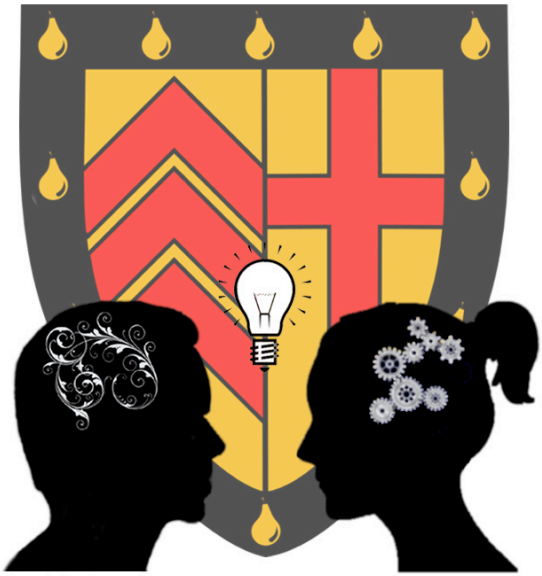
Clare College Research Symposium

14th March 2008, Latimer Room & MCR



Our purpose is that through their study and teaching at the University, they should discover and acquire the precious pearl of learning

- Elizabeth de Burgh, Lady of Clare, 1359

Welcome to the First Annual Clare College Research Symposium

The idea behind this new Clare College venture is to showcase the research activities that occur in the college, from undergraduate, through postgraduate to research associate levels, and to encourage interdisciplinary exchanges of ideas.

We would like to take this opportunity to thank everyone who has helped make this day a success: Patricia Fara for all her help and support, the Master for agreeing to give the keynote speech, Rachael Morris for logistical support, and Anna Tristram, Vicki Russell and Kenrick Turner. Funding for the day was generously provided by the College Research and Scholarship Fund.

With best wishes,

Anne Helme, David Jones and Christoph Teufel
(Organising Committee)

Timetable ~ Morning sessions

09:00 – 09:20 Coffee & Registration

09:20 – 09:30 Opening Remarks

09:30 – 10:50 Session 1 ~ Arts Chair: Dr Terry Moore

09:30 - 09:50 Anna Tristram, PhD Student, Linguistics

09:50 - 10:10 Inga Schowengerdt, PhD Student, Social Psychology

10:10 - 10:30 Vladimir Orlov, PhD Student, Musicology

10:30 - 10:50 Dr Stephen Fennell, CRA, MML

10:50 – 11:10 Coffee Break

11:10 – 12:50 Session 2 ~ Sciences Chair: Dr Phil Jones

11:10 - 11:30 Dean Alexis, PhD Student, Experimental Psychology

11:30 - 11:50 Lee Harper, Part III, Chemistry

11:50 - 12:10 Franziska Lautenschlager, PhD Student, Biophysics

12:10 - 12:30 Dr Giuseppe Lupo, CRA, Medicine

12:30 - 12:50 Melanie Stefan, PhD Student, Molecular Biology

12:50 – 14:00 Lunch

Timetable ~ Afternoon sessions

14:00 – 14:50 Keynote speech – Prof. A J Badger
Introduced by Dr Rodrigo Cacho

"Albert Gore Sr and the Transformation of the Modern American South"

14:50 – 16:10 Session 3 ~ Arts Chair: Prof. Paul Cartledge

14:50 - 15:10 Katyuli Lloyd, Part II, Russian

15:10 - 15:30 Uditi Sen, PhD Student, History

15:30 - 15:50 Charlotte Kingston, Part II, English

15:50 - 16:10 Natasha Goldberg, MPhil,
History & Philosophy of Science

16:10 – 16:30 Coffee Break

16:30 – 18:00 Session 4 ~ Sciences Chair: Dr William Foster

16:30 - 16:50 Chris Bird, PhD Student, Zoology

16:50 - 17:10 Suzannah Wake, Part IIB, Engineering

17:10 - 17:30 Tom Walters, PhD Student,
Physiology, Development & Neuroscience

17:30 - 18:00 Dr Lidia Duncan, CRA, Biology

18:00 – 19:30 Drinks Reception

Session 1 ~ Arts (Chair: Dr Terry Moore)

09:30 – 09:50 Anna Tristram

PhD Student – Linguistics

Variable concord in French and Spanish: An investigation of grammatical and social variation

Variable concord (or agreement) is the alternation between singular and plural agreement. One context in which variable concord is found is where there is a mismatch between the syntactic (or grammatical) and semantic (or notional) properties of a noun or noun phrase. This occurs in English, for example, with collective nouns: E.g. *The government* ***have*** *broken their promises*. Grammatical agreement would require the singular (*has*), but plural agreement is frequently encountered in such cases.

In French, this occurs with quantifying expressions, especially when these are accompanied by a plural noun phrase, e.g. *la* majorité$_{SING}$ *des hommes* ***disent***$_{PL}$. In Spanish, both collective nouns and quantifying expressions show variation, e.g. *la gente*$_{SING}$ ***tienen***$_{PL}$ *ganas de progresar*. Such variation is problematic for theories of agreement, as it implies that in such cases it is not formal but semantic properties that determine agreement. It is also interesting linguistically because a wide range of linguistic factors are involved in determining agreement of this type. My research investigates how these factors interact in determining agreement, and what the implications of this are for theories of agreement and language production.

Such variation is also interesting sociolinguistically, because the choices speakers make when variable agreement is possible reveal the complex relationship between linguistic variables, sociolinguistic variables and normative pressures. My research therefore also investigates how sociolinguistic factors such as age, gender, socio-economic status, education and region interact with the linguistic factors involved in this type of agreement, as well as the prescriptive norms for such constructions. The history of language standardization and the development of the prescriptive (normative) tradition differs quite substantially between France and Spain, and this is therefore an important comparative dimension.

09:50 – 10:10 Inga Schowengerdt

PhD Student – Social and Developmental Psychology

Gender schematicity and gender-role identity in adolescents, and girls' participation in maths and engineering summer programs

Gender schematicity is '*...the internalization of the gender polarization of the culture and readiness to see reality carved naturally into sex and power categories, not as, whether naturally or unnaturally into some other set of categories. It is the imposition of gender-based classification of social reality, of sorting persons, attributes, behaviours and other things on the polarized definitions of masculinity and femininity that prevail in the culture rather than on other dimensions which could serve equally well.*' *(Bem, 1993).*

This paper investigates gender schematicity in a sample of male and female American high school students and a group of girls of the same age who participated in single-sex residential summer programs in the traditionally masculine subjects of maths and engineering. Building on the literature linking gender schematicity to gender-role identity and gender-congruent behavior, this paper will explore whether the reliance on gender-based cognitive schemas is related to the perception of the self in terms of sex-typed attributes and girls' participation in maths and engineering in an extracurricular setting.

10:10 – 10:30 Vladimir Orlov

PhD Student – Musicology

'*Musica Sacra*' of the Soviet State: Cantatas and oratorios by Sergei Prokofiev

Monumental genres like cantata and oratorio had a top position in the hierarchy of Soviet music. "They should propagandize the valuable ideas and heroic images, create the 'portraits' of great people of the past and our modernity, i.e. to perform the certain role in music which Lenin determined for the 'monumental propaganda' by means of sculpture and poetry", as a Soviet official wrote.

After his return to the USSR in 1936, Prokofiev immediately started his work with the most prestigious genre, and he created a number of striking, mammoth oratorios which were received with different degrees of success. These multiple large compositions by Prokofiev represented the whole history of the Soviet political mythology during Stalin's lifetime. Some contained intense dramatic movement, the special avant-gardistic innovations (guns, fires, shouts and outbursts, depictions of live battles). The first, *Cantata for the 20th Anniversary of October Revolution* (1937), Prokofiev dared to write based on the original literary texts by Marks, Engel, Lenin and Stalin. It was immediately banned. The next cantata, *Alexander Nevsky* (1939), which was honoured with success, narrated about the German invasion of Russia in the XIIIth Century, and also contained a vivid scene of battle and astonishing sound experiments.

Some cantatas dedicated to the sacred objects of the Soviet State contained religious motives (such as *Toast to Stalin*, 1939). The different considerations of today's perception of these compositions will be discussed in this talk.

10:30 – 10:50 Dr Stephen Fennell

College Research Associate – Modern & Medieval Languages

The brothers Schlegel and the Bhagavadgita: The ultimate Romance?

This paper charts the history of the fascination which the Bhagavadgita held for the two Schlegel brothers: Friedrich Schlegel, who went to Paris in the early 1800s to study it and other Sanskrit texts available there, and August Wilhelm Schlegel, who made a proper study of the language, became Germany's first Professor of it, and later produced a critically edited and Devanagari-printed Gita with elegant Latin translation in the early 1820s. This paper charts as well the changing faces of what the Germans conceived as Romanticism.

Session 2 ~ Sciences (Chair: Dr Phil Jones)

11:10 – 11:30 Dean Alexis

PhD Student – Experimental Psychology

Animal foresight: Can Western Scrub-jays plan for the future?

It has been proposed in both the arts and the sciences that unlike humans, animals are mentally bound to the present and cannot anticipate the future. Comparative psychologists have formalized this in the Bischof-Köhler hypothesis, which states that animals other than humans cannot plan for needs they do not currently experience. My research has used a species of food storing bird, the Western scrub-jay, to test this hypothesis. The results of this work suggest that scrub-jays use their past experiences to anticipate their future needs, and then take action to meet these needs. This finding merits a rethink of the Bischof-Köhler hypothesis and animal foresight.

11:30 – 11:50 Lee Harper

Part III - Chemistry

Development of an instrument for laboratory studies of atmospheric aerosol particles

Aerosol particles are micron-sized (one millionth of a metre) liquid or solid species that float around in the Earth's atmosphere. They are extremely important and are known to profoundly affect several atmospheric systems. For instance, they are known to provide an offset to global warming from greenhouse gasses, and they have been strongly linked to human health problems in polluted cities.

Unfortunately, the mechanisms and specific composition of aerosols is relatively poorly understood. Hence, there is currently a significant worldwide research effort in this field.

Relatively recently, laboratory methods have become available that allow the trapping of single aerosol particles. These give us the ability to carefully control the environment and composition of aerosols studied.

One such method makes use of electric fields to levitate slightly charged aerosols. An instrument for doing this, known as an electrodynamic balance, was recently constructed in Cambridge, and it has now been calibrated and validated for comparison against other more established methods using atmospherically relevant species.

11:50 – 12:10 Franziska Lautenschlager

PhD Student - Biophysics

Changes in optical deformability during differentiation – A physicist's view of stem cells

Regenerative medicine is a promising approach to finding remedies for many diseases. A prerequisite for successful strategies is the characterising and sorting of suitable stem cells from mixed populations for subsequent transplantation. The most common procedure consists of binding fluorescent antibodies to specific cell-surface proteins and then separating labelled cells by fluorescence-activated cell sorting (FACS).

In contrast, I propose that the identification of stem cells through mechanical rather than molecular characteristics may offer substantial advantages in defining stem cells. As an organism develops, the function of stem cells changes dramatically. Functional changes are reflected by changes in the cell structure, which is also the primary determinant of the mechanical properties of a cell. Thus, differentiation from a stem cell into a more mature cell type can be detected by changes in cell mechanics. I have measured the mechanical properties of cells with an optical stretcher – a device that traps cells between two low-power laser beams, permitting the gentle, contact-free, mechanical analysis of single cells.

12:10 – 12:30 Dr Giuseppe Lupo

College Research Associate - Medicine

The retina as a model system for the study of embryonic development, disease and stem cell biology

Due to its accessibility and its simple, well-defined structure, the retina is an excellent model system for the study of the molecular mechanisms that control development of specific organs and tissues during embryogenesis. At the same time, the retina is an essential structure in visual function and the target of several, currently incurable, blindness-causing diseases, which can be of either genetic (inheritable) or environmental origin.

The structure and organization of the retina is very conserved in all higher organisms from fish to man, meaning that studies performed in animal systems can be used to understand the mechanisms of development and disease in the human retina. By using zebrafish embryos as an experimental system, we have identified molecular pathways that are crucial for the correct formation of the retina and whose inactivation result in defects very close to those observed in some forms of human eye disease. In the first part of this talk, I will present evidence that vitamin A metabolism, in addition to providing photopigments required for adult vision, is also essential for proper eye development in the embryo, and that impaired vitamin A metabolism in fish embryos results in defects strikingly similar to those observed in a human disease known as a coloboma, whose causes are still largely unknown.

The rapid progress made in the field of stem cell biology in the last few years has suggested that one promising therapeutic strategy for the cure of retinal diseases could be the transplantation of functional retinal cells generated from cultured stem cells. Therefore, we recently started a project aimed at generating retinal cells from human embryonic stem cells in well-defined and reproducible culture conditions. The current results from this work will be presented in the second part of the talk.

12:30 – 12:50 Melanie Stefan

PhD Student – Molecular Biology

Models and brains

Computational modelling is becoming an increasingly important tool in systems biology. I will first provide a general introduction into concepts and approaches of modelling, and then talk about how these can be applied to a specific problem: Understanding the molecular basis of learning and memory.

Keynote Speech

Professor A J Badger – Master, Clare College

- *introduced by Dr Rodrigo Cacho*

Albert Gore Sr and the transformation of the modern American South

The Master will be presenting some of the research from his forthcoming biography of Albert Gore Sr.

Session 3 ~ Arts (Chair: Prof. Paul Cartledge)

14:50 – 15:10 Katyuli Lloyd

Part II – Russian (MML)

Cocaine in Russian literary culture 1910-25: A critical discussion

There is a deficit of work into the role which cocaine played in Russian literary culture at the beginning of the 20th Century. Cocaine histories for Russia in this period are likewise scarce, particularly in English, for the most part due to a lack of statistics. However, as several literary texts from the first quarter of the 20th Century would lead us to believe, cocaine did indeed play a significant role in Russia and Russian literary culture around the 1917 Revolution. I propose to look at evidence of cocaine in literary texts, set during or written between 1910-25. My texts include the works and memoirs of songwriters, poets, émigré authors and novelists.

By way of these texts I shall explore whether cocaine was being used as a metaphor for the 1917 Revolution. I shall ask if cocaine was used as a literary device to suggest political, geographic as well as social transition, whether cocaine was a means of characterization and whether it can be attached to a particular stereotype. I shall ask whether it was symbolic of a new world. I shall enquire into whether cocaine was a stabilizing factor in the short term: if it represented a way of suppressing the 'daily grind' and thus describes the political and social environment in the context of 'быт' (everyday life). Or indeed whether cocaine contributed to the political and social chaos. Here I shall look into the long-term effects and consequences of cocaine abuse. Finally, whatever the more wide-ranging questions might be, an appreciation of cocaine as a phenomenon at this time can assist ones understanding of literary texts of the period.

In my conclusion I shall try to evaluate what intentions the authors may have had when incorporating cocaine themes and images into their works and to what extent the 1917 Revolution can be said to be the cocaine 'high' of early 20th Century Russia.

15:10 – 15:30 Uditi Sen
PhD Student - History

The citizen-refugees of post-colonial India: Complicating agency and victimhood

My research deals with refugees who came into India from Pakistan in the aftermath of the decolonisation and partition of the British colony in India in 1947. As no less than 15 million were uprooted from their homes and forced to flee for safety to the 'right side' of new international borders, the nascent state of India was forced to innovate a regime of rehabilitation even before it could write its constitution. The partition refugees of India stand apart from contemporary European refugees as citizenship was guaranteed to most refugees. In this paper, I will explore interactions between the Indian state and its citizen-refugees. I will try to challenge the common characterisation of refugees as victims by focusing on refugee agency in rebuilding their lives.

A majority of the partition refugees in India did not rely on the state for rehabilitation. Many chose to settle themselves by squatting on empty land. Many more manipulated the benefits available to them through creative, often not entirely legal means to extract maximum benefit from the state. Refugee associations proliferated and pressurised the state to grant greater benefits. There was also a political radicalisation of refugees in Bengal leading to a veritable refugee movement. I will conclude my paper by focussing on how these myriad engagements between the refugees and the Indian state at the moment of its birth, left an indelible mark on the body-politic and social milieu of India.

15:30 – 15:50 Charlotte Kingston

Part II - English

Vernacular Vitae: What Adam and Eve did next in Middle English

The story of Adam and Eve has fascinated, concerned and puzzled readers and listeners from its inception. One concern is the frustrating brevity with which the first sin is treated in Genesis 3 that has, understandably, generated much curiosity. The two Middle English poems I have selected to discuss derive from the vast tradition of the apocryphal Adambook – a story that loosely describes what Adam and Eve did after their exile from Eden. This source is not stable; it manifests itself in hundreds of texts across Europe and the Middle East, and reverberates into the many Western vernaculars of the medieval period. The poems I have chosen to talk about are unique among English reworkings of the Adambook because they are written in verse.

I shall describe how the poems, at one level, are interesting for the way in which they expand Genesis, and how they might be located among other literal-historical explanatory works with biblical content, such as the Mystery Play cycles. In addition, I shall attempt to establish the poems as independent literary works, as something more than an aid to comprehension for a medieval layman. I wish to explore the sophistication of these texts in their engagements with themes crucial to the Fall, most importantly, death and writing.

15:50 – 16:10 Natasha Goldberg

MPhil – History and Philosphy of Science

Is the Universe 'finely-tuned' for life?

Cosmologists claim that the universe is 'finely-tuned' for life (i.e. that even tiny alterations in its basic parameters would have made life's evolution impossible). This claim has unleashed a storm of philosophical controversy. Some advance the 'fine-tuning argument' as the strongest weapon in the 21st Century theist's armoury. Others cite it as evidence for a multiverse. But are we really sure that the evidence warrants such grandiose explanations? In fact, does the so-called 'fine-tuning' actually 'cry out for explanation' at all?

Session 4 ~ Sciences (Chair: Dr William Foster)

16:30 – 16:50 Chris Bird

PhD Student – Zoology

What do birds expect? Using the expectancy violation paradigm with rooks (Corvus frugilegus)

Developing children learn rules about their environment and form expectations about what should happen. For example, gravity causes an unsupported object to fall down or a ball to roll down a slope rather than up it. We are surprised when we see something impossible happen! One way in which we can find out what pre-lingual children or animals understand about the world is to measure their surprise when presented with an impossible event. These experiments are called expectancy violation experiments or preferential looking time experiments, as we can use looking time as a measure of surprise.

A number of experiments with humans have confirmed that babies look for longer at an unexpected or impossible event than a likely or possible one. For example, babies look for longer at a barrier passing through a solid object. Scientists have also shown that chimpanzees look for longer at an impossible event such as a floating banana compared to a banana properly supported on a bench. My study is the first to use this technique with birds to investigate what they understand about the world, using a novel looking-hole technique to accurately tell where the bird is looking and how long they look for.

Birds, like chimpanzees and humans, seem to look for longer at an impossible event, and appear to perceive the impossibility of an object floating in mid-air, or rolling up a hill. This suggests a folk physical understanding of contact and gravity. In a further study the birds have shown an ability to perceive the impossibility of an object being inappropriately supported, looking for longer at an object contacting the side of a surface rather than resting on the top. There may also be dissociation between perceptual knowledge and action systems, as the birds often fail to take into account such physical rules when having to make an active choice for a food reward.

16:50 – 17:10 Suzannah Wake
Part IIB - Engineering

Like smoke on water: The linking of vortex rings

Vortex rings traditionally conjure up images of men in black and white films blowing smoke rings, but they can be found elsewhere as well. Dolphins blow vortex rings for swimming through - just for fun, and they are also used in some direct engineering applications. Cavitated rings have been used in underwater drilling, and there has been a proposal to use them in the fighting of oil well fires. They can easily be observed by allowing a drop of milk to fall off your spoon and into your tea – surface tension providing energy for the rotational motion.

Vortex rings are often used in science for the understanding of fluid motion, as they are fairly robust and easy to generate and analyse. A current field of research into the source of noise within turbulence includes the pressure fluctuations produced when vortex rings merge.

In 1992 a simulation suggested that it may be possible to link two vortex rings together, but until now no experimental work has been done to back this up. The aim of my project is to test this hypothesis. In this talk I will present some preliminary results, and hopefully convince you of just how fascinating vortex rings are!

17:10 – 17:30 Tom Walters

PhD Student – Physiology, Development and Neuroscience

Making computers hear like humans: Auditory features for sound search

The human auditory system is an amazingly complex signal-processing system. We can listen to something while ignoring noise and we can deal with million-fold differences in sound level. We can also understand speech from all sorts of human voices. That might sound easy, but when a child and an adult say the same thing, for example, the actual sounds they produce are very different - the pitch of their voices will be different, and so will the size of their vocal tracts. This makes a big difference to the sound they make, but it's something that the auditory system apparently copes with effortlessly.

In our lab, the Centre for the Neural Basis of Hearing, we are developing a computational model of aspects of the human auditory system, called the Auditory Image Model (AIM). This model attempts to replicate some of the processing which we think makes the auditory system robust to changes in pitch and size. We have now started to use AIM as the first stage in a speech recognition system, to provide 'features' from sounds which can be given to a standard recogniser.

In this talk, I will demonstrate what a 5 metre tall castrato (probably) sounds like, how AIM works, and how a computational model of the auditory system might be useful in the real world.

17:30 – 18:00 Dr Lidia Duncan

College Research Associate - Biology & Medicine

From bench to boardroom; From a PhD in molecular immunology to a University spin-out company

Lidia is a postdoctoral Molecular Immunologist at the University's Department of Medicine and Managing Director of the Cambridge University spin-out company, The British Stem Cell Registry.

More and more innovative research students and staff realise that an aspect of their work may also provide a solution to an industrial, medical or social need and thus represents a business opportunity. The University has a number of programmes to support budding entrepreneurs. These programmes include a combination of teaching sessions by seasoned entrepreneurs, personal mentoring, networking, pitching sessions for investors, legal advice on intellectual property and much more. The aim is to help develop innovative ideas and thus improve the prospects of new businesses. The British Stem Cell Registry thanks its existence today to the fertile entrepreneurial environment that is cultivated between the University and the Cambridge business community.

Lidia will recollect how a concept to provide transplantation-quality stem cells for future use in regenerative medicine grew into a business model and a registered company – all with continual support from an array of University organisations, such as the student-run Cambridge University Entrepreneurs Society or the Judge Institute's Centre for Entrepreneurial Learning.

Notes: