

**FASS STS Cluster Workshop on, “From Model Organisms to Synthetic Biology: STS Perspectives on Experimentation in the Life Sciences”**

**13<sup>th</sup> January 2014; 2.30pm-5.00pm**

**Research Division Seminar Room (6<sup>TH</sup> Floor AS7, The Shaw Foundation Building)**

**Presentation Abstracts**

**1) Model Organisms as Experimental Subjects in the Life Sciences**

**Rachel A. Ankeny  
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University of Adelaide**

Some organisms are specifically selected to solve certain experimental problems, while other organisms—the so-called ‘model organisms—are studied because they are thought to represent a larger group of organisms beyond themselves (often including human beings), and thus can serve as the basis for articulating processes thought to be shared across several (or all) other types of organisms, particularly those processes whose molecular bases can be articulated. Key examples include the fruitfly *Drosophila*, various strains of mice, the nematode *C. elegans*, and the mustard weed *Arabidopsis*. These organisms are not studied primarily because they are interesting in their own right (though they may well be!) but because of the value they have as objects for investigating processes that can be generalised: “the fish is a frog...is a chicken...is a mouse” (Grunwald & Eisen 2002).

In this paper, I argue that the choice of organism together with the technologies and practices utilized to work with it are central features that contribute to the success (or failure) of any research program, and hence that model organisms are particularly well-suited only to certain types of research. In current practice, even if scientists’ questions are more focused on problem-based approaches to research, organisms nonetheless have become critical ‘units of research’ (to borrow a term) which allow scientists to produce answers even to “questions that we are not yet able to ask clearly” (Fleck 1979). Hence model organisms in fact shape the questions that their scientist-users are seeking to answer and, together with the practices associated with them, come to be a form of “machine[s] for making the future” (Jacob 1988) that is simultaneously a “way of knowing” (Pickstone 2000). Questions about the choice of organism and resulting experimental limitations are essential to science policymakers, particularly to setting conditions for gauging likelihood of success of funding based on particular research models.

## **2) Knowing Objects in Synthetic Biology: The Epistemic Life of Things**

**Axel Gelfert**  
**Associate Professor,**  
**Department of Philosophy,**  
**National University of Singapore**

Recent years have witnessed multiple attempts to tell the story of contemporary synthetic biology and its origins. Located as it is at the intersection of science, engineering, and technology, synthetic biology has attracted attention from scholars in the philosophy of technology as much as from historians and sociologists of the life sciences. In the present paper, I aim to forge a connection between these studies of synthetic biology and the epistemology of technology. In particular, I will argue that synthetic biological artifacts lend themselves to an analysis in terms of ‘thing knowledge’. As such, they should neither be regarded as the simple outcome of applying theoretical knowledge and engineering principles to specific technological problems, nor should they be treated as mere sources of new evidence in the general pursuit of scientific understanding. Instead, they should be viewed as partly autonomous research objects that, quite literally, embody knowledge about the natural world – knowledge which, qua the material constitution of its bearers, may well outstrip that of their designers and which requires close interrogation for it to become accessible.

## **3) Interdisciplinary experimentation in synthetic biology: what can STS learn from art and design?**

**Jane Cavert**  
**Reader,**  
**Science, Technology, and Innovation Studies,**  
**University of Edinburgh**

In this presentation I reflect on a project called ‘Synthetic Aesthetics’, which brought together synthetic biologists, social scientists, and artists and designers. During the project, I was struck by the similarities between the STS researchers and the artists and designers in our interactions with this new scientific field. We shared aims such as: forging new collaborations with synthetic biologists; exploring implicit assumptions and possible alternatives; and critically interrogating the science. But there were clearly also differences between us, the most important being that the artists and designers made tangible artefacts, which had an immediacy and an ability to travel, and which seemed to allow different types of discussions from those produced by our academic texts. The artists and designers also seemed to have the freedom to be more playful, challenging and perhaps more subversive in their engagements with synthetic biology. In this presentation I ask what STS researchers can learn from art and design, and whether engaging more closely with artists and designers can enrich social scientific work, and expand its critical capacity by providing alternative entry points into discussions of the future of an engineered biology.

#### **4) Clinical experimentation: research method, innovation or standard practice?**

**Tamra Lysaght  
STS Cluster,  
Asia Research Institute,  
NUS**

Clinical experimentation is generally understood as a methodology whereby interventions are tested in a controlled environment, such as a clinical trial, to establish evidence on the safety and efficacy of their use in patient populations experiencing certain medical indications. In the context of evidence-based practice, data generated from these studies are assessed according to a hierarchy of evidence that situates the meta-analysis of randomised controlled trials (RCT) as the gold standard in which results are generalised to broader patient populations experiencing those indications. However, this simplified version of experimentation not only obscures the methodological and epistemic limitations of RCTs but masks the complexities of clinical practice and how new and innovative interventions are introduced into clinical contexts. Indeed, clinical innovations are often introduced into clinical practice well before these standards of evidence have been established. Yet, the epistemological status, social meanings and ethico-regulatory implications of these practices as a category of clinical experimentation are poorly understood and under-theorised.

In this presentation, I draw on the case of stem cell science and the introduction of novel interventions with stem cells outside the context of clinical trials to problematize current understandings of clinical experimentation. Specifically, I present an analysis of how the framing of stem cell innovation as either research or practice implies different methodologies that prioritise certain types of knowledge and expertise over the translation of stem cell medicines. I argue that this framing not only reflects the institutional interests of the scientific community and the medical profession but is indicative of tensions over who should have the authority to oversee the collection, validation and dissemination of evidence in clinical contexts. I suggest that a more sophisticated, empirically-informed, understanding of how experimental interventions are introduced into clinical settings and accepted as the standard of care is needed to more effectively deliver safe and efficacious treatments to patients in a timely manner without exposing them to unduly risks of harm or exploitation. I conclude by proposing a cross-disciplinary research agenda that re-examines what constitutes as clinical experimentation and develops an ethico-regulatory framework for introducing new and innovative interventions into clinical care.