaches using a priori knowledge regarding cardiac fibre structure within the heart of a particular species (see Figure 3, next page).

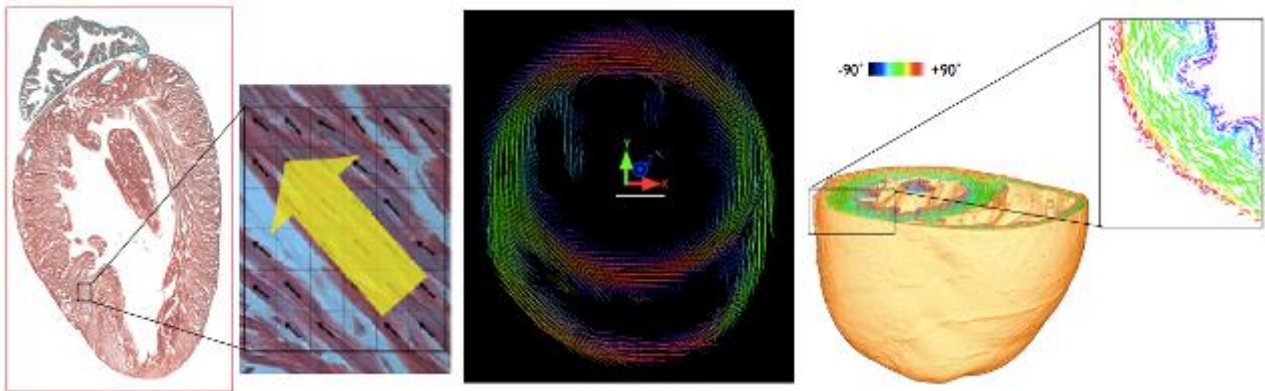


Figure 3 – Examples of ways of deriving cardiac fibre orientation for use in computational models. (Left) Histology image (courtesy of Rebecca Burton, DPAG) demonstrating how the prevailing cell alignment can be visualised from the high resolution data (resolution  $\sim 1 \mu\text{m}$  in plane). (Centre) DTMRI data (courtesy of Patrick Hales, Dept. Cardiovascular Medicine) showing the primary eigen-vector (with XYZ-RGB colour-scheme) from the diffusion tensor data corresponding to the fibre orientation within the tissue. (Right) Incorporation of fibre vector information into computational ventricular model using a rule-based approach; rotation of fibres through the heart wall is seen to match with the same effect predicted by the DTMRI data.

Finally, mathematical equations which represent the electrical behaviour of individual cardiac cells within the heart, as well as equations which model the electrical coupling between cells, can be solved numerically over the high resolution computational finite element cardiac model using specialised cardiac simulation software. Figure 4 shows snap-shots of the spread of electrical activation throughout the model following stimulation close to the apex. Here we compare the differences between incorporating an accurate representation of cardiac fibre architecture within the model: anisotropic conduction (*bottom*), and isotropic conduction (*top*).

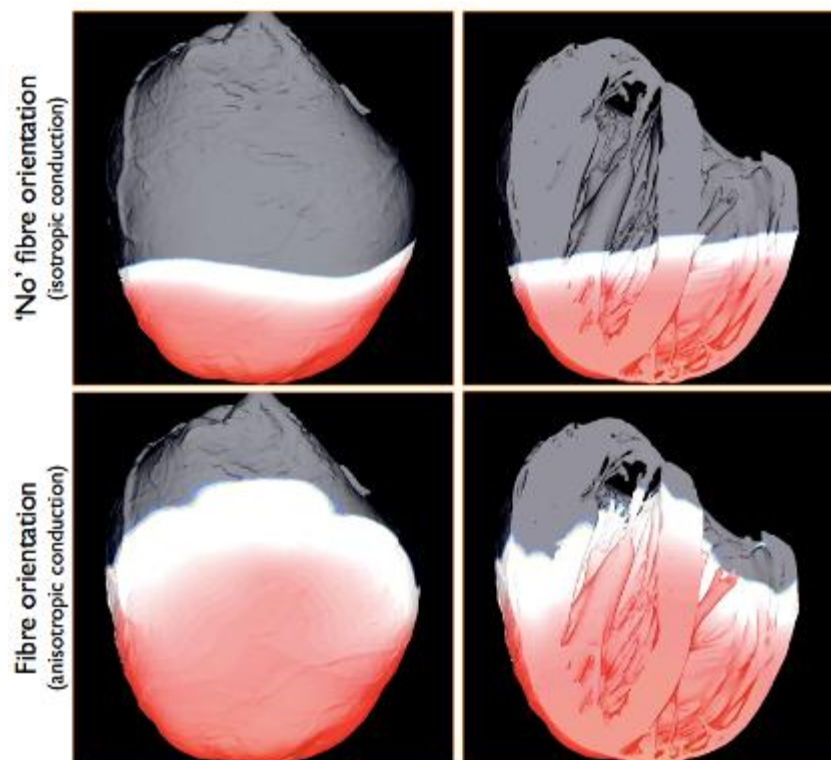


Figure 4 – Snap-shot of spread of electrical activation within computational rabbit ventricular model containing realistic fibre architecture (*bottom*) and isotropic conduction (*top*). Simulations performed with the Cardiac Arrhythmia Research Package (CARP).

## Conclusions

Use of this next generation of computational cardiac models, of which groups in Oxford are leading the way in the development, are currently facilitating the investigation of how fine-scale anatomical structures and heterogeneity affect the functioning of the heart during normal and pathological conditions. It is hoped that acquiring such insight will not only bring a new level of understanding to our knowledge of cardiac arrhythmia mechanisms and their treatment through electrical-shock therapies, but more importantly, will lead to more effective and patient-specific diagnoses and intervention-planning.



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Dr Martin Bishop's research, the combination of advanced computational simulations alongside experimental measurements, will provide a new level of insight into how differences in cardiac structure and anatomical heterogeneity, both between and within individuals, affect the basic dynamics of electrical propagation and electromechanical interaction during arrhythmogenesis, resulting in pro- or anti-arrhythmic tendencies.

## What can gravity tell us about Africa's export performance?

Dr Alberto Behar, Biegun Warburg JRF, St Anne's College

Gravity models are a workhorse employed by economists to analyse trade flows between countries. Based on the Newtonian concept, they seek to describe patterns of trade between two countries in terms of their size and the distance between them. Some worry that Africa does not export enough because its policies make trade hard (difficult). The gravity framework can be used to estimate the impact of a variable of interest, for example tariffs or trade infrastructure, on trade. The framework can also be used to see whether Africa exports a lot or a little relative to its peers.

After introducing the gravity model, this note selectively discusses some issues that may impede exports from Africa. It shows that after one has accounted for the basic elements of the gravity model, namely that Africa has a low GDP and far from attractive markets, an African country does not export less than any other country. Showing this will hopefully illuminate the utility of this basic model in examining Africa's trade levels. However, this article concludes with a brief discussion of gravity models, cautioning that they do not tell us about trade performance.

Since Tinbergen (1962), economists have studied international trade patterns using so-called gravity models. Fifty years is a long time in economics, but, of course, the Newtonian origins go back much further. Those who did secondary-school physics may recall that the gravitational pull between two objects is proportional to their mass and inversely proportional to the (squared) distance between them. Instead of mass, think of country size as the value of its goods and services. Instead of measuring gravitational pull in Newtons, think of the trade between those two countries in monetary terms. For the time being, distance is in kilometres.

This forms the basis for a theory to explain the size of export flows. A simple gravity model for exports from country 1 to country 2 would then be expressed as follows:

$$Exports_{12} = \beta_0 + \beta_1 * GDP_1 + \beta_2 * GDP_2 - \gamma * distance + u_{12} \quad (\text{equation 1})$$

All variables are in logs. Gross Domestic Product (GDP) measures country size and  $u_{12}$  is an 'error' term, which captures all other potential factors influencing exports from country 1 to country 2. Economists are typically interested in estimating the coefficients given by the Greek letters using statistical methods ('econometrics'). To do this, they take data on those variables for every country pair<sup>1</sup> and apply an 'estimator', which is a rule used to determine how to calculate the coefficients. A common method, 'ordinary least squares', uses linear algebra to find those values that minimise the unexplained variation in exports across all countries.

Figure 1 gives the output representative of what an econometrics package would produce when asked to do this.<sup>2</sup>

<sup>1</sup> For example, if there are 100 countries and everyone trades with everyone else, there would be  $100 * (100 - 1) = 9,900$  observations.

<sup>2</sup> The export data are from the IMF's *Direction of Trade Statistics* while the GDP figures are from the World Bank's *World Development Indicators*.

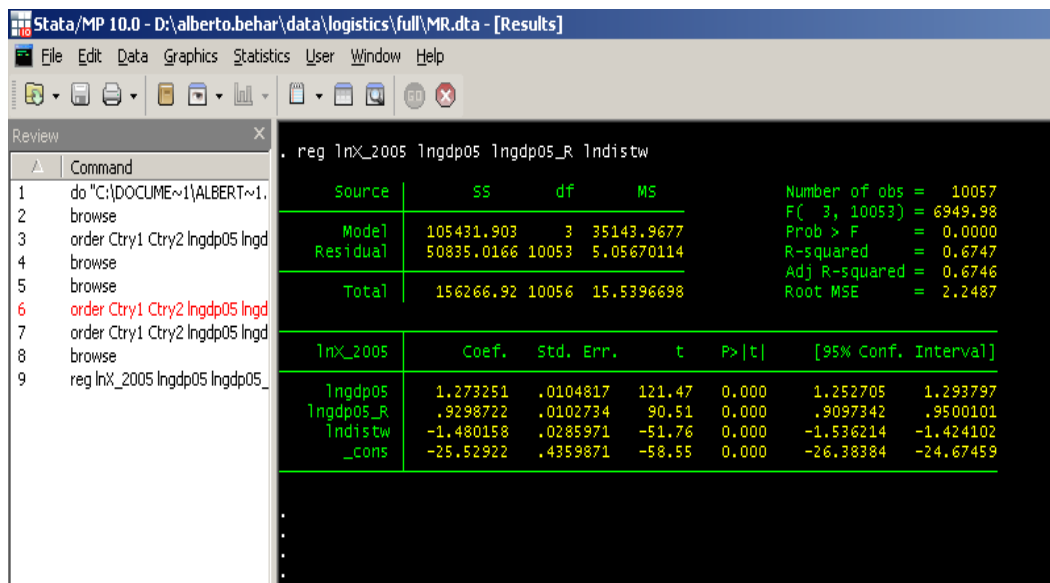


Figure 1: Computer output of an estimate of a gravity model (equation 1). *lngdp05* is the exporter's GDP, *lngdp05\_R* is the importer's GDP and *lndistw* is the distance between them. All variables are in logs. The results suggest trade flows are higher if GDP is higher and the distance between two countries is lower. Alberto Behar (2009).

Substituting in the values from the figure into equation 1, we can predict values for exports as:

$$\text{Exports}_{12}^{\text{predicted}} = -25 + 1.27 * \text{GDP}_1 + 0.93 * \text{GDP}_2 - 1.48 * \text{distance} \quad (\text{equation 2})$$

The statistics back up the theory; we see exports between two countries are bigger if (i) the exporter is bigger, (ii) the importer is bigger or (iii) the distance between them is smaller. For example, the coefficient on distance implies that a pair of countries that are 10% closer will tend to trade 14.8% more.

What about Africa? The World Bank (2006) documents that Africa's share of world trade has fallen from more than 6% in 1980 to barely 2% in 2002 (it has subsequently stabilised). Many worry that this drop in world trade participation is bad and seek to find explanations for it.

Gravity models are often employed as an aid. Distance need not only refer to physical distance; the actual time and difficulty inherent in transporting goods depends on other geographical aspects. Limão & Venables calculate that landlocked countries export less because transport costs are 55% higher. Gallup, Sachs & Mellinger (1999) suggest such countries are particularly vulnerable because their coastal neighbours may have military or economic incentives to impose costs on them deliberately. As emphasised by Collier (2007), this is particularly relevant for Africa because it has a disproportionately high number of landlocked countries.

In a practical sense, distance can also be a function of man-made technological features, like the quality of roads, ports or general trade logistics (Behar, Manners & Nelson, 2009). However, it is no good having a shiny new road if it means you spend longer waiting to load your goods on to a ship because the customs clearance office is on its tea break. The ability to clear goods across bureaucratic hurdles can also facilitate exports. Djankov et al (2006)

contrast Denmark – it takes two signatures, three documents and five days to get goods from the factory gate onto a ship – with Burundi, where it takes 29 signatures, 11 documents and 67 days.

Empirical work typically uses gravity models to measure the impact of the phenomena discussed on exports. Variables to capture all these features have been added to specifications such as equation 1 and have been shown to influence trade levels. However, what we will see next is that the basic elements of the gravity model can already tell us a great deal.

Africa's GDP is a small share of world GDP. In 2004, sub-Saharan Africa's trade to GDP ratio (66%) was actually above the world average of 52% (Behar & Manners, 2009). Furthermore, Sub-Saharan Africa is distant from the big/rich markets and is close to small/poor markets (including other African countries). Contrast this with North Africa or Eastern Europe, which are both close to big Western European markets.

Given the typical African country is small and remote, can that explain its low export values? We add one variable to equation 1 and re-estimate the model to get:

$$Exports_{12}^{predicted} = -25 + 1.27 * GDP_1 + 0.93 * GDP_2 - 1.48 * distance - 0.03 * Africa \quad (\text{equation 3})$$

Africa is a dummy variable<sup>3</sup> which equals 1 if the exporter is in Africa and 0 otherwise. The coefficient is close to zero (and is indistinguishable from zero in a statistical sense). Were we to find a large negative coefficient, then we would conclude that Africa trades relatively little. Then one could investigate further and point to the candidates indicated above. However, the result in equation 3 implies that, once we control for GDP and distance, Africa does not typically export less than other countries.

The analysis may be informative but it not entirely satisfactory. We have seen that gravity can be used to benchmark Africa against the rest of the world and that the coefficient of zero implies it is on a par. Does that mean it is performing well? Should it be trying to match its peers in the first place? Furthermore, it is not clear what a strong positive coefficient on the Africa dummy would imply. Would it mean that Africa is 'outperforming' the rest of the world or would it mean that it is exporting 'too much'? We don't know because gravity models do not tell us what the optimal level of trade is. This is because the theoretical foundations are not designed to tell us why exports (or trade in general) are good. People often fret about trade performance because they think it affects GDP growth. In fact, many studies on the determinants of GDP growth have trade measures as an explanatory variable. In other words, GDP and trade measures would swap places in the equations, which raises the question of cause and effect.

Controlling for GDP and distance may establish that poor trade policies are not necessarily to blame, but attributing low African exports to its low GDP does not mean we shouldn't worry about it. That would be akin to dismissing malnutrition as a problem because its cause is low GDP. The statement 'African malnutrition is not so bad given how poor it is' is a statement that most would find both crass and unproductive. (One might then want to address the issue of whether malnutrition should be addressed directly or through general improvements in GDP.)

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<sup>3</sup> It is often joked that "Economists like to do it with dummies". St Anne's economics students will know that this particular economist likes to use the Ribena dummy in tutorials.



We may want to consider this analogue for exports, but we would be getting ahead of ourselves. Some may first want to discuss why free trade is good. Now is not the time to explain why but it is the time to summarise what has been said. The gravity model seeks to account for trade flows (or just exports) between countries in terms of their size and the distance between them. Gravity can tell us Africa is exporting as much as everyone else, given its low GDP and distance from places with high GDPs. However, gravity cannot tell us what the optimum level of trade is and hence cannot be used to evaluate Africa's export performance.

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## Does Plato radically reject visual arts? References to the epistemological function of arts in Plato's dialogues

Sarah Hegenbart

At the subject family event, I aimed to tackle the question of whether Plato radically rejects visual arts. Plato is considered to be an opponent of visual arts as his famous mirror analogy in *Republic X* is often interpreted as a rejection of visual arts.

In my talk, however, I suggested that Plato's attitude towards visual arts is not that negative. My claim was that Plato only dislikes arts which prevent man from gaining new knowledge. By focussing on the Platonic dialogues *Symposium*, *Ion* and *Sophist* which challenge the traditional reading of *Republic X*, I showed that visual arts can fulfil an epistemological function. To substantiate my claim, I illustrated my talk with different artworks. I referred to Barnett Newman's [Midnight Blue](#) and to Franz Marc's *Der Turm der blauen Pferde* ([The Tower of Blue Horses](#)) as examples of modern paintings which Plato might have appreciated. Richard Estes's photorealistic paintings, by contrast, may be examples of a type of visual arts Plato might have disliked because of their illusory effect.

By reference to these different forms of visual arts, I aimed to make clear that there are some epistemologically valuable artworks. These might establish a new way to a form of knowledge which cannot be realised in a philosophical dialogue. Since Plato might acknowledge this crucial epistemological function of visual arts, I argued that he must not be misinterpreted as an outright opponent of pictorial representation.

In the analogy of *Cave*, Plato draws a crucial distinction between truth and appearances. This distinction is important for his conception of mimesis. In *Republic X*, Plato argues against mimetic images. He states that paintings are only an imitation of appearances because the painter does not look up to the forms as the craftsman does. Therefore, the painter is 'by nature third from the [philosopher-] king and the truth (*Rep.* 597<sup>e</sup>6-7). He is a mere 'mimêtês' (*Rep.* 597<sup>e</sup>2) because his paintings are only imitations 'of appearances' (*Rep.* 598<sup>b</sup>3).

However, I do not agree that paintings only mirror appearances. For example, the vase painter Polygnotos depicts a fight between gods and giants on his *kratêr*. This scene is no imitation of appearances, but rather makes something visible which does not appear in nature. In addition, Zeuxis of Heraclea tried to illustrate the ideal conception of a beautiful woman. Both Zeuxis' and Polygnotos' paintings require more than sensory perception of mere appearances.

In what follows, I intended to show that Plato acknowledges a kind of art which contributes to man's acquirement of knowledge.

In *Symposium*, Plato outlines a way to gain knowledge of the forms. Being closely connected with sensual perception, this way differs from the usual road to knowledge, the philosophical dialogue.

Plato describes how the 'Spirit called Love' (*Symp.* 204<sup>c</sup>1) advances the ascent to the forms. As Love is a 'lover of wisdom' (*Symp.* 204<sup>b</sup>4), he starts out from beautiful bodies and uses them as 'raising stairs' (*Symp.* 211<sup>c</sup>4) to the 'beauty of knowledge' (*Symp.* 210<sup>d</sup>1). After having ascended from the sensual perception of beautiful bodies to the intellectual perception of the beauty of knowledge, one is all of a sudden turned to 'the great sea of beauty' (*Symp.* 210<sup>d</sup>5). Then man has reached the 'final and highest mystery' (*Symp.* 210<sup>a</sup>1) which might be

analogous to the knowledge of the forms. Plato emphasises how sensual perception of beautiful bodies leads to the intellectual perception of the beautiful which, characterised as being 'always one in form' (*Symp.* 211<sup>b</sup>1-2), seems to be similar to the Platonic theory of forms. In addition, Plato states that 'all the other beautiful things share in that [the beautiful; note by the author]' (*Symp.* 211<sup>b</sup>2-3).

This may be viewed as evidence in favour of the thesis that visual arts do have an epistemological function. Similarly to Plato's example of the beautiful bodies, visual arts may encourage Love to ascend to the 'superior nature'<sup>1</sup> of the physical medium of paintings, for example. Furthermore, a picture 'might share in and allude to the forms, although its nature differs from the forms'.<sup>2</sup> Accordingly, visual arts might be necessary in order to gain knowledge of certain forms. As beauty is closely connected with the sensual perception of vision, one might even assume that it is hardly possible to gain knowledge of the form of beauty in a philosophical conversation. Therefore, sensual perception is required in order to approach to the form of the beautiful.

During the perception of beautiful things, one has to become aware of the fact that there is something which 'transcend[s] the particularity of particular things'.<sup>3</sup> In order to recognise the 'law of beauty manifested in all of them',<sup>4</sup> one needs certain intellectual abilities. If visual arts managed to create pictures which encourage the activity of these intellectual abilities as well as sensual perception, they might even be superior to the beautiful bodies which activate Love to pursue wisdom without any reference to intellectual cognition. Thus, the epistemological advantage of visual arts compared to philosophical dialogues may be that arts appeal to intellectual as well as to sensual cognition. The combination of both abilities could lead to a specific kind of knowledge which cannot be achieved by philosophy alone, as philosophy is mainly based on the activity of the intellect.

The fact that pictures might be connected to the forms is already implied by the linguistic affinity of the Greek terms *eidos* (form) and *eidôlon* (image). *Eidôla* deal with mere appearances. In contrast, *eidos* refers to 'to on' (being) (*Rep.* 598<sup>b</sup>2) and therefore makes knowledge of the truth possible. However, both terms are linked with each other as they derive from the verb *idein*. This Greek term does not only mean sensory perception, but also the intellectual process of gaining knowledge. As the terminology already implies, sensual perception may serve for the ascent to knowledge. Sensory perception which leads to intellectual cognition might not only be encouraged by beautiful bodies, but also by visual arts. I tend to assume that Plato would acknowledge this kind of art which encourages man to gain knowledge of the forms which exist beyond the sensible world.

In the *Ion*, Plato illustrates how arts differ from the other *technai*. By giving an example of a poet who 'is not able to make poetry until he becomes inspired and goes out of his mind' (*Ion* 534<sup>b</sup>4-6), he shows that arts contain a certain element which cannot be rationally explained. Artists need a 'divine gift' (*Ion* 534<sup>c</sup>6) in order to be able to create works of art. This is why arts differ from *technai*. Plato explicitly states that the god uses the artists as 'his servants' (*Ion* 534<sup>c</sup>8). The god himself speaks and 'gives voice through them [the artists; note by the author]' (*Ion* 534<sup>d</sup>4). Plato's approach to arts in the *Ion* therefore corresponds with the 'Hellenic view of arts as divine in origin'.<sup>5</sup>

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<sup>1</sup> Lodge, 1953, p. 173

<sup>2</sup> Cassirer, 1924, p. 21

<sup>3</sup> Lodge, 1953, p. 175

<sup>4</sup> *ibidem*, p. 175-176

<sup>5</sup> *ibidem*, p. 168

This characterisation of art as inspired by a supernatural power challenges the mirror analogy in *Republic X*. If art reveals the message a god wants to convey, it cannot be viewed as a mere mirroring of appearances. Then art rather displays a medium which manifests a 'higher kind of reality'.<sup>6</sup> It is questionable whether this supernatural reality could be hinted at in a mere intellectual medium such as a philosophical conversation. As the god takes the artists' intellect away in order to announce his message via the works of art, it seems as if it were necessary to pause one's intellectual activities in order to experience the whole meaning of the god's message. Thus, the philosophical way of gaining knowledge by relying on one's intellect does not seem to be appropriate for the experience of the supernatural reality. In order to understand the divine pronouncement, one has to rely on the guidance of the god. During the process of artistic inspiration, the god appears to lead us to the knowledge of a reality which is beyond our sensible world of physical things. This knowledge, however, could not be fully understood if we only perceived with our intellect. As art encourages us to perceive in a way which is not rationally explainable, it is necessary for the experience of a supernatural reality. This experience, namely inspiration, might lead to an increase of our knowledge because it grants us access to a reality which transcends our sensible world. Without art we were not able to gain knowledge of this divine sphere. Thus, art which results from inspiration establishes a new way to knowledge and therefore has an epistemological function. I assume that Plato would acknowledge this kind of art which conveys a voice from above.

In the *Sophist*, Plato draws a crucial distinction between 'literal (eicastic) and viewer-dependent (phantastic) kinds of mimesis'.<sup>7</sup> Eicastic mimesis is characterised as producing an imitation by 'keeping to the proportions of length, breadth, and depth of his model, and also by keeping the appropriate colors of its parts' (*Sophist* 235<sup>d7-e1</sup>). In contrast to eicastic mimesis which is 'likeness-making' (*Sophist* 236<sup>b2</sup>), phantastic mimesis produces 'appearances that aren't likenesses' (*Sophist* 236<sup>c3</sup>) because it requires a certain 'viewpoint' (*Sophist* 236<sup>b4-5</sup>) of the observer.

Phantastic mimesis qualifies all visual arts which employ *skenographia* and *skiagraphia*. Both techniques were established in the late fifth century, shading (*skiagraphia*) by Apollodorus and scene-painting (*skenographia*) by Agatharchus.<sup>8</sup> Plato distrusts arts which use these techniques as they distort our sensory perception. Consequentially, we remain ignorant because we take these images for the truth. Phantastic mimesis prevents us from gaining knowledge as we believe that the appearances it depicts already are the true being. Phantastic mimesis deceives the observer who is not able to recognise an appearance for what it is because of the tricky application of *skenographia* and *skiagraphia*. This is why Plato dislikes these kinds of images.

In contrast to phantastic mimesis which is produced with regard to the observer, eicastic mimesis does not consider the observer's viewpoint and is therefore rather objective than subjective. As eicastic pictures do not employ techniques like *skenographia*, it is difficult to find out what these images depict. During the creation of an eicastic image, the artist concentrates rather on the nature of the entity he wants to depict than on the observer's viewpoint. Therefore, the image is similar to the nature of the entity. However, the viewer is not immediately able to find out about this nature as it is hard for him to recognise the content of the image because of the lack of viewer-friendly techniques. That is why the viewer of eicastic images has to activate his capacity for reasoned reflection in order to make sense of

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<sup>6</sup> Lodge, 1953, p. 174

<sup>7</sup> Halliwell, 2002, p. 25

<sup>8</sup> Morgan, 1990, p. 130

the image. Thus, the viewer of eicastic mimesis has to employ his intellectual abilities in addition to his sensory perception. By the contemplation of eicastic mimesis, he is 'stimulated in the right way, without being fed the answer'.<sup>9</sup> In fact, the technique for stimulating the soul to approach the truth is the Socratic dialogue. Apparently, eicastic mimesis is able to stimulate man in a way the dialogue does. The perception of an eicastic image which cannot immediately be identified with reality 'provoke[s] the soul to think about what is beyond the perceptual'.<sup>10</sup> This stimulation reminds us of mathematical *dianoia* which is 'central to the educational program that will train the philosopher'<sup>11</sup> as Plato illustrates in the analogies of Line and Cave. As eicastic images strengthen our capacity for critical reflection which is essential for the knowledge of the forms, eicastic images may be viewed as fulfilling an epistemological function. That is why Plato may accept this kind of visual arts.

My conclusion was that Plato is not a general opponent of visual arts. Rather he dislikes arts distracting one from gaining knowledge. I proposed, however, that Plato may acknowledge arts which can fulfil a certain epistemological function. Having shown that visual arts can encourage man to look beyond physical appearances, I emphasised that sensual perception can offer an incentive to experience the physical world in a way which reveals that there must be a superior principle behind the mere appearances.

As a result, I stated that Plato may acknowledge all kinds of arts which have a philosophical impact. In *Republic VII*, he even compares the philosopher with a painter as both 'look to what is most true, make constant reference to it, and study it as exactly as possible' (*Rep.* 484<sup>c9-d1</sup>). Eventually, my suggestion was that maybe the ideal artist has to be a philosopher, too.

I especially enjoyed the discussions after my talk. It was extremely enriching that students from different disciplines contributed with their comments to the discussion. So I got the unique opportunity to get feedback to my research from very diversified viewpoints.



Sarah Hegenbart currently examines the question of how one can develop a virtuous constitution. Her suggestion is that an encounter with beauty in arts contributes to such a constitution since it enables us to create an authentic form of our life. This is why she would agree with Iris Murdoch who held that: 'Art then is not a diversion or a side issue, it is the most educational of all human activities and a place in which the nature of morality can be *seen*.'

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<sup>9</sup> Irwin, 1989, p. 95

<sup>10</sup> Morgan, 1990, p. 125

<sup>11</sup> *ibidem*

## Modelling Nano Peapods for Quantum Computing

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Nanotechnology is the engineering of materials, devices and operating systems on a very small scale, typically within the range of just under 1 and up to 100 nanometres (nm). One nanometre is equal to one billionth of a metre ( $1 \times 10^{-9}$  m). To put that in context, the smallest existing pollen grain is 6 micrometres in diameter, 6,000 times the size of a single nanometre. While a single carbon atom has a diameter of about 0.1nm, buckminsterfullerenes, which are hollow, spherical structures composed of between 20 and 60 carbon atoms, have a diameter of about 0.7nm. We can also put atoms inside the carbon buckyball, (the so-called endohedral fullerene). Once we are looking at systems containing a few hundred atoms  $\sim 10$ nm across we can't avoid quantum effects!

The use of nanotechnology has witnessed explosive growth in recent years, finding use in medicine (nanomedicine), electronics, consumer products and nanomaterials. The application of nanoparticles in sunscreens is one of the most common uses in consumer products today: well over 300 sunscreens on the market contain zinc oxide and titanium dioxide nanoparticles to reduce the visibility of the cream. Silver nanoparticles can be added to fabrics to kill bacteria and make them odour resistant. Nanotechnology is able to reduce the size and lower the production and operation costs of devices such as solar cells, fuel cells and batteries.

A much more recent application of nanotechnology is in the development of quantum computing: an entirely new form of computer technology, which leaves behind classical mechanics and instead uses principles based on quantum theory. Quantum theory is essentially based on the idea that as objects become extremely small (on the atomic and molecular scale), they start to behave very differently to how we usually know and understand. You may have heard of the concept of wave-particle duality, which explains that very small particles, such as electrons can behave as both a particle, with mass and momentum, and a wave. It may be helpful to imagine a travelling electron as a particle, whose path is controlled by a wave. The same idea can be applied in quantum computing.

As you may have heard from newspapers and televisions, quantum computing has become a fascinating research area nowadays. In particular, I am going to talk about single walled carbon nanotubes (SWNT), which have things inside them that might be used to embody the quantum information. Spin chains have potential to provide the controlled interactions needed for quantum computing. Carbon is a candidate host for spin quantum bits (qubits) because in  $^{12}\text{C}$  materials the small spin-orbit coupling and absence of hyperfine coupling ensures long spin coherence times. Carbon peapods, that is, single-walled carbon nanotubes containing fullerenes, have been proposed as particularly suitable spin chain systems. The fabrication of nanoscale electronic devices, such as field effect transistors, with carbon peapods containing various endohedral fullerenes is well established. When metallic atoms with an unpaired electron such as scandium (Sc) are incarcerated in a carbon cage, the system develops hybridised orbitals resulting in an unpaired electron delocalised across the fullerene cage – potentially a near ideal qubit.

Here we report on detailed numerical simulations that establish the nature of the spin-spin interactions both between endohedral fullerenes and between fullerenes and nanotubes. The dominant interaction is of the Heisenberg form, which has potential for quantum computing in the one-dimensional chain. Quantum computing protocols have been devised and experimentally demonstrated which allow chains of identical units to be controlled globally,

circumventing the difficulty in local addressing. For this to be achieved it is necessary to set and measure the qubits at the end of the chain, but all the other qubits in the chain can be manipulated collectively, without the need for individual addressing. In this way information can be propagated and processed in the spin chain, and scalable quantum computations can be performed.

Four fundamental problems need to be understood in order to demonstrate well-defined qubits in carbon peapods: (i) the charge arrangement within the carbon peapods; (ii) the electron spin distribution; (iii) the coupling between spin-qubits; (iv) the nature of the spin interactions between fullerenes and nanotube.

The CRYSTAL code, developed by STFC's Computational Materials Science Group with collaborators at the University of Turin, was used to perform these *first principles* calculations. We find well-defined spin-1/2 qubits on the fullerenes, with strong evidence for a nearest-neighbour Heisenberg exchange interaction. In order to describe the influence on the spin-qubits localised on the fullerenes of propagating electrons or holes in the nanotube, it is necessary to go beyond density functional theory to a model which is capable of describing the low-energy charge-spin excitations of the system. We conjecture a generic Hubbard-Anderson model; which captures the Heisenberg exchange between spins along the fullerene chain and the Kondo exchange interaction between localised spins on the fullerenes and spins of propagating electrons or holes in the nanotube.

Figure 1 (a) shows the calculated electronic eigenspectrum for the relaxed Sc@C<sub>82</sub>. Sc has three valence electrons and the ground state of Sc@C<sub>82</sub> is found to be a spin-1/2 system. The unpaired electron occupies the highest occupied molecular orbital (HOMO) of Sc@C<sub>82</sub>, which constitutes the spin qubit. The HOMO is well separated from the energy levels above and below leading to a well-defined qubit. We establish that the HOMO of Sc@C<sub>82</sub> is virtually identical to the (LUMO+1) of C<sub>82</sub>, as shown in Fig.1 (c), whereas the lower lying orbitals are hybrids of Sc and C<sub>82</sub>. Thus Sc acts as a perfect donor to the C<sub>82</sub> cage for the HOMO state.

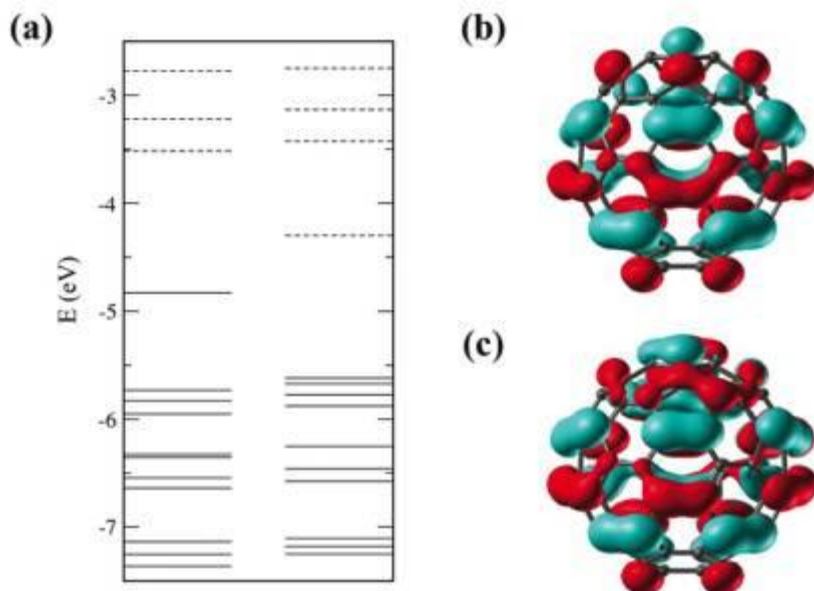


Figure 1 – Electronic structure of Sc@C<sub>82</sub>

Figure 2 shows the electronic charge rearrangement following the Sc@C<sub>82</sub> encapsulation in the (14,7) nanotube (semiconducting). The charge depletion from the nanotube is concentrated around the fullerene sites. Similar qualitative results are obtained for the (11,11) nanotube (metallic). In both peapods, electron transfer occurs from the nanotube and

the Sc atom to the  $C_{82}$  cage due to hybridisation between the occupied states of the nanotube and fullerenes. The charge transfer from the Sc atom to the  $C_{82}$  cage in  $Sc@C_{82} @ (14,7)$  and  $Sc@C_{82} @ (11,11)$  is very similar to that of  $Sc@C_{82}$ . The shape of the spin density distribution in the peapods closely resembles that of the HOMO of  $Sc@C_{82}$  illustrated in Figure 1 (b). The charge transfer and spin distribution are insensitive to encapsulation.

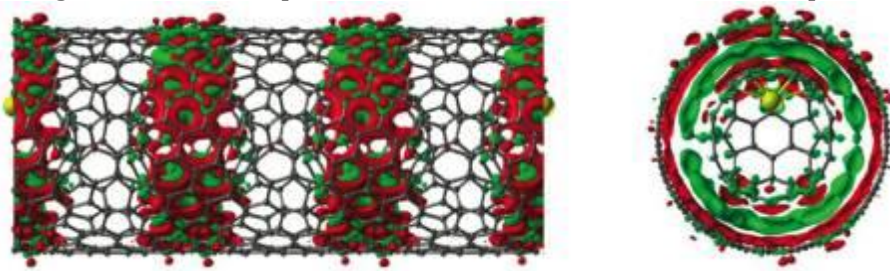


Figure 2 – Charge transfer in  $Sc@C_{82}@(14,7)$  peapod

In the predicted ground state configuration of the peapods, the spin direction alternates along the  $Sc@C_{82}$  chain; the corresponding configuration with parallel spins being higher in energy. We denote these configurations as antiferromagnetic (AF) and ferromagnetic (FM) states, respectively. Both states are found to be Mott insulators and have a total energy lower than the restricted Kohn-Sham solution. The exchange parameter  $J$ , defined as the energy difference between FM and AF configurations, is 3 meV per cell (containing two spins). The behavior of  $J$  as a function of the inter-fullerene separation,  $R$ , in a  $Sc@C_{82}$  chain is plotted in Figure 3. Values of  $J$  calculated for the peapods at discrete values of  $R$ , as indicated in Figure 3, coincide with those obtained for the  $Sc@C_{82}$  chain within the accuracy of the present calculations. At these separations the inter-molecular spin interaction is therefore via direct exchange between fullerenes, with a negligible contribution from interactions via the nanotube. This inter-molecular coupling is much larger than the classical dipole coupling of  $N@C_{60}$  and even larger than that computed for defective fullerenes with inter-cage links. This surprising result follows from the HOMOs in the  $Sc@C_{82}$  chain being very extended as illustrated in Figure 3. The  $p_z$  orbitals on the closest C atoms belonging to adjacent molecules overlap in a  $\sigma$ -type fashion. This implies that the exchange interaction could be tuned by varying the separation between the fullerenes in peapods.

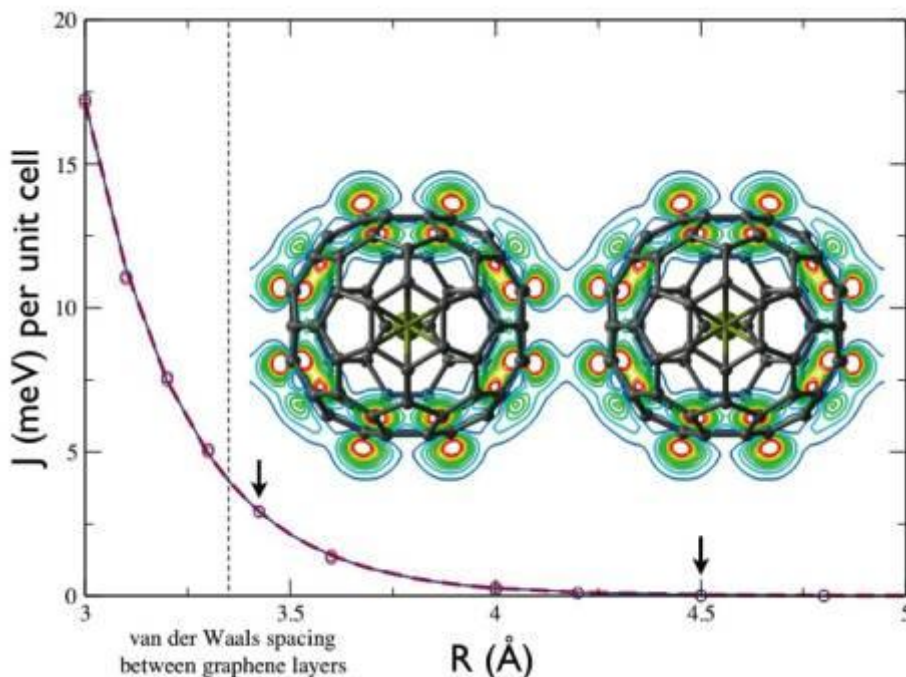


Figure 3 – Exchange interaction strength as a function of the interfullerene separation for an isolated chain of  $Sc@C_{82}$  fullerenes (full curve) and the peapod structures (arrows).



The AF band structures of the peapods are plotted in Figure 4. They are consistent with a chain of fullerenes interacting weakly with a nanotube. In the semiconducting case, Figure 4a, there are very narrow bands, consistent with weak hopping of electrons along the fullerene chain. In the metallic case, Figure 4b, these bands cross the wide nanotube bands. The weak interaction opens small hybridisation gaps (circled in Figure 4) that are reproduced in the generic Anderson-Hubbard type model.

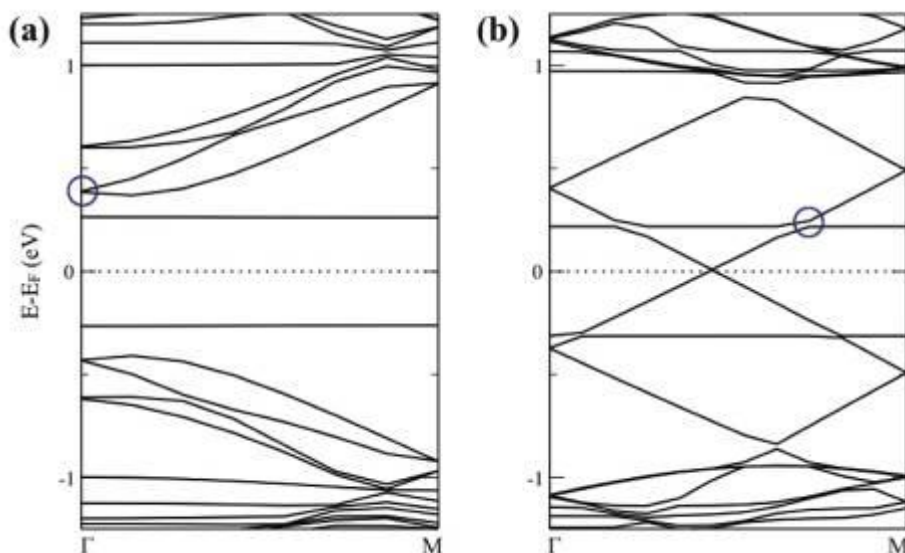


Figure 4 – Spin-polarised band structures of the (a)  $Sc@C_{82}@ (14,7)$  and (b)  $Sc@C_{82}@ (11,11)$  peapods for the AF configuration.

In conclusion,  $Sc@C_{82}$  peapods offer well-defined spin-qubits on the  $C_{82}$  cage, coupled via antiferromagnetic Heisenberg exchange interactions. For the semiconducting case, the upper and lower Hubbard bands of the fullerene chain are little affected by the nanotube and occur entirely within the band gap of the nanotube, allowing excitations of the  $Sc@C_{82}$  chain independently of the nanotube. Remarkably, for the peapods discussed in this paper, the main function of the nanotubes will be to give mechanical support for the endohedral fullerenes and to protect them from the environment, rather than to provide controlled interactions between the spins. An endohedral fullerene peapod thus provides a candidate nanostructure for spin-chain quantum computing.

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Dr Ge's DPhil work has been published in several prestigious journals such as Nature Nanotechnology, American Chemical Society (ACS) Nano, Nano Letters, and Physical Review B.

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# Policy and Power: The Formulation of the Education Strategic Plan of Ghana<sup>1</sup>

Emefa J.A. Takyi-Amoako

## Introduction

This article examines the power systems and spaces immanent in the primary findings of a qualitative research undertaken in response to calls to contribute to investigations on how global and national education policy processes interact in national contexts and on the exact nature of the roles and interactions of the policy agents (Ayamdoo & Ayine 2002; Monkman & Baird 2002; Little 2008). It presents part of the findings of a study that explores how a policy text, the *Education Strategic Plan 2003-2015* (ESP) of Ghana, is negotiated, produced and shaped when the Ministry of Education (MoE) and foreign donors interact. Drawing on notions of power expressed by Pierre Bourdieu (1990; 1991; 1992) and Steven Lukes (2005), it compares the spaces and positions which donors and the MoE occupy in the power geography. The article argues that power operating in the ESP formulation process through the MoE-donor interactions is a dominating and three-dimensional force (Lukes 2005). Its first dimension is the control over agenda setting, and the second is the authority exercised over the political agenda, which engenders decision or non-decision making by organising priorities into or out of the political process. The third dimension is the most potent and epitomises the less observable, hidden forms of power, which is also referred to as 'symbolic violence' (Bourdieu 1991).

## Power as one-dimensional – agenda setting

Findings show that there is more evidence of the donors rather than the MoE setting the agenda and determining policy priorities in the ESP shaping process. This authority of the donors over the MoE could be likened to the one-dimensional view of power. Lukes describes the one-dimensional view of power as a notion of power expressed through visible behaviour in a decision-making setting, where conflicts of interest occur, which indicates policy interests during political agency (Lukes 2005). This implies one party prevailing in a political contest of policy preferences over another. In order to subject this form of power to analysis, the researcher has to observe real behaviour either directly 'or by reconstructing behaviour from documents, informants, newspapers, and other appropriate sources' (ibid.: 17). Findings of the study that exemplify this one-dimensional form of power derive mostly from the latter kind of analysis.

Power as domination is seen in the act of agenda setting among donors with financial authority and an erosion of recipients' sense of agency. For instance, a donor official maintains that the effect of donor support on the MoE initiative has not been that positive:

I would assess, I think it undermines their initiative. We have stifled their own initiative ... There has been too much setting the agenda over the last couple of years and I think that ministries are undermined ... because we have the money (**Interview**).

Findings which depict donors and not the MoE as significantly setting the agenda and leading the ESP text production process are evidence of donors' authority to name, earmark and legitimise because of their financial clout, approved knowledge authority and donor-initiated

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<sup>1</sup> The ESP text published in two volumes is 'a whole sector, or sector wide approach' to education development in Ghana (ESP I 2003: 4). It is 'an overview of education sector policies, targets and strategies for the plan period 2003 to 2015', and 'the Work Programme...presents the policy objectives in terms of targeted outcomes linked to timeframes and institutional responsibilities' (ibid.: 5).

global policy framework of Education for All (EFA) goals, the Millennium Development Goals (MDGs), the Ghana Poverty Reduction Strategy (GPRS): a macro policy prescription for Ghana. These engender donor domination which is recognised as an undermining, imposing and controlling attitude over the MoE in the MoE-donor interactions. While the observable actions of donors and the MoE show how the former are controlling agenda setting and determining policy preferences more than the latter, there are other indications which suggest that intangible or not readily observable interests are being stifled in the MoE-donor interactions. These are examined below in the context of the two-dimensional view of power.

### **Power as two-dimensional – authority over political agenda**

The degree to which donors intentionally or unintentionally construct or reinforce impediments to the MoE's expression of policy disagreements suggests that the former have authority over the political agenda. Lukes maintains that every political entity tends to take advantage of, or approve of, certain types of conflict while repressing others, 'because *organization is the mobilization of bias*. Some issues are organized into politics while others are organized out' (Lukes 2005: 20). He sees the 'mobilization of bias' as a range of ideals, customs, practices and organisational processes that function constantly and methodically (ibid.). In a similar vein, one could argue that the global policy framework mobilises bias into decision-making in the MoE-donor interactions by organising priorities into or out of the policy process. For instance, findings suggest that donors coerce the MoE into complying with prioritising girl-child education by threatening to withdraw funds. Thus, while the girl-child issue is 'organized into' the politics of the policy process, the MoE priority of developing higher levels of education is partially 'organized out'. This form of power is analogous to the coercive type of power, which Lukes notes as: 'the securing of compliance through the threat of sanctions (ibid.: 21)'.

Nevertheless, the key focus of the two-dimensional view of power counters the behavioural aspects, which fails to consider that power may often be expressed through narrowing the span of decision-making to innocuous concerns (ibid.). For example, since some MoE officials allege that the MDGs and EFA goals are being used as an excuse to exclude particular concerns from the policy process, they claim that donors use these to justify neglecting other levels of education or not allocating funds to them at all. As one MoE official comments:

It's true that basic education is the government's priority. Very often the donors tend to capitalise on this. They put too much emphasis on basic education and tend to neglect the other levels of education, especially tertiary education (**Interview**).

The ESP, which represents a plan for the entire education sector, is thus more biased towards primary education, one of the international and global agendas of the donors. A number of the interviews confirm that these global and donor agendas determine which policies must be prioritised within the education sector of Ghana. Since it is likely that the donor-initiated framework of EFA and MDGs predetermines the MoE-donor interactions and the MoE education policy priorities, 'nondecision-making' may have occurred. 'Nondecisions', which limit the range of decision-making, are themselves regarded '(observable) decisions'. Nondecision-making is a means of suppressing calls for transforming inequities within the prevailing order of things even before they are expressed (ibid.). While from the one-dimensional perspective what counts as a political concern in the MoE-donor interactions is determined by the observable donor agenda, the two-dimensional view helps to detect possible priorities that the restriction imposed by donor agenda has stopped from being fulfilled. Both forms of power discussed so far emphasise observable conflict, whether explicit or implicit, yet the third dimension does not.

**Power's third dimension – symbolic violence: Prevention of grievances by shaping views.**

The third dimension of power, also known as symbolic violence, challenges presumed consensus, and is a type that prevents grievances by shaping perspectives to secure compliance of the dominated. It suggests that power may not only be exerted in settings where (overt or covert) conflict is rife, especially when manipulation and authority as well as structural bias as forms of power tend to preclude it, but also in those where it is absent. Central to this form are the institution of political alliance and legitimate linguistic exchange that are normalised and therefore capable of attracting economic capital (Bourdieu 1991).

This form of power queries the assumption that if the MoE bears no complaints then its priorities are not undermined by the donor power being exercised. In fact, one main and most subtle effect of power is to prevent people from feeling aggrieved by shaping their views, thoughts and values in a manner that 'they accept their role in the existing order of things, either because they can see or imagine no alternative to it, or because they see it as natural and unchangeable, or ... beneficial' (Lukes 2005: 28). For instance, the EFA goals, MDGs, the GPRS and the Medium Term Expenditure Framework (MTEF), which represent components of the macro policy framework prescribed by the World Bank for Ghana, supported by other international donors (multilateral and bilateral) and to which the MoE have, in principle, signed-up, influence significantly the ESP formulation process. They have, probably, begun shaping subtly the thought processes and ways of seeing of the MoE as an institution.

Assertions by some MoE officials of the importance of the MoE priorities to conform to international/donor policy priorities in order to secure external funding, perhaps, marks the start of deliberate and unintentional subtle reshaping of the MoE perspectives. An instance is Ghana's proposal for inclusion in the EFA/Fast Track Initiative (FTI) through which the MoE hopes to secure donor funds to implement their ESP and attain the EFA goal of UPE. It may seem here that no conflict exists between donor and MoE priorities and that there has been no act of overt coercion of the MoE by the donors to adopt these priorities. However, the assumption that an agenda setting process devoid of grievances implies real consensus overlooks the possibility of phony consensus (*ibid.*). The issue of manipulation and authority without conflict emerges when donors' funding authority and commitments facilitate means that guarantee the MoE conformity.

Power's third dimension has the capacity to marshal, reproduce and strengthen structural bias not only maintained by personal actions, but also, most crucially, 'by the socially structured and culturally patterned behaviour of groups, and practices of institutions, which may indeed be manifested by individuals' inaction' (*ibid.*: 26). Global policy agendas predetermine the MoE-donor interactions and MoE education policy priorities. These agendas rally, recreate and fortify structural bias in ways that appear to be the unintentional results of the choices of particular individuals. However, structural bias of the frame within which the MoE-donor interactions and the ESP formulation occur could be seen as not maintained merely by individuals but also by the social and cultural behaviour of groups and organisations like the donor agencies, the MoE and their communities all of which are steeped in the neoliberal agenda of global policies (*ibid.*; Stromquist 2002).

The way that international donor agendas and authority shape and contextualise the ESP formulation process and the MoE-donor interactions could be described as an instance of symbolic violence. This suggests that symbolic power in this context does not exist as a commanding or dictating force, but that it prevails within and by means of an approved connection between the dominating donor group and the dominated MoE in the context of the configured field where (policy) knowledge to which language is central is (re)produced

(Bourdieu 1991). What produces linguistic authority, the authority to uphold or undermine the social order, is the trust in the legitimacy not only of (policy) language, but also its users (ibid.). Donor-initiated global discourses, such as those articulated in the MDGs, EFA and GPRS documents have an approved linguistic status that is normalised, and are integrated into a national policy document such as the ESP to ensure political alliance between the MoE and donors. Using this legitimate, normalised language (for example, the EFA/FTI benchmarks to shape its education vision and set targets), the MoE could secure economic advantages from donors. The language of global policy documents symbolises wealth and authority. Its integration into the ESP text and EFA/FTI proposal endows both with an authority that yields donor approval and attracts donor funds.

## Conclusion

This paper has compared the differential positions of power which the MoE and donors occupy in shaping the ESP. It has done so by seeing power as three-dimensional and symbolic, illustrated through donors controlling agenda-setting, wielding authority over political agenda and the third dimension of power which encapsulated structural bias, prevention of grievances, manipulation and authority. It has also demonstrated how the legitimisation of discourses or language maintains power imbalance between actors, thus revealing the inequality of power that exists between donors and the MoE. This power inequality seemed to be undermining designated aid effectiveness goals and partnership principles. However, the question of how feasible it is for there to be a balance of power between donors and recipients, when it is clear that the latter continue to depend financially on the former remains to be addressed.

It is, nevertheless, important to acknowledge that there are other possible interpretations of how power operates in the MoE-donor interactions. There has been criticism of the excessive portrayal of donor-recipient interactions as donor-dominated at the expense of the need to explore how power exercised by recipients through manipulation, for example, impacts donors and their international agendas (Little, 2008). However, the findings of the present study suggest that donors persistently occupy a dominant position in their relations with recipients with little or no financial authority, despite discourses advocating country-led partnership.



## Acknowledgements

I wish to thank Dr Elina Tsalicoglou for proofreading an earlier draft of this article.

Emefa is interested in youth education and has successfully designed and implemented an educational and motivational programme, Attaining the Peak, for young people in state secondary schools in the UK and elsewhere with the support of a dynamic advisory board: [www.attainingthepeak.org](http://www.attainingthepeak.org)

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## Vacation Laboratory Studentship: Homology of the Daffodil Corona

### Hannah Greene

Last summer I was fortunate enough to be supported by St Anne's under the 'Vacation Laboratory Studentship' scheme to undertake five weeks working in a lab at the Department of Plant Sciences, here in Oxford. The project I worked on forms part of Dr Robert Scotland's research investigating the homology of the daffodil trumpet (corona). Homology concerns the similarities between characters (physical traits) or DNA sequences due to their shared (common) ancestry.



Figure 1: *Narcissus bulbocodium*  
Photo: [www.pacificbulbsociety.org](http://www.pacificbulbsociety.org)

In particular, one of the aims of the study is to determine the developmental origin of the corona, since it is uncertain whether it is derived from the stamens or the petals (known in this group of plants as 'tepals'). Dr Scotland had been growing 1,000 bulbs of the hoop petticoat daffodil, *Narcissus bulbocodium* (Figure 1), on the roof area of the department since autumn 2007. These plants flowered in spring 2008, and shortly after those flowers died, new ones were beginning to develop deep inside the bulbs, ready to flower in spring 2009. The project involved dissecting these tiny flowers at varying developmental stages from the centre of each bulb, and then viewing and recording images of the specimens using a scanning electron microscope (SEM).

Initially it proved very difficult to find and identify the earliest floral primordia due to their small size of c. 200 microns – a fifth of a millimetre. Given that we were doing this under a normal dissecting microscope, using only razor blades, tweezers and fine mounted needles, it was pretty tricky, to say the least! After many hours of peeling and cutting up the bulbs, however, I gradually developed a technique that resulted in more successful dissections and 'cleaner' specimens. The task demanded a steady hand, a good eye and plenty of patience to succeed – skills which I improved over the course of the project. Confidence was also required to dissect quickly and decisively, before the tissue dried out.

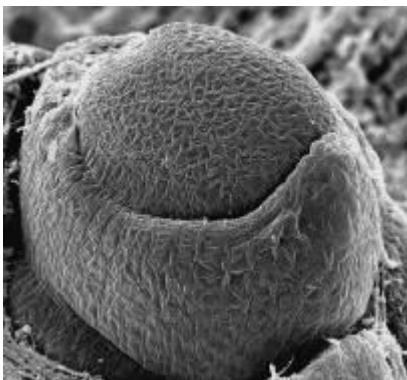


Figure 2: The bract grows over the meristem.

As each specimen was dissected, it was put straight into a fixative solution made up earlier in the day, and left in it overnight in a walk-in fridge. The next day these specimens were put through an alcohol series from 40% to 100% ethanol, changing the concentration every hour. The day after that, they could be critically point dried (a process that removes the water from specimens) then carefully mounted onto 'stubs'. After being coated with silver in the 'sputter coater' they were finally ready for viewing in the SEM.

It was possible to identify a number of clear developmental stages in the transition from meristem to mature flower. The first of these is simply the meristem, surrounded by two leaves – one large and one small. Next, a 'bract' is seen starting to grow over the surface of the meristem, initially with a distinctive beak shape that made this stage easy to identify (Figure 2). Incidentally, in a mature daffodil the bract can be seen as a brown papery structure at the base of the flower (Figure 3).



Figure 3: The bract in a mature flower.  
Photo: [www.microscopy-uk.org.uk](http://www.microscopy-uk.org.uk)

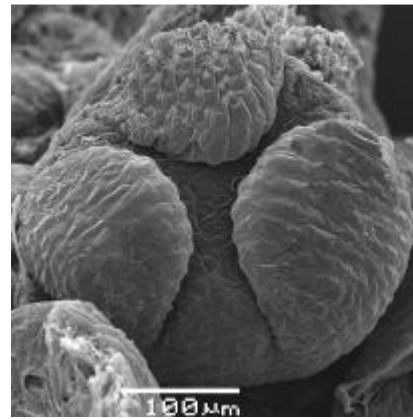


Figure 4: Bumps on the meristem which will develop into three of the tepals.

Once the bract had grown completely over the meristem, it had to be removed to observe the subsequent stages, and this was particularly fiddly. Beneath the bract, a number of bumps then develop on the meristematic surface (Figure 4); this is the start of the differentiation of the floral parts, with these bumps becoming three of the six tepals.

The next structures seen to develop are the six stamens (Figure 5), followed by the three carpels; it is not until the standard floral parts are really quite mature that the corona begins to develop (Figure 6).

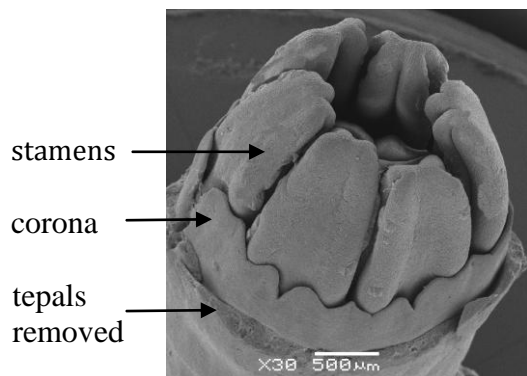


Figure 5: The tepals have been removed to show the developing corona



Figure 6: The six tepals, six stamens and three carpels are visible. The corona is still quite small – it is just visible in the red circle.

It was interesting to work with *N. bulbocodium* in the lab, having encountered the species in its natural setting during the 3rd year 'Plants' field trip to Portugal that Easter. During the studentship I also did some work using two other species of daffodil, which made for an interesting comparison with *N. bulbocodium*.

Another component of Dr Scotland's research into the daffodil corona involves determining the pattern of evolution of the corona over the whole of the daffodil family, the *Amaryllidaceae*. This confirmed that the corona has evolved independently a number of times within the family. A 'tree-building' program was used to construct the phylogenetic tree of the *Amaryllidaceae*, on which species with different types of corona were marked: staminal (derived from the stamens) and perianthal (derived from the perianth, i.e. sepals and petals). Such tree-building processes are often described and discussed in lectures, but it was a lot

easier to understand it in relation to a concrete example, seeing it through from the raw data to the finished tree.

Other aspects of the project include using '*in situ* hybridisation' to find out whether the genes which are 'switched on' in the corona are those usually expressed in the stamens, or those usually expressed in the petals. It is hoped this will provide further evidence to support Dr Scotland's initial investigations using a Northern blot, which indicated that the *Narcissus* corona is staminal.

During the time I spent in the department I also attended weekly lab meetings, at which any matters relevant to the lab members were discussed. Sometimes, one or two people would make an informal presentation of some progress they had made on their work, report back on a conference, or lead a discussion on a journal article of interest. It was interesting to hear about the kind of projects the PhD and postdoctorate students were working on, even if the details were somewhat beyond me! It also helped me to get a better idea of how it might be to work in a lab atmosphere – getting to know people a little and feeling included as part of the lab team.

The early development of floral organs is something which I encountered briefly in my 2nd year course prior to doing the studentship, but which featured strongly in the 3rd year 'Plant and Microbial Biology' course that I chose as one of my two 'major' options. The 'ABC model of floral development', which is integral to the genetics component of the daffodil project, has been highly influential in the study of development in angiosperms (flowering plants). I found it interesting to be able to tie that theoretical aspect of the work into a study involving microscopy, morphology and homology too.

Despite periods of frustration with the low success rate of peeling the bulbs to the necessary standard, there was a real satisfaction to be gained from seeing the gradual improvement in my ability to get it right. I found the work could be very absorbing, and the moments when I got a further glimpse into part of the daffodil trumpet story gave me the drive to keep going, and the desire to find out more.

Unfortunately, I did not get to see the tail end of the process during the course of my five weeks because the development of the flowers turned out to take place later in the year and more slowly than anticipated. Nevertheless, I gained a huge amount from the experience and really enjoyed contributing to some 'real research'. Working on this aspect of morphology in the daffodil family was a really exciting opportunity to apply modern microscopy techniques to a significant question, which it has only been feasible to tackle relatively recently, because of the practical methods required. It enabled me both to consolidate practical skills I've encountered previously – such as dissection and the use of a dissecting microscope – and to learn new ones, such as using the SEM, something I would certainly not otherwise have got the chance to use in my undergraduate course.

I'm very grateful to St Anne's for supporting me with this studentship. I would also like to thank Dr Scotland for kindly allowing me to be involved in this key stage of his project, and for his time and encouragement over the course of the studentship.





## **Appendix**

Here you can find a list of all the past speakers at the St Anne's Lunchtime Discussion Groups, as well as the list of speakers at the Subject Family Events 2008-09.



## Lunchtime Discussion Groups: Past Speakers

### Sciences Discussion Group, 2007-09

#### Dr Luke Alphey

Reader in Genetics, and founder and Chief Scientist at the university biotech spin-out Oxitec Ltd  
*Starting a spin-out company*

#### Robert, Lord May of Oxford OM AC FRS

Chief Scientific Adviser to the UK Government (1995-2000) and President of The Royal Society (2000-2005)  
*Reflections on the changing world of science*

#### Fiona Fox

Director, Science Media Centre  
*Science and the news media: the view from the front line*

#### Professor Lord John Krebs

Principal of Jesus College, Oxford; Chairman of the Food Standards Agency (2000-2005); Chief Executive of the Natural Environment Research Council (1994-1999)  
*Whose risk? Whose choice? Whose health?*

#### Professor Lord Robert Winston

Professor of Science and Society & Emeritus Professor of Fertility Studies, Imperial College London  
*The scientist as citizen*

#### Professor Sir Richard Gardner FRS

Edward Penley Abraham Research Professor of the Royal Society (Department of Zoology), Chair of the Royal Society Working Group on Stem Cells and Cloning and a member of the Scientific and Clinical Advances Group of the Human Fertilization and Embryology Authority  
*Stem cells and regenerative medicine: principles and problems*

#### Dr Sarah E. Thomas

Bodley's Librarian and Director of University Library Services at the University of Oxford  
*New directions in library service in science*

#### Dr Manuel Berdoy

Department of Veterinary Services, University of Oxford  
*The laboratory rat: a natural history*

#### Professor Dame Louise N. Johnson FRS

Molecular Biophysics Laboratory, University of Oxford  
*Women in crystallography: why so many?*

#### Dr Philip Campbell

Editor in Chief of *Nature*  
*Scientific knowledge: facts and frictions*

#### Dr Frank Kelly

Professor of the Mathematics of Systems and Master of Christ's College, University of Cambridge  
*The challenges of road pricing*

#### Hilton Lord

Partner in Marks & Clerks, Patent Attorney  
*Intellectual property*

#### Professor Christl Donnelly

Professor of Statistical Epidemiology, Imperial College London  
*To what extent should public policy be based on science?*

#### Professor David Acheson

Emeritus Fellow of Jesus College, Oxford  
*What's the problem with maths?*

#### Nina Alphey

DPhil Student at St Anne's College, Oxford  
*IdeasLab – a taste of Davos*

#### Dr Simon Benjamin

University of Oxford  
*Harnessing the 'spooky' quantum realm*

#### Professor Paul Fairchild

Co-Director of Oxford Stem Cell Institute, 21<sup>st</sup> Century School  
*Stem cell biology: medical dream or ethical nightmare?*

#### Professor Anthony Monaco

Pro-Vice-Chancellor and Head of the Neurogenetics Laboratory, University of Oxford  
*Genes for walking, genes for talking: discovery in human genetics over 25 years*

#### Professor Malcolm Levitt, FRS

Professor of Physical Chemistry, University of Southampton:  
*Making life difficult for oneself – reflections of an anti-Zionist scientist*

#### Dr Graham Nelson

Mathematician, Poet and Fellow at St Anne's College, Oxford  
*Growing up with television: science on TV, 1945 to 2000, and how it spoke to us*

#### Matt Goode

Deputy Head of External Relations, BBSRC  
*The importance of communicating the outputs of publicly funded research and its impacts*

**Duncan Dallas**

Creator of the Café Scientifique and Producer of  
Science Programmes for TV  
*Bringing science back into culture*

**Professor Angela McLean, FRS**

Co-Director of the Institute for Emerging Infections  
of Humans, Oxford; Senior Research Fellow at All  
Souls College  
*Immunity and evolution of HIV*

**Professor Julian Savulescu**

Director of the Programme on Ethics in the New  
Biosciences; Uehiro Chair in Practical Ethics;  
Director of the Oxford Centre for Neuroethics all at  
the University of Oxford  
*The moral imperative to enhance human beings*

**Arts, Humanities and Social Sciences Discussion Group, 2008-09****Edwina Currie**

Former Conservative Party MP, Junior Health  
Minister, Author and Media Personality  
*The women swing it*

**Alan Leaman**

Chief Executive, Management Consultancies  
Association  
*Management consultancy in the downturn*

**Dr Andrew Stockley**

Senior Tutor and Fellow of Brasenose College,  
Oxford, previously Head of the Law School at the  
University of Canterbury, New Zealand  
*Making elections matter*

**Professor David Williams**

Faculty of Law, University of Auckland  
*History wars – lawyers, historians and their myths*

**Korky Paul**

Award-winning children's book Illustrator  
*Paid to play – making children's books happen*

**Baroness Northover**

Liberal Democrat Spokesperson on International  
Development, House of Lords  
*Do foreign affairs and international development  
matter?*

**Philip Pullman**

Best-selling Author  
*What are stories made of?*

**Dr Andrew Moran**

London Guildhall University  
*The death penalty in the United States*

**Professor Virginia Berridge**

London School of Hygiene & Tropical Medicine,  
London  
*Why do policy makers ignore history?*



## Subject Family Events: Past Speakers, 2008-09

### Wednesday 5<sup>th</sup> November 2008

**Dr Terry O'Shaughnessy**

Tutor in Economics

*Reflections on the current crisis*

**Mr Antonios Tzanakopoulos**

DPhil Student, Law

*State reaction to security council illegal action*

**Professor Carol Sanger**

Columbia University, New York, and Visiting Plumer  
Fellow, Law

*Regulating abortion: the peculiar American  
approach*

### Wednesday 19<sup>th</sup> November 2008

**Mr Khim Heng Lau**

DPhil Student

*NanoSIMS analysis of biological materials*

**Dr Martin Bishop**

Stipendiary Lecturer

*Using computational modelling to combat sudden  
cardiac death*

**Dr Martin Speight**

Fellow and Reader in Zoology, Tutor for Biology

*Habitat associations of coral reef fish – complexity,  
connectivity and catchability*

### Wednesday 25<sup>th</sup> February 2009

Medical Event Special

**Christina Mayer**

DPhil Student

*Malarial proteins: how do they look and what do they do?*

**Vaughan Dutton**

DPhil Student

*Few come out though many go in: fever mortality in  
the Royal Navy anti-slavery squadron*

**Dr Peter Judge**

Stipendiary Lecturer in Biochemistry

*The viral ion channels of HIV-1 and influenza A*

Special Guest External Dinner Speaker:

**Professor Chris Lavy**

Visiting Professor of Orthopaedic Surgery at the  
Nuffield Orthopaedic Centre

*Setting up a hospital and surgical research centre in  
Malawi – the academic, the practical and the  
romantic*

### Wednesday 4<sup>th</sup> March 2009

**Simon Howes**

DPhil Student in the History of Medicine

*Thomas Sydenham: the sceptical galenist*

**Sarah Hegenbart**

DPhil Student in Philosophy

*Does Plato radically reject visual arts? References to  
the epistemological function of arts in Plato's  
dialogues*

**Dr Alberto Behar**

Biegun Warburg JRF, St Anne's College and Centre  
for the Study of African Economies

*What can gravity tell us about Africa's export  
performance?*

### Wednesday 13<sup>th</sup> May 2009

**Dr Jennifer Higgins**

Kathleen Bourne Junior Research Fellow in French

*Repeat after me: French poetry in English and stance  
of the translator*

**Dr Ling Ge**

Recent DPhil Graduate, Department of Materials

*Modelling nano peapods for quantum computing*

**Emefa Amoako**

DPhil Student, Department of Education

A qualitative study of the Ministry of Education-  
donor interactions and their shaping of the  
Education Strategic Plan of Ghana



## STAAR Submissions Guidelines

The activities of the vibrant research community here at St Anne's inspired us to collect a wide range of articles into a multi-disciplinary e-journal. We want to encourage academic debate between the SCR, MCR and JCR, help you build up your research profile, and give others an insight into your work.

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- We are also looking for short reports of up to 500 words\* on prizes or scholarships, research trips, conference papers or seminars.
- The journal is aimed at a broad audience, so please ensure that your article is accessible for non-specialists.
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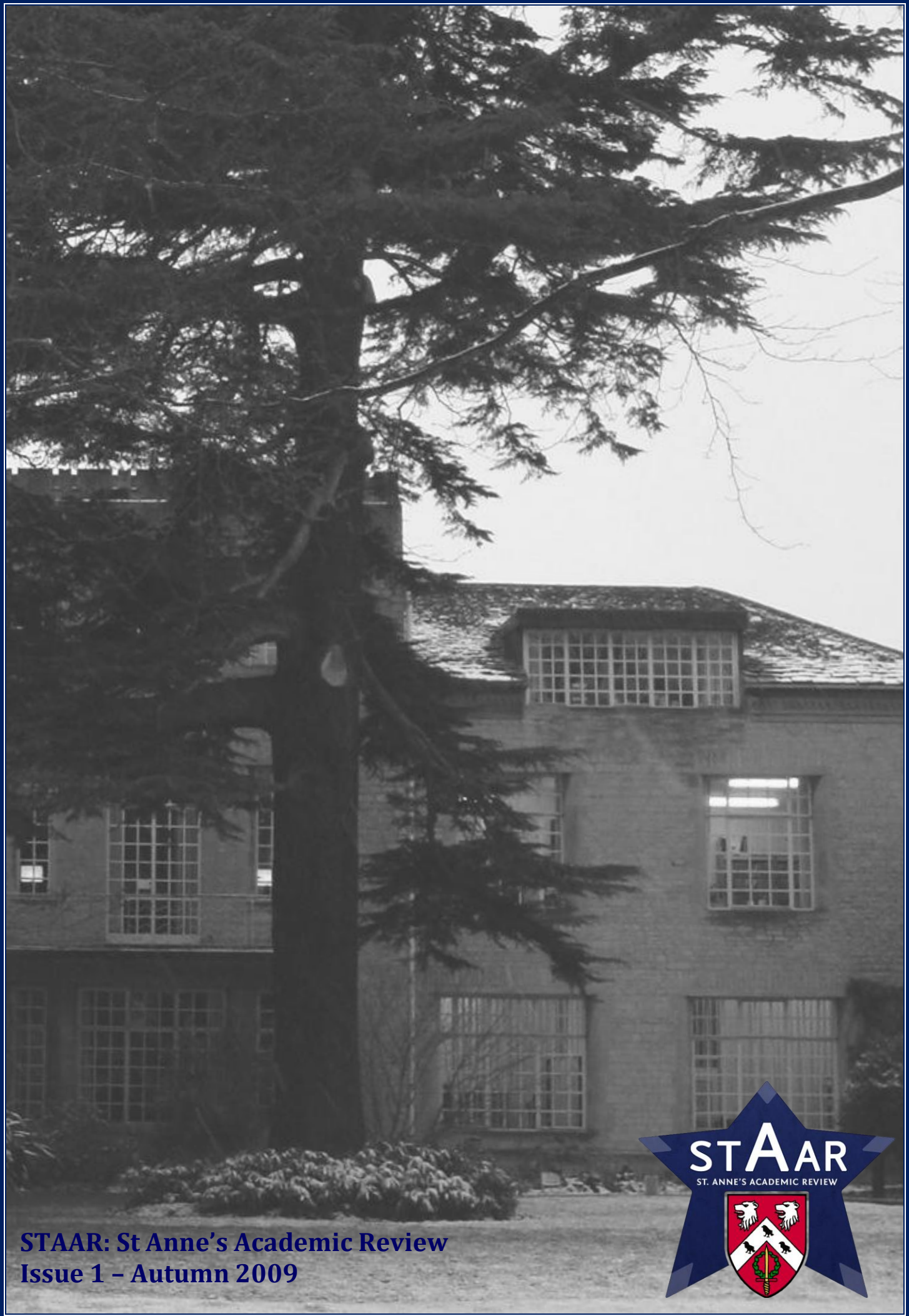
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