



**Girton Hammond Science
Communication Prize 2023**

IMBALANCE

Monday 27th February 2023
8pm, the Stanley Library

Abstracts

1. Emily Birt

Gordon Holmes Syndrome: A Life Out of Balance

Gordon Holmes Syndrome and its related disorders are characterised by an unusual set of symptoms: ataxia and hypogonadotropism. Patients demonstrate difficulty eliciting movement, maintaining balance and display delayed puberty with low sex steroid levels (oestrogen, testosterone, and progesterone). Patients with this disorder live out of balance in both their external and internal world. First described in 1908 by Gordon Holmes, a forerunner in cerebellar research and discovery, the aetiology behind this rare syndrome has eluded discovery until recent years. However, the advent of new techniques has enabled the identification of a possible common mechanism which provides the link between issues observed in the reproductive system and the motor coordination system. The body is meant to be balanced; homeostasis is a central tenet of physiology. Gordon Holmes Syndrome and related disorders are evidence of how finely this balance is set, and hence, how wide reaching issues can occur with relatively minute alterations to the norm.

2. Joe Bray

Art as technique: rehumanising migration through language, not statistics.

This talk is based on the assertion that immigration is necessary for a balanced, just world. Because of this, to say that an individual is bound to one place by birth causes unjust imbalance. This unjustness is particularly pertinent as an ongoing climate crisis risks mass displacement. Despite this, migration has succumbed to soundbites and populist rhetoric, which states: this land is *my* land, not yours. Opponents of strict border control have used statistics and media to challenge this philosophy. Yet, my talk argues that populist rhetoric creates a hermeneutic circle and imbalance that has dehumanised 'the migrant'. This power imbalance means that when, for example, British Media details over 2,000 'small boat crossings', the figures become about abstraction instead of individual stories of estrangement. The talk argues we can counter abstraction by turning to contemporary Scottish writer Ali Smith, to consider how literature can engage and confront injustice in populist rhetoric. It argues that art creates *defamiliarization*, a term coined by literary theorist Schvloskly, and that literature can change how we see contemporary issues. It observes the techniques Smith uses, which include using novel perspective, slowness, and the interaction of different narrative voices. Ultimately, this talk proposes that rethinking how we talk about migration must happen at the level of words. This allows a restructuring of debate, through art as a technique, which is increasingly vital to a just world; ultimately, justice and symbiosis must be achieved through language, not statistics.

3. Vlad Filip

Radiation in Global Warming: Balancing the Albedo tightrope

Global warming is the result of anthropogenic CO₂ imbalances in the atmosphere, leading to ocean levels rising, Arctic ice melting and biodiversity loss. It disrupts entire global ecosystems, weakening the resilience of natural carbon sinks, consequently, setting in motion a domino effect with irreversible consequences.

How does global warming occur? Incident solar radiation is absorbed by Earth's surface transferring heat from the Sun, substantially, giving our planet the essential resource to maintain life — light. Some part of the incident radiation is reflected into space, a ratio called the Earth's natural Albedo. With this understanding, a global temperature average can be calculated from a straightforward radiative energy equation, computing to about -18°C. Now, this surprisingly low estimation neglected the Earth's atmosphere which enhances heat absorption, consequently, raising the average to habitable conditions. Hence, the natural heating effect of the atmosphere is vital to life on Earth.

However, we have now tipped this balance in the direction of global warming. Anthropogenic emissions have reached an estimated 1.5 trillion CO₂ tons, enhancing atmospheric absorptivity. This has a recursive effect. Take the Arctic ice melting, consequently, a loss of a highly reflective natural surface, decreasing the Earth's Albedo further, and contributing to more global warming.

So how do we re-balance the Albedo tightrope? We can stop emitting greenhouse gases by transitioning to renewables and nuclear. We can resort to geoengineering to block the incoming radiation and increase Earth's Albedo – e.g., cloud brightening. Whatever we do, we need caution and adaptability because we do not want to experience the consequences of falling off the tightrope.

4. Rookmini Mukhopadhyay

“Starvation in the midst of plenty” – how diabetes mellitus sends the body’s metabolism spiralling into imbalance

A healthy, hungry individual eats a banana. Soon after, glucose is released into their bloodstream. Their body tackles this minor imbalance using a powerful regulatory tool – insulin – which allocates the influx of energy either for use or storage.

However, what happens if this tool fails, and the banana is no longer a source of nourishment, but the herald of chaos? This is true in diabetes type 1, where insulin is not produced, and in type 2, where tissues are insulin resistant. Without insulin, muscle and fat cells cannot recruit the vital transporter for glucose uptake; hence, it remains in blood, upsetting the balance, with many dangerous consequences. Believing insulin is low, the body looks to the liver for energy: glycogen is broken down, and glucose is synthesised. It rushes eagerly into the blood, unaware that it simply exacerbates the problem. Still undeterred, the body turns to its fat and protein, yielding increasing amounts of fatty acids and amino acids, respectively. They are processed and channelled into a metabolic cycle that is eventually overwhelmed. Meanwhile, convinced the crisis has abated, muscles avidly take up fatty acids, unfortunately making glucose usage even more unlikely.

Thus, the body’s reserves are depleted in vain, regardless of food intake. The imbalance is inescapable. Appreciating this process of dysregulation is crucial to understanding how to effectively prevent/manage diabetes, help the body restore balance, and allow the individual to live freely.

5. Sid Nayak

Helminths: Drivers of disorder, or bringers of balance?

Our immune system has evolved over millions of years and represents a fine balance between ignorance of cells of self and harmless organisms (commensals), whilst exquisite and selective targeting of harmful organisms and potentially cancerous cells. Helminths, worms that parasitise our bodily processes, represent imbalance – disruptors of this fine equilibrium in order to evade our immune responses and replicate themselves. This class of organism utilise many different strategies to bring disorder to this balance, and this can have several downstream effects, from ineffective responses to other pathogens, to ignorance of cancerous cells. These parasites represent a heavy disease burden around the world and there are initiatives to combat this through accessible strategies even in the absence of appropriate infrastructure.

However, natural imbalance exists in our immune system: autoimmune conditions, such as Type 1 diabetes, and hypersensitivity reactions, such as forms of asthma, highlight how tipping of the scales can lead to debilitating responses against harmless components of ourselves and innocuous chemicals we come into contact with. These infamous helminths and their natural immunosuppression could pave the way for potential therapies that could lead to restoration of this imbalance, begging the question – do helminths drive disorder in our immune system, or are they the solution to bringing balance?

6. Emmanuela Onah

AI and the justice system – Predictive or Predatory?

What do an earthquake and crime have in common? More than most would think - both are more likely to occur at the site of a recent occurrence. This is the basis of PREDPOL, a new software which uses data analysis and algorithmic modelling to predict the occurrence of crime in neighbourhoods, giving police the power to solve crime before it happens. It also uses vast datasets to determine patterns in behaviour and detect who will likely become a perpetrator of crime. Currently employed in the UK, USA and parts of Australia, PREDPOL aims to make policing more efficient, and reduce the bias behind policing by using data. There are similar counterparts to PREDPOL, including AI that determines how much bail should be allocated to offenders, with the intent of reducing the variance between the results of this, judge to judge. Except, how well does it truly do this? Can human behaviour really be modelled? Can algorithms take into account human biases? To what extent does policing affect the policed? How much care is taken when replacing human judgement with AI? My presentation focuses not on answering these questions, but exploring them by looking at the features of predictive policing algorithms, the parameters put in place, and how well these account for, or mask, our own biases. The presentation will also look at machine learning, data sets, and how we can make AI more inclusive of the areas we aim to serve.

7. Kate Sin

On the oxidative-antioxidative imbalance in Alzheimer's disease, and its therapeutic implications

An oxidative-antioxidative imbalance in the brain wherein oxidants are favoured has been implicated in the aetiology of Alzheimer's disease (AD). AD is characterised by amyloid-beta plaques and neurofibrillary tangles. Both lesions result from oxidative damage to biomolecules caused by reactive oxygen species (ROS). I will illustrate this process through a Postman Pat analogy. Treatments of AD targeted at these lesions have been ineffective, but the study of oxidative-antioxidative imbalance demonstrates great potential in the development of methods for early diagnosis and treatment. ROS acts in 4 ways to trigger apoptosis and inflammation: lipid peroxidation, protein oxidation, DNA damage and glycooxidation. Products from these reactions, such as MDA, percolate through the blood-brain barrier and thus can be used as blood markers to track the progression of AD, or to allow for early diagnosis. Furthermore, studies have shown that AD symptoms are attenuated by enhancing mitochondrial health to prevent leakage of ROS through exercise or antioxidant therapies. I will also explain why clinical trials of antioxidant therapies may be failing to produce positive outcomes despite evidence of ROS-mediated damage being sufficient to cause AD pathophysiology in animal models. AD affects millions of people worldwide. Its psychological symptoms, e.g., memory loss and disorientation, are deeply distressing. Not all AD sufferers experience the same quality of life and death due to the cost of care. It is imperative that we continue to explore the patho-mechanisms of AD in pursuit of a just world.

Dr Phil Hammond is an NHS doctor, journalist, broadcaster, speaker, campaigner, comedian - and Old Girtonian. He was a GP for 20 years, worked in sexual health and as a lecturer in medical communication at two universities (Birmingham and Bristol). He spent 11 years in a specialist team for young people with severe fatigue, including post viral fatigue and long Covid. Phil is *Private Eye's* medical correspondent and possibly the only comedian to have appeared at a Public Inquiry; his coverage of the pandemic in *Private Eye* was highly praised, and a book of the columns – *Dr Hammond's Covid Casebook* – is a *Sunday Times* bestseller. As a comedian, Phil was half of the award-winning double-act *Struck Off and Die*, with Tony Gardner. They won a Writer's Guild Award, a Silver Sony Award and received record numbers of complaints to the Broadcasting Standards Council. He has done Edinburgh fringe shows since 1990 and four solo UK tours, and has appeared on *Have I Got News For You*, *Question Time*, *Countdown*, *The One Show* and *Long Live Britain*. His NHS comedy *Polyoaks*, written with David Spicer, had five series on Radio 4. He also presented multiple series of *Pillories of the State*, *The Music Group* and *The Motion Show* for Radio 4. In his last Radio 4 series – *Dr Phil's Bedside Manner* – Phil toured NHS hospitals, chatting intimately with staff, patients, carers and volunteers, and then cheered them up with a comedy show. Phil took two shows to the 2022 Edinburgh Fringe: *Dr Hammond's Covid Inquiry* and *How I Ruined Medicine*. Phil is currently pretending to work on a memoir...



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Thank you to our judges

Dr Phil Hammond (Sponsor and External)

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Dr Stéphanie Swarbreck (Biological Sciences)

Professor Toni Williams (Law)

Dr John Tadross - Prize convenor