

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Institutional Change in the Natural Sciences

A thesis presented in partial fulfilment of the requirements for the degree of

Masters in Business Studies
in
Management

at Massey University, Palmerston North,
New Zealand.

Andrew Gordon Dickson

2007

Abstract

This thesis investigates the Allan Wilson Centre for Molecular Ecology and Evolution, a Centre of Research Excellence financed by the New Zealand Government's CoRE fund, which was established in 2001. The CoRE fund represented a change from traditional science funding in New Zealand. Its aim was to make use of existing networks of scientists, from several institutions and disciplines, to form new 'Centres of Research Excellence', independent from any existing institution, but made up of members who remained in their existing positions.

The aim of this thesis is to investigate whether the formation of the Allan Wilson Centre has made a difference to the way its members carry out their science and, if so, how. To do this, an actor-network approach is used to analyse the various 'modes of ordering' the Centre, to make sense of the networks represented by it.

The results show an interesting shift in the way that science is carried out in the Allan Wilson Centre in contrast to the pre-Centre form. Although the focus of the Centre remains firmly on the science they do, they now also interact regularly with the discourse of management in order to better 'do' and 'encourage' their science, creating new successes but also new tensions.

The importance of this thesis is two-fold. First, it provides a mechanism through which to 'hear' the voice of the Allan Wilson Centre and its members; and second, it provides a means through which science policy makers can see how this particular policy mechanism may have changed the process of science.

Acknowledgements

First, I sincerely thank my Masters supervisors, Dr Craig Prichard and Professor Ralph Stablein, for your encouragement and advice. If it were not for your guidance I would not be critical, in thought or action.

To my wife, Anna, for putting up with the “Hey, can I just read this paragraph to you?” comments every five minutes. You are my intellectual hero; I will never stop admiring your boundless pursuit of thought. You are my “lady scientist”.

To my family and friends, thanks for your support, and for listening to my diatribes. Mark – I really appreciate your guidance, and binding advice. Sean – my fellow Masters traveller, thanks for being interested. Sweep and Sooty – thanks for keeping me company on the runs.

To the members of the Allan Wilson Centre for Molecular Ecology and Evolution, thank you for talking with me about your experience of the Centre. Your science is truly inspiring.

Financial support for this thesis was provided by Massey University and Goodman Family Scholarships, for which I am most appreciative.

Ethics approval was gained through the Massey University Human Ethics Committee prior to embarking on this research study.

Table of Contents

Abstract.....	ii
Acknowledgements	iii
Table of Contents	iv
List of Figures.....	vi
1. Introduction.....	1
2. Literature.....	6
2.1. The Public Management of Science Organisations	6
2.1.1. <i>A Global Change in Government Research Funding</i>	7
2.1.2. <i>History of NZ Government Research Funding</i>	8
2.1.3. <i>New Zealand Research Policy</i>	10
2.1.4. <i>Discipline and the Production of Knowledge in Research</i>	15
2.1.5. <i>Institutional Change in Academia</i>	26
2.2. Ordering Organisations	32
2.2.1. <i>John Law: Narratives of a Public Science Institution</i>	32
2.2.2. <i>Gail Davies: The Natural History Unit of the BBC</i>	38
2.2.3. <i>Bill Doolin: Competing Narratives in a New Zealand Hospital</i>	41
2.3. Conclusion: Research Problem	43
3. Methodology	45
3.1. Actor-Network Theory.....	46
3.1.1. <i>Beginnings of ANT – Latour and Callon</i>	46
3.1.2. <i>Heterogeneity</i>	47
3.1.3. <i>Processes not Stases</i>	48
3.1.4. <i>Translation, Immutable Mobiles and De-centering</i>	48
3.1.5. <i>Empirical Agnosticism and Free Association</i>	51
3.1.6. <i>Criticisms of Actor-Network Theory</i>	52
3.2. An ANT Analytical Model: Modes of Ordering.....	54
3.3. The Case Study Approach	58
3.4. Data	60
3.4.1. <i>Quantitative Citation Analysis</i>	60
3.4.2. <i>Print Media Articles</i>	61
3.4.3. <i>Interviewing</i>	63
3.4.4. <i>Autoethnographic Accounts</i>	66
3.5. Ethical Considerations	68
3.6. Limitations of my Research Methodology	68
3.7. Conclusion	69
4. Doing Science.....	71
4.1. Doing Excellent Science	71
4.1.1. <i>Doing Visionary Science</i>	73
4.1.2. <i>Doing Interdisciplinary Science</i>	75
4.2. Doing Allan Wilson’s Science.....	77
4.3. Doing Serendipitous Science	80
4.3.1. <i>Manufacturing Serendipity</i>	80
4.3.2. <i>Research Freedom</i>	83

4.3.3.	<i>Doing Directed Science</i>	87
5.	Encouraging Science	88
5.1.	Profiling Science	89
5.2.	The Stewards of Science	92
5.3.	Encouraging Students	97
5.4.	Reaching Society	99
6.	Managing Science	104
6.1.	In the Beginning	104
6.2.	The Long Arm of New Public Management	105
6.2.1.	<i>Administering Science</i>	106
6.2.2.	<i>Enterprising Science</i>	110
6.2.3.	<i>Managing Equipment</i>	118
6.3.	In Sum: Managing Science	119
7.	Conclusion: Intersecting Modes	120
7.1.	Allan Wilson's Identity	121
7.2.	Valuing the Management of Science	122
7.2.1.	<i>Encouragement Management</i>	122
7.2.2.	<i>Clashing Cultures</i>	123
7.3.	Polarisation: To Do or To Encourage?	124
7.3.1.	<i>Synergy vs. Business as 'Almost' Usual</i>	125
7.3.2.	<i>Quaternary Education</i>	125
7.4.	Changing Discourses of Science	127
7.5.	The Power of Excellence	129
7.6.	Research Shortcomings & Directions for Future Research	130
8.	References	133

List of Figures

Figure 1: Components of Risk Diagram	30
Figure 2: Average ISI Impact Rating 2002 - 2006	72

1. Introduction

This thesis is fundamentally about institutional change. In particular it is about the impact of a government policy, the Centre's of Research Excellence (CoRE) fund, on the formation and function of a science institution, the Allan Wilson Centre for Molecular Ecology and Evolution. Studying the impact of government policy on science institutions is not a new thing, John Law for example wrote '*Organizing Modernity*' (1994a) based on his experiences researching the impact of government policy on a UK public sector science institution, and this is just one example. Before Law works such as Thomas Kuhn's '*The Structure of Scientific Revolutions*' (1970) and Latour & Woolgar's '*Laboratory Life*' (1979) provided a strong basis for the social study of science institutions, it is upon these, and others, that I build my theoretical and analytical foundation. In spite of this international academic basis, not many studies have specifically considered government policy impact on New Zealand science institutions, some exceptions to this include Leitch & Davenport's work on the science funding framework (2005); Doolin's research into government policy impacts on a public hospital (1999; 2003) and Davenport & Daellenbach's recent research on the formation and function of another of the CoRE's, the MacDiarmid Institute for Advanced Materials and Nanotechnology (2006). This research adds to this small body of research by investigating the impact of the CoRE fund on the Allan Wilson Centre.

I chose the Allan Wilson Centre (AWC) as I have been interested in the precursors to and the current AWC since about 1998; when, as an undergraduate student within Massey University's College of Sciences, I was able to watch, with my student colleagues, the research strengths that Massey showed in the disciplines of molecular biology, theoretical genetics and mathematics that were a major factor in the awarding of the CoRE fund and establishment of the AWC in 2002. My wife was undertaking a Bachelor of Science honours degree in Molecular Genetics with David Penny (now Research Director of the AWC), and it was accepted that David and his associates were rather impressive scientists on an international scale. Particularly I was fascinated by the interdisciplinary nature of much of their investigation, watching my wife struggle with the mathematics

and computing that was a large part of her honours thesis made me realise that this science (molecular genetics) had become, by necessity, interdisciplinary. The fact that government policy around the same time (see Tertiary Education Advisory Commission, 2000) was gearing up to identify and specifically promote interdisciplinary and inter-institutional collaboration may have been coincidence, but this, along with the research strengths acknowledged above, seem to have led to the formation and funding of the AWC. What interests me now is how the institutional and disciplinary relationships have changed under the new ordering regime.

Before looking at the demographics of the AWC it is important to introduce its name sake: Allan Wilson. Allan Wilson passed away in 1991 during treatment for leukaemia at the age of 57; this was a tragic loss for New Zealand and for the study of molecular evolution. Allan Wilson was a pioneer of molecular techniques, bringing the study of DNA to bear on the scientific fields of biochemistry, genetics, palaeontology and archaeology amongst others. During his 35 year tenure at the University of California, Berkeley, Allan Wilson trained most of the current 'superstars' of molecular evolution; his ideas were revolutionary and transformed Humans' knowledge of their own evolution, particularly his 'out of Africa' Human evolution theory is still recognised today as one of the most significant scientific breakthroughs of the 20th century. Allan Wilson was a New Zealander, born in Ngaruawahia, and trained initially at Otago University, however this fact is not well known – particularly by people outside of New Zealand. By using his name, the AWC is doing two things; firstly recognising and celebrating the success of an extraordinary New Zealander on an international front by rhetorically drawing a link to Allan Wilson's identity as a New Zealander, and secondly, using Allan Wilson's name and profile to draw attention to the Centre's own successes in molecular evolution. To me, a proud New Zealander, these both are admirable efforts.

The institutional constitution of the AWC between 2002 and 2006 involves five universities; Massey University is the host institution and provides two of the main sites. Massey's Turitea campus (in Palmerston North) is the official headquarters but Massey's Albany campus (in Auckland) is also host to several collaborators. The other universities are: The University of Auckland; Victoria University of Wellington; Canterbury

University and Otago University. From a disciplinary perspective, in their own words, the AWC “comprises world class ecologists, evolutionary biologists and mathematicians who will work together to unlock the secrets of our plants, animals, and microbes” (Allan Wilson Centre for Molecular Ecology and Evolution, n.d.a, para. 1). From this clearly the AWC can be described as an interdisciplinary research centre, particularly one that brings together scientists from the disciplines of ecology, evolutionary biology and mathematics.

Although the breadth of science undertaken under auspices of the Centre is rather grand the actual Centre is quite small. In total it currently comprises less than one hundred members (including all scientists, students and support staff). Of these, ten are primary investigators with the rest made up of post-doctoral fellows, support staff and graduate students (many of which originate from outside of New Zealand); this is approximately similar in size to a small University department.

The AWC has four main research projects covering a broad spectrum of evolutionary science; project one looks at the rates and modes of evolution; project two at biodiversity; project three at human settlement in Aotearoa/New Zealand and project four is aimed at developing new ecological and evolutionary theoretical models. These four projects form a research programme which together address issues currently central within the fields of molecular ecology and evolution. Recent examples of their science include the breakthrough investigation of how the microevolutionary processes of Adelie penguins are impacted by environmental changes such as the movement of icebergs; and more generally the role of microevolutionary processes in macroevolution, such as the evolution of mammals.

Although the research programme is broken up the four major projects mentioned above, they do not appear to be in any way disciplinarily distinct, in fact the interactions between the biologists and the mathematicians can be seen in all of the work. For instance, the introductory blurb for project four states “we seek to exploit the dynamic interaction that exists in this group between mathematicians and biologists” (Allan Wilson Centre for Molecular Ecology and Evolution, n.d.b, para 1). Also the projects are not in any way institutionally distinct, all involve members from across the spectrum of universities

involved. In many ways this does not seem odd as prior to the establishment of the Centre many of the collaborations forming the current project streams were already in various stages of existence.

My research investigates the form and function of the Allan Wilson Centre using an actor-network model informed primarily by Law's modes of ordering analytical approach (1994a). Actor-network theory, with its emphasis on the 'process' of organising rather than the 'forms' of organising, is generally written utilising odd grammatical devices. In particular verbs such as 'embodying' and 'performing' are used to describe things that are more commonly portrayed as stable nouns such as an 'institution'. Within actor-network theory the emphasis is on the performance of the institution rather than the structural nature of the institution for instance. Consequently, I offer a cautionary note: At certain points some readers may find the text a little 'lumpy'; please be assured that this is a purposeful ANT inspired discursive strategy.

Briefly, the results show an interesting shift in the way that the scientific practices and the management of science are constituted together in the current Centre in contrast to the pre-Centre form. The Centre interacts with the discourse of management in order to better do, promote and encourage their science. This has interesting ramifications for the nature of science policy and management of science through the Centre of Research Excellence form.

I believe that the results of my thesis will be of use in several forums. Firstly, my thesis follows in a line of other studies of science institutions conducted using an actor-network approach, in this way it adds to the body of actor-network literature. Secondly, the results of my research will allow those interested in the science sector in New Zealand to 'hear' the voice of this particular Centre, and its members, at least through the prism of my analysis. Thirdly, I think that science policy makers may be interested in my interpretations of how this particular policy mechanism has changed the process of science, and how it appears to be revealing other things, such as how the tertiary research and tertiary teaching structures seem to be somewhat divergent.

This thesis is organised into seven chapters, following this introductory chapter, chapter two considers the literature supporting my thesis, this concludes with an overview of my theoretical position. Chapter three presents my research methods and methodology, actor-network theory, and gives more detail on the specific analytic framework through which I conducted the analysis of data. Chapters four, five and six are the results and discussion chapters; each of these presents one of the three 'modes of ordering' the Allan Wilson Centre, these are doing science, encouraging science and managing science. Chapter seven presents the conclusions that I have reached through the process of my thesis by looking specifically at areas where the different modes of ordering intersect and how this has changed things before looking at some of the limiting factors inherent within my research approach and providing some directions for future research.