

*Galtonia candicans*

# The Galton Institute

## NEWSLETTER

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### The Galton Institute

**Annual Conference  
October 1<sup>st</sup>, 2009**

**William Bateson:  
His exceptions and Origin of  
Species Revisited**

The 45<sup>th</sup> Annual Conference of the Galton Institute was held on 1<sup>st</sup> October, 2009 at The Royal Society and was entitled *William Bateson: His exceptions and origin of species revisited*. This is a short report of the proceedings of the day.

**Professor Donald Forsdyke** started with the report of 1902 to The Royal Society where Bateson promulgated the Mendelian view of inheritance. Bateson's report intensified the fierce debate between the biometricians, led by Karl Pearson, and the Mendelians. The lecturer then considered Bateson's contribution to speciation theory and suggested from the work of George Romanes, that reproductive isolation would need to precede Natural Selection for species to evolve. Darwin considered Natural Selection as the prime factor in speciation. Professor Forsdyke then discussed the Darwin lecture given by Bateson in 1909 and gave his own original and provocative views on the cause of hybrid sterility. He took the case of the union of horse with ass to produce the sterile mule. He believed that DNA sequences have an 'accent', rather like the different accents in speech, so that eventually the DNA

from species destined to diverge could not pair with each other at meiosis. He believed this 'accent' resided in the percent differences in G-C content of the genome of horse and ass. A later speaker contested this view of hybrid sterility; that it may be more due to gene sequences coding for ligand-receptor interactions, enzymes, transport proteins etc being sufficiently different between horse and ass, particularly with regard to gonadal development, that leads to hybrid sterility.

**Professor Sir Walter Bodmer** started from the problem that Darwin's ideas on the mechanism of inheritance were inconsistent with his theory of evolution by Natural Selection. Mendel's paper of 1866 had a well developed set of algebraic expressions accounting for his hybridization and segregation data producing a type of variation that Natural Selection could work on. Mendel's work was taken up by G E Hardy (1908) who proposed that Mendelian variants in a random mating population without other interfering factors would reach equilibrium in one generation. This later led to test for the Hardy-Weinberg equilibrium in population genetics. R A Fisher, a founding father of population genetics (together with Haldane and Sewell Wright), demonstrated how blending inheritance could be explained by the inheritance of a few Mendelian factors working together. Bateson appeared to lack the mathematical abilities to appreciate Fisher's contribution to the controversy of the Biometricians versus the Mendelians. Fisher also proposed the use of linkage studies for the prognosis of hereditary ailments in a paper as early as 1935; this was the dawn of the use of polymorphic gene markers to attempt to

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trace 'disease' alleles. The subject started with the use of the ABO blood groups, then moved to the HLA system, and latterly to the use of DNA polymorphisms. The early success of linking HLA B27 to ankylosing spondylitis with an Odds Ratio of 158 was a great stimulus to the field. Solomon and Bodmer made the very interesting suggestion in the *Lancet* (1979) that the newly described DNA polymorphisms have the potential to cover the whole genome and so detect any of the genes involved in the inheritance of disease – a prediction that has come true. The lecture ended by noting that very rare variants have been detected by a straight forward Mendelian analysis, and common variants by association with DNA polymorphisms, so that it was now time to identify variants of frequency between very rare and common that may have a large impact on disease expression. Sir Walter illustrated this with a histogram of the Odds Ratios of the genetic components of Type 1 Diabetes showing the HLA system having the greatest impact, then variation of the insulin gene, grading down to the right hand tail of genes that are common but with a minor impact. Variants lying between the two clusters now need to be identified.

**Professor Gabriel Dover** enlarged on one of Bateson's ideas that variation comprised not only in the structure of material but also in the arrangement or 'motion' or 'harmonics' of the material. This led to Professor Dover's views on epistasis of being two types: 1. genetic interaction fixed by evolutionary processes i.e. co-adaptation; or 2. liberating interactions or combinatorial flexibility. Professor Dover pointed out that there were many non-Mendelian interactions of DNA leading to flexibility such as unequal crossing-over, gene conversion, slippage, copy number variation, imprinting etc. He then went on to describe various combinatorial regulatory networks using the mathematics of topology. In the simplest terms a single gene can interact with a variety of networks (pleiotropy); or different genes can interact with a single network (epistasis).

Professor Dover considers these networks to be the equivalent of Bateson's 'motions' and 'harmonics'. During ontogeny individuals have to construct their own networks anew. A theory of evolution also requires theory of molecular interactions (epistasis). He then gave one practical example that this reviewer did not fully understand, so an interested reader should refer directly to Professor Dover's publications.

**Professor Sir David Baulcombe** opened his Galton Lecture 2009 by showing how the study of plants has benefited our understanding of the basic structure and genetics of all living organisms. Beginning with van Leeuwenhoek's microscopic studies of plants, showing that they are made up of cells, to Mendel's discoveries of particulate genetics in the garden pea, to Barbara McClintock's discovery of transposons in maize and to the infection of plants by viruses such as the tobacco mosaic virus. Studies of the latter have led to the discovery of a unique mechanism of resistance to viral infection in plants. This involves the plant genome making an antisense RNA to target the sense RNA of the infecting virus and so neutralising it. It is a type of 'immune' mechanism whereby the plant gets specificity from the invading virus to make a small double-stranded antisense RNA. This is cleaved by dicer enzymes to single strands for combination with the invading viral RNA.

There are about 5000 genes in the plant genome that make small RNAs not only as a defence mechanism but also to regulate gene expression and integrate gene function in epistatic interactions. Some siRNAs may operate at the level of DNA promoters either to switch on or off gene transcription. There is also evidence for uniparental expression of siRNAs, for example the maternal genome can suppress the paternal genome. Professor Baulcombe then showed how this work in plants has been extended to non-Mendelian types of inheritance in the mouse.

**Professor Timothy Cox** first listed the

major contributions that Bateson had made. Bateson's large book on *Materials for the Study of Variation* was published in 1894, that is six years before the re-discovery of Mendel and the importance of discrete variation was recognised. Bateson strongly promoted Mendel's views on inheritance in British academic circles and applied it to human disease through a suggestion he made to A E Garrod. Bateson later put forward the idea of linkage (which he called gametic coupling). He coined the term epistasis where two or more genes interact. He also coined the terms homeosis and meristic variation where he considered there to be a 'master' locus affecting bodily structures and repetitive elements in development, giving examples such as polydactyly.

Professor Cox then went on to elaborate each of these concepts. He gave a very lucid and helpful account of the inborn errors of metabolism that Garrod first described, and noted that more than 2,000 'single-gene defects' have been documented. He then gave examples of epistasis, taking as one example amongst others, a single mutation at the cystic fibrosis locus giving rise to five different phenotypes depending on the interaction with 'background' genes at other loci. He then went on to a detailed account of homeotic mutations. The Hox genes regulate developmental events and were first described in *Drosophila* where mutations cause gross bodily defects such as bithorax and antennapedia – as first shown in Bateson's early work, *Materials for the Study of Variation* (1894). He gave many examples in humans such as mutations in the Hox d13 genes cause polydactyly. He then dealt with the intracellular signalling pathways involving the Hedgehog proteins which act as morphogens and require sterols for their full functional activity. They direct embryonic development into different body parts and are conserved from flies to humans. Sonic Hedgehog is the one most studied in mammals and is active critically during early human development. Disruption of the pathway in humans can produce grotesque mal-

formations of the skull and brain, such as holoprosencephaly – an extreme example of which was cyclopia. The final part of this lecture emphasised the relationship between Science and Medicine exemplified by Bateson's dictum: 'Treasure your Exceptions'. Not only did Garrod and Bateson show how science and medicine interacted reciprocally in the cause of advancement through discovery but also how both illuminated our understanding of biological phenomena in the context of evolutionary theory. Through this prism, Garrod was able to consider chemical individuality as a reflection of variation and disease, not as an analogy of the 'broken machine', but as an evolutionary maladaptation of certain humans to their particular environment.

The final talk was by **Professor Peter Holland**. The theme of homeosis was taken up again in relation to evolution. He began with some early work by Bateson on the classification in the animal kingdom of the worm-like animal *Balanoglossus*. The adult has gill slits and so could be related to the fishes; however its larvae more resembled the larvae of echinoderms. Bateson was the first to show it was a chordate and therefore related to the fishes. Bateson was rather dismissive of his own morphological work; and wanted to branch out into something newer than animal classification. Believing that discontinuous varia-

tion was the substrate for Natural Selection he assembled a vast array of all the discrete variants he could find to publish in his book *Materials for the Study of Variation*.

Bateson invented the word homeosis to indicate a new sort of variation, not just a single change, but a change in a whole set of structures. For example a leg of a butterfly could be transformed into a wing; an eye of a lobster may become an antenna. Some error has occurred in development and although these changes are too drastic to be of much use for the evolution of species, they may help us to understand the process of evolution of species via the homeotic (Hox) genes. The Hox genes in *Drosophila* have been mapped as clusters on several chromosomes. They mainly code for transcription factors and determine such bodily characteristics as the position of head and tail of the fly, its right or left sides, of its upper or lower surfaces. If there were minor changes in these Hox genes it could produce minor changes in bodily structures and perhaps lead to variation that Natural Selection could work on.

As an example, a comparison has been made of the Hox gene clusters between amphioxus and the mouse. Surprisingly some of the Hox genes present in amphioxus have been lost from the mouse genome whereas the reverse might have been expected. However, the mouse has

acquired new Hox genes, possibly by gene duplication, perhaps in its need for a more complex body plan than amphioxus. Comparing Hox genes between species like this gives insight into the genetic basis of the evolutionary differences in body structures. These data fit in very well with an early quotation from Bateson's book *Materials for the Study of Variation*: 'If facts of the old kind will not help, let us seek for facts of a new kind'; as Bateson undoubtedly did during his life-time.

**Reported by: David J Galton**, Emeritus Professor at the Wolfson Institute of Preventive Medicine, St Bartholomew's Hospital Medical College as well as a trustee of The Galton Institute.

### **Programme**

**Professor Donald Forsdyke**

*Bateson's Contributions to Evolutionary Theory*

**Professor Sir Walter Bodmer**

*Quantitative Genetics and Variation*

**Professor Gabriel Dover**

*Epistasis and the Co-evolution of Genetic Networks*

**The Galton Lecture**

**Professor Sir David Baulcombe**

*How Nature Influences Nature*

**Professor Timothy Cox**

*Bateson and Medicine*

**Professor Peter Holland**

*Homeosis and Evolution*

## **British Society for Population Studies Annual Conference 2009**

The 2009 BSPS Annual Conference was held at the University of Sussex from 9-11 September and was again very well attended, with over 190 participants over the course of the three days. In addition to the three plenary sessions from invited speakers, Professor John Cleland, Professor Ron Lesthaeghe, and Professor Nyovani Madise, there were two special sessions honouring the work of the late John Hajnal.

The first plenary was given by Professor John Cleland of the London School

of Hygiene and Tropical Medicine which addressed 'Reproductive Change in Sub-Saharan Africa: Cause for Concern'. The plenary set out how Africa is different from the rest of the world as the demographic transition has abated rather than accelerated there. This is of course of grave concern for the prospects of development within the region and also because of the growing threat of climate change. Climatic stability is dependent upon the absolute population size and sustained high fertility clearly will result in a larger future global population.

Professor Cleland described three sets of indicators for measurement of the potential for fertility decline; whether the populace was ready, willing and/or

able. The first set of indicators looking at being 'ready' for fertility decline considered the demand for delaying and reducing family size. 'Willingness' considers the approval of family planning methods, intentions to use such methods and whether there had been discussion of using contraceptives within the household. Finally 'ability' examines whether individuals are knowledgeable about specific family planning methods and if they knew of a source from where to obtain them. Macro level results from Demographic Health Survey data was then presented for 13 west African and 11 eastern and southern countries. These results clearly highlighted that there is a growing divide between western Africa and the rest of the region. Particular barriers in west Africa are the attitudes to-

wards family size limitation and inadequate access to contraceptive *material*. In light of this the current UN forecasts for fertility decline in the western African region may well be highly optimistic.

Professor Cleland concluded that for both policy makers and academics there has perhaps been too much focus in recent years on reproductive health, at the expense of explicitly reducing fertility. He highlighted that for Niger there had been more meetings looking at sexuality and old age than at fertility. High fertility needs to be viewed as a problem in its own right, and it was argued that opinion was swinging back towards this viewpoint. One reason for the divergence of western Africa maybe its colonial legacy. As these countries are largely Francophone, cultural diffusion of reproductive norms is possibly somewhat harder than elsewhere. Similarly, French international donors have not seemed to be as supportive of family planning programmes as other international agencies. It was noted that the environmental case for fertility limitation was not limited to climate change. At the micro level, population pressure can act as a powerful causal factor in local environmental degradation. As a final point, it was acknowledged that there is an inter-correlation between the three sets of indicators and it is important to consider fertility demand as very much a latent concept.

An excellent second plenary was delivered by Professor Ron Lesthaeghe of the Belgian Academy of Sciences on 'The American spatial pattern of the Second Demographic Transition and the Presidential Elections'. Professor Lesthaeghe first summarised the theoretical background of the concept of the Second Demographic Transition, and examined previous work on linking demographic and political behaviour. The earliest work of this type was carried out by Julius Wolf in early twentieth century Germany. Subsequently Massimo Livi Bacci had shown strong associations between geographical variations in the timing of the first demographic transition in Italy and voting on divorce considerably later. Otherwise, apart from the recent work of Professor Lesthaeghe and his collabora-

tors, the field had subsequently been little explored. Professor Lesthaeghe then turned to geography of Second Demographic Transition behaviours in the contemporary USA population and illustrated the wide divergences between the North Eastern seaboard at one end of the spectrum to Utah at the other. In previous analyses of state and county variations in summary factor scores of these behaviours, Professor Lesthaeghe and colleagues had demonstrated that these variations were strongly associated with voting behaviour in the 1994 US Presidential elections. In this plenary he presented new results showing continuing, or indeed even stronger associations in the most recent US presidential election. Strong loadings on second demographic type behaviours at state or county level were strongly negatively associated with voting for Bush, or later McCain, even after control for a range of structural and other characteristics. The only one of these which changed the strength of the association in any substantial way was religion. In his conclusion Professor Lesthaeghe noted that these results, in conjunction with other research, illustrated the importance of lifestyle and attitudes and values in shaping demographic behaviour. Time for questions was restricted but lively debates on the lecture continued less formally over lunch and coffee breaks.

The final day of the conference began with a very thought provoking plenary address by **Professor Nyovani Madise** (University of Southampton) titled 'Lives hanging in the balance: motherhood in Africa'.

### **Maternal Mortality Matters**

Nyovani began her presentation by relating some of the phrases and terms she had heard during her childhood in Malawi which refer to the state of pregnancy. Terms like 'in between' referring to being in a state between life and death, reveal how pregnancy is seen as a considerably risky time and a pregnancy is not celebrated until it concludes with a safe live birth. She then went on to outline some key statistics to demonstrate why maternal mortality matters. These highlighted that among the Millennium De-

velopment Goals, Goal 5 to improve maternal health is the area where the least progress has been made. Also made clear were the regional disparities in progress in maternal health with sub-Saharan Africa being the area where the problems remain greatest. The maternal mortality ratio for sub-Saharan Africa as a whole was estimated at 940 deaths per 100,000 live births in 1990 and this decreased only slightly in the 15 years to 2005 to 920 per 100,000.

### **What are the Issues?**

Nyovani then discussed some of the key issues in sub-Saharan Africa contributing to the high maternal mortality rates. She stated that the biggest challenge was access to healthcare, especially for rural and urban slum populations. Another problem is the quality of the care that is available. She noted that it is often the case that services such as clinics and health personal that exist 'on paper', for example in a DHS, in reality often do not live up to the quality of services they are assumed to be providing. Unmet need for contraception also has a key role in maternal mortality with women being exposed to risk from unwanted pregnancies. Nyovani also presented data showing a significant correlation between percentage of births attended by a skilled attendant and maternal mortality ratio. Other less direct factors in maternal mortality are socio-economic indicators such as GDP, lack of investment in female education and gender inequality.

### **Strategies with Limited Success**

The presentation went on to introduce some of the interventions to improve maternal health in sub-Saharan Africa which have been met with limited levels of success. The two main strategies discussed were antenatal risk screening and traditional birth attendants. Nyovani defined some of the individual risk factors of maternal mortality as being maternal age, parity, spacing of births and wantedness of pregnancy. However she went on to explain that antenatal risk screening is not always an effective strategy due to the unpredictable nature of many deaths. She illustrated this point with data on leading causes of maternal deaths which include unpredictable causes such as

bleeding and obstructed labour. The training of Traditional Birth Attendants has also been ineffective in reducing mortality rates primarily due to quality of care issues and the lack of a supporting referral system and the associated infrastructure for when complications arise.

### What is working?

Having discussed the strategies with limited success Nyovani then went on to talk about what is working to improve maternal health. This includes:

- i) Strategies following the principle of a continuum of care, beginning at home and following through to a healthcare facility
- ii) The use of skilled professionals as birth attendants
- iii) Strong health systems and an established referral system, which uses traditional birth attendants to provide referrals rather than to attend deliveries
- iv) Access to safe abortion

Finally Nyovani highlighted the need for good data in order to accurately measure maternal mortality and monitor progress, and she cautioned against over reliance on hospital data.

The presentation was followed by some questions from the audience. One question raised the issue of caesarean section and whether or not this could play a role in reducing maternal mortality in Africa. Nyovani responded that she did believe that lack of access to caesarean sections was a significant problem. She noted that access to this type of service was highly uneven and in rural areas women are dying for lack of access to this level of care. She also pointed out that an aspect of this problem is the challenge of employing and retaining skilled and qualified health personnel in rural areas.

### John Hajnal sessions:

The list of presenters at the sessions to celebrate the life and work of John Hajnal say much for his impact on the world of demography (and beyond), and also the high respect in which he was held.

In their presentations, Richard Smith,

Tony Wrigley, Ron Lesthaeghe, Maire Ni Bhrolchain, Mike Murphy and Chris Langford all recognised the quiet and considered influence of John across a vast range of demographic and statistical fields.

In two seminal articles (1965, 1982), John had described the distinctive marriage pattern evident in North West Europe - relatively high ages at first marriage, relatively high proportions of the population not marrying. He also hypothesised why and when the pattern developed. In this first presentation Richard Smith focused on these articles and on John's insight on the importance of understanding marriage patterns. Richard also highlighted John's habit of continually questioning his ideas (and the ideas of anyone and everyone else!). Indeed, the development of his work on marriage patterns between his original paper in 1965 and the 1982 paper is a clear example of this trait.

Much of what Tony Wrigley discussed in the second session came out of John's 1982 paper. Focussing on average household size, Tony spoke of the relationship between the economy, household size and marriage patterns from the Early Modern Period until the Industrial Revolution and the move from sexual maturity as a control of marriage to economics as a control of marriage.

Consideration of economic control of marriage was taken onwards by Professor Lesthaeghe. Using evidence from Flanders and Brabant 1450 – 1789, along with a lovely selection of artwork, Ron described how moral controls were used to bring about economic controls in marriage during times of economic downturn.

Maire Ni Bhrolchain progressed from marriage to fertility. Citing three main pieces of John's work in this field (a study of birth statistics in the first edition of *Population Studies* in 1947, *The Royal Commission on Population 1944-48*, a study of fertility and reproduction for Millbank in 1959) Maire explained how observations made by John more than 60 years ago are still relevant in the study of fertility today. The debate on which

measure of fertility is most appropriate to use in population projections is as active today as it was when John raised the issue in 1947. In addition to John's work on fertility, Maire emphasised how we might all learn a great deal from the considered way in which John handled limited data.

Professor Murphy described John Hajnal's role in changing how population projections were carried out. He described how John was pivotal in the move from logistic growth models to cohort component models. The longevity of John's insight was demonstrated yet again, as Mike noted how John's observations on the population projections are as manifestly relevant today as they were when he made them in the 1950s.

In the final session Chris Langford concentrated on John's work for the Royal Commission on Population. Chris described how John's input into this immense piece of analysis was incredible not only because of the lack of technology, but also because John was just 19 years old when he joined the commission.

These sessions were very personal. They emphasised the positive impact of John Hajnal on both the demographic world and on the individual lives of those of us who knew him.

In addition to the invited sessions, 106 contributed papers were also presented in strand sessions spread over the course of the Conference. The abstracts for all papers can be found on the BSPS website at [www.bsps.org.uk](http://www.bsps.org.uk) together with some of the presentations themselves, accessible via the hyperlink in the title of the abstract.

Thanks to Paul Mathews, Emily Grundy, Claire Bailey and Briony Epstein for their reports of the plenary and Hajnal sessions.

**BSPS** would like to take this opportunity to thank **The Galton Institute** for their generous financial support for the Annual Conference.

## The Origins of Percussive Technology: A Smashing Time in Cambridge

On the 18<sup>th</sup> October 2008 the Leverhulme Centre for Human Evolutionary Studies (LCHES), University of Cambridge, hosted a one-day symposium on 'The Origins of Percussive Technology'. This was the second in a series of annual LCHES *Palaeoanthropology Meets Primatology* meetings, which began in 2007 as a means of connecting researchers working on issues in human evolution who otherwise might rarely meet. The symposium brought together an international, multi-disciplinary group of speakers specializing in analysis of the earliest archaeological stone tools and the use of stone by chimpanzees and capuchins. The event was sponsored by the **Galton Institute**, the Roberts Fund (University of Cambridge), King's College, Cambridge and the National Science Foundation (Revealing Hominid Origins Initiative).

### Non-human primate models

The earliest known hominin technology is typified by unstandardized stone cores and flakes, which have led to its being interchangeably referred to as a 'pebble tool' or 'core tool' culture. Known as the Oldowan after its initial discovery at Olduvai Gorge, this technology has been found at sites dating from 2.6 million years ago<sup>1</sup>. No undisputed artifacts have been recovered from older deposits, but many archeologists hypothesize the existence of a 'pre-Oldowan' based on hominin morphology, comparative primatology and the relative complexity of early flaking strategies<sup>2</sup>.

But how does one go about searching for a hypothetical product in a material record? The comparative approach provides a valuable starting point. Chimpanzees (*Pan* sp.) and more recently capuchin monkeys (*Cebus* sp.) have been used in an often *ad hoc* manner to

model aspects of the percussive technology of early hominins. Proposed similarities between *Pan* nut-cracking site-assemblages and the material culture of Plio-Pleistocene hominins, together with recent reports of wild *Cebus* nut-cracking pounding tools<sup>3</sup> have initiated a debate between archaeologists and primatologists. Re-examination of percussion tools from Oldowan assemblages further suggests that pounding tools played a more important role than was previously thought in the development of the first hominin lithic industries<sup>4</sup>.

This research has led not only to claims that the pounding activities of non-human primates provide a valuable proxy for gauging the potential functions of early hominin stone tools, but also that the stone assemblages produced are similar to reputed hominin pounding tools with respect to typology and technology. Although such claims are open to variable interpretation, this developing field clearly emphasizes the need for extensive interspecies comparisons of percussive technologies and a focus upon the *intentionality* of behaviours of tool production. Despite the potential benefits of such a comparison, however, cross-communication between paleoanthropologists and primatologists on this issue remains limited. The LCHES symposium provided an important bridge across this gap through a series of intriguing and thought-provoking talks.

### First principles: the elements of percussion

Several presentations focused on the need for clarity in our understanding of the factors underlying percussive action, and for critical consideration of the validity of drawing parallels between extinct hominin and extant primates. William McGrew (Cambridge) began the day with a comprehensive introduction to the various forms of percussion, ranging from the use of stone hammers for pounding foods to the precise use of a billiards cue. The role of internal (bodily) and external (environmental) constraints was highlighted by Hélène Roche (Nanterre, France) in her discussion of key differences between simple

percussion and the skilled stone knapping evidenced at some early Oldowan localities. Ignacio de la Torre (London) continued this theme, stressing that there are fundamental apples-with-oranges problems with regard to comparisons of chimpanzee anvil use and intentional hard-hammer lithic reduction as seen in the initial archaeological record. Dietrich Stout (London) provided a fresh perspective on the evolutionary neurology of lithic reduction, pointing out key links between percussive actions and language production.

### Primate lithics: monkeys, apes and hominins

A second theme running through the symposium was the application of archaeological practice to the study of non-human primate stone tools. Julio Mercader (Calgary), one of the pioneers of the emerging discipline of chimpanzee archaeology, stressed the need for comparable methods of data collection among researchers dealing with early archaeological and present day primate stone assemblages. Susana Carvalho (Cambridge) presented recent work indicating that chimpanzees re-use the same pair of stones when nut-cracking, amplifying use-wear and increasing the likelihood of detaching flakes. Tetsuro Matsuzawa (Kyoto) demonstrated a free on-line database of video footage from experiments both in the field at Bossou, Guinea, and in the laboratory. Chimpanzees are not of course the only primates that use stone percussion. Elisabetta Visalberghi (Rome) presented the latest results on field experiments testing the capacity of capuchin monkeys to select hammer tools on the basis of functional features, such as size and weight.

### A testing time: actualistic studies of percussive technology

One methodological thread woven throughout the day was the use of experimental research to provide clues to the form and function of the earliest percussive technologies. Andrew Du, April DeStefano and Jack Harris (Rutgers) used data generated from the experimental manufacture of digging sticks and the

processing of meats and nuts to suggest that otherwise unmodified Plio-Pleistocene cobbles may retain diagnostic wear patterns. This work was supported by Bruce Hardy (Kenyon), who demonstrated the long-term survival of residues on archaeological tools and, importantly, showed that pounding certain foods was adaptive in that it reduced toxicity and increased nutritional value. From a different perspective, Michael Petraglia (Cambridge) argued that while the use of chimpanzees and capuchins as models may be beneficial in many respects, it may also be constraining our view of the early hominin technological record. He presented evidence that nonpounding percussive activities such as throwing may provide diagnostic features beyond conchoidal fracture that could aid in the recognition of pre-Oldowan sites.

#### Future directions

Proceedings concluded with an insightful synthesis of the day's main themes by Robert Foley (Cambridge), followed by a focused workshop amongst the speakers. The workshop played a central role in ensuring that the symposium's advertisement stressing cross-collaboration was more than mere rhetoric. Overall, both the presenters and the international audience recognized the value of applying archaeo-

logical methods of data collection to primate research, as well as the necessity of broadening the range of primate behavior considered in the interpretation of early archaeological assemblages. The results of such endeavors should provide significant guidance for ongoing research into early percussive technology.

The 2008 *Palaeoanthropology Meets Primatology* meeting was successful in its aim of advancing our understanding of the origins of early hominin technology. The symposium also demonstrated the critical place of focused face-to-face discussion between researchers working in disparate disciplines, which often produces unexpected outcomes and breakthroughs that are rarely achievable through literature synthesis alone. The emphasis on cooperative advancement of the field seen at this symposium augurs well for future work in this area.

Further information regarding the Leverhulme Centre of Human Evolutionary Studies can be found at <http://www.human-evol.cam.ac.uk/>.

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**Victoria Ling, Adriana Hernandez-Aguilar, Michael Haslam and Susana Carvalho** - Leverhulme Centre for Human Evolutionary Studies

**The Galton Institute** helped support this symposium with a grant of £1,000.

## The Darwinian Renaissance in the Humanities and Social Sciences

Held November 2009 at Queen Mary University of London and supported by a grant from The Galton Institute

The purpose of this one-day conference, held at Queen Mary University of London and supported by the Galton Institute (along with the School of Biological and Chemical Sciences, Queen Mary University of London, and the European Human Behaviour and Evolution Association), was to discuss and debate the rise of Darwinian thinking in the humanities and social sciences. This was spurred by the fact that for several

decades the humanities and social sciences (or HSS) have adopted certain epistemological perspectives which actively eschew scientific and especially biological understanding. In so doing they have forsaken a theoretical framework (evolution) that provides coherence, breadth and depth to the understanding of human behaviour. On the other hand, and in spite of this history of ideological criticism, what might be termed the Human Evolutionary Behavioural Sciences (HEBS) have flourished. In this meeting we showcased new and exciting work from within HEBS as applied to the traditional humanities and social sciences, and examined where efforts should be focused in the future. Seven speakers and one keynote, all of whom are young researchers in their fields, gave talks from a range of disciplinary backgrounds to an audience

of 70 delegates. The talks concerned the application of evolutionary theory in a range of fields including anthropology, demography, politics, culture, archaeology, psychology, and development.

The conference began with three talks on the application of evolutionary principles to our understanding of cultural transmission with specific examples, such as those from archeology and social psychology (Alex Mesoudi, Alex Bentley and Stephen Lycett). The next talk took on a core concern in psychology – mate choice – and demonstrated how we can successfully use sexual selection theory to illuminate this (Ian Penton-Voak). Subsequent talks focused on the state-of-the-art in evolutionary anthropology (Mhairi Gibson) and evolutionary demography (Rebecca Sear).

These talks also provided an important historical and social context to how academic disciplines might hope to develop within a Darwinian framework and within the UK university system (for example, delegates were shown how this has begun to bear fruit in the field of demography). The main series of talks ended with an analysis of how global security concerns, a central topic in politics, could demonstrably benefit from models of evolutionary change (Dominic Johnson)

A keynote address was given by Daniel Nettle on the necessity of thinking about human behaviour and affairs in a "Tinbergian" sense. This talk also provided healthy and important cautionary notes for scholars within HEBS and HSS. This was followed by a "question time" session with a panel comprising all the speakers which resulted in active debate around the core topics of the meeting. A wine reception at the end of the evening resulted in even further discussion.

In sum, these talks provided a thought-provoking range of responses to the title of the conference, and will no doubt stimulate further debate. We are currently in discussions to organize a special issue of the *Journal of Evolutionary Psychology*, to which speakers at the event will be invited to contribute manuscripts.

**Qazi Rahman**

(Queen Mary, University of London)

**Tom Dickins,**

(University of East London)

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## Why Aren't the Social Sciences Darwinian?

Held May 2009 at University of Cambridge and supported by a grant from The Galton Institute

Why aren't the social sciences Darwinian? While Darwin's theory of evolution has permeated through the biological sciences during the last 150 years since the publication of *The Origin of Species*, the various branches of the social sciences - social anthropology, archaeology, sociology, psychology, economics, linguistics - have generally resisted evolutionary explanations of human behaviour, cognition, culture and society. The aim of this conference, held at the Leverhulme Centre for Human Evolutionary Studies, University of Cambridge and supported by the **Galton Institute** (along with the Centre for Research in the Arts, Social Sciences and Humanities and the Mellon Foundation), was to explore possible answers to this question. Twenty speakers from a range of disciplinary backgrounds gave talks to an audience of almost 100 attendees, with talks ranging from historical and philosophical analyses to presentations of cutting edge contemporary research in the evolutionary social sciences.

The conference began with a keynote address by Michael Tomasello (Max Planck Institute), who gave an excellent overview of how evolutionary principles can illuminate aspects of human development, behaviour, cognition, language and culture. There then followed two days of talks that took a range of perspectives. Invaluable historical analyses were provided by Jamie Tehrani (University of Durham) on social anthropology, Geoffrey Hodgson (University of Hertfordshire) on economics and Felix Riede (University of Aarhus) on archaeology, while Raymond Corbey (Leiden University) and John van Wyhe (University of Cambridge) gave philosophical and historical perspectives on the traditional divide between the social and natural sciences.

Other talks presented state-of-the-art overviews of current evolutionary social science research: Robert Foley (University of Cambridge) on genetics and paleo-anthropology, Stephen Levinson (Max Planck Institute) and Simon Kirby (University of Edinburgh) on evolutionary linguistics, Alex Mesoudi (Queen Mary, University of London) on cultural evolution, Lewis Wolpert (University College London) on the evolutionary roots of supernatural beliefs, Gillian Bentley (University of Durham) on health and medical-related research, David S. Wilson (Binghamton University) on educational programmes and

public policy, William Brown (Brunel University) on evolutionary aesthetics, Tim Lewens (University of Cambridge) on history, Robin Dunbar (University of Oxford) on human behaviour, and Robert Layton (University of Durham) on co-evolution and anthropology. Important notes of caution were expressed by Tom Dickins (University of East London) and Daniel Nettle (University of Newcastle), while Ruth Mace and George Perry (University College London) presented findings from a survey of attitudes towards evolution amongst social science students.

Collectively, these talks provided an illuminating and thought-provoking range of responses to the title question of the conference, and will no doubt stimulate further debate in the future. The conference has also generated a forthcoming special issue of the *Journal of Evolutionary Psychology*, to which speakers at the event will contribute papers. My co-organisers (Robert Foley, Michael Lamb and Djuke Velduis) and I would like to thank all of the attendees, speakers and helpers who contributed to making this such a successful event.

**Alex Mesoudi**

(Queen Mary University of London)



# Fertility declines in the past, present and future: what we don't know and what we need to know

University of Cambridge  
15-17<sup>th</sup> July 2009

Report of the British  
Society for Population Studies  
and Max Planck Institute for  
Demographic Research workshop

The aim of this meeting was to gather an inter-disciplinary and international group of researchers to discuss what is known about fertility decline, what remains unknown, and how might the unknown become known and better understood. Speakers, discussants and participants were chosen to span the different 'strands' of fertility decline research, historical, contemporary developed and contemporary developing, and the different disciplines working on this problem, including demographers, economists, evolutionary biologists and anthropologists. The workshop was attended by 60 active researchers in the field of fertility research, who listened to 17 papers; 9 discussants added their comments to the proceedings.

The organisers, Eilidh Garrett, Rebecca Sear and Mikolaj Szoltysek would like to extend their grateful thanks to the sponsors of this meeting, the *British Society for Population Studies*, Joshua Goldstein and the *Max Planck Institute for Demographic Research*, the *Cambridge Group for the History of Population and Social Structure* and the *Galton Institute*; to Anne Shepherd, Alison Harvey and Brigit Moeller for their invaluable administrative support; and to Richard Smith for hosting the conference in the Department of Geography, University of Cambridge.

By way of introduction **Mikolaj**

**Szoltysek** set out the reasons why he believed a more reasoned theoretical structure was necessary for fertility declines past, present and future, in effect the *raison d'être* of the conference. The key debate, that would run throughout the following presentations and discussions was established here; whether there is greater utility in academic endeavour working towards a general theory and framework within which all fertility declines can be located, or in rejecting this approach to focus more on detailed specific declines with their own unique sub-narratives.

**Dirk van de Kaa** opened the first session with his paper on 'Demographic transitions'. He made two key arguments. First, there does not appear to have been just a single demographic 'revolution.' Indeed the phrase 'revolution' is misleading, implying a transition from one period of stability and equilibrium to another. Fertility change is perhaps best seen as a continual process of change, within which there have been two fairly discrete components: the First Demographic Transition (FDT) and the Second Demographic Transition (SDT). Secondly, he argued that it is necessary to maintain an overarching demographic perspective so that if research focuses just on the middle-range demographic processes of fertility, mortality or migration, this may well produce a misleading picture.

**Simon Szreter's** paper on 'Questions, questions, questions! The expanding universe of research on fertility declines' argued that a broad theoretical framework was not needed. It further argued that a general theory of fertility has been a 'teleological drug' with substantial intellectual opportunity costs. Instead of searching for a general theory, research should be conducted acknowledging the three principles of the historical method: i) difference, both within the past and between the past and the present ii) context and iii) process. Whilst data has been most easily collected at the level of national and sub-national administrative units, Szreter considered 'communication communities' to be more important

social units. In the discussion which followed it was noted that one reason a teleological general theory has been so 'addictive' to researchers is that the audience for their arguments is often comprised of policy makers and a more simplistic overview resonates well within an action-oriented policy world. However, arguments were set out that whilst there always remains some variance at the different stages of the fertility transition broadly there is still a transition between high and low fertility states so some generalisation remains possible.

**Bob Woods**, as discussant of Szreter's paper, noted that an important consideration was that the debate on holding a general theory does not reflect an epistemological crisis and should be seen as a sign of strength of the discipline. He reiterated scepticism that the SDT is of equivalent magnitude to the FDT and argued that the term 'transition' may become devalued if it is used in the former context as, while the plausibility of the changes wrought during the FDT being reversed remains extremely improbable, the same cannot be said of the changes associated with the SDT, such as below replacement fertility.

**Sebastian Klüsener** began the second session by presenting a paper co-authored with Joshua Goldstein entitled 'Culture strikes back: a geographic analysis of fertility decline in Prussia'. This presentation suggested that the basic conflict concerning a general theory of fertility decline has been between cultural diffusionists and economists. From a geographical perspective the cultural diffusion explanation of changes in fertility behaviour across space seems to be more effective. The authors had used a panel model in combination with Ordinary Least Squares approaches, to look at changes in variables, rather than at absolute values, taking their data from historic Prussia. The results broadly supported the cultural diffusion hypothesis, indicating that hotspots of decline in regional centres led the transition to lower fertility, with slower rates of change occurring in peripheral rural and Catholic administrative units.

In the question and answer session which followed an analogy was drawn between the cultural diffusionist view of changing fertility and an incoming tide. This highlighted, first, the underlying difficulty of measuring the broader 'tide' from observations of individual waves and, second, the difficulty of explaining the underlying causal process from simple observations at the surface level. A particular problem for those wishing to use a cultural diffusion model is the lack of acceptable data. While economic variables, which can be more robustly measured, can be controlled, a potentially major assumption may be made that the unobserved residuals can simply be attributed to cultural processes. For example it was noted that in the UK fertility change spread out in a similar fashion from both London and Lancashire, yet there were significant differences in the process and context between the two areas.

**Neil Cummins** and **Greg Clarke** then jointly presented their work 'Malthus to modernity: England's first fertility transition, 1760-1800'. From a historical perspective, they argued, there were two main events: the industrial revolution and the demographic transition, but the interaction between the two has perhaps not been sufficiently appreciated to date. Using data collected from 7,000 historic wills in south eastern England, it was noted that prior to 1770 those with greater assets had higher fertility but afterwards the fertility advantage of the rich was lost and there was a systematic reduction of the fertility of the richer strata of society. The timing of the change suggests the influence of factors associated with the industrial revolution. However further analysis of this data, to establish what drove the decline in the fertility of the rich, has proven to be inconclusive with regards to income, child survival and quality / quantity trade-off hypotheses.

As this session's discussant, **Stephan Warg** highlighted that changes in both cultural and economic domains would be important as innovation of cultural values would in part be determined by the socio-economic context. The difference be-

tween cultural and economic theories of fertility decline may be seen from the perspective of individual innovation or adaptation. The suddenness of the changes around 1800 might suggest that the cultural response to the economic changes occurring at that time was actually influenced by the intellectual ideas of Malthus. Evidence of the dissemination of his theories suggests, however, that this is actually extremely unlikely to have been the case.

The second day of the conference was opened by a joint presentation from **Frans van Poppel** and **David Reher**. They discussed recent analyses of historic demographic trends in Spain and the Netherlands during the 19<sup>th</sup> and 20<sup>th</sup> century. Using linked reproductive histories from both regions, fertility trends were analysed at the individual rather than at the aggregate population level. The role of child survival as a stimulus for reproductive change, the use of stopping and spacing strategies to achieve reproductive goals, and the timing of change were all discussed. Most importantly, these analyses demonstrated strong evidence for replacement fertility, with child deaths associated with an elevated likelihood of later births. In this light, fertility limitation is seen as strategy to protect families from the effects of increases in child survival. Following the presentation of these analyses, Reher provided further discussion of the implications of this research for demographic transition theory; arguing for the central importance of mortality declines as a precursor to fertility reduction and the persistence of small desired family size throughout European history.

Their discussant, **Chris Wilson**, praised the use of longitudinal micro-data in the comparative analysis of Spanish and Dutch fertility trends. He noted a general agreement with their interpretations, and reinforced the call for further research linking childhood mortality to individual fertility patterns in historical demography. It was also stressed that future studies should strive to test competing hypotheses for the precursor of fertility decline with the same data – ar-

guing that the central importance of any factor ultimately can only rest upon the exclusion of rival hypotheses. Wider discussion considered the need for demography to move beyond its focus on central tendencies in population data and into the study of the intra-population diversity in fertility histories.

The late morning session focused on evolutionary approaches to fertility with presentations from **Lesley Newson** and **Ruth Mace**. Both provided a brief overview of evolutionary models of human behavioural diversity with specific regard to variation in human reproductive strategies. It was argued that the rich theoretical nature of this literature has much to offer population scientists focusing on fertility trends, whether their focus is historical, contemporary developing or contemporary developed populations. Newson then outlined the 'kin-influence hypothesis' for demographic transition; arguing that fertility decline is set in motion by the dissolution of extended-kin networks associated with modernisation, leading to a gradual erosion of pro-natal norms in favour of alternative social rewards. Evidence from role-play experiments were used to support this model; showing that individuals playing the role of friends rather than kin were less likely to offer favourable advice about reproduction. Ruth Mace then provided an empirical test of the influence of kin on the decision to use contraception in rural Gambia. In this case, fertility histories indicate that contraception is used primarily as a tool to schedule births, rather than to reduce the chance of conception. When controlling for individual socio-demographic factors, there was little evidence that kin directly influence contraceptive uptake, either by their absence/presence or by acting as models for social learning.

Discussion of these papers was led by **Sarah Walters**. She further underlined the potential for evolutionary models of fertility to contribute new theories and methodologies to the study of demographic transition. In particular, the non-teleological and broad comparative study of fertility patterns adopted by this ap-

proach was commended. Walters then outlined the need to tie together the 'big narratives' of demographic transition, such as the kin-influence hypothesis, with the intricate 'sub-plots' of regional fertility trends, which in extreme cases can eclipse the anticipated effects of local social or economic shifts. Wider debate focused on the utility of evolutionary models and how they should be integrated with traditional demographic perspectives.

Sessions five and six of the conference moved further into the worlds of contemporary changes in fertility and the ideas that underpin our understanding of it. **Christine Oppong** started proceedings with a paper entitled "Parental Perceptions of Child Costs". Based on her extensive ethnographic studies in Ghana in the 1960s and 1970s, Oppong proposed that the behaviour in fertility control displayed by educated subgroups might be regarded as innovative, particularly when such behaviour is situated within its gendered context and given the desire of parents to provide the best for any future children. From a more methodological perspective, she argued that multi-method, small scale studies could be partly constitutive of a broader way of understanding family planning and fertility choices amongst couples, stressing the parallels with Simon Szreter's much-mentioned "communication communities". **Ian Timaeus'** contribution continued the theoretical thrust of the session, taking particular issue with the popular classification of signs of fertility transition into stopping and spacing behaviour. His suggestion was that we think rather of "postponement", as a means of understanding the flexibility of couples' intentions as well as the unpredictability with which circumstances can change. Far from being a mere matter of semantics, such an amendment to the concept of 'spacing' provided a real means of understanding fertility decline.

Both papers met with a broadly appreciative response, and the discussant, **Tim Dyson**, was keen to highlight a point both presenters had made: that the African experience of fertility was distinctly dif-

ferent, and that scholars of this subject would benefit from the overt reintroduction of the ideas of Jack Goody into their work. Dyson's comments proved as provocative as the papers in some regards, sparking an intriguing discussion about the relationship of mortality decline to the fertility transition and the extent to which England and Wales fitted the pattern of a mortality fall preceding a decline in fertility.

Session six saw **Geoffrey McNicoll** and **Arland Thornton** take up the challenge of the conference title in somewhat differing manners. McNicoll was keen to highlight the links between policy and the encouragement of the fertility transition in developing countries. He identified four "legacies" of these efforts. These were: the responsiveness of the family unit, the organisation of communities at a local level, agency (in particular the relative power of women within institutional arrangements), and the actions of governments and authorities. He regarded these as common to fertility transitions globally, achieved in much of the developing world through already-prevalent institutional and cultural entities. Thornton also assessed the global nature of aspects of the fertility transition, with regard to the spread of developmental idealism. This was defined as a certain worldview, akin to the Fukayaman notion of western liberal democracies having reached the end of history, via a path which other nations would inevitably follow. This made it possible to look elsewhere in the world and see how Europe used to be, a process of "reading history sideways". Such an ideological position comes with certain ethical problems, but Thornton chose to highlight how widespread certain values associated with fertility and modernity were in a geographically and economically disparate selection of nations, drawing from his surveys the conclusion that such changes were viewed as positive by respondents. The discussant **Laura Bernardi** took up a number of these themes of complex change, and the way in which community transmits change, calling also for a consideration of migration from high fertility areas to those where fertility

is now low, and the policy implications that such a population movement would entail.

The final day of the conference was opened by **Maire Ni Bhrolchain**, whose presentation was on 'Time and measurement in explaining fertility change.' The pretext for this paper was, she argued, that we (demographers) lack any systematic treatment of time despite its centrality to demographic processes. As demographers we are concerned with establishing causality and this is something that we are not able to do unless we establish a start date for a particular phenomenon. The example cited was that of the baby boom, but there are other numerous examples, such as when did fertility transition begin in any particular country? There is then the question of how we should view demographic change – an approach viewing change as continuous might very well yield different results to a more episodic approach. A successful explanation of any fertility trend requires a proper delineation of fertility in time and also indicators designed to measure fertility as the dependant variable.

The second paper of the session on 'Where have all the children gone?', presented by **Mike Murphy**, called into question the validity of survey data. The thrust of this paper was the discovery that in the General Household Survey (GHS) childlessness appeared to be being reported incorrectly. The problem Mike found was that the proportion of women who reported being childless increased as their cohort increased in age. The conclusion Mike came to was that the explanation had to be the conscious concealment of adult children perhaps due to estrangement or boredom with the length of the survey. The implication of this is not good for the use of survey data. If there is a problem with the reporting of fertility then it is hard to be confident in the responses given to more complicated questions.

The discussant **Jan Hoem** commented on Maire's paper by suggesting that as demographers we should attempt to get at what we are actually looking at and not

adjust measures designed for other purposes, and that using individual level data and running hazard regression models is a useful approach; in doing this, he pointed out, it is also possible to contrast cohort and calendar time. He then questioned whether the implication of Mike's findings could be that we should stop using survey data entirely, but asked what would be left if we were to give up on survey data. The answer given was that registers alone would be left and thus everyone would be forced to analyse Scandinavian countries. Mike's response was that he was trying to draw attention to the problems with survey data in order that they might be solved. He said that histories must be validated, but they are still absolutely indispensable.

Tomas Sobotka followed with a paper on 'Is the only way down? Many factors behind contemporary very low fertility are likely to be temporary' in the final session. He argued that there is still a very strong desire for children and that lowest low fertility is far from inevitable. In fact many factors are now likely to increase fertility and the empirical floor may have been reached in the year 2000. As evidence for his optimism Tomas pointed out that the number of people living in a country with a Total Fertility Rate lower than 1.3 has been going down since 2000 after a year on year increase from zero since 1990. The explanation for this, he argued, is a combination of good economic conditions, immigration from high fertility countries and targeted policy interventions.

**Paul Demeny**, in discussing this paper, said that everyone is already convinced that lowest low fertility is not inevitable. However, "not being inevitable" is not enough to prevent something from occurring in reality. He remarked that the European welfare states are already over-extended and in trouble. They will have to make drastic cutbacks soon. Paul argued that the personal answer to this crisis would seem to be the accumulation of assets and not having children.

The final paper of the conference was a joint presentation by **Stuart Basten** and

**David Coleman** on 'The future of reproduction: an interdisciplinary challenge'. They began by outlining the problems demographers face when trying to predict future fertility trends such as the high levels of divergence, increasing levels of childlessness and the decline of the larger family. An important question then identified was "Why we bother to have children at all?". In the modern developed world it seems to be a mark of material irrationality to have any children. Several possible explanations for continued child-bearing (despite its apparent irrationality) were mooted. There seems to be a biological need to nurture and motherhood appears to be instinctive. These possibilities generated many questions: 'Will people stop having children?' 'Are men actually necessary?' 'Is the desire for children fundamental?' 'Is one child enough?' 'Who will be the parents of tomorrow?' Basten and Coleman argued that such questions need to be addressed and although they are the type of questions which cannot be answered via traditional demographic forms of enquiry.

To end the conference **Paul Demeny**, in line with David Coleman's suggestion that we need to think 'outside the box', came up with some unusual possibilities. First, he suggested that parenthood could be turned into a profession. Then, in relation to solving the economic problems associated with low fertility he proposed that it might be possible to link pension schemes to fertility or (even more bizarrely) that the value of a person's vote could be related to life expectancy and that this could be calculated to take children borne into account as well. A further suggestion he offered was that, instead of assuming immigrants would take low skilled, poorly paid jobs, national service could be reintroduced with dispensation only being offered under extraordinary circumstances; such as having a baby.

The organisers would like to end with a vote of thanks to all speakers, discussants, chairs and participants for their varied and highly stimulating contributions. Their hopes for the meeting of bringing a diverse group of people together to en-

gender cross-disciplinary discussion and cross-fertilisation of ideas were certainly fulfilled.

**Report contributors:**

**Melanie Frost, Eilidh Garrett, David Lawson, Paul Mathews, Rebecca Sear and Catherine Sumnall**

**BSPS would also like to take this opportunity to again thank The Galton Institute for their generous financial support for the Annual Conference.**

**Richard Allen Soloway  
1934 - 2009**

Galton lecturer, 1997, distinguished historian of the British eugenics movement, Richard Allen Soloway, Eugen Merzbacher Distinguished Professor of History, University of North Carolina, Chapel Hill, died in May 2009 of metastatic melanoma. He produced two definitive works on *Birth control and the population question in England, 1877-1930* (1982) and *Demography and degeneration: eugenics and the declining birthrate in twentieth-century Britain* (1990), and several important articles. Of recent years his conscientious discharge of his responsibilities as Dean of the College of Arts and Sciences at Chapel Hill regrettably curtailed his research activities, to which he had hoped to return on retirement.

**Lesley Hall  
Wellcome Library**

**The Galton Institute** is compiling a database of members' email addresses in order to inform members more efficiently of news and events at the Institute. The information will not be shared with any other organisation. Please let the General Secretary have a note of your e-address at: [betty.nixon@talk21.com](mailto:betty.nixon@talk21.com)

Thank you.