



# Downing College MCR Seminar Night

Wednesday 12<sup>th</sup> November, 6pm @ West Lodge



## Synthetic Biology: Making Biology Easier to Engineer

*James Brown (jrb62@cam.ac.uk), Haseloff Lab., Cellular Development, Department of Plant Sciences*

Since the 1980's, technologies such as recombinant DNA, the PCR reaction and DNA sequencing have facilitated the genetic engineering of biological systems. Unfortunately, these technologies, while liberating, have restricted genetic engineering to the introduction of a limited number of gene products that directly, or indirectly confer benefit to a transgenic system. Attempts to engineer biological systems in a rational context have ultimately been restricted by biological complexity, reliability and time.

For some years, scientists such as Tom Knight at MIT have realised that genes might be fashioned as modular building blocks for general-purpose use as genetic logic elements, and that the impending collision between new technologies for design and assembly of genetic systems will provide opportunities for a fundamental rethink in our approach to biology and its application.

Synthetic Biology is the discipline that has resulted from this collision of new enabling technologies. Thus, recombinant DNA and improved DNA synthesis techniques provide the means of assembling new genetic systems, and computational approaches borrowed from systems biology provide tools for the design and modelling of artificial biological circuits. In addition however, the shift from analysis of naturally evolved biological systems to the construction of synthetic systems requires the recruitment of engineering principles to biology. For the first time, it is possible to consider the rational engineering of biological systems.

Basic research on electronic phenomena and solid-state physics has given rise to new fields and entire industries devoted to microelectronics, optics and software development which dwarf their origins. One might expect a similar shift in biological research as Synthetic Biology begins to offer improved rational design and reprogramming of biological systems. If so, synthetic biology will contribute to future improvements in the microbial, plant and animal cell engineering that are clearly needed for the renewable technologies of the 21st century.

This talk will outline how basic engineering principles can be applied to biological systems, introduce the notion of BioBricks and the Registry of Standard Biological Parts, as well as highlighting examples of fundamental research within Synthetic Biology and the international Genetically Engineered Machine (iGEM) Competition, specifically our work here in Cambridge.

## Perceptions of Extremism - the Social Psychology of Deciding What is Extreme

*Shahzad Shafiqat (ss797@cam.ac.uk)*

This research investigated the notion of extremism from the perspective of social science, instead of addressing it from the conventional political or theological standpoint. Considering the psycho-social connotations of extremism can provide a better understanding into how this issue can be understood and dealt with. It was conjectured that individuals consider the phenomenon of extremism as menacing only when there is a factor of 'threat' involved. Two sequential studies were carried out to measure what constitutes people's perception of others as 'extremists'. The sample though was not colossal in number, yet was spread across six continents, allowing for a wholesome view on the study area. After viewing the video of a person who was describing a religious induction, the respondents were asked to describe their opinion about the person through standardized personality tests. The video was preceded by four different background stories about the religious group; each participant was introduced to only one version of the stories while a fifth control group had no background story. The manipulations in the stories revolved around the stimuli of extremism and threat both inclusively and exclusively. The findings of the studies provide credible psychological impetus for understanding how people perceive extremism, while highlighting certain psycho-social variables within this paradigm. The results help in providing ground-work for creating interventions and management strategies to address the issue of extremism constructively. The findings are also critical to furthering our understanding of the psycho-social differences between extremism and terrorism, and the diverse countering mechanisms that should result as a consequence of this difference.

## AIDS, RNA and Translation

*Harriet Groom (hctg2@cam.ac.uk)*

Human immunodeficiency virus type-1 (HIV-1) is the causative agent of the majority of cases of acquired immunodeficiency syndrome (AIDS). It is estimated that in 2007 33 million people were living with HIV infection and 2 million people died of AIDS. 25 years of research have gleaned a number of therapeutics but we are still far from a cure or vaccine and many scientists are heralding a back to the bench approach. In my PhD I am using a basic scientific approach to learn more about how the virus replicates. I will discuss how the virus regulates part of its life cycle: decoding of its genetic material to produce proteins or 'translation'. I will show that the viral protein Rev is important for regulating viral translation, a role distinct from its more well-known function. This new role is dependent on the presence of a small loop in the untranslated region of the viral RNA. I will finish by discussing how this information can help lead to therapeutics and hopefully with some pretty pictures!