PLAYING DICE WITH MICE: BUILDING EXPERIMENTAL FUTURES IN SINGAPORE

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The 2009 special issue of *New Genetics and Society* on 'Biopolitics in Asia' provides a fascinating and provocative reorientation of a growing interest in biopolitics, taking ideas from Foucault cultivated in reflection on the developing life sciences in Europe, and considering their application to the major and diverse initiatives in the biosciences in contemporary Asia (Gottweis 2009). This paper is a response to and further elaboration of these questions. The short argument presented here does not seek to disagree with the emerging geographies of biopolitics the special issue seeks to map, but rather offers an extension, by introducing questions of temporality to those of spatiality.

The papers in the special issue productively explore the links between research governance, economic development and the conduct and co-option of national populations in a variety of biopolitical projects. The narratives of biopolitics that emerge focus our attention on the rise of 'bionationalism' in Korea and China (Gottweis and Kim 2009; Greenhalgh 2009); the regulatory complexity of research governance throughout the region, which is often both locally specific and also outward looking (Chen 2009; Glasner 2009); and, most pertinently for my argument, the specific reconfiguring of an experimental population in the pursuit of bioeconomic development in Singapore (Waldby 2009a). Yet, there is less attention paid to the questions linking scientific epistemology, research infrastructure and the complex topologies of experimental futures in these biopolitical accounts. I want to argue, or rather add, there is something significant in the changing epistemologies of knowledge production in these emerging bioeconomies, which may be as important as the mobilisation of nations and populations in rereading the implications of biopolitics and the operation of biocapital in the region.

The argument about the emergence of an experimental population in Singapore invites a more specific exploration of how experimentality operates temporally, as well as spatially, with implications for social development too. There are geographical lessons here, about the specificity of Asia's ventures in the life sciences, which open up questions about the concept of biopolitics in the Asian context. But there are also indications of an alternative temporality of the future enacted as well, linking science and social development in ways that differ from the narratives told of the co-constitution of Western scientific practices and civic subjectivities, and the historic association between science and democracy. To open up this small but potentially significant oversight, I want to read the emergence of the biosciences alongside the recent investment in casinos in Singapore. This unlikely comparison between the genomic sciences and gambling in the city state brings the nature of political and technological investments in the future into the frame, and raises arguments about the emergence of a rather different experimental orientation to science, economic investment and social development in Singapore. Theoretically, this connects specific questions identified by the historian Hans Jorg Rheinberger on the operation of experimental systems with general reflections from the sociology of expectations on the enactment of

biotechnological futures, inserting this into the context of an emerging biopolitics in Asia. This is a short paper, so I want to start with the punch line, and explain the empirical focus on 'playing dice with mice'.

Before I leave Singapore, where I have researching the establishment of the biological resource centres which support the biotechnological aspirations of the island, I am taken out for dinner by some of my respondents. It is an informal end to an intense three weeks. I have been exploring the changing geographies of bioscience, through the construction and coordination of genetically altered mouse resources in the USA, UK and here in Singapore, talking to the local regulators, Western consultants, and international scientists involved in their development[1]. The people are extraordinarily generous and hospitable, but there are sensitivities to this kind of work, in Singapore and elsewhere. Animal experimentation is not particularly easy dinner party conservation, so our talk roams as we search for safer topics. It turns to the two vast casino resorts nearing completion adjacent to the financial centre and on the neighbouring island of Sentosa (Chean 2010). The scale of the sites and ambitions here are astonishing, perhaps matching the scope of Singapore's investment in the bioeconomy. Their development has been rapid too. Singapore only recently overturned legislation banning gambling, with the Casino Control Act of 2006, and already hopes to surpass Las Vegas as a tourist and gambling destination. We laugh. It seems comically at odds with the international reputation of Singapore as an overly regulated nation. It also sits incongruously with efforts at nation-building around science, education, and biomedical research. So, of course, the conversation returns to science. What are we to make of this diversification of state investment from bioscience to gambling? Are there overlaps with the relaxation of social regulation that the search for international scientific talent is thought to have enhanced? Are political tensions emerging around the scale of investments in biomedical science, or are there complementarities, even unexpected similarities between developments in the mouse house and the gambling house? This leads to a question I didn't ask then, but want to pose now. Is there something telling about the turn to gambling, which can help elucidate the speculative strategies and social consequences of these experimental future in Singapore?

We know from recent scholarship in geography and science and technology studies that the experimental sciences are historically and socially situated in complex ways (Livingstone 1995; Powell 2007; Henke and Gieryn 2007). This is something amply demonstrated in the national and population-based 'narrativations of biopolitics in Asia' (Gottweis, 2009, p.2002) recounted in the special issue.

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[1] This paper is based on research carried out for the ESRC fellowship, Biogeography and Transgenic Life, Grant no RES-063-27-0093. This fellowship is tracing the different ways in which mice are 'on the move' in contemporary biomedical research: firstly, internationally, in the development of large-scale mutant mouse resource centres and functional genomics; secondly, corporeally, in the development of further mouse models of human disease; and thirdly, affectively, in the changing ways these animals are figured in different scientific, regulatory and ethical cultures. The research is based on participant observation, literature review and in-depth interviews with over 80 research scientists, animal welfare scientists, regulators, patient groups and others involved in the changing use of mouse models in the UK, USA and SE Asia from 2008-2010. All research participants were offered anonymity. An earlier version of this paper was presented to the RGS/IBG annual conference in London in a sessions on 'Geography and the Future', 1-3rd September 2010 organised by Ben Anderson and Peter Adey.

However, science and technology are also enacted through complex overlapping temporalities, whose configuration and interpretation have also shifted, and with them, the potential relations between techno-scientific innovation, state organisation and civic epistemologies (Jasanoff 2005). To develop this argument, it is helpful to go back to the earlier work of Popper on the philosophy of science, which may be critiqued as an inaccurate account of the epistemology of science or the social history of ideas, but which still informs liberal political arguments linking scientific development to the 'open society' (Ferris 2010). In the mid 1940s, the philosopher Karl Popper (1945) drew attention to the openness of the experimental moment, and the willingness of scientists to put themselves and their knowledges at constant risk of falsification. In his work, science becomes the best method of developing knowledge, not because science is always right, but because scientists are open to the future possibility of being wrong. Progress is made towards better understandings by openness and critical interrogation. This imagination of the openness of the experimental moment overspills science into his writing on democracy and the open society. Democracy becomes the best method of governance, not because the democratic process necessarily results in the election of the best person to lead, but because in an open society any leader can be removed in the future without violence. Writing in the midst of World War Two, Popper links democratic politics to scientific practice through its openness to future falsification.

Making such a direct link between scientific experimentation and democratic decision-making is now much more fraught, not least because the work of philosophers and sociologists of science have shown that experimental practices simultaneously enact more than one kind of future. Experimental systems have components that are open to the future, but at the same time they are constrained by standardized apparatus, shared protocols, and institutional commitments. These confer experimental systems with the stable temporalities which make paradigms slow to change, direct investigators towards certain expectations, but critically they also allow scientists to make sense of the moments of emergence in experimental practice. These opposing experimental qualities, of durability and immanence, have been the subject of much exploration, albeit often in isolation, in literatures charting either the role of standardization or the place of emergence in experimental practices (see for example Fujimura 1996; Rader 2004; Braun 2008; Bennett 2010). Yet, of course, these processes are intricately related to each other. The historian Hans Jorg Rheinberger (1997) has perhaps done most to draw these together, in a compelling account of the material assemblage of twentieth century molecular biology. Rheinberger suggests experimentation involves an oscillation between what can be held constant in the context of experimentation, these he calls technical objects, and what forms the focus of current inquiry, that is epistemic things. This allows experimenters to simultaneously hold two forms of expectation about the future in concert. Epistemic things are necessarily underdetermined; they embody what one does not already know; they are 'absent in their experimental presence' (Rheinberger, 1997: 28); 'graspable only in the moment of emergence' (Michael et al, 2005: 376). Technical objects in contrast embody concrete futures; they are the instruments, inscription devices and biological entities, with given standards of purity and precision, whose stable linear temporalities allow researchers to make sense of the immanence of epistemic things. In this more material account of experimental systems, not all elements are open to future falsification.

While the work of Rheinberger explores how experimental systems can embody divergent potential futures, work on the 'sociology of expectations' has explored the way the future is mobilized in the present to marshal resources, coordinate activities and manage uncertainty at an institutional level. The 'topologies of the future' become even more complex, for these are also related. As experimental systems become larger, more interdependent and more complex, growing levels of capital investment are required to develop the technical, regulatory and legal infrastructures, which enable the emergence and coherence of value. There has been a shift from what Mike Fischer calls the cause-effect epistemologies of molecular biology to the high-throughput statistical sleuthing of the 'omic' sciences, such as genomics, regenerative medicine or epigenetics[2]. Banks of computers, arrays of samples, tubes of stem cells, racks of genetically altered animals and populated biobanks are the fixed structures that need to be assembled prior to the emergence of statistical insight or added value. Such investments need to be mobilised prior to practical utility or demonstrable value, which may be decades away. Such sciences are controversial too, and so are associated with approaches to anticipatory governance, which seek to identify and resolve socio-ethical controversies before they emerge (Barden et al 2008). As the work of Mike Michael, Nik Brown and others have persuasively argued the assemblage of such large techno-scientific programmes rely on a range of future-orientated claims about their commercial and social value in order to cohere in the present (Brown and Michael 2003). The future here is to be made, not dismantled. The future value of science is not premised on its potential for falsification, but in its efficiencies at playing the odds. The civic epistemologies linking experimental practices and democratic decision-making are more tenuous, but the political cultures linking scientific futures with capital markets are undoubtedly stronger.

Some of these dynamics play out in the process of establishing Singapore as a centre for biomedical research and innovation. The key to attracting foreign scientists and investors to Singapore has been the adoption of international best practice in infrastructure and regulation. The shift in the geographies of science east from Western Europe and the USA has accelerated in the last ten years, facilitated by the construction of large scale science parks, such as at Biopolis (refs). Contrary to some early commentary, the science is not following lax regulatory regimes where anything goes; rather the island state has swiftly and efficiently adopted strong Western regulations for clinical trials, drug and vaccine testing, animal care, biosecurity protocols and patent protection. At times it has judiciously selected these regulations, following FDA approvals that allow access to large US health markets, adopting less costly USA animal care regulations, but UK style approaches to the availability of stem cells for research. Such regulations offer familiarity and certainty to international scientists, increasing the efficiencies in large-scale science and allowing the research done here to be easily transferable. Scientists are attracted by the fact that resources are available in-house, facilities are new, research is well-funded, and there are generous tax breaks for foreign investment. All of these serve to reduce the growing uncertainties of Western science for individuals and institutions, providing the expensive infrastructure which allows

[2] This comment is taken from a personal communication in a concept note on the Knowledge Value workshops being organised by Kaushik Sunder Rajan, Department of Anthropology, University of Chicago.

scientists to focus on facilitating and capturing the potential moments of experimental emergence. For the scientists I spoke to, Singapore simply becomes a place where they can concentrate on getting the work done, unencumbered by the uncertain times frames of Western science resulting from changing political priorities, beleaguered processes of research funding and the rising costs and public controversy of maintaining large animal houses. Neal and Nancy Copeland, who moved their research programme to Biopolis in 2006 after 22 years at the National Cancer Institute, give a similar account in the press. In answer to the question, 'What lured them away?' they point to the operation of research governance and the uncertainty of science funding in America.

> '"It was a number of things', Copeland says, perhaps chief among them the growing frustration of dealing with the government bureaucracy at the NCI. "It seemed to be getting worse every year," he says. And added to that were the uncertainties of the annual budget cycle. "We had an operating budget that didn't mean anything, and all of a sudden—six months into the fiscal year—we'd get a budget that included cuts," Copeland says. "That's not a way to run anything."' (Macmillan, 2009, p.18)

The relationship between scientific subjectivity and the open society suggested by Popper seem stretched in this context. Yet, it is perhaps possible to still see its distant echoes in work by Olds (2007), Waldby (2009b), Ong (2005) and others, who have written about the changes wrought to Singaporean society by these biotechnological innovations. They point to a reorientation of the educational aspirations of Singapore from rote learning towards entrepreneurialism, increasing collaborative exchange with overseas institutions and the adoption of Western values embedded in adopted bioethical norms. There is what Waldby calls a 'wider social experiment' evident here, as the city is reimagined and rebuilt to host both science and overseas scientists (Waldby 2009b). Yet, in practice this is both highly selective and also spatially constrained (Holden and Demeritt 2008; Ong 2005). Those international scientists who contribute the most value to the economy benefit from privileged access to personal freedoms and expressive life in creative neighbourhoods out of the reach of the majority population living in highly regulated and publicly funded housing estates. And, while international scientists enjoy more permissive housing policies, they also enjoy protection from the political protest that has accompanied research on biotechnology in Europe and stem cell research in the USA, and animal experimentation in both (Jasanoff 2005). Most political demonstrations are banned in Singapore, with the new Public Order Act passed in April 2009 placing further restrictions on public assembly and activities causing public disruption. Many expatriate consultants setting up the biological resources facilities in Singapore valued the state's adoption of strong regulation to protect animal welfare, but they also appreciated this lack of public opposition. The state investments in biotechnology and control of public order confer future certainties for scientists around the provision of animals and technical infrastructure, which allows them to focus attention on maximising the efficiencies demanded by the high investments and information rich environments of contemporary experimental systems.

So, how do we read Singapore's 'multibillion dollar gamble' (Van Epps, 2006) on biomedical science alongside the new investments in casinos? Does this represent a shift from investing in knowledge, to exploiting our ignorance of the odds? Is it evidence of movement towards economic, political and social

liberalisation, or the emergence of a rather different configuration of subjectivity, uncertainty and control? I would suggest there are parallels between the development of the biomedical sciences and the construction of casinos in this context. Both are large technical and legal infrastructures built from scratch. They are both outward looking in welcoming overseas expertise and adopting the most efficient Western regulations for their global operation. While looking to the West for experience in developing facilities, they both look to growing Asian markets for health care and leisure activities. Yet, for both the links between experimental practices and social openness are more opaque than might first appear. A disjuncture in the expected temporalities linking scientific development and social freedoms is evident in bemused Western media reports. This was a society where you couldn't buy chewing gum, but human stem cells were available with a simple purchase order. Whichever side of this equation you might want to contest; to Westerners this is the emergence of an unusual epistemic and ethical landscape, mixing permissiveness with paternalistic moral leadership, in ways that do not necessarily herald political pluralism. Perhaps in this conjuncture we find something of the specific nature of an emerging Asian biopolitics. There is a similar mix in the development of the casino. It is only with a strong state and social regulation that casinos can constitute an unproblematic investment strategy. The infrastructures of the vast casino resemble those of the large-scale 'omic' sciences, dependent on high investment in fixed technologies, the efficiencies of complex informatics and the willing concentration of individual attention away from externalities and towards the moments of statistical emergence, or gaming serendipity. They are both protected from public opposition, whether to biotechnological developments, animal experimentation or gambling. In science and in the casino, those who contribute the most value gain the most privilege in housing arrangements or VIP status, as the entitlements of belonging are marketised rather than democratised. Both are also potentially profitable if you own the house, in the context of the state led corporate strategies of Singapore's developmental state.

So, what implications does this have for the relations between science, capitalism and democracy and for our understanding of the future of biopolitics in Asia? I want to return to questions, by turning not to Foucault but to Žižek. The reflections of Žižek suggest the future of biopolitics in Asia has a rather different face. As Žižek reports, 'If there is one person to whom monuments will be built a hundred years from now, Peter Sloterdijk once remarked, it is Lee Kuan Yew, the Singaporean leader who thought up and put into practice a 'capitalism with Asian values'" (2009, p.3). Žižek goes on, 'The virus of authoritarian capitalism is slowly but surely spreading around the globe. Deng Xiaoping praised Singapore as the model that all of China should follow. Until now, capitalism has always seemed to be inextricably linked with democracy. Now, however, the link between democracy and capitalism has been broken" (Žižek, 2009, p.3). The unlikely parallels between the gaming house and the mouse house, and the growth of the biosciences in China, suggests the link between science and democracy is broken too. The hopeful contingencies of biology, where social theorists have looked to recuperate from the apparently grid-like rationalities of science, capital or biopolitical appear rather misplaced. Such indeterminacies are written into the efficiencies of the large scale sciences, where opportunities for immanence are both shaped and stimulated. The contingency may instead be one of history and of the future. Western expectations of a link between scientific practices, and civic epistemologies linked to

democratic decision-making are replaced by the economic and political values of a scientific future being made rather differently, somewhere else.

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