FROM THE MEDICAL RESEARCH COUNCIL

TO THE CANADIAN INSTITUTES OF HEALTH RESEARCH:

UNDERSTANDING TRANSFORMATIONAL INSTITUTIONAL CHANGE

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ABSTRACT

The focus of this dissertation is an institutional study of an unusual and complex event – the transformation of the Medical Research Council into the Canadian Institutes of Health Research. Its core contribution is that, in the fields of Canadian science and innovation policy, it is the first to examine in depth the full policy and institutional account of biomedical, clinical and health sciences. A second contribution is that it offers fresh insights into how an institutional transformation can be incorporated into neo-institutionalist theory as it applies to science and knowledge-centred realms of governance.

The theoretical exploration presented in this research is an explanatory study of institutional change and the relationships between ideas, institutional (and policy) legacies, and agency as they combine to contribute to new institutional outcomes. The conceptual core is grounded in neo-institutionalism and is consistent with the assumptions of historical institutionalism's and organizational sociology's theories of institutional stasis and change. However, neither historical institutionalism nor organizational sociology explain the factors in the political economy that come to bear on institutions such as why formerly held ideas are no longer tenable. Therefore, in the research framework, theories from historical institutionalism and organizational sociology are enriched by theories of the knowledge-based economy (KBE). This theory allows us to explore why the interpretive frameworks and worldviews of a policy field, and the institutions supporting those policies, can change over time.

Due to the prominent role of Dr. Henry Friesen, the MRC's last President, in directing the institutional responses of the MRC towards a transformation, the concepts of agency are significance to this research. This theoretical element allows us to reflect more precisely on how new ideas emerging under the KBE, opened up strategic opportunities for Friesen. Also of importance, within the context of agency, is how the practices of strategic management assisted bricolage – using existing institutional models considered successful such as the National Centres of Excellence (NCE), to reframe the MRC-CIHR. Strategy also assisted Friesen, a self-conscious institutional actor, to organize the medical and health research communities around certain responses to the KBE in the knowledge-centred realm of biomedical, clinical and health research, while excluding other options.

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This work is dedicated to my father James B. Murphy, my mother Francis M. Murphy (MacDonald) and to my grandparents Jamie L. Murphy and Meta P. Murphy (Tarr).

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LIST OF ACRONYMS

AHCPR	Agency for Health Care Policy and Research
AHFMR	Alberta Heritage Foundation for Medical Research
BCHCRF	British Columbia Health Care Research Foundation
CBDN	Canadian Bacterial Diseases Network
CCFF	Canadian Cystic Fibrosis Foundation
CFI	Canadian Foundation for Innovation
CIHR	Canadian Institutions of Health Research
DND	Department of National Defence
FRSQ	Fonds de Recherche en Santé du Quebec
HC	Health Canada
HHMI	Howard Hughes Medical Institute
HHS	US Department of Health and Human Services
HRE	Health Research Enterprise
H&S	Heart and Stroke Foundation
ICT	Information and Communication Technologies
IGC	Interim Governing Council (Canadian Institutes of Health Research)
USIOM	US Institute of Medicine
KBE/S	Knowledge Based Economy/Society
MRC	Medical Research Council of Canada
NCE	Networks of Centres of Excellence Program
NCI	National Cancer Institute
NHRDP	National Health Research and Development Program
NIH	National Institutes of Health
NPM	New Public Management
NRC	National Research Council
NCE	National Research Council's Network Centres of Excellence
NSERC	National Science and Engineering Research Council
NSI	National Systems of Innovation
PMAC	Pharmaceutical Manufactures Association of Canada
SSHRC	Social Sciences and Humanities Research Council

INTRODUCTION

Purpose

The focus of this dissertation is an institutional study regarding the transformation of the Medical Research Council into the Canadian Institutes of Health Research. All institutions change by adjusting to continuously evolving conditions. However transformation is an unusual and complex event. Our primary aim is an exploration that considers why, despite political and institutional obstacles, in the year 2000 the federal government took the extraordinary step of decommissioning and replacing one of Canada's three Research Councils. The task of the newly designed and branded CIHR is "to transform health research in Canada".[1] The purpose of this research is to understand this complex occurrence by developing a deeper sense of how institutional and policy legacies evolve through successor paths to derive new outcomes.

We argue that to begin to understand the phenomenon of the CIHR a nuanced theoretical framework is necessary. This perspective applied to an analysis of the MRC-CIHR transformation allows us to strip away the legend of the 'event' and the 'event makers' from the multi-layered and nested processes that conjointly influence institutional continuity and change between consecutive points in time.

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[1] Medical Research Council of Canada 1999,The Medical Research Council of Canada 1998-99, The Report of the President, Medical Research Council Of Canada, Ottawa, p.7.

Contribution

The main contribution of this research is that, in the fields of Canadian science and innovation policy analysis, it is the first to examine in depth the full policy and institutional story of biomedical, clinical and health sciences. A second contribution is that it offers new insights into how an institutional transformation can be incorporated into neo-institutionalist theory as applied to science and knowledge-centred realms of governance.

The theoretical exploration presented in this research is an explanatory study of institutional stasis and change and the relationships between ideas, institutional (and policy) legacies, and agency as they combine to contribute to new outcomes. The conceptual core of this research is anchored in neo-institutionalism and is compatible with the basic assumptions of historical institutionalism. Historical institutionalism assists us in understanding how institutions change, and how over time iteratively they take their meaning and derive their purposes from broader influences within the political economy. From a theoretical perspective, historical institutionalism has done much to shed light on institutional development. However, to develop a finer level of analytic granularity about the complex forces of continuity and renewal exerted on and from within institutions, we augment an historical institutional framework with complementary theoretical perspectives to develop a thorough reflection on outcomes.

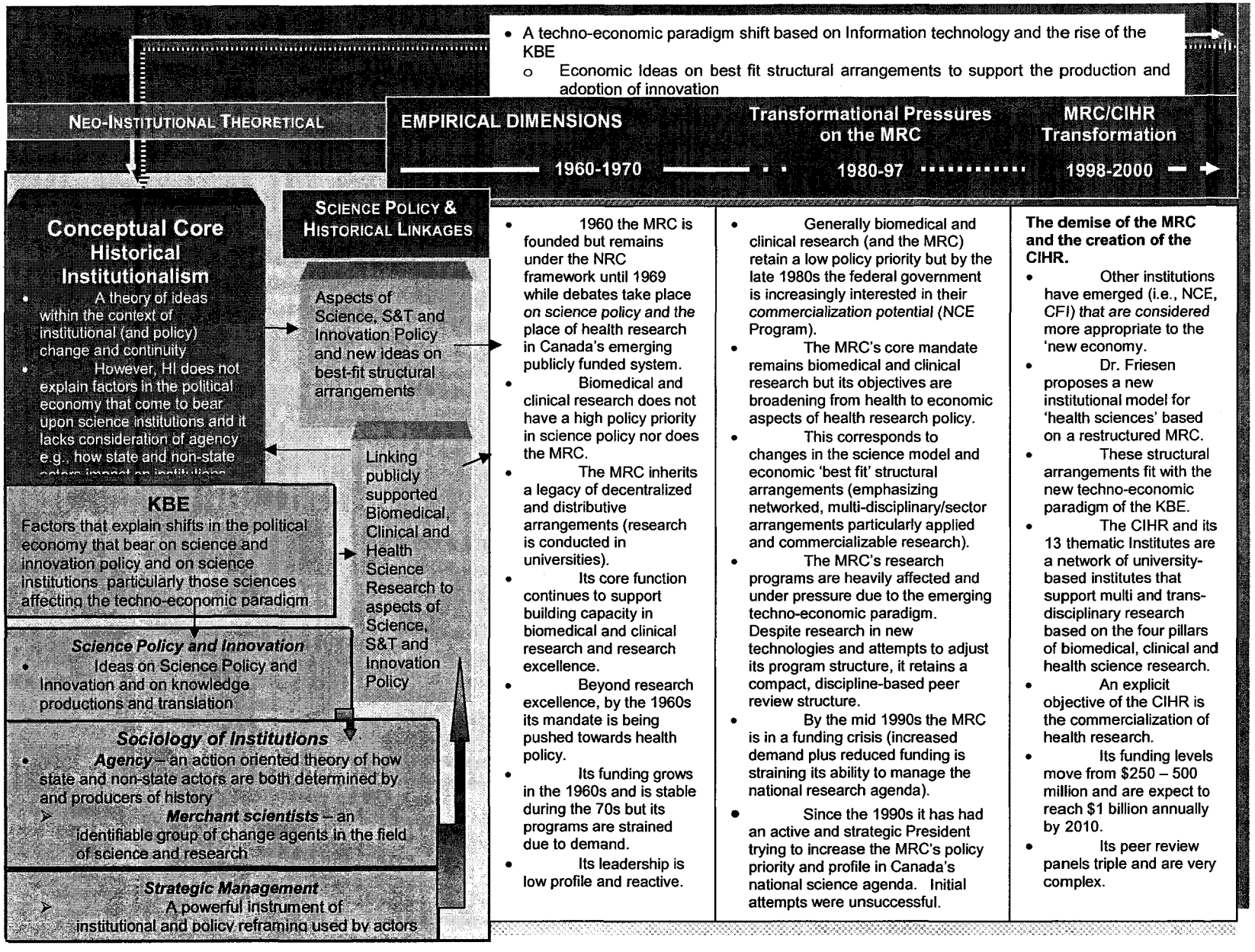
This balanced theoretical perspective overcomes some of the observed weaknesses or 'blind spots' in historical analysis. For example, we propose that

where the role of ideas is stressed to the exclusion of other considerations, or where the ideational and institutional conflate (Hay 2001; Kjaer & Pedersen 2001) it becomes impossible to address "how ideas become influential, why some ideas win out over others, or why ideas catch on at the time that they do".[2] Consequently, it is important to consider the processes that propel change forward in the political economy, the actors (state and other) that convey these changes into institutional and policy contexts, and the conditions that allow them to do so.

The following diagram is a preview of the conceptual framework.

[2] Weir, M 1992, *Politics and Jobs; The Boundaries of Employment Policy in the United States*, Princeton University Press, Princeton, p. 88.

Figure 1: Context: The Changing Nature of Ideas Impacting on Knowledge–Centred Realms



To begin to resolve the many complex puzzles around the demise of the MRC and the inception of the CIHR this dissertation examines the dynamics that underlie the occurrence of this institutional transformation. The axis of exploration revolves around a central research question.

Within the context of the Innovation Policy paradigm, how can we account for the MRC-CIHR transformation?

The research framework developed in chapter 2 is largely derived from historical institutionalism's and organizational sociology's theories of institutional stasis and change. However, neither historical institutionalism nor organizational sociology explain the factors in the political economy that come to bear on institutions such as why formerly held ideas are no longer tenable. Therefore, in the research framework, theories from historical institutionalism and organizational sociology are enriched by theories of the knowledge-based economy (KBE). This theory allows us to explore why the interpretive frameworks and worldviews of a policy field, and the institutions supporting those policies, can change over time.

The knowledge-based economy is a vague term that often refers to the use of knowledge to produce economic benefits. Various observers describe today's global economy as one in transition to a knowledge economy which is an extension of an information society.[3] This shift started in the 1980s as a result of the emergence of new Information and Communication Technology (ICT). Neo-Schumpeterians argue that as societies and their economies adapt to certain

[3] Castells, M 2000, *The rise of the network society, the information age: economy, society and culture*, vol. 1, Blackwell Press, Cambridge.

types of technical change, a 'techno-economic paradigm',[4] the widespread consequences of adoption lead to 'long waves' of adjustments. During these periods of transition the rules and practices that determined success in the former economy are rewritten. In Canada, in 1994, these new rules began to be loosely organized and reconstructed by Industry Canada under the rubric of the Innovation Agenda.

In essence, when the broadly held ideas of the post World War II Keynesian welfare state were no longer amenable to the emerging economic, political and cultural conditions of an information society and knowledge economy, new ideas were proposed as notional solutions to emerging conditions. Pressure for institutional and policy responses gathered momentum. At this point, these narratives and their solutions were still abstract expressions of the acceptance of changing conditions. Although these ideas advocated different paths, the acceptance of an idea does not constitute action.

Therefore, this thesis emphasizes the importance of agency, a theoretical element which historical institutionalism lacks but is addressed in organizational sociology. To put a theoretical lens on the role of state and non-state actors and how they can exploit opportunities to move change (and agendas) forward affecting institutional outcomes, we therefore incorporate literature from organizational sociology into the research framework. This literature allows us to focus more precisely on the methods and processes that actors use to promote institutional conformity (or stasis) to emerging conditions. In this context, agency

[4] Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter Publishers, London & New York, pp. 38-66.

is not used in the economic sense of principal-agent relationships. Rather, organizational sociology proposes agency as an element of how individuals can affect and interact with the nested processes through which institutions remain constant or how they change over time. From this perspective, the KBE ideas that advocated for institutional responses under the emerging paradigm of the KBE, opened up strategic opportunities for actors which they could take advantage of to achieve their goals.

Within the realm of science and research, there is an identifiable group of change agents. 'Merchant scientists' are star performers in their research fields. Their communities of practice recognize them as leaders. They tend to be charismatic and they straddle both public and private domains with confidence and flare. Through their entrepreneurial or strategic behaviour, these scientist change agents push the mandate for public science within their domain much closer to the emerging worldviews and rules of the KBE.[5] One way they do this is by introducing crisis narratives and proposing solutions through the formal and informal scripts and routines of strategic management. The practices of strategic management also assist bricolage[6] - where the self-conscious institutional actor can transpose models considered successful in one context to other situations. These practices significantly aided and accelerated the reframing of the MRC-CIHR using existing institutional models such as the National Centres of

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[5] Zucker, LG & Darby M R 1997, 'Individual action and the demand for institutions.' *American Behavioural Scientist*, vol. 40, no. 4, pp. 502-14. Also see Slaughter, S & Leslie, LL 1997, *Academic Capitalism: Politics, Policies, and the Entrepreneurial University',* Johns Hopkins University Press, Baltimore, and Atkinson-Grosjean, J 2001, 'Adventures in the nature of trade: the quest for "relevance" and excellence" in Canadian science', PhD Thesis, University of British Columbia. Retrieved August 11, 2006 from National Library of Canada.

[6] Douglas, M 1986, *How institutions think*, Syracuse University Press, Syracuse.

Excellence (NCE). Through the processes of strategy as a means by Dr. Friesen to organize the medical and health research communities, certain responses to the KBE in the knowledge-centred realm of biomedical, clinical and health research were reinforced while other options were excluded.

Finally, because this dissertation is focused on a science and research institution, the research framework also draws on theory, ideas and aspects from science, S&T and innovation policy literature, and of knowledge production and translation.

The research framework put forward in this dissertation is consistent with what some scholars have called a second movement in neo-institutional analysis (Campbell & Pedersen 2001). This literature explores how a multi-layered investigation drawing on subtle theoretical distinctions and variations sheds new light on institutional stasis and change.

Nonetheless, an explanatory analysis of institutional change requires more than consideration of the contingent bearers of political and institutional amendments. It also requires sensitivity to historical antecedents. This allows us to identify the time of transformation and the magnitude of change so that the broader social, political and economic meanings of transformation can be brought under scrutiny.

Context and Historical Linkages

A first order condition in understanding the transformation in this case, is to know more precisely the history of biomedical and clinical research and the nature of the structural arrangements supporting public funding for these

activities. This longer view is the objective of chapters 1 and 3. Chapter 4 focuses on the emergence of the MRC in 1960 and its developments throughout a decade of Royal Commissions, which articulated new ideas on science policy and on biomedical, clinical and health sciences policy. It is a transition chapter between the historical context and core analysis conducted in chapters 5 and 6.

Developing a deeply set historical context is not a straightforward undertaking. Given the low policy priority and funding for these sciences and their research activities, they did not generate much attention in political science or economic literature for most of the period under consideration. In order to develop the historical context, the first three empirical chapters of this dissertation rely partly on research conducted by Dr. Peter Aucoin in his doctoral dissertation published in 1972.[7] The focus of his research was largely on the influences of the biomedical, clinical and health sciences research communities on the production of health research policy. His work also provides a rich record of this group of emerging sciences in Canada as well as foundational data for a contemporary and nuanced institutional analysis of change within this realm.

This medical research base is vetted through a review of early and more contemporary sources of science policy literature and in particular Doern and Levesque's analysis of the National Research Council (NRC). By combining these sources, as well as others in science policy, we have produced a history and context for biomedical and clinical research in Canada. This upfront research allows us to propose a set of historical conditions, which have had

[7] Aucoin, P 1972, 'Health scientists and the making of health science policy in Canada', PhD Thesis, Queen's University, Kingston.

lasting consequences as key characteristics in federally supported biomedical and clinical research. In chapters 1 and 3 these specifics are discussed in detail. They are the legacy paths though which these sciences and their research activities progressed towards the latter decades of the last century.

Through this historical contextual perspective, we can compare and link the precursors of the MRC, which resided first within the Associate and then the Divisional structures of the NRC, to the rapidly evolving MRC of the 1960s and 1970s, prior to the period of transformation. Establishing this groundwork first is consistent with an historical institutional analysis, which emphasizes the successive nature of institutional (and policy) change. By assessing the pre-existing arrangements of the MRC against the present new arrangements of the CIHR, we find that biomedical and clinical research under the MRC was decentralized, multi-sector and multi-disciplined. Generally research projects were undertaken in response to the applied and empirical nature of biomedical and clinical science. Due to jurisdictional issues in health and education and the complex multi-sector arrangements for conducting and funding biomedical and clinical research, the activities of this research were quite decentralized in universities, their affiliated teaching hospitals and in foundations.

The structural arrangements of the CIHR are proposed as a new mode of virtual and networked organization. The spectrum of health sciences under the CIHR and the scope of its decentralized arrangements for funding and producing research results are orders of magnitude larger than under the MRC. The CIHR has 13 virtual institutes designed to address thematic, multi-disciplinary research.

The CIHR has many more review panels and a complex peer system due to the interdisciplinary research proposal and the institutes' strategic research thrusts. The complexity and growth of the CIHR from that of the MRC is undeniable. But other aspects of the CIHR are quite similar to the MRC, such as decentralization of research projects and their locations, which generally remain based in universities. Multi-disciplinarity and complex multi-sector funding arrangements are also part of the historical context of these sciences. Does this raise a contradiction in that what first appears to be a whole transformative change initiative, also has connections to the past? Rather than a contradiction, we argue that this provides invaluable clues to the nature of transformation. What has been changed in even more significant ways is the mandate of the CIHR from that of the MRC. An important aspect of this transformation change initiative is that the CIHR's mandate includes commercialization. The MRC's mandate did not.

The Three Main Lines of Argument

A key research issue in this dissertation has been: *How can we reconcile the claims that the CIHR is a transformational solution ushered in by an apparent crisis in institutional arrangements and outcomes, against an empirical record that shows many characteristics of the MRC also reside within the CIHR? What are the key differences between the early and later periods of the MRC's development and the period of transformation, 1980s and 1990s?*

Accordingly, three main arguments are advanced in the analysis. The first argument is that a change occurred in the relationship of biomedical and clinical

sciences to society due to a 'techno-economic paradigm' shift corresponding to the emergence of the knowledge-based economy. Of special significance is the fact that during the techno-economic shift of the 1980s and 1990s, biomedical and clinical sciences became economically important. Previously these sciences had been socially productive but not of significant interest to federal priorities for economic growth. This changed circumstance set the conditions for an institutional transformation.

The second main argument is that a key factor in the transformation was the MRC's last President, Dr. Henry Friesen and his entrepreneurial and strategic behaviour. In 1997 Friesen put forward a conceptual redesign and a new approach for Canada's premier health research institution: the idea of a virtual and networked Canadian Institutes of Health Research (CIHR).

The third argument centres on the view that the 'event' of the CIHR's formation and its structure, in many respects, was partly a catch-up process to more accurately reflect changes already embedded and evolving in the former MRC, and in the very nature of health and medical research which, based on its inherent characteristics, has a more decentralized and networked structure. Medical and health research was always different from research in the other natural and social sciences. Therefore both the first main argument of a paradigm shift and second argument that the strategic leadership of Dr. Friesen as a merchant scientist accelerated and affected the processes of institutional change and reframing are complemented by these embedded fertile inherent characteristics of medical and health research.

The Transformation In Brief

In April 2000, Health Canada's $9 million National Health and Development Research Program (NHDRP)[8] and the much larger $250 million Medical Research Council merged. Canada's new, premier health research institution became the CIHR. The overall goal of the CIHR is to produce science that excels "according to internationally accepted standards of scientific excellence".[9] However, the CIHR Act also formalized different institutional objectives from those of the MRC. The MRC's mandate focused primarily on promoting, assisting and undertaking basic, applied, and clinical research in Canada and acting as an advisor on health research to the National Minister of Health.[10]

The CIHR has a much broader mandate. It is expected to promote the dissemination of knowledge and the application of health research, to forge an integrated health research agenda across disciplines, sectors and regions, and importantly, to facilitate economic development through the commercialization of health research. To assist in making this transformation happen, the budget of the CIHR is reaching the target set in 2000 of $1 billion annually.[11]

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[8] The NHRDP was Health Canada's 9 million dollar extramural investigator-driven, health research program. Since 1975 it had not only provided research support for a wide range of applied health research issues, it was an important link between Health Canada and the research Granting Councils. Through these linkages to Health Canada drew the attention of the research community to the kinds of inquiries necessary to further the national health policy agenda.

[9] <http://www.parl.gc.ca/36/2/parlbus/chambus/house/bills/government/C-13/C-13_4/C-13_cover-E.html>

[10] Medical Research Council of Canada 1991,The Medical Research Council of Canada 1990-91, The Report of the President, Medical research Council Of Canada, Ottawa.

[11] Canadian Institutes for Health Research 2005, First report on peer review innovations, Canadian Institutes of Health Research, Ottawa. <http://www.cihr-irsc.gc.ca/dgi-bin/primt-imprimer.pl>

The stated rationale for the CIHR's creation was to invigorate the national biomedical and health services science research agenda.[12] A reasonable question then is, why was it necessary to decommission the $250 million MRC, an established and respected institution, to invigorate biomedical and health services research in Canada? Despite low funding levels, the MRC had been producing internationally recognized research when compared to peer OECD countries. In 1993, the University of British Columbia's Dr. Michael Smith, a long-term recipient of MRC funding, won a Nobel Prize for his contributions to the developments of methods within DNA-based chemistry. Throughout the MRC's stewardship of the national biomedical and clinical research agenda, Canada had an impressive rate of research citations according to the National Science Indicators. Why was the MRC no longer able to generate innovation despite decades of impressive research breakthroughs? What was so convincing about the conceptual representation of the CIHR that it could do in theory what apparently, the MRC and the NHRDP were no longer able to do in practice?

A look at the institutional partners involved with the CIHR, or more generally in medical research, draws attention as well to an even more complex puzzle when one considers the mix of interests involved. The CIHR's research agenda certainly reaches out to and explicitly embraces support of economic interests by emphasizing the commercialization of biomedical and clinical research. These arrangements are more multifaceted and difficult to account for than an interest-based argument suggests. Key players in the national research agenda include the influential health research charities. Charities such as the

[12] Ibid.

National Cancer Institute of Canada (NCIC) and Canadian Arthritis and Rheumatism Society (CARS) and later associations like the Heart and Stroke Foundation of Canada, the Canadian Cystic Fibrosis Foundation, and the Juvenile Diabetes Research Foundation Canada, among many others, have provided considerable financial assistance to support the national research agenda for decades. These organizations are largely supported by private donations. Health research charities and their stakeholders are very quick to express concern to the federal government and to the CIHR when they feel that commercialization plays too important a role in the national research agenda or why their research projects are funded.

To assist in resolving the many complex puzzles around the demise of the MRC and the inception of the CIHR, one must turn to the literature on the knowledge-based economy (KBE). Based on this literature, we show that the policy priority of biomedical and clinical research changed as the result of a techno-economic paradigm shift caused by the emergence of information and related technologies. Techno-economic shifts have other consequences. Their diffusion is accompanied by major structural crises necessitating all manner of social and institutional changes to bring in a system of social management based on these technologies.[13] These adjustments were heralded in with the KBE. Biotechnology as an information-based technology provides one of the new economy's essential foundations. It is expected to be a major factor in improving

[13]. Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter, London & New York, pp. 38-66.

living standards by lowering production costs.[14] We argue that the techno-economic shift and the emergence of the KBE started the transformational pressures on the MRC in the 1980s and that these pressures intensified throughout the 1990s.

As the broad post-World War II logics of the welfare state and related industrial policies declined and came into question, the presumptions of a more knowledge-intensive economy grew in importance. Under the rubric and ideas of the knowledge-based economy, new policy priorities arose in areas such as skills development, education and research through their linkages to economic competitiveness.

In Canada, the promise of the knowledge-based economy gave rise to a demanding and somewhat more specific policy paradigm – the Innovation Agenda, where it is proposed that businesses and jobs will cluster around talent. This talent will create the products and processes of innovation that, when adopted particularly through commercialization, will lead to improved social and economic prosperity as predicted by the shift toward a knowledge-based economy. Supporting these views are economic theories that bear on the production and adoption of innovation policies and outcomes as key to enhancing national productivity and economic growth, and those that link the creation of innovations to the interactions between multi-disciplinary research teams that also cross sectors. In Canada, due to the division of federal and provincial

[14] Kenny, M 1986, *Biotechnology: the university-industrial complex*, Yale University Press, New Haven and London.

powers under the constitution, health and medical research projects in particular can cut across political jurisdictions.

This Agenda gained policy momentum in the early 1990s and then accelerated towards the end of the decade. This changed the source and type of demands placed on the national science agenda for biomedical and clinical research. It also assigned very different public and private purposes to the expanding continuum of sciences related to health. The ideas behind the KBE and the solutions proposed in the Innovation Agenda became powerful conveyors of change embedding new meanings, purposes and values into Canada's publicly funded national science agenda and into the institutions tasked to implement these policies.

We also argue that the 'event' of the MRC-CIHR transformation resulted from the actions taken by its President, Dr. Henry Friesen, and his activities from 1998 to 2000. During the late 1980s and early 1990s Canada moved away from a modestly resourced and low profiled national mandate for biomedical, clinical and health research, towards a much more ambitious and expanded research agenda. Several provincial and federal institutions emerged that could compete for aspects of the MRC's mandate. Provincially this included The Ontario Centres of Excellence and the Alberta Heritage Foundation for Medical Research. At the federal level new competitors included the Canadian Health Services Research Foundation (CHSRF), a revitalized Canadian Institute for Health Information (CIHI) and, of special note, the National Centres of Excellence (NCE).

The NCE was attracting considerable policy favour, attention and funding. It also offered a model that could be transposed into other contexts. Some claim that the reason for the NCE's success was its networked structure, its multidisciplinary, multi-sector research agenda and its focus on university-based research activities. These arrangements were proposed as a better fit with science under the principles of a new economy and revisions to the science model. Others believed that its favour with the federal government was based on a structural design that allowed the government to work around jurisdictional issues in health and education. Regardless of the actual or perceived reasons for the NCE, it did give the federal government a tool to directly access university-based biomedical and clinical researchers and to focus their research projects on application and commercialization.

Not only was the NCE attracting policy favour it was also attracting resources. Since its inception in 1989, part of these resources, which were increasing annually, came directly from the MRC's budget. This was an arrangement forced on the MRC by the federal government precisely at the same time Dr. Friesen was trying to attract more funding to the MRC. The MRC and its research programs were under tremendous pressure. The MRC's research programs were under increasing demands from the growing number of researchers attracted to biomedical, clinical research and health sciences. Meanwhile the complexity of assessing research proposals and projects as new technologies changed these sciences stretched the MRC's ability to respond. Complicating this already challenging scenario was that during most of 1990s the

MRC's budget was reduced as part of the cost cutting measures of the Chretien-Martin Liberals.

During the 1990s and the initial years of Dr. Friesen's Presidency, the MRC was losing its institutional position as Canada's premier research institution capable of producing internationally recognized science. Under the direction of the CIHR – a CIHR that was proposed as a new networked and virtual mode of organization – its status as Canada's premier institution responsible for the national health research agenda was restored. This research will consider why the status of biomedical, clinical and health research changed during the 1980s and 1990s; why the structural arrangements of the CIHR have themselves become instruments of policy; and how an actor such as Dr. Henry Friesen influenced institutional outcomes, to guide insight into the formation of the CIHR.

There are no reasons either in theory or in history as to why the MRC would prosper under the new conditions of the KBE, even if its research programs were in key areas of potential economic, science and social interest. The reality was that other institutions could simply take its place and appeared to be doing so. In fact, in Canada, although for other reasons, this has happened before. In chapter 4 section 4.1.1 we discuss how in the 1960s the National Research Council fell out of favour and entered into a period of considerable decline until the late 1980s and early 1990s. Throughout the 1970s many of its responsibilities were removed and placed under the auspices of other institutions and their programs. For example, by 1979, a new research council was formed,

the National Science and Engineering Research Council (NSERC), which took over the NRC's research granting activities.

We argue that the conditions of an emerging paradigm provided Dr. Friesen with a powerful catalyst to support his strategic intentions. Opportunities were opened up for him as an institutional actor such that he could use new ideas in the mediation of his strategic conduct and hence significantly influence political and institutional outcomes.

The budget announcements of 1997 heralded in a period of renewed economic optimism. The MRC's funding was restored to former levels. Dr. Friesen was alarmed and surprised that funding to the MRC was not increased significantly. He considered the restoration of the MRC's budget totally inadequate to sustaining a viable research community in Canada that could compete internationally. Although his initial attempts in the early and mid 1990s to attract additional funding from the federal government for the MRC had failed, in 1997 Dr. Friesen developed a new strategy. He proposed a new organizational structure for Canada's premier health sciences research institution, which included virtual institutes and an integrated multi-disciplinary research agenda. The conceptual model of the CIHR had many similarities to the NCE including a focus on commercialization of research, except now it was being proposed on the scale of Research Granting Council.

Between 1998 and 2000 when the CIHR came into existence, Dr. Friesen relentlessly pursued this goal. Largely removed from public interest or debate, the vision and mandate for Canada's national biomedical and clinical sciences as

well as those of public health and the more traditional health sciences were reframed.

Methodology and Sources

This study undertakes qualitative research on a complex phenomenon in a context-specific way to generate understanding (e.g., research directed at real-world settings without the manipulation of the phenomenon of interest).[15] The quality concept in social science research is focused on dependably generating understanding and is closely matched to the concept of reliability in quantitative research. Reliability is conceptualized as trustworthiness, rigor and quality in the qualitative paradigm.[16] The reliability of this research is obtained by examination of trustworthy sources. The research framework is designed to structure thinking about institutional transformation in a way that clarifies and promotes understanding.

The methodology focuses on four aspects of research: relevance; plausibility; confirmability; and credibility with the goal of making the research systematic and dependable.

Relevance is accomplished by linking historical analysis, descriptive research and scholarly literature in new ways to illuminate the possibilities and constraints of institutional change and to shed light on the MRC-CIHR transformation. This study is *plausible* in that it does not seek to irrefutably prove untested hypothesis, but suggests three main lines of argument that are suitably

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[15] Golafshani, N 2003, 'Understanding reliability and validity in qualitative research', *The Qualitative Report*, vol. 8, No. 4, December pp. 597-607 < http://www.nova.edu/sss/QR/QR8-4/golafshani.pdf >
[16] Ibid., 604.

investigated and thoroughly considered throughout this research project. The research can be *confirmed* by similar investigations. It is *credible* in that the approach taken was to conduct a long-term research project and pursue it with rigor.

The method for this research project involves a comparative case-oriented research approach examining various expressions of one institution over consecutive periods of time. The empirical content to test the theoretical framework comes from a variety of sources that deal with the nature, activities and administration of medical and health sciences research in Canada.

Documentation on the Medical Research Council comes from a variety of sources: Dr. Aucoin's doctoral dissertation and the numerous sources referenced in that work; archived material on the Medical Research Committee and Division of the NRC, the MRC's Quarterly News Letters from 1971-1999, the Medical Research Council's annual reports; archived strategic planning documents from the MRC, the interim and final reports from the Interim Governing Council of the CIHR as well as published and unpublished material on the CIHR since its inception. These sources were supplemented with data from surveys conducted by the National Research Council, the Medical Research Council, and the Canadian Institutes of Health Research. Also referenced were Senate Committees, Health Canada documentation and sources from various health research associations.

Secondary sources to complement primary material were interviews as approved by the Carleton University Graduate Studies Research Ethics

Committee. These tertiary research sources consisted of an initial set of semi-structured interviews with key persons from the public and voluntary sectors both past and present, academics, and private sector business people. These interviewees were chosen because these people had knowledge of or had been involved in the MRC-CIHR transformation. The objective of these interviews was to obtain background information, opinion, names for additional interviews, and documented sources of information. The selection of interviewees was intended to acquire as broad a perspective as possible of the events of transformation. These interviews were carried out between January 2004 and April 2005.

The next set of interviews was more formal and structured. They were conducted with the key players involved in the transformation and were conducted between June 2006 and August 2007.

All the interviews were confidential, anonymous, and not-for-direct attribution. This approach was taken because many of those involved in the interviews were less willing to share openly their experiences if they knew that their names would be published along with comments they had made. All interviewees were provided with information about the author ahead of time, an abstract of the work, and a list of questions to be discussed.

The interviews were conducted in accordance with the protocols of Carleton University Graduate Studies Research Ethics Committee.

Chapter Layout

In Chapter 1 – The historical conditions that contributed to key characteristics of science policy are reviewed as an organizing perspective to present the early developments in public support for biomedical and clinical sciences.

In Chapter 2 – The primary objective of this chapter is to develop the conceptual framework for the main empirical points in time considered in this dissertation, the 1980s to present. To do this, the first task of this chapter is to state the research question and then position this question within the literature. The literature drawn on to develop the research framework comes from various literature streams within neo-institutional disciplines. Specifically, this is theory from historical institutionalism, organizational sociology and theory, strategic management, and ideas and aspects from science, S&T and innovation policy literature and related knowledge production and translation.

In Chapter 3 – This chapter presents the sub-characteristics of biomedical and clinical sciences. The time period considered is between 1939, first systematic public support for these sciences conducted through the NCR, up to just before the MRC was established in 1960. Given the enduring quality of these characteristics, we propose them as the legacy paths through which later developments in biomedical and clinical research took place.

Chapter 4 – This chapter provides a bridge between the historical concepts and the empirical core chapters. It focuses on the formation of the MRC in the 1960s and its development throughout the 1970s. We look at the dominant ideas driving knowledge-centred realms and in particular those impacting on public support for biomedical and clinical sciences.

Chapter 5 – Beginning Part Two's overall three chapter empirical analysis this chapter initiates the analysis of the core empirical period of transformation, using the research framework set out in chapter 2. The time period covered is the 1980s when new and emerging technologies and ideas are putting the national science agenda for biomedical and clinical research under pressure. A number of early experiments in institutional designs intended to better suit emerging conditions were underway. Because they were generally considered successful, these models opened up strategic opportunities for transposition into other contexts.

Chapter 6 – In this chapter we apply the research framework to the final period and the eventual occurrence of transformation in 2000. We consider the exogenous institutional factors and issues that were putting pressure on the MRC and the nature of the MRC's response under its last President, Dr. Henry Friesen. We also consider the role of Dr. Henry Friesen as both the President of the MRC and as a merchant scientist with an agenda for change. Through the rituals and practices of strategic management he built a change coalition and

introduced new scripts and routines into the MRC and its programs. This provided a powerful catalyst to the role of agency. In part change was framed as a response to new political, economic and science ideas and conditions. Importantly it was also a conscious effort by Dr. Friesen to seize and shape strategic opportunities and to promote a revised national mandate for health sciences. This more thorough consideration of endogenous change factors allows us to understand why the same exogenous factors faced by all institutions netted different responses and outcomes in the MRC and resulted in the formation of the CIHR.

Chapter 7 – Finally in chapter 7 we consider the early post transformation period. The chapter is not intended as an evaluation of the CIHR but it does provide an early assessment of some of the challenges and pressures faced by this vastly expanded institution and national research program. Its design is intended to support multi- and even trans-disciplinary research based on four thematic pillars of science – bio-medical, clinical, health systems and services, and population health. The integration of the research agenda raises issues and provides a fruitful area for further study.

Conclusions

In this dissertation we argue that key influences on the MRC-CIHR transformation were the 'techno economic paradigm shift' associated with the rise of the KBE and the strategic behaviour of the MRC's last president.

To assist Canada in meeting the new demands of the KBE, a demanding policy paradigm, referred to as the Innovation Agenda, was initiated in the early 1990s. Throughout the decade and into the next, the Innovation Agenda was iteratively augmented and refined. The Innovation Agenda was a broad and sometimes seemingly unconnected portfolio of policy and regulator initiatives, but aspects of the Agenda focused on research. The promise of new and emerging technologies and how best to support their development and application, was expected to assist Canada in successfully transitioning toward the KBE.

Throughout the 1990s Dr. Friesen had been trying to preserve the MRC's place as Canada's premier health research institution despite a prolonged period of relentless change and pressures. Throughout most of the 1990s Dr. Friesen had been unsuccessful in retaining the MRC's annual funding allocations, let alone attracting additional resources to mediate these conditions. This put the MRC under tremendous pressure and disadvantaged its ability to negotiate the structural disruptions and adjustments set into motion by the emergence of the KBE and Canada's science policy thrusts under the Innovation Agenda. The MRC's ability to deliver on a national biomedical and clinical research agenda was in question. Other research institutions were taking primary roles in its research mandate and agenda. A notable example at the federal level was the politically successful National Centres of Excellence (NCE), which offered a model for emulation.

The historical research presented in this dissertation demonstrates that biomedical and clinical research was conducted in the triple helix of university,

industry and government science decades before this term was coined in the 1990s. We argue that although the model of the CIHR was influenced and built from the legacies of the MRC, its scope, scale and purpose are very different. Dr. Friesen persistently marketed this new institutional solution to the research community and politicians as a better fit with the emerging conditions in science and society. The claim was that the networked and virtual structural arrangements of the CIHR and its thematic multi- and even trans-disciplinary research agenda would lead to better research outcomes improving both health and the economy. Dr. Friesen was successful in his pursuit and in 2000 the CIHR came into existence. The challenging task of managing its implementation and delivering on its promise fell to the first President of the CIHR, Dr. Alan Bernstein.

The findings in this research are consistent with theoretical perspectives of historical institutionalism. What at first seems to be a wholly transformational institutional change project is often in some sense linked to and enabled by paths that precede change, even transformation change.

PART 1: HISTORY, CONTEXT AND CONCEPTUAL FRAMEWORK

CHAPTER 1

Early Biomedical Research in Canada

Introduction

To begin the exploration, this chapter explores early biomedical research in Canada. It starts with a brief discussion of the early history of Canada's science policy. To assist us in cultivating a deeper understanding of the empirical record, we apply an organizing perspective proposed and used by several science policy scholars. This organizing perspective is discussed in science policy literature as "historical conditioners" which lead to a generalizable set of "enduring characteristics" (Dufour & de la Mothe 1993). Dufour and de la Mothe argue that these are consistent and fundamental factors that directly bear on the directions and objectives of Canada's science policy over many years. They are:

- The importance of the perceived relationship of science to the economic goals of the state;
- The personalist style of the leadership in the science community; and
- International influences on the culture, mandate and organization of science and research.[17]

[17] Dufour, P & de la Mothe, J 1993, 'The organization, structure and decision processes of science and technology', in P Dufour & J de la Mothe (eds), *Science and technology in Canada*, Longman Press, London, pp. 6-22.

These factors are important to this research because they provide key insights into why biomedical and clinical sciences were unimportant for many years in Canada's science policy. As with traditional science research, personality, connections, and international influences drove (and to various extents continue to drive) much of Canada's science policy regardless of discipline. However, initially biomedical and clinical research had no connection to the economic agenda of the federal government. Since these sciences were not considered economically important, they received relatively little funding and attention at the national level. This would not change until the advent of information and biotechnology as part of what some scholars have identified as long waves in economic history (Freeman & Perez 1989; Schumpeter 1964). The current 'techno-economic paradigm' shift of this cycle started in the late 1970s and 1980s and carried on throughout the 1990s. This will be discussed in greater detail in chapter 2 in section 2.3 because it corresponds to the period of transformation of the MRC, which eventually led to the establishment of the CIHR.

In section 1.2 we consider the role and contributions of the National Research Council (NRC) in promoting an environment to pursue these sciences in Canada. The NRC was Canada's first science institution responsible for interpreting, implementing, and influencing the direction of Canada's early science policy even before Canada had an articulated direction for this policy

field.[18] A key question here is "why did the NRC develop a very different policy and structural response for medical research than for the traditional chemical and physical sciences?" As noted earlier, biomedical sciences had virtually no connection to the economic goals of the federal government, which largely focused on nation-building projects and later support for secondary industries. What we find is that jurisdictional issues, complex multi-sector funding arrangements, and the applied nature of biomedical and clinical research (which early on led to multi-sector alliances) also contributed to the NRC's unique response in supporting these sciences. The result of all these factors contributed to the NRC's decision to use the university sector as the primary site to conduct biomedical and clinical research. Over several decades, this built a well respected research capacity in Canadian universities, their teaching hospitals and health research foundations, and, eventually, their health research complexes.

In chapter 3 we take this analysis a step further. Although we argue that three primary conditioners of science policy apply to biomedical and clinical research – economic importance, personality and international influences – we propose a secondary set of characteristics specific to public support for biomedical and clinical research as the reasons for the NRC's decentralized approach in supporting these sciences. We argue that these attributes set the foundation for very different institutional paths for biomedical and clinical research in contrast to public support for research in the traditional physical and

[18] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.

chemical sciences in Canada. We propose the following secondary characteristics:

- A history of complex and various funding arrangements among public, private, and not-for-profit partners in matters related to support for biomedical and clinical research.
- Tight connections between basic and applied (although not necessarily mission-driven)[19] research due to the empirical nature of biomedical and clinical research; and,
- A legacy of decentralization in policy development and the structural arrangements supporting publicly funded biomedical and clinical research in Canada.

1.1 Key Characteristics of Science Policy

1.1.1 Economic Relevance and Publicly Funded Science

In 1842 the government of what would become Canada began to support science and exploration through the work of the Geological Survey of Canada (GSC). Although the activities of the GSC were not directed by any 'official' science policy, they attended to practical matters of nation building through the inventorying and exploitation of natural resources.[20]

As an illustration of how the government targeted science toward pragmatic matters, the Geological Survey conducted a comprehensive survey of the Dominion. As William Logan, the first scientific director of the Geological

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[19] Generally, with the exception of WW II, mission driven research is a more recent phenomena in Canada for these sciences. Mission driven refers to research being directed at specific research questions usually through the granting process rather than research proposals being based on the interests and experiences of researchers.

[20] Thistle, MW 1966, *The inner ring: the early history of the National Research Council of Canada*, University of Toronto Press, Toronto; Dufour, P & de la Mothe, J 1993, 'The historical conditioning of S&T', in P Dufour, and J. de la Mothe (eds), *Science and technology in Canada*, Longman Press, London, pp. 6-22; Doern, GB 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal; Meisel, J 1998, 'Caesar and the savants: some socio-political contexts of science and technology in Canada', in AM Herzberg & I Krupka (eds), *Statistics, science and public policy*, Queen's University, Kingston; Langford, C, Langford, M & Burch, RD 1997, 'The well-stirred reactor: evolution of industry-government-university relations in Canada', *Science and Public Policy*, vol. 24, no. 1, pp. 21-27; Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.

Survey noted: "The objective of the Survey is to ascertain the mineral resources of the country, and this is kept steadily in view. Whatever new scientific facts have resulted from it, has come out in the course of what I conceive to be economic research, carried out in a scientific way." [21]

In the 1880's the GSC began support for astronomy. This research was undertaken to produce longitudinal maps used in building the Canadian National Railway.

Subsequent to the establishment of the GSC, the Dominion Experimental Farms were created in 1866. These farms were modeled after the USA's land grant movement and were directed at producing innovations suited to increase agricultural productivity in cold climates. Marine research stations for the fishing industry were created in the 1890s and became the Biological Board in 1912. The forestry experimental stations followed shortly after.[22]

During this same period, the late 19th century, scientific methods were introduced into modern Western medicine through the use of anesthetics and antiseptic conditions in surgeries and childbirths.[23] By the early twentieth century the discovery of insulin and penicillin would be added to the growing list of medical research's achievements. Insulin was discovered in 1921 as part of a deliberate and relentless investigation of diabetes. Penicillin was the first

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[21] Adams, FD 1967, 'The history of geology in Canada', in HM Tory (ed) *A History of Science in Canada*, McClelland and Steward Ltd., Toronto, cited in Kinder, J 2003, 'The doubling of government science and Canada's innovation strategy,' in B Doern, (ed.) *How Ottawa Spends 2003-2004: Regime Change and Policy Shift*, Oxford University Press, pp 204-220.

Kinder, J 2003, 'The doubling of government science and Canada's innovation strategy,' in B Doern, (ed.) *How Ottawa Spends 2003-2004: Regime Change and Policy Shift*, Oxford University Press, Oxford.

[22] Ibid.

[23] MacDermot, HE 1967, *One hundred years of medicine in Canada*, McClelland & Stewart, Toronto.

antibiotic, or bacteria killer, discovered. It was reproduced in a lab quite by chance by a Scottish Professor of Bacteriology, Alexander Fleming in his somewhat chaotic lab in 1928. Dr. Fleming had developed a reputation as a brilliant researcher, but quite a careless lab technician. The combination changed the world because now simple infections that had been lethal killers could be readily treated. Despite the accumulating early evidence of the impact of medicinal science and biomedical research, these foundational discoveries were made without support from any level of government.

In 1921 in an "overheated and under-funded lab",[24] Canadian biomedical researchers produced groundbreaking results and international acclaim when Frederick Banting, John James Macleod, Charles Best, and James Bertram Collip discovered how to use insulin therapeutically and how to reproduce it synthetically. Prior to this discovery, diabetes had been a death sentence. As a result of their work, a widespread appreciation developed for research in medical practice due to the countless lives that were saved. This highly productive biomedical research project also led to Canada's first Nobel Prize generating a high public profile for its discoverers through enthusiastic and extensive media coverage. This event was added to a growing list of accomplishments attributable to the new scientific fields of medical research. Private sources from philanthropy, the volunteer sector of health research charities, and the private sector filled the funding gap encouraging researchers to continue their efforts.

[24] <http://www.cbc.ca/greatest/top_ten/nominee/banting-frederick.html>

Nonetheless, publicly funded support for research activities from federal sources was reserved for projects that contributed directly to Canada's early nation building initiatives and the exploitation of natural resources.

In the next three sections we will consider three historical conditioners and enduring characteristics developed by John de la Mothe and Paul Dufour in their 1995 work "Science and Technology in Canada".[25] Over the next three sections we will juxtapose biomedical and clinical research within this organizing perspective to identify similarities and differences in factors that conditioned early public support for biomedical and clinical research in Canada.

1.1.2 Personalist Styles

The early history of Canadian science policy was in large part dependent on a handful of well-connected and influential men and their beliefs about science. This elite group tended to come from similar socio-economic and scientific backgrounds.[26] They held positions of power at the most senior levels of industry, academic, and government science. "Everybody knew everybody else," and certainly anybody of importance or influence in matters that related to science and science policy.[27]

Frequently cited to illustrate the personalist style was the close working relationship between Dr. C.J. Mackenzie, then president of the NRC, and the

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[25] This organizing perspective has been applied by other science scholars when considering the historical developments of science policy in Canada. As an example, see Atkinson-Grosjean, J 2001, 'Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science', PhD Thesis, University of British Columbia, British Columbia.

[26] Most of these men were Canadian-born of British extraction, middle-class in origin, and Protestant. See Porter, J 1965, *The vertical mosaic: an analysis of social class and power in Canada*, University of Toronto Press, Toronto, pp. 507-11. For the operation of the US power elite, see Mills, CW 1956, *The power elite*, Oxford University Press, New York.

[27] Atkinson-Grosjean, J, House, D & Fisher, D 2001, 'Canadian science policy and public research organizations in the 20th century', *Science Studies: An Interdisciplinary Journal for Science and Technology Studies*, vol. 14, no. 1, p. 2.

Minister of Trade and Commerce, the Honourable C.D. Howe. Both men were engineers. When questioned by a journalist on the difficulty of establishing a nuclear research unit in the NRC during the Second World War, Mackenzie replied:

> It was surprisingly easy. In those days the NRC reported to C.D. Howe [then Minster of Trade and Commerce]...C.D. was a particular friend of mine....We all went to C.D.'s office and discussed the idea with him. I remember he sat there and listened to the whole thing, then he turned to me and said, "What do you think?" I told him I thought it was a sound idea, then he nodded a couple of times and said: 'Okay, let's go'.[28]

The personalist style was enhanced by influences such as the Second World War, where small groups of influential men made rapid decisions, often in secrecy.[29] Although this set a path for the NRC that was subsequently hard to break, this situation began to change in the 1960's when the personalist system began to be perceived as inefficient.[30] Even so, it left a legacy of - and an appetite for - strong, well-connected leadership in research institutions. Perhaps almost ironically, as science became more politicized in the 1960's by the various governments of the day, demands increased that science policy decisions follow "scientific" methods complete with rational justifications. These pressures made the influence of the personalist system more discrete, but even in recent years personal influence remains a major factor: "This is Canada. When these people speak, others listen."[31]

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[28] Lee, B 1961, 'The Atom Secrets', Globe Magazine, 28 October 1961, in J Porter, 1965, *The vertical mosaic: an analysis of social class and power in Canada*, University of Toronto Press, Toronto, p. 432.
[29] Doern, G B 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal, pp. 4, 48.
[30] Royal Commission on Government Organization 1963, *The Royal Commission on Health Services 1963*, vol. IV, no. 23, Queen's Printer, Ottawa.
[31] Henderson, M 2001, 'Life sciences commercialization initiative seeks to capture benefits of Canada's growing research base', *Re$earch Money*, 4 April.

These same patterns can be observed in biomedical research. The legacies of Banting, Collip, and Best went well beyond their achievements at the science bench. They were instrumental in establishing Canada's biomedical research infrastructure, constantly lobbying for funding support from private and public sources.[32]

In chapter 2 we take a slightly different slant on the personalist perspective through a review of the sociological literature. In this literature a specific group of influencers has been identified who are largely within the domain of medical science. This literature will provide an additional level of granularity to the personalist perspective by ascribing more precise characteristics to this group of change agents. Studies conducted on what has been variously referred to as 'star', 'capitalist' or 'merchant' scientists focus on the personality traits and style of scientists who have become leaders in the organization of biomedical research. This literature will be applied to the leadership of the MRC during the time of transformation to develop a more thorough understanding the role of Dr. Henry Friesen during the MRC-CIHR transformation.

1.1.3 International Influences

Science policy literature discusses two aspects to international influences. The first relates to the confluence of science cultures often through training abroad and through conferences. The second focuses on the transfer of policy objectives and institutional models to support research activities through

[32] Medical Research Council of Canada 1985, *The establishment of medical research in Canada*, MRC Newsletter, Ottawa.

isomorphic convergence. In this section we first deal with cultural aspects of science, followed by convergence.

In the early years, although Canadians tended to think of themselves in terms of their British heritage and "held alliances to the Crown",[33] their lives were continually affected by the presence of the rapidly growing, sometimes politically turbulent, but almost always economically vigorous, United States. These cultural conditions served to promote and strengthen the development of individual and institutional ties among Canadian researchers with their American and European colleagues.

As early as 1857 - 1889, international ties were being forged and strengthened through associations. During these years, the annual meetings of both the American and British Associations for the Advancement of Sciences were held in Montreal and Toronto. These activities reinforced Canadian connections to prominent scientists in America and Europe in areas such as physics, chemistry, medicine, biology, and geology. In addition, numerous Canadians interested in post-graduate studies went to Cambridge, London, Oxford, Heidelberg, Paris, New York, Berkeley, and Boston for advanced education. As an illustration of this, between 1875 and 1900 more than 300 Canadian students received graduate education at the University of Chicago and Harvard; and between 1891 and 1917, nearly 50 Canadian students benefited

[33] Dufour, P & de la Mothe, J 1993, 'The historical conditioning of S&T', in P Dufour, and J de la Mothe (eds), *Science and technology in Canada*, Longman Press, London, pp. 6-22.

from the '1851 Scholar's Program', which was set up by the UK (in part) from the profits of the 1851 Universal World Exposition in London.[34]

A second element of international influence shaping Canadian policy in the twentieth and twenty-first century relates not just to training researchers and the confluence of science cultures. The influence of other national models on the organization and rationales for publicly funded science and research (among other policy fields) looms large in the literature. The pattern is referred to as "isomorphic convergence".[35] This tendency was clearly discernable in the early formation of Canadian science policy and science institutions particularly through the influence of British traditions. In fact, Canada's National Research Council has been cited as an example of isomorphic convergence with similar bodies in the United Kingdom (and the Dominion countries) when it was founded in 1916.[36]

In the present day context, international forums such as the OECD and the G8 summit meetings set international trends in science policy by promoting the adoption of particular science policies and models. However, the historical particularities of a nation's institutional and cultural legacies tend to provide a countervailing force for divergence.[37] In Canada, forces of divergence would centre on jurisdictional issues resulting from Canada's brand of federalism, which resulted in a more decentralized approach to supporting biomedical and clinical research.

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[34] Ibid.

[35] Powell, W & DiMaggio, P 1983, 'The iron cage revisited: institutional isomorphism and collective rationality in organization fields', in W Powell and P DiMaggio (eds), *The New Institutionalism in Organizational Analysis*, 1991 edn, University of Chicago Press, Chicago.

[36] Atkinson-Grosjean, J, House, D & Fisher, D 2001, 'Canadian science policy and public research organizations in the 20th century', *Science Studies: An Interdisciplinary Journal for Science and Technology Studies*, vol. 14, no. 1, pp. 3-25.

[37] Banting K, Hoberg G & Simeon R 1997, *Degrees of freedom: Canada and the United States in a changing world*, McGill-Queen's University Press, Kingston.

1.2 *Early NRC Support for Biomedical and Clinical Research*

1.2.1 THE NRC'S ROLE

The technical advances associated with the advancement of the First World War brought the need to support science and technology to the attention of policymakers. This was combined with pressures from businesses and universities for industrial and basic research support. Wartime cuts in processed materials and manufactured goods were leading several industrialists in Canada's emerging secondary industries to recommend to the government that universities be provided with financial support to conduct industrial research.[38]

Meanwhile, simply as part of the growth and maturing of Canada's research capacity, the Royal Society of Canada was campaigning for the development of a national science program to pursue more basic, curiosity driven research questions.[39] Although not promoting the same kind of national science agenda, jointly these were powerful voices in encouraging the federal government to take action to support science and technology, beyond the needs of nation building and the exploitation of natural resources.

These pressures became even more difficult to resist in 1916 when Britain created a Department of Scientific and Industrial Research (DSIR). In part, the British interest in a national science institution was connected to their intention to offset German dominance in science and technology. Britain strongly urged

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[38] Thistle, MW 1966, *The inner ring: the early history of the National Research Council of Canada*, University of Toronto Press, Toronto, pp. 4-5.
[39] Enros, PC 1983, *The Bureau of Scientific and Industrial Research of the Royal Canadian Institute 1914-1918*, HSTC Bulletin 23.

Commonwealth countries such as Canada, Australia, India, New Zealand, and South Africa to do the same.[40]

Initially the Canadian government seemed uninterested but this changed when William Peterson, the principal of McGill University, was invited to form a research alliance with the DSIR. This forced the federal government's hand. If the Canadian government did not create a comparable research body based on the British example, Peterson intended to persuade his fellow university presidents to join forces with DSIR on their own.[41]

On June 6, 1916, an Order-in-Council was passed to create the Honorary Advisory Council on Scientific and Industrial Research. In 1917 the Council was renamed the National Research Council (NRC).[42] The NRC was a general-purpose national scientific agency expected to coordinate the resources available for research.[43]

Modelled after Britain's Imperial Trust for Scientific and Industrial Research, the National Research Council marked a change in approach to the federal government's support for science. However, it did not denote any significant change in why science was supported. The Council was put under the

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[40] Dufour. P & de la Mothe, J 1993, 'The organization, structure and decision processes of science and technology', in P Dufour & J de la Mothe (eds), *Science and technology in Canada*, Longman Press, London, pp. 23-67; Finnemore, M 1993, 'International organizations as teachers of norms: the United Nations educational, scientific, and cultural organization and science policy', *International Organization,* vol. 47, no. 4, Autumn, pp. 565-97.

[41] Thistle, MW 1966, *The Inner Ring: The Early History of the National Research Council of Canada*, University of Toronto Press, Toronto, p. 6.

[42] An additional and enduring pressure on the federal government has been the interest of provinces in science, research and development. During the early years of the NRC, experimentation was underway in Ontario and Alberta to establish economic development and industrial research institutes – i.e., The Research Council of Alberta (1921) and the Ontario Research Foundation (1928). The Ontario Research Foundation provided impetus for the federal government to establish labs in the NRC. See chapter 2 of Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto.

[43] Doern, GB 1972, *Science and politics in Canada,* McGill-Queen's University Press, Montreal.

direction of the Minister of Trade and Commerce. The role of the NRC was to support industry and provide advice to the government through the newly created and first statutory Cabinet Committee, the Privy Council Committee on Scientific and Industrial Research. The Committee's responsibilities were to plan, coordinate, and direct research toward "the most practical and pressing problems indicated by industrial necessities".[44] With no laboratories of its own, the NRC carried out its mandate through a program of directed grants based on a peer-reviewed process. Most of this research was conducted on university campuses.[45]

The idea of constructing institutes for industrial research on university campuses had earlier caught the imagination of some top-ranking university officials. This was rejected however, when a parliamentary sub-committee, the Cronyn committee struck in April 1919, discovered that university faculty were opposed to "bargaining with manufacturers".[46] The position taken at the time was not surprising. Canadian universities modelled themselves after the humanistic traditions of Oxbridge. In this era, teaching was the priority in postsecondary education. Research was not a central theme, nor was it encouraged. It was difficult enough for fundamental scientific inquiry to gain a

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[44] Lamontagne, M et al. 1970, *A science policy for Canada: report of the senate special committee on science policy, vol. I - a critical review: past and present*, Queen's Printer for Canada, Ottawa, p. 27.
[45] Doern, GB 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal.
[46] University of Toronto Professor Lash Miller, Cronyn Committee Proceedings, June 4, 1919, cited in Lamontagne, M et al. 1970, *A science policy for Canada: report of the senate special committee on science policy, vol. I - a critical review: past and present*, Queen's Printer for Canada, Ottawa, p. 31.

foothold in universities, let alone to work in research partnerships with industry.[47] This model remained influential in Canadian universities up until the 1950s.

The NRC's views closely followed those of university faculty on this matter but for different reasons. Within the NRC there was concern that universities would subvert the NRC's role if they conducted industrial research. It would take ten years for Dr. A.R. MacCallum, the NRC's first chair, to persuade the government to construct a national laboratory complex staffed by scientifically trained personnel. The argument that Dr. MacCallum put forward to the government was twofold. First, laboratories would allow the NRC to develop the new technologies Canada needed to keep pace with other nations. Second, these laboratories could train and retain scientific talent in the country; a talent that could be directed at practical matters and industrial research. Dr. MacCallum proposed that this arrangement would best allow the NRC to serve the research needs of industry, an obligation that was literally engraved in stone above the doors of the laboratories on Sussex Drive in Ottawa.[48]

In order for the NRC to expedite its mandate, one of its first tasks was to inventory the state of industrial research in Canada and to gauge the numbers of scientifically trained personnel available to conduct these activities. The 1917 survey results showed that only 37 of the 2,800 firms responding to the survey performed research on an ongoing basis. Those that did generally employed

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[47] Cameron, D 2002, 'The challenge of change: universities in the 21st century', *Canadian Public Administration*, vol. 45, no. 2, pp. 145-74; Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto, p. 43.

[48] Atkinson-Grosjean, J, House, D & Fisher, D 2001, 'Canadian science policy and public research organizations in the 20th century', *Science Studies: An Interdisciplinary Journal for Science and Technology Studies*, vol. 14, no. 1, pp. 8

only one researcher.[49] These findings convinced the NRC that it had little to plan, direct, or coordinate.[50] It was also clear that Canadian industries did not have the capacity to conduct research of sufficient quantity or quality for long-term industrial development, let alone contribute to the war effort. The assessment of the NRC was that this state of scientific underdevelopment could be attributed to a serious shortage of scientific manpower and infrastructure in the country. In 1917 the NRC introduced post-graduate scholarships in the sciences in order to build a critical mass of researchers.[51] For several decades the NRC focused on building scientific capacity in Canada through fundamental inquiries mostly conducted in universities.

Up until 1932, the Privy Council Committee on Scientific and Industrial Research convened only once a year.[52] Nonetheless, between 1917 and 1939 the NRC grew from one full-time employee and an annual budget of $91,600 to 2,000 employees and a budget of close to $7 million within months of the start of the Second World War.[53] This was achieved despite the fact that before 1928, the presidency of the NRC was a part-time appointment and only a small secretariat was available to assist the NRC in carrying out its mandate. The NRC

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[49] Thistle, MW 1966, The inner ring: the early history of the National Research Council of Canada, University of Toronto Press, Toronto, pp. 29.

[50] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.

[51] Thistle, MW 1966, The inner ring: the early history of the National Research Council of Canada, University of Toronto Press, Toronto, pp. 26, 127.

[52] Doern, GB 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal. Thistle, MW 1966, *The inner ring: the early history of the National Research Council of Canada*, University of Toronto Press, Toronto.

[53] National Research Council Canada 1983, *Associate Committees of the National Research Council of Canada, 1917-1975*, report prepared by, DJC Phillipson, National Research Council Canada, Ottawa; Lamontagne, M et al. 1970, *A science policy for Canada: report of the senate special committee on science policy, vol. I - a critical review: past and present*, Queen's Printer for Canada, Ottawa, p. 61.

was not authorized by the government to hire scientific staff or to set up central laboratories.

Initially the NRC was not permitted to have its own laboratories. It was determined that a practical way to conduct its work on evaluating research problems and commissioning research programs was through a structure of Associate Committees. In 1917, the first Associate Committees were set up as the NRC's "extramural arm of action".[54] The Associate Committees provided a flexible structure to coordinate the activities of small groups of researchers located in various institutions across the country. Membership on the Committees was diverse and included specialists who were not employed by Council or the government. Except for travelling expenses, Committee members were not paid for participation. These Committees reported to the Council but generally they were self-governing.

The Committee system in the NRC was deliberately reflexive and demonstrated an ability to respond quickly to sudden changes in the intellectual or economic environment. Sponsorship ranged from established research areas through to support for new disciplines such as plasma physics and radiation biology, and new technologies like the hovercraft. Some Committees focused inquiries on specific research problems. These problems ranged from packing apples through to tuberculosis or on even the impact of changes in tariffs on Canadian exports such as bacon. Some Associate Committees were managed by NRC staff and oriented towards a statutory function under the National

[54] National Research Council Canada 1983, *Associate Committees of the National Research Council of Canada, 1917-1975*, report prepared by DJC Phillipson, National Research Council Canada, Ottawa.

Building Code. Others were truly national bodies for which the NRC was merely an administrative convenience.[55]

In 1928, after protracted and considerable debates about the appropriateness of setting up laboratories in a government institution that advised government on science policy, the NRC was allowed to do so.[56] There were political reasons beyond President Tory's (the then President of the NRC) successful arguments, as the federal government did not want to be perceived as willing to do "less that Queen's Park" when the Ontario Government created the Ontario Research Foundation.[57]

After the NRC established national laboratories and acquired its own scientific and engineering staff, its stature as a research institution and science policy advisor increased.[58] During the legendary presidency of Dr. E.W.R. Steacie from 1952-1962, the Council ratified his decision to end the granting powers of Associate Committees. Except in special cases, such as the Associate Committee for Medical Research, applications for research went through the disciplinary grants committees of the NRC's Grants and Scholarships Organization. Nonetheless, up until the 1950's Associate Committees were the main vehicle for managing and funding extramural research. The Associate Committees and the Divisions of the NRC, which came into existence in 1928, were the "chief and typical instruments for the coordination of the three main

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[55] Ibid. p. 6.
[56] Doern, GB 1972, *Science and politics in Canada,* McGill-Queen's University Press, Montreal.
[57] Peter, O 1975, 'Government, Industry and Science in Ontario', in *Public & private persons: the Ontario political culture 1914-1934*, Clarke Irwin & Company, Toronto. p.3.
[58] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto, pp. 38-39.

sectors of scientific and technical activity, viz. government, universities, and industry, in Canada".[59]

1.2.2 Distinct Characteristics of the NRC's Associate Committee of Medical Research

As soon as the Associate Committee on Medical Research was set up in 1939, it was recognized as being unlike other Associate Committees in several ways.[60] Canada's constitutional authorities, although silent on jurisdictional responsibilities for research, clearly placed responsibility for health care with the provinces. Though all levels of government played a role in supporting medical research, the broad field of health was considered one of provincial rather than federal jurisdiction.

In addition to the delicate federal-provincial jurisdictional issues in the area of health, other distinguishing traits of biomedical and clinical research were conditioning a unique structural response from the NRC. Supplementing the federal merger funding for biomedical and clinical research through the NRC, there was a rapidly growing source of additional funding. These funds were becoming available from the private sector, the emerging voluntary sector of health research charities, from private donations, and even from international sources (mostly American and some British). This was a marked difference from the funding situation for the physical and chemical sciences.

These funding sources included financial support from insurance and pharmaceutical companies, the not-for-profit sector through rapidly expanding research charities directed at specific diseases, and private donations from the

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[59] National Research Council Canada 1983, *Associate Committees of the National Research Council of Canada, 1917-1975*, report prepared by, DJC Phillipson, National Research Council Canada, Ottawa.
[60] Ibid.

community-at-large or from philanthropists. All these groups as well as large donations coming from both private and public sources in the United States were raising money for Canadian biomedical and clinical researchers and their projects. Their attraction was based on the excellence of some of the pioneering work being conducted by Canadian biomedical and clinical researchers, the research on insulin being a case in point.

The conditions and circumstances around medical research were vastly different from those of the traditional, more basic research activities in the chemical and physical science. Thus the NRC entered into biomedical and clinical research rather circumspectly and did not attempt to "take charge".[61]

In 1921, Frederick Banting and his team of researchers made Canadians conscious of the potential of biomedical science when the news of their groundbreaking work on diabetes was widely circulated by an excited press. Recognition of this work made Banting and his colleagues national and international personalities. In keeping with the personalist system of science, Banting, Best, and Collip were also pivotal in assisting to establish national support for biomedical research in Canada for years to come.[62]

Prior to the discovery of insulin and the public and private enthusiasm for biomedical research that it created, medical scientists intent on pursuing research interests typically went to either the US or Britain. There were established medical schools at the Universities of Toronto, Manitoba, and Western Ontario, as well as McGill University. Accomplished teachers (mostly of

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[61] Ibid.
[62] John James Macleod was Scottish and returned to Scotland shortly after the discovery of insulin.

British origin) were training young biochemists and physiologists. Prior to 1921, very little systematic research was done in Canadian medical schools, which was the only place biomedical research was likely to happen.[63] Subsequent to 1921 and the discovery of insulin, this situation began to change.

After the discovery of insulin, Banting was offered research appointments in the United States and in Europe. To keep him in Canada, Parliament voted on providing Banting with an annuity and the Provincial Legislature established a Chair of Medical Research with a small annual budget for him at the University of Toronto. The Toronto business community collected a large sum of money to establish the Banting Research Foundation to support his research activities. In Banting fashion, he requested that only part of this money be used for his research. The rest would be used to support "any Canadian investigator who had a good medical problem."[64]

Insulin and the international stir it caused caught the attention of generous American benefactors. This included large foundations, which began to take a serious interest in Canadian biomedical researchers. As an example, from 1920 to 1934, the Rockefeller Foundation made gifts to Canadian medical schools amounting to over $6,000,000. Fellowship grants exceeded $122,000. These gifts were complemented by contributions from Canadian sources. The rush of money and the attending increase in research interest and activities lead to an expansion in the physical facilities in university based medical school complexes.

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[63] Aucoin, P 1972, *'Health scientists and the making of health science policy in Canada'*, PhD Thesis, Queen's University, Kingston, pp. 64-75; Also see Grant, RP 1966, 'National biomedical research agencies: a comparative study of fifteen countries', *Minerva*, vol. 5, no. 6, pp. 466-88.

[64] Ettinger, GH 1946, *History of the Associate Committee on Medical Research, 1938-1946*, National Research Council of Canada, Ottawa, p.2.

Among the new installations were the Montreal Neurological Institute at McGill University, the University of Toronto's School of Hygiene, the Connaught Laboratories, and the Banting Institute.[65]

Banting initially refused to patent the process for extracting insulin. Eventually he was convinced that patenting was necessary to ensure standardization to protect patients. An American pharmaceutical company was licensed to prepare and sell insulin and within a very short period the royalties amounted to an astonishing sum. By agreement, half was divided among the three Canadian scientists credited with the discovery and purification – Banting, Best, and Collip[66]: "not for their personal income, but for the maintenance of their research programmes in the laboratories in which they worked."[67]

For many years this arrangement assured considerable income for medical research in the Department of Biochemistry at the University of Alberta and the Departments of Physiology and Medical Research at the University of Toronto. When Collip moved to McGill, insulin royalties moved with him. Due to these arrangements, medical research programs expanded rapidly in these schools.

For several years after the discovery of insulin, medical researchers found it easier to get funds from private gifts and from public corporations, while federal funding support was still absent. Aided by his international status as an extraordinary researcher, Banting undertook a campaign of tireless lobbying to increase funding for research. His efforts were significantly assisted by the approach of the Second World War. Finally, the first major steps toward

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[65] Ibid., p. 3.
[66] Dr. MacLeod, the fourth member of the team, returned to Scotland in 1928
[67] Ibid., p. 3.

systematic support for bio-medical research in Canada were taken.[68] In 1935, Banting was invited to sit on the National Research Council. In 1936, the President of the NRC, General A.G. L. McNaughton, submitted proposals on the organization of medical research to the Canadian Medical Association, the Royal College of Physicians and Surgeons of Canada, and the Department of Pensions and National Health. In 1938 the NRC established the Associate Committee on Medical Research. This Associate Committee reported through the National Research Council to the Privy Council Committee on Scientific and Industrial Research. Not surprisingly, the first Chair of the Committee was Sir Frederick Banting.[69]

Banting conducted a survey of research facilities and resources in Canadian medical schools. The survey indicated that larger centres such as Toronto and McGill were conducting research in endocrine and metabolic fields, and McGill and Western Ontario were conducting important work in neurology. However, smaller centres had less active laboratories and needed additional help to establish research programs.

In its first year the NRC's Associate Committee on Medical Research was given a legacy of research from the Associate Committee on Tuberculosis, which was folded into the new Medical Research Committee. The Medical Research Committee's budget in its first year was $53,000.00. Most of these funds were dispersed as grants to individual researchers working in universities on chronic

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[68] Medical Research Council of Canada 1985, *The establishment of medical research in Canada*, MRC Newsletter.

[69] Ettinger, GH 1950, *Report of the Royal Commission on National Development in Arts, Letters, and Sciences*, The Massey Commission Studies, pp. 317-336.

diseases (such as cancer, arthritis and tuberculosis) or on diseases of the heart and blood vessels. Unlike the approach taken to support research in physical and chemical sciences through the NRC, there was no intention of establishing central laboratories. This arrangement was unlike Great Britain and the United States, where there was a "network of governmental research laboratories" for biomedical research.[70]

1.2.3 War-time Medical Research

During the war Sir Frederick Banting, Prof. C.H. Best, and Prof. W.G. Penfield coordinated research with the MRC of Great Britain. This work was conducted through the Associate Committee structure on Medical Research, which investigated problems that were common to all branches of the Services (and to the civilian population) – i.e., prevention and treatment of shock, storage of blood, preparation of blood derivatives, treatment of infection of wounds, treatment of burns, and traumatic injuries. The Armed Services and the Department of Pensions and National Health were invited to submit research proposals to the Associate Committee for opinions.[71]

Within a short time the Council set up three additional medical committees – the Associate Committees on Aviation Medical Research, Naval Medical Research, and Army Medical Research. Each of these well-funded committees

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[70] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston, pp. 21. For a general comparative description of biomedical research organization in the advanced countries, see Grant, RP 1966, 'National biomedical research agencies: a comparative study of fifteen countries', *Minerva*, vol. 5, no. 6, pp. 466-88.

[71] Ettinger, GH 1950, *Report of the Royal Commission on National Development in Arts, Letters, and Sciences*, The Massey Commission Studies, pp. 317-336. Ettinger, GH 1946, *History of the Associate Committee on Medical Research, 1938-1946*, National Research Council of Canada, Ottawa, p.2

studied issues related to the comfort, safety, protection, clothing, and nutrition of the particular Services for which it was created. [72]

The Associate Medical Committees of the NRC were directed by and composed of university educators and their colleagues who joined the Services and were seconded to investigative work. Generally, research sponsored by the four Committees was conducted in university laboratories, as well as some smaller laboratories such as the Institute of Aviation Medicine. During the war medical researchers, educators, and those with medical training were pressed to focus on applied matters.

After the war, the Council's Services Committees were dissolved but the Department of National Defence continued its interest in medical research and initiated a program under its newly formed Defence Research Boards. Its research activities were served by a system of grants-in-aid, and by directed researchers.[73]

By the end of the war, there was renewed enthusiasm for more fundamental inquires. Universities had well equipped laboratories and technically trained staff. Faced with returning veterans seeking medical training and graduate studies, universities resumed and expanded their basic research programs and activities.

> During the war period medical investigations had been carried out chiefly by request; the Armed Services asked that certain researches be initiatives; committees were set up to plan the investigation and to approach responsible investigators with what was equivalent to a contract. But this type of directed investigation was not continued by the Medical

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[72] Ettinger, GH 1946, *History of the Associate Committee on Medical Research, 1938-1946*, National Research Council of Canada, Ottawa.
[73] Ibid., p.8.

> Division of Council. Applications for assistance in carrying out specific investigations must come directly from the interested investigators. They come almost exclusively from university laboratories and clinics, from physiologists, pharmacologists, biochemists, pathologists, surgeons, and internists.[74]

There remained "only a need for increased financial support".[75]

1.3 Conclusions

In this chapter we considered how three generalizable conditions and characteristics largely influenced the early organization of publicly funded support for science and research in Canada – i.e., economic relevance, personalist styles of leadership, and international trends. We applied this organizing perspective to an analysis of the early development of biomedical and clinical sciences. Although this list applies to public support for biomedical and clinical sciences, we also found early evidence that biomedical and clinical research activities were influenced by a secondary set of conditions and characteristics. After the discovery of insulin and the awakening of interest in Canadian biomedical and clinical research, funds for this research came from public, not-for-profit, and private sector sources and even from the international community. This combined with sensitive jurisdictional issues around health research, contributing to a very different policy approach and structural response from the NRC in support of these research activities.

Further, the analysis revealed that the emerging biomedical and clinical sciences were productive in terms of social efficiencies but they were not

[74] Ibid., p.8.
[75] Ibid., p.8.

considered to be of economic relevance by the federal governments of the time. They simply were not important to the early nation building aspirations of various federal governments, which focused more on the exploitation of natural resources, and later on, growth in secondary industries. Thus biomedical and clinical research had a low policy profile when compared to other science initiatives, and this would remain the case for many years. In the core empirical chapters we will discuss why and when this changed. We will also consider how over time this change lead to the MRC-CIHR transformation.

CHAPTER 2

Conceptual Theory Review and Framework

Introduction

The primary objective of this chapter is to review conceptual theoretical literature and develop the framework previewed in the Introduction and used in the empirical analysis. To do this, the first task of this chapter is to state the research question and then position this question within the literature. The literature drawn on to develop the research framework comes from various literature streams within neo-institutional disciplines.

To organize this review, this chapter proceeds in the following manner. First, in section 2.1 we introduce the research question. In section 2.2 we begin with an overview of neo-institutional literature. In section 2.3 we review literature on the knowledge-based economy and aspects of this literature that bear on science. In section 2.4 we present a definitional discussion of historical institutionalism. This is an important step in assisting us to figure how institutions can be an object of a theoretical analysis. At a high-level, historical institutionalism is a theory that considers ideas and their structuring impacts within institutional and policy contexts. This theoretical perspective focuses on how ideas that influence a broad understanding of the organization of social and political life can change over time. Having identified historical institutionalism's core assumptions about the structuring impacts of ideas considered against

institutional and policy constraints and legacies, we take the discussion to the frontier of an historical institutional analysis by situating it with complementary ideational concepts from organizational sociology. By incorporating strands from other complementary theoretical perspectives we can construct a deeper, more balanced conceptual framework for the core empirical period under consideration in chapters 4, 5, 6 and 7.

In section 2.5 we introduce literature from organizational sociology. This literature is important in the research framework because it has derived a more action-oriented theory of institutionalism by interpreting the role of ideas and of actors in a slightly different way from the perspective of historical institutionalism. This fills a gap around the concept of agency and then allows us to bring in the concept of the merchant scientists into our theoretical equation in section 2.6. This heuristic reflects more precisely on the role of agency within knowledge-centred realms. As change agents, merchant scientists draw on the ideological themes of the emerging worldview of a knowledge intensive and driven economy and society to frame institutional alternatives or to reframe existing soc-political structures in new ways to exploit (or create) strategic opportunities.

In section 2.7 we introduce a further component of the conceptual framework; the practices and approaches of strategic management, which provide the 'merchants', among others, with a pre-legitimized tool kit to organize their reframing activities.

In section 2.8 we explore the nature and evolution of ideas that inform science policies and innovation and demand a response from non-state actors

charged with the leadership of publicly funded research institutions. The focus is on the evolution of the guiding principles of the science model that have been set into motion by the structural shifts attending to emerging technologies. The objective of this section is to consider how the logic of these models have effects on policy rationales for publicly funded science, on institutional modes of organization (such as the NCE and the CIHR), and on the proposed advantages of networks as promoting institutional connectivity with other entities involved in the research enterprise. We begin this section with a discussion of the linear model of science. We then discuss the contemporary iterative views of innovation through a brief discussion of Mode 1, Mode 2 systems and the Triple Helix model of knowledge production.

Section 2.9 then provides the resultant conceptual framework for the analysis and discusses some related methodological issues to complement those already noted in the Introduction to the thesis.

Conclusions then follow.

2.1 Research Question

The central research question for the analysis is:

Within the context of the Innovation Policy paradigm, how can we account for the MRC-CIHR transformation?

Making way for new social architecture, in 2000, an Act of Parliament decommissioned one of Canada's three Research Granting Councils, the Medical Research Council (MRC), and replaced it with the Canadian Institutes of Health Research (CIHR). The event of institutional change in this case is well

known. At first glance, the rationale for the CIHR's creation was to invigorate the national biomedical and health science research agenda.[76] However a residual question is why was it necessary to decommission the $250 million MRC, an established and respected institution, to invigorate medical and health services research in Canada? The MRC had been producing internationally recognized research excellence in medical sciences when compared to peer OECD countries. Under the auspices of the MRC, Canada had an impressive rate of citations on the National Science Indicators – a Thompson/ISI evaluation tool – when compared to other OECD countries. Typifying Canadian research excellence, in 1993, the University of British Columbia's Dr. Michael Smith, a long-term recipient of MRC funding, won a Nobel Prize for his contributions to the developments of methods within DNA-based chemistry.

The circumstances around the MRC-CIHR transformation raise many questions. Why was removing the National Health Research Development Program (NHRDP) from Health Canada part of the plan to invigorate the national agenda for medical and health sciences research? The NHRDP was Health Canada's $9 million extramural, investigator-driven, health research program. Since 1975 it had not only provided research support for a wide range of applied health research issues, but was also an important link between Health Canada and the research Granting Councils. Through these links Health Canada drew the attention of the research community to the kinds of inquiries necessary to

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[76] Canadian Institutes of Health Research 2000, *Where Health Research Meets the Future*, The Final Report of the Interim Governing Council of the Canadian Institutes of Health Research, Ottawa. Also see: Canadian Institutes of Health Research 2000,The Interim Governing Councils *Working Papers Series – Proposed Institute Creation for the CIHR*; Health Research Institutes; Clinical Research within the CIHR; The Ethics Mandate of the CIHR; Implementing a Transformative Vision; Partnership and Commercialization; Peer Review in the CIHR, Ottawa.

further the national health policy agenda. Disconnecting Health Canada from direct interaction with the health research community has been rather quickly identified as a likely contributor to a health policy capability and capacity problem.[77]

Why was the MRC no longer able to generate innovation despite decades of impressive research breakthroughs? What was so convincing about the conceptual representation of the CIHR that it could do in theory what apparently, the MRC and the NHRDP were no longer able to do in practice?

The key supplementary question regarding research interests to be addressed in this dissertation is, "How is the CIHR different from the MRC, and how might we know this?" The mix of interests and their formation in this case is complex and perplexing. Historically, relations among the expanding continuum of health sciences that make up the CIHR's integrative research agenda and 'science pillars' have been uneasy to say the least. These are the sciences of: "bio-medical research, clinical research, research respecting health systems, health services, the health of populations, societal and cultural dimensions of health and environmental influences on health, and other research as required",[78]

This is not a homogenous grouping of research interests or research pursuits. These sciences do not have equal status within the health research communities of practice, and they are based on very different research interests,

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[77] Stranchan-Tomlison, January 2004 Report on the Health and Society Research Workshop – *'The Challenge of Change'*.

[78] <http://www.parl.gc.ca/36/2/parlbus/chambus/house/bills/government/C-13/C-13_4/C-13_cover-E.html>.

traditions, approaches, methodologies, tools, histories and cultures. There is also intense competition among these sciences for funding.[79]

This integration issue is nested within a larger one of the perceived legitimacy of research based on the different methodological approaches or purposes to issues and problems of health. It has been noted that there is a lack of recognition for 'health sciences' – e.g., non-biomedical health sciences and the social sciences directed at health issues, in the attitudes of the core 'biomedical and clinical' research communities of the CIHR. However, within the newer health sciences communities of practice, researchers are just as inclined to be dismissive of traditional biomedical and clinical approaches to meeting the challenges to health and well-being.[80] An interesting point of commonality between biomedical, clinical, or health sciences researchers is that they are equally uncomfortable with the mission-oriented[81] and 'science pillar' focus of the national research agenda under the CIHR.

Assuming for the moment that in some sense the formation of the CIHR maps readily to defined interests, whose interests are represented by the CIHR? What factors contributed to the collective realization that the MRC (and possibly the NHRDP) could no longer accommodate their interests? Once formed, how were interests then propelled into the machinery of the state?

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[79] Thorngate W, Faregh, N & Young, M 2002, *Mining the Archives: Analysis of CIHR Research Granting Adjudications*, Canadian Institutes of Health Research.

[80] Stranchan-Tomlison, January 2004 Report on the Health and Society Research Workshop – '*The Challenge of Change*'.

[81] As noted in section 1.2.3, in general, with the exception of WWII, mission driven research is a more recent phenomenon in Canada for these sciences. Mission driven refers to research being directed at specific research questions usually through the granting process rather than research proposals being based on the interests and experiences of researchers.

A look at the institutional partners involved with the CIHR paints an even more complex problem for interest formation. The CIHR's research agenda reaches out to and is supported by commercial interests such as the pharmaceutical sector, but key players in the national research agenda include the very powerful health charities. The research activities of charities such as the Canadian Cancer Society, the Heart and Stroke Foundation of Canada, the Canadian Cystic Fibrosis Foundation, and the Juvenile Diabetes Research Foundation Canada, among many others, are largely supported by private or philanthropic donations. These organizations are quick to express concern to the federal government, the CIHR, and to their stakeholders, when commercialization plays a priority role in the formation of the national medical and health sciences research agenda, and an input into funding research projects.

To begin to resolve these and many other complex puzzles around the demise of the MRC and the inception of the CIHR this dissertation examines the dynamics and linkages that underlie the occurrence of institutional transformation.

2.2 Neo-Institutionalism

At its broadest level, neo-institutionalism assists us in understanding institutions as patterns of self-organization and controlled performance in the pursuit of collective goals, separate from, but fixed within, their environment and, generally, beyond the conscious intentions of individuals. The scholarly study of institutions, although by no means a unified intellectual quest, is important in identifying periods or junctures where political, economic and social behaviours

change the prescribed rules of social organization. As social artefacts, institutions assist us in the consideration of causal accounts: the normative 'why' questions and the processes and methods oriented 'how' questions of social and political change. In this way, the study of institutions can assist us in comprehending the nature of modernization, and the variable processes and paths through which modernization takes place.

In this dissertation we argue that the Canadian Institutes of Health Research (CIHR) is part of the political resettlements and negotiated institutional solutions associated with a shift towards the knowledge economy, or at least certain kinds of knowledge, as a key factor of production in the economy and in the emergence of globalization. In response to a more knowledge-exploiting and globalized economy, all manner of structural and policy adjustments continue to take place. These ideas and their narratives have come to dominate in many fields in pubic policy but are particularly prevalent in the knowledge-centred realms such as publicly funded science and research. To make these claims however, we need to understand more about the nature of the KBE, its emergence, its rationales and its potential scope.

2.3 The Knowledge-Based Economy

The economic stagflation of the 1970s-1980s coincided remarkably well with the prediction of theorists such as Schumpeter who forecasted long cycles or long waves in economic growth due to creative destruction.[82] These theories go on to discuss the failure of neo-classical and Keynesian economists to

[82] Kenny, M 1986, *Biotechnology: the university-industrial complex*, Yale University Press, New Haven and London.

address the relationship between technical change and economic growth.[83] Schumpeterians postulate that such long-term fluctuations correspond to periods of economic crisis. During times of crisis and uncertainty businesses reduce investment spending in traditional production practices while searching for new technologies and processes to lower production costs.

Mandel (1978) and Mensch (1979) associated a group of core technologies with each upward phase of these cycles or waves. For example, they conclude that the period of growth in the world economy experienced from 1896 – 1914 was guided by innovations such as the electric motor and the internal combustion engine. The electric motor provided the decentralized power source necessary to productively organize the assembly line. When entrepreneurs successfully adopted these innovations to production processes, production costs were lowered while productive capacity increased. The next expansionary wave dated from 1945 to 1970. The important technologies in this period included petrochemicals (synthetic fibres, plastics, and other polymers) and electronics.[84]

Freeman and Perez (1983) went even further. They considered the specific characteristics of changing technologies in each historical period. They developed a heuristic which supports the conclusion that:

> certain types of technical change – defined as changes in 'techno-economic paradigm' – have such widespread consequences for all sectors of the economy and that their diffusion is accompanied by a major structural crisis of adjustment, in which social and institutional changes are

[83] Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter Publishers, London & New York, pp. 38-66.
[84] Mandel, E 1978, *Late capitalism*, Verso Books, London; Mensch, G 1979, *Stalemate in technology: innovations overcome the depression*, Ballinger, New York.

necessary to bring about a better 'match' between the new technology and the system of social management of the economy – or 'regime of regulation."[85]

They proposed a taxonomy of innovation making distinctions between: (1) Incremental innovation; (2) radical innovation; (3) new technology systems; and (4) changes of the techno-economic paradigm. These have been described as follows:

> ***Incremental innovation*** – These types of innovation occur more or less continuously in any industry or service activity although at differing rates in any industry or service activity although at differing rates in different industries and different countries, depending upon a combination of demand pressures, socio-cultural factors, technological opportunities and trajectories. They may often occur, not so much as the result of any deliberate research and development activity, but as the outcome of invitations and improvements suggested by engineers and others directly engaged in the production process, or as a result of initiative and proposals by users ('learning by doing and 'learning by using')
>
> ***Radical innovation*** – These are discontinuous events and in recent times are usually the result of deliberate research and development activity in enterprises and/or in university and government laboratories. There is no way in which nylon could have emerged from improving the production process in rayon plants or the woollen industry.
>
> ***Changes of technology systems*** – These are far-reaching changes in technology, affecting several branches of the economy, as well as giving rise to entirely new sectors. They are based on a combination of radical and incremental innovations, together with organizational and managerial innovations affecting more that one or a few firms.
>
> ***Changes in the 'techno-economic paradigm' ('technological revolutions')*** – Some changes in technology systems are so far-reaching in their effects that they have a major influence on the behavior of the entire economy. A change of this kind carries with it many clusters of radical and incremental innovations, and may eventually embody a number of new technology systems. A vital characteristic of this fourth

[85] Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter Publishers, London & New York, p. 38.

> type of technological change is that it has pervasive effects throughout the economy, i.e., it not only leads to the emergence of a new range of products, services, systems and industries in its own right; it also affects directly or indirectly almost every other branch of the economy, i.e., it is a 'meta-paradigm'. We use the expression 'techno-economic' (Perez, 1983) rather that 'technological paradigm' (Dosi, 1982) because the changes involved go beyond engineering trajectories for specific products or process technologies and affect the input cost structure and conditions of production and distribution throughout the system.[86]

In regard to the last element of their taxonomy, Freeman and Perez relate the 'succession of new techno-economic paradigms' to what Schumpeter referred to as 'creative gales of destruction'. The techno-economic paradigm that Freeman and Perez proposed is in agreement with what Nelson and Winter considered as 'general natural trajectories'. Once these technologies are established as the dominant influences in the economy, they become part of a 'technological regime'. This regime usually lasts for several decades before a new one takes its place. [87] Each of these 'long cycles' has a 'characteristic institutional framework'. As a techno-economic paradigm emerges, a new framework comes forward from within the old regime, but only "after a painful process of structural change".[88]

Long wave theorists have argued that the ascendancy of information technology prompted a new set of technologies, which lead the recovery of the late 1980s and 1990s. This point has usually been underscored by the

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[86] Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter Publishers, London & New York, pp. 38-66.

[87] Nelson, RR & Winter, SG 1977, 'In search of a useful theory of innovation', *Research Policy*, vol. 6, no. 1, pp. 36-76.

[88] Freeman, C & Perez, C 1988, 'Structural crises of adjustment, business cycles and investment behaviour', in G Giovanni, C Freeman, R Nelson, G Silverberg & L Soete (eds), *Technical change and economic theory*, Pinter Publishers, London & New York, pp. 38-66.

foundational emergence of the new economy, or more accurately, a new economic regime based on information technologies. Martin Kenny determined that biotechnology, as an information-intensive technology, would easily fit into a restructured economy based on information.

> Indeed biotechnology will provide one of the new economy's critical underpinnings. Biotechnology could be a significant factor in increasing real living standards by lowering production cost in the following industries: food processing, agriculture, pharmaceuticals, forestry, chemicals, waste disposal, and energy. With the exception of agriculture and forestry, these are the very industries that experienced dramatic price increases in the 1970s.[89]

However, as the new technologies of this techno-economic paradigm pervaded the economy, as predicted, they have been accompanied by the destabilization of the former economic arrangements before stable patterns of growth set in. "The productive forces of these technologies cannot have such tremendous impacts without severely affecting the social relations of a society. In periods of crises not only are new technologies adopted, but old institutions are transformed or entirely swept away".[90] In this way, throughout the 1980s and 1990s the ideas or paradigms that anchored the post World War II welfare state were gradually challenged and partially supplanted by the paradigm of the KBE. The impacts of destabilization were widespread across economies. Along with them came the patterns and processes of globalization.

Globalization, with its many comprehensive and various processes, is considered to be a "natural outcome of the growing complexity and reach of

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[89] Kenny, M 1986, *Biotechnology: the university-industrial complex*, Yale University Press, New Haven and London, p. 4
[90] Ibid., p. 3.

scientific and technological advances".[91] Scaling-up technological progress meant that the enormous costs associated with present day technological advancements had to be spread over increasingly larger markets to ensure that adoption was accompanied by profitability. This required producers of these technologies to broaden their global reach, setting into motion the complex interconnections of the technological, economic, political and social dimensions of present day globalization.

In scholarly literature, initially globalization was viewed narrowly. In general it was seen as the removal of barriers to cross-border flows of trade, capital and labour. Institutions of global regulation – such as the International Monetary Fund (IMF), the World Bank and the World Trade Organization (WTO), supported this process. The European Union (EU), the North American Free Trade Agreement (NAFTA) and the Association of South-East Asian Nations (ASEAN) evidenced the political expressions of international integration.

However, in contemporary literature globalization is no longer restricted to economic flows across national boundaries and the institutions that regulate international trade. It includes processes that are widely considered to be social in nature such as the exchange of knowledge, information, belief systems, ideas and values. These dimensions of globalization are related to the "curiosity of the human species" aided by ever "increasingly cheap and sophisticated communications systems". This perspective also includes consideration of agency, or how globalization can be understood in relation to the ambitions and

[91] Kaplinsky, R 2005, *Globalization, poverty and inequality*, Polity Press, UK, p.11.

actions of key global actors such as firms, as well as groups seeking political, religious and cultural domination (Kaplinsky 2005, p. 12).

Present day globalization is viewed through a variety of lenses. In essence, it can be understood as the pursuit of personal, economic, social or political goals. In consequence, individuals, institutions and nations have extended their activities across national boundaries (Kaplinsky 2005).

There is nothing equitable about who benefits from these processes. In a Polanyian sense, some scholars argue that this creates opportunities or even responsibilities for the modern state to manage the outcomes of these 'naturally occurring' processes.[92]

Others are less convinced that social disruptions and economic inequality accompanying the present techno-economic paradigm will be reduced, or that the processes of globalization are naturally occurring. They would agree that the change initiatives of the current techno-economic paradigm focus on flexibility and adaptability for an efficient and speedy restructuring of institutions and firms. However, this has been and is happening "within the constraining framework of past history". Without new information technologies and the current conditions of technological and economic development, the possibilities of a global capitalism would have been limited.

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[92] In his famous book, *The Great Transformation*, Karl Polanyi used the social and political upheavals in England during the rise of the market economy, to argue that the development of the modern state and market economies are unavoidably linked. His reasoning was that only a powerful modern state could defend against the disruption of the most violent periods of economic change and the naturally destructive tendencies of unchecked capitalism. The modern state was necessary to push changes in social structure that allowed capitalism to be a productive force. For Polanyi, these changes implied the destruction of the basic social order that had existed throughout all earlier history, which is why he emphasized the greatness of the transformation. Less discussed is that Polanyi believed that the 'market society' was unsustainable because it is fatally destructive to the human and natural contexts it inhabits. Polanyi, K 2001, *The Great Transformation: the political and economic origins of our time*, 2nd edn, Beacon Press, Boston.

> Flexible management would have been reduced to labor trimming, and the new round of spending in both capital goods and new consumer products would not have been sufficient to compensate for the reduction in public spending. Thus, informationalism is linked to the expansion and rejuvenation of capitalism, as industrialism was linked to its constitution as a mode of production.[93]

From this perspective the decisive factor in embedding a new techno-economic paradigm is not the relationship between technology and society. Rather the key variable is the role of the state in either delaying, promoting, or leading technological innovation and how the state "organizes the social and cultural forces that dominate in a given space and time". In this way, "technology expresses the ability of a society to propel itself into technological mastery through the institutions of society, including the state".[94]

For Manual Castells, the decisive historical factors hastening and shaping the techno-economic information technology paradigm were not the natural processes of embedding new technologies, but the restructuring of capitalism, which began in the 1980s. He has characterized this period as informational capitalism.[95]

In a nutshell, the reforms of informational capitalism, both at the level of institutions and in the management of firms aimed at four main goals:

> deepening the capitalist logic of profit-seeking in capital-labor relationships; enhancing the productivity of labor and capital; globalizing production, circulation, and markets, seizing the opportunity of the most advantageous conditions for profit-making everywhere; and marshalling the state's support for productivity gains and competitiveness of national

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[93] Castells, M 2000, *The rise of the network society, the information age: economy, society and culture*, vol. 1, Blackwell Press, Cambridge, p. 19.
[94] Ibid., pp.12-13.
[95] Ibid., p. 18.

economies, often to the detriment of social protection and public interest regulations.[96]

From either perspective – those that see the forces of the present techno-economic paradigm as naturally occurring, or those that see these occurrences as the regulating processes of a new brand of capitalism – how the state restructures its institutions has consequences. In the next section we explore the literature on institutions and consider how institutions change or remain constant.

2.4 Historical Institutionalism - Constraints and Legacies

Notwithstanding a 'curious silence' around the theory and methods of institutionalism prior to the 1990s (Lowndes 1996, p. 181)[97] studies of institutions and their arrangements have been central subjects in political science and in its sub-disciplines (Hood, 1987). Structural dynamics combined with the pace and scale of change in governance and the adoption of new management practices in the delivery of public services, as well as the impact of these adjustments on relations with citizens, renewed interests in analyzing institutions. These occurrences combined with other events, including the movement away from the Keynesian styled interventionism of the welfare state and related industrial policies and practices in favour of the principles of liberalism. There was also the involvement of the International Monetary Fund and the World Bank in policy experiments in developing economies that did not always go according to plan – i.e., the collapse of the Argentinean economy, the Asian financial crisis, and the

[96] Ibid., p. 19.
[97] Lowndes, V 1996, 'Varieties of new institutionalism: a critical appraisal', *Public Administration*, vol. 74, summer, pp. 181-197.

difficulties former communist countries were having in adopting capitalism. These illustrative factors, among others, were leading institutional scholars to an increasing sensitivity towards exploring the theoretical foundations of institutions. Generally, the 1990's became a period of 'rediscovery' in institutional analysis.

The dictionary definition of institution is often described as established law, custom or practice. As a vernacular term, it is often associated with the practices and customs of government. However, the 'concept' of institution within contemporary institutional analysis is more slippery. Institutions are often understood as broader than government (e.g., markets, the family, or the church). It has also been used to refer to social organizations that are either specific or abstract (Williams 1983, p. 169). For example, as social phenomena institutions can be informal codes of behaviour, organizational routines, conventions and written contracts, taken-for-granted normative or cognitive structures, or as complex organizations.

For purposes of this research the definitional elements of 'institution' comes from the work of Vivien Lowndes. This definition is in keeping with and is an elaboration of working definitions developed by other historical institutionalists such as (Steinmo, Thelen & Longstreth 1992[98]; Hall 1992[99] & Ikenberry 1988).[100]

> (a) ***An Institution is a middle-level (or 'meso') concept.*** Institutions are devised by individuals, but in turn constrain their action. They are part of the broad social fabric, but also the medium through which day-to-day

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[98] Steinmo, S, Thelen K, & Longstreth, F (eds) 1992, *Structuring politics: historical institutionalism in comparative analysis*, Cambridge University Press, New York, pp. 2.

[99] Hall, PA 1992, 'The movement from Keynesianism to monetarism: institutional analysis and British economic policy in the 1970s', in S Steinmo, K Thelen & F Longstreth (eds), *Structuring Politics: Historical Institutionalism in Comparative Analysis*, Cambridge University Press, New York, pp. 90-113.

[100] Ikenberry, JG 1988, 'Conclusion: an institutional approach to American foreign economic policy', in JG Ikenberry, DA Lake, & M Mastanduno (eds), *The State and American Foreign Economic Policy*, Cornell University Press, pp. 222-3.

decisions and actions are taken. Institutions shape human action, impose constraints whilst also providing opportunities.

(b) ***Institutions have formal and informal aspects.*** Institutions involve formal rules or laws, but also informal norms and customs. Unlike formal institutions informal institutions are not consciously designed nor neatly specified, but are part of habitual action. Institutions may be expressed in organizational form, but also relate to processes – the way things are done.

(c) ***Institutions have legitimacy and show stability over time.*** Institutions have a legitimacy beyond the preferences of individual actors. They are valued in themselves and not simply for their immediate purposes and outputs. Institutions may gain their legitimacy because of their relative stability over time, or because of their link with a 'sense of place.[101]

Lowndes 1996 p. 182

Regardless of the different theoretical starting points about motive and rationality, institutional theorists are often concerned with accounts of behaviour and organization that emphasize explanations in which actors, individuals, or collectives are constrained but also sometimes enabled by institutions. In a general sense, institutions constitute an endogenous source of order (Kjaer & Pederson 2001, p. 222). Within these theories, institutions are key explanatory variables influencing choice, regulating behaviour, and ordering social interaction.

At its broadest level, historical institutionalism represents an attempt to illuminate how political struggles "are mediated by the institutional setting in which [they] take place".[102] In part, historical institutionalism is a response to

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[101] Lowndes, V 1996, 'Varieties of new institutionalism: a critical appraisal', *Public Administration*, vol. 74, summer, pp. 181-197.

[102] Ikenberry, JG 1988, 'Conclusion: an institutional approach to American foreign economic policy', in JG Ikenberry, DA Lake, & M Mastanduno (eds), *The State and American Foreign Economic Policy*, Cornell University Press, pp. 222-3; Steinmo, S, Thelen K, & Longstreth, F (eds) 1992, *Structuring politics: historical institutionalism in comparative analysis*, Cambridge University Press, New York, pp. 2; Streeck, W & Thelen, K (eds) 2005, *Beyond continuity: institutional change in advanced political economies*, Oxford University Press, Oxford.

rational choice theory and atomistic accounts of social processes. The literature is diverse but scholars in this school share a theoretical project aimed at a middle range that confronts issues of both historical contingency and "path dependency"[103] that other theoretical perspectives tend to obscure.[104] Historical institutionalism is grounded in the assumption that a historically constructed set of institutional constraints affects the behaviour of actors, individuals and collectives involved in the policy process. Variations in political or other institutions shape actors' capacities for action, policy making, and institution building.

A general thrust early on in this literature was that the material interests of political and economic actors such as political parties, unions, the business community and influential political and intellectual elites, were the primary motivators of politics (e.g., Evans, Rueschemeyer, & Skocpol 1985; Hall 1986; Katzenstein 1978). Interests were institutionally determined because influence was mediated by how much access these actors had to critical policy-making arenas.

Gradually the relationship between interests and institutions was acknowledged to be more complex than initially thought. There was recognition among scholars that politicians as well as actors, individuals, or collectives outside the state sporadically made efforts for political changes that improved government, the economy, and society more generally. Inspirations were not

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[103] Path-dependency is a phrase used to mean that institutions are self-reinforcing and that these paths become legacies, which have bearing on future institutional or policy development. Pierson, P 2000, Increasing Returns, Path Dependence, and the Study of Politics, *American Political Science Review*, June.
[104] Steinmo, S, Thelen K, & Longstreth, F (eds) 1992, *Structuring politics: historical institutionalism in comparative analysis,* Cambridge University Press, New York.

always driven from personal gain (e.g., Quirk 1990; Rueschemeyer and Skocpol 1996; Skocpol 1992; Skowronek 1982).

Struggling with how and why policy advice gets picked up, some scholars turned their attention to more fully explore the role of ideas in policy-making and negotiated institutional solutions. It was evident, if taken for granted, that ideas were always present in policy and institutional contexts. The question was how?

Given the initial prominence within historical institutionalism to think of institutions as constraints, it is not surprising that the first impulse in studying how ideas affect policy making and institutional outcomes was to explore how ideas were constrained in policy making. Factors of constraint include the relative insulation and centralization of political elites, or how underlying normative structures restrict the set of policy ideas that political elites find acceptable (e.g., Hall 1989a; Katzenstein 1993; Weir 1992, p. 169).

Contributions to how ideas facilitate rather than constrain action were rather modest. For instance, some researchers recognized that ideas spur action by providing specific "road maps" out of policy dilemmas (Goldstein 1993). They argued the obvious point that policy makers use economic theories as explicit guides for reducing inflation, stimulating economic growth, resolving trade imbalances, and solving other policy puzzles (Campbell 2001). In this sense, ideas push policy making in very precise directions by giving policy makers clear reasons to adopt a specific course of action. Policy makers then use policy ideas as the basis for creating new policy tools, government agencies, and other formal institutions that limit policy options later on (Goldstein 1993; Goldstein & Keohane

1993; Pierson 1994). Nonetheless arguments remained close to the traditional notion that institutions rather than ideas *per se* are the critical policy-making constraints (Jacobsen 1995, p. 294-305; Yee 1996, p. 86-89).

A sustained, systematic attempt to accord a key role for ideas in the determination of institutional outcomes is found in the work of Peter Hall, first in his writings on policy paradigms and political change, and subsequently on policy as social learning. Hall's frequently referenced work on policy paradigms is based on an analogy drawn from Thomas Kuhn's celebrated (but subsequently discredited) analysis, "The Structures of Scientific Revolutions" (1962). In an influential discussion of ideas and policymaking, (Hall 1989a, p. 383-86) acknowledges that national political discourse sets important normative limits on policy-making options. Within this literature scholars generally agree that ideas are imbued with explanatory powers when they become part of the belief systems that order the world as "world images" (Goldstein & Keohane 1993, p.12) or as "interpretive frameworks" (Hall 1993, p. 279). As an 'interpretive framework', the logic of ideas and their attending discourse, guide behaviour and shape the agendas through which problems are defined and solutions proposed. Once interpretive frameworks become enshrined as a policy paradigm and embedded into institutional contexts, much of the 'heavy lifting' of policy reform is done "because so much of it can be taken for granted".[105]

Drawing on the pioneering work of Heclo, Hall also notes, "policy responds less directly to social and economic conditions than it does to the consequences

[105] Hall, PA 1993, 'Policy paradigms, social learning and the state', *Comparative Politics*, vol. 25, pp. 275-296.

of past policy" (Hall 1993, p. 277).[106] Policy makers, as reflexive and strategic (if not utility maximizing) actors, are engaged in a constant process of evaluation and assessment of the consequences of prior policy choices – a process of social learning. This is partly intuitive, partly explicit.

> Learning is conventionally said to occur when individuals assimilate new information, including that based on past experience, and apply it to their subsequent actions...[We] can define social learning as a deliberate attempt to adjust the goals or techniques of policy in response to past experience and new information. Learning is indicated when policy changes as the result of such a process.[107]

As useful as the more subtle discussions of social learning are, they neglect how elites and other actors deliberately package and frame policy ideas in order to convince each other, as well as the general public, that certain policy proposals constitute plausible or acceptable solutions to pressing problems (Campbell 2001; Beland 2005). Barely mentioned is that these structures also provide participants in policy debates with a conceptual repertoire for actively framing these options. Indeed, the ability of elites to transport an idea into influential arenas may turn on their ability to successfully package and frame it in the first place – hence, the importance of "spin doctors," media relations personnel, and other communications specialists in politics (e.g. Jamieson 1996). The point is that ideas facilitate policy-making action not just by serving as road maps or social learning, but also by providing other discursive schema that actors can use to make these maps appealing, convincing, and legitimate.

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[106] Similar points were made by Heclo, H 1994, 'Ideas, interests, and institutions', in L Dodd & C Jillson (eds), *The dynamics of American politics*, Westview, Boulder, pp. 366-392; Argylis, C & Schon, D 1978, *Organizational Learning*, Addison-Westley, England; Haas, PM 1992, 'Introduction: epistemic communities and international policy coordination', *International Organization*, vol. 46, no. 1, pp.1-37.

[107] Hall, PA 1993, 'Policy paradigms, social learning and the state', *Comparative Politics*, vol. 25, p 278.

More recent institutionalist work has started to focus on how the processes of crisis narration are factors in setting worldviews into motion (Hay 2001). This literature is consistent with Hall's work that considered how competing contested paradigms eventually lead to the ascendancy of a new political economic order (Hall 1993, 1998). The work of more discursively oriented institutional scholars has extended this logic forward noting that the power of ideas is often discursively vested. They argue that ideational logics ascend through their crises discourse and their vignettes of proposed solutions to new or emerging conditions. These narratives guide the behaviour of their advocates. They shape the agendas through which problems are defined or redefined, through which solutions are sought, and even the instruments proposed as the resolutions to crises.

Historical institutionalism largely ignored how the content of ideas can become elements that political actors use in carrying out more explicit and deliberate manipulations. This is a serious omission because whether an idea might be considered a 'good one', does not mean that it exerts an independent influence on either how policy is developed or how ideas become enshrined into institutional and policy contexts. (Blyth 1997)

Clearly, historical institutionalism offers crucial insights into the complex and uneven processes of social and political reordering. Certainly ideational factors are profoundly implicated in paradigm shifts and political change. But as (Hay 2001) cautions, historical institutionalists should not restrict their focus on policy change to those exceptional and intense moments in which paradigms are

transcended, superseded, and replaced. In this regard, historical institutionalism came under considerable criticism. It was generally felt that within this literature there was a propensity to focus almost exclusively on the processes of institutional formation and the mechanisms within institutions that promote stasis and restrain change once the point of formation is past (Hay 2001, p. 194). The result of this tendency within the literature has been to overstate or understate change.

Debates within institutionalism compared various theoretical points of view – such as those that consider institutions as behaviourally-driven by norms, customs, values, interests, identities or beliefs (March and Olsen 1989, p. 17), or as the aggregation of individual choice based on utility-maximizing preferences (Shepsle 1989, p. 134). Notwithstanding these debates, criticism persisted that the most prominent institutional theoretical frameworks generally lacked the analytical tools necessary to comprehend the range of adjustments that were (and are) indisputably going on (Streek and Thelen 2005, p.2.). The alternative perspective remained that observed ideational change was coded as minor adaptive adjustments to altered circumstance in the service of continuous reproduction of existing systems (Bradford 1998, 1999, 1999a, 2004).[108]

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[108] Bradford, N 1999, 'The policy influence of ideas: interests, institutions and innovation in Canada', *Studies in Political Economy*, vol. 59, Summer, pp. 17-64; Bradford, N 2004, 'Governing the Canadian economy: ideas and politics', G Williams & M Whittington (eds), *Canadian politics in the 21st century*, 6 ed, Nelson, Toronto; Bradford, N 1999a, Innovation by commission: policy paradigms and the Canadian political system', in AG Gagnon & J Bickerton (eds), *Canadian Politics*, 3rd ed., Broadview Press, Peterborough, pp. 541-564; Bradford, Neil 1998, *Commissioning Ideas: Canadian National Policy Innovation in Comparative Perspective*, Oxford University Press, Toronto.

In an attempt to resolve some of the observed weakness of historical institutionalism while retaining and building on its strengths, in recent years several institutional scholars have begun to offer comprehensive theoretical accounts of how and why institutions change over time. This work stems from what was initially called a 'second movement' in institutional analysis. This movement is informed by recognition that institutions and institutional change are more complex than any one paradigm portrays by itself. By working at the crossroads of various theoretic paradigms these scholars began to explore how the various theoretical perspectives can complement and connect with each other in new ways that generate deeper insights when analyzing institutions (Campbell & Pedersen 2001, p.2).

The approach of supplementing historical institutionalism's theoretical perspectives has many benefits but it involves a number of specific strategies. By carefully transcending paradigmatic boundaries, scholars put down their theoretical lens and pick up analytic prisms. This more robust approach provides the way forward to discover a wider, more complex array of mechanisms of institutional change or stasis than each theoretical paradigm generally can alone. A blended theoretical perspective assists us in identifying areas where paradigms overlap, where they complement or supplement each other, and where paradigms describe different parts of the empirical world (Ruggie 1998, p.885). This approach has been found to be particularly useful in providing insights into the various mechanisms of policy and institutional change and how different causal processes operate, are connected to, or are nested within each other –

such as political struggle, diffusion, imitation, translation, learning, and experimentation and discovery.

2.5 Organizational Sociology – Ideas and Agency

Importantly, drawing insights from historical institutionalism allows us to retain the core assumptions about the structuring impacts of political institutions and policy legacies. Over time, existing institutional and policy legacies mesh with perceived problems to build alternatives that are grounded in specific or new thought paradigms. However, for most historical institutionalists, whether or not 'change' happens still depends largely on whether key elites deem these ideas to be normatively acceptable and whether they can transport them through institutional channels into influential policy-making arenas.

These theoretical perspectives have tended to overlook the important role of agency in policymaking. Their theory of action leaves the impression that individuals within the institutional context blindly follow the institutionalized normative signal around them. To put a theoretical lens on the role of state and non-state actors and how they can exploit opportunities to move change (and agendas) forward in ways that affect institutional outcomes, we incorporate literature from organizational sociology. Organizational sociology positions ideas and actors into the institutional context differently and much more directly than do historical institutionalists. From the perspective of organizational sociology the concept of agency – understood as individuals being both determined by and producers of history through their actions – allows us to focus more precisely on

the methods and processes that actors use to promote institutional conformity to emerging conditions.

In part, the criticism that historical institutionalism fails to specify the causal processes through which institutional actors operate results from the type of case studies undertaken from this tradition. Often the empirical work involves the analysis of a large number of states or institutions. This broader, higher-level view tends to obscure causal processes that are revealed by the finer details and granularity of case studies that focus on a more specific range of adjustments within the policy and institutional context. Organizational sociology however, allows us to do this by focusing more directly on the methods and processes of change. From the perspective of organizational sociology, the ability to successfully frame policy alternatives can become a decisive aspect of the policy process (Beland 2005).[109] This means that the insights on the influence of ideas in policymaking are viewed differently in historical institutionalism and in organizational institutionalism.

Historical institutionalists see that ideas constrain policymaking and focus almost entirely on how the background constraints underlying policy debates are normatively derived. In contrast, organizational institutionalism has deliberately moved away from this normative position in a cognitive direction.[110] Whereas historical institutionalists have a rather static view of how ideas constitute action by means of exogenously-given road maps, some organizational institutionalists

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[109] Beland, D 2005, *Social Policy & Administration*, issn 0144-5596, vol. 39, no. 1, February, pp. 1-18.

[110] Among historical institutionalists Peter Hall is probably the only one who has paid much attention to cognitive issues and then primarily to identify the conditions under which shifts in cognitive paradigms occur rather than how they constrain or enable policy making once they are established. Hall, PA 1993, 'Policy paradigms, social learning and the state', *Comparative Politics*, vol. 25, pp. 175-196.

offer the possibilities for a more dynamic theory of action that acknowledges the importance of agency through the concepts of bricolage and transposition – terms that capture the notion that actors self-consciously devise solutions to their problems by deliberately manipulating explicit, culturally-given concepts that reside in the cognitive foreground. For example, when stressing the need to reform and promote new alternatives, policy entrepreneurs or merchant scientists can draw on existing or emerging ideological repertoires to frame new alternatives or to reframe (or at least repackage) existing solutions.

In various ways, given the pre-existing structural arrangements in biomedical and clinical research in Canada, i.e., decentralized, university-based and multi-sector, the CIHR seems somewhat less transformative and more of a repackaging. In fact, through the preliminary interview process the CIHR was described to me as 'the MRC on steroids'.[111] This was in reference to the CIHR's considerably expanded funding, but seemingly steadfast affinity to the normal science and research projects of biomedical and clinical research. Throughout the 1990s Dr. Friesen had been resolved to secure more funding for an MRC that was constantly under funding pressure due to increasing demand on its research programs and the fiscal constraints associated with the Liberal government's priority of eliminating Canada's deficits and eventually reducing debt. He had been unsuccessful in this goal until he connected the conceptual model of the CIHR to ideas and principles of KBE and the Innovation Agenda. This was solidified through the integration of the research agenda and in particular the prospects of commercialization of outputs of publicly supported biomedical and

[111] Interview A4, 15 January, 2004.

clinical research, much like the National Centres of Excellence Program had done before in 1989.

Mary Douglas'[112] work supports the view that actors self-consciously craft solutions to their problems through a process of bricolage – combining already available and legitimate concepts, scripts, models, and other cultural artefacts that they find around them in their institutional environment (also see Campbell 1997; Powell 1991; Beland 2005). In this view, change can result from the deliberate modification and recombination of old institutional elements in new and socially acceptable ways. Ann Swindler (1986) developed a similar idea, that culture provides the "tool kit" with which actors construct their worldviews and devise strategies of action (also see Goldstone 1991; Snow et al. 1986; Snow & Benford 1992).

Evidently, organizational institutionalism positions ideas and actors in institutional contexts differently and much more directly than do historical institutionalists. Further, its adherents maintain that because organizational environments are often uncertain, people's interests are ambiguous. Thus, their actions are motivated more by institutionalized routines, habits, rituals, scripts and cues than by interests. Routines, habits, scripts and the like are important parts of an actor's underlying cognitive framework. However, within organizational institutionalism cognitive structures – structures that are taken for granted by policy makers and others as part of the nature of reality – can both constrain and enable action (Jepperson 1991, p. 146). These structures constrain in the sense that the underlying cognitive frames and schema through

[112] Douglas, M 1986, *How institutions think*, Syracuse University Press, Syracuse, pp. 66-67.

which actors view and interpret the world limit the possibilities for action (W.R. Scott 1994a, pp. 66-68). Some possibilities are simply not recognized due to the cognitive blinders with which actors operate (DiMaggio & Powell 1991; Meyer, Boli, & Thomas 1987; W.R. Scott 1995). To infuse their perspective with a theory of action, several organizational institutionalists have claimed that these structures can also "enable" or "empower" actors to generate new solutions to present problems, by providing cues and scripts that constitute legitimate forms of action (e.g., Meyer 1994; Powell 1990, p. 304).

For instance, Dobbin argued that French policy makers initially employed a central state planning model to build highways and then *transposed* this model to the development of canals and subsequently to railroads (Dobbin 1994). However, he did not specify whether this was a conscious and thoughtful adoption of policy–making patterns inherited from the past or not, thus the role of agency in his account was unclear.[113] Other analyses of transposition fare better in respect to their treatment of agency. Notably, Yasemin (Soysal 1994) showed that as a new model of citizenship emerged at the world level during the latter half of the twentieth century, it was gradually adopted by many nation-states, but with significant variations across countries because local actors tailored the new model to existing national political institutions.

We argue that Dr. Friesen assisted the federal government in transposing institutional models when he applied the pre-existing and considered successful

[113] Elsewhere Dobbin does a much better job showing how cognitive structures are enabling. Notable is his discussion of how the failed paradigm of traditional economics – e.g., balanced budgets – guided policy innovation during the Great Depression and provided policy makers with a model of what *not to do.* Dobbin, F 1993, 'The social construction of the great depression: industrial policy during the 1930's in the United States, Britain and France', *Theory and Society*, vol. 2, pp. 1-56.

architecture of the NCE Program to the national health research program through the conceptual representation of the CIHR.[114] This will be discussed in more detail in Chapter 5 section 3.

The point is that analysts' acknowledgment of the self-conscious capacity of actors to engage in deliberate and creative transposition is one way to develop a more refined and dynamic theory of action.[115] Another way to do this is through a heuristic development in sociologically based science literature, which discusses a characteristic group of 'star', 'capitalist' or 'merchant scientists'. This identifiable group actively seeks to change science-based institutions in specific ways.

2.6 Merchant Scientists

Various sociological studies have proposed heuristics to describe the phenomenon of a small but distinguishable group of scientists who readily straddle the worlds of academia and commercial enterprise. The heuristics of star, academic capitalists or merchant scientists establish a recognizable group in the science literature act as institutional change agents. This minority group of elite scientists embeds new ideas about why science is undertaken and new

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[114] Interview A3, 13 December, 2004; Interview A4, 15 January 2004; Interview A6, 18 March. 2004 and Interview A8, 7 April 2005. During the interview processes I asked several key interviewees a direct question about the use of the NCE Program as an influential reference for the CIHR. This question was usually received by a general sense of discomfort. The author attributes this to the fact that there is great sensitivity within the health research communities of practice on the commercialization aspects of the CIHR's mandate. Other models were always offered as having more bearing on the design of the CIHR, although this author found no evidence that there is a better match than that of the NCE. In fact, in the Interim Reports of the Governing Council the NIH and the Howard Hughes Medical Institute (HHMI) was offered as the model of emulation for the CIHR. There is very little relationship between either the NIH or the HHMI and the CIHR apart from their granting status. This, plus the frequent references to the NCE Program in the MRC's quarterly newsletters throughout the 1990s as not only a symbol of success but also one of competition with the MRC led the author to conclude the NCE is a much more likely object of transposition (at the federal level) than other institutions.

[115] Sewell, WH Jr. 1992, 'A theory of structure, duality, agency, and transformation', *American Journal of Sociology*, vol. 91, pp. 1-29.

rationales as to how science is organized to achieve the intended results. The characteristics of this group of change agents is that they are always recognized as scientific and institutional leaders in their fields. They have strong entrepreneurial characteristics and move between public and private sector structures with ease and sophistication. With cleverness and entrepreneurial flair, these scientists actively concern themselves with "all stages of the pipe" from contract research and clinical trials through to raising venture capital for spin-off companies, scaling up, and in some cases even product promotion.[116] This heuristic fits remarkably well with the presenting personality characteristics of Dr. Friesen. For example, one of Dr. Friesen's most prized accomplishments as President of the MRC was to establish a venture capital fund[117]and a clinical trial company, Chromatica. Both projects were undertaken to promote the commercialization of the outputs of biomedical and clinical research that were supported by MRC funding.

In studies on the pioneering molecular biologists who established the biotechnology industry in the United States, Lynne Zucker and Michael Darby referred to this elite group as 'star scientists.'[118] Stars are a cadre of scientists who excel in both the profit-making sector and academia. They are 'extraordinarily creative, innovative, and productive individuals' with the 'vision and genius [to] consciously change the boundaries of what is possible.'[119]

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[116] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto, p.169.
[117] Canadian Medical Discoveries Fund. Medical Research Council of Canada 1997, *1997-98 Estimates*, Minister of Supply and Service Canada, Ottawa, p.5.
[118] Zucker, LG & Darby M R 1997, 'Individual action and the demand for institutions', *American Behavioral Scientist*, vol. 40, no. 4, pp. 502-14.
[119] Ibid.

In the higher education literature, Sheila Slaughter and Larry Leslie use the term 'academic capitalists' to describe the same phenomena amongst researchers. In their research, academic capitalists saw no conflict in having the state subsidize their commercial interests.[120] Since these scientists "define market values as contributing to the advancement of science and the public interest", financing their research from the public purse posed no conflicting issues.[121]

Like star scientists or academic capitalists, the 'merchant' scientist referred to in Janet Atkinson-Grosjean`s research is an elite performer. The credibility of the merchant scientist is grounded in peer recognition. They are intellectuals at the top of their league with exceptional records of publication, promotion, grants and awards. In her doctoral thesis, Grosjean proposed that the 'reputational capital' of merchant scientists confers a 'halo effect' on their non-scientific activities as well.[122]

In another example of how Dr. Friesen fits into this heuristic, in his research career he was a top performer in endocrinology. The following bio on Dr. Friesen is quoted from the web site of the Canadian Medical Hall of Fame:

> After acquiring post-graduate medical training as an endocrinologist in Boston, Dr. Friesen entered the Department of Medicine at McGill University. There, he carried out research on the human growth hormone (HGH), which made successful replacement therapy in hormone deficient children possible. Further endocrine research led to his isolation and purification of the hormone prolactin. Later, in collaboration with researchers in the pharmaceutical industry, Dr. Friesen developed the

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[120] Slaughter, S & Leslie, LL 1997, *Academic capitalism: politics, policies, and the entrepreneurial university*, Johns Hopkins University Press, Baltimore, Pp.179
[121] Ibid.
[122] Atkinson-Grosjean, J 2001, *'Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science'*, PhD Thesis, University of British Columbia, British Columbia.

drug Bromocryptine that proved to be effective in the treatment of infertility in women.

As an administrator, Dr. Friesen served on the Medical Research Council of Canada for twenty years. As its President from 1991 to 2000, he piloted the Council during challenging times with competence and diplomacy and envisioned its transformation into the Canadian Institutes of Health Research.

He was appointed an Officer of the Order of Canada in 1992, and has received Honorary Doctorates from the Universities of Western Ontario, Manitoba, British Columbia, McGill and McMaster.[123]

A common theme throughout all of the studies on 'stars', 'capitalist', and 'merchant' scientists is that the majority of academic researchers choose not to engage in commercial enterprises. Rather they pay, "lip service to current policy...just enough to meet the strategic requirements of their grants".[124] For them, the potential cost to academic freedom when engaging in science for economic or social purposes is simply too high. The non-merchant scientists are established in the free intellectual inquiry and open exchange of knowledge.

As a group, non-merchant scientists, referred to in this heuristic as settlers, are concerned about changes in their academic havens. In their view the quest for profit is tedious and distracts from the pursuit for fundamental knowledge. Non-merchant scientists value their intellectual freedom and see that it flows from their privileges as university researchers. While merchant scientists

[123] <http://www.virtualmuseum.ca/Exhibitions/Medicentre/en/frie_print.htm>
[124] This has been referred by Rip as 'reluctant accommodation.' Rip, A 2000, 'Fashions, lock-ins, and the heterogeneity of knowledge production', in M Jacob & T Hellstrom (eds), *The future of knowledge production in the academy*, Open University Press, Buckingham, pp 28-39.

embrace new expectations of commercial and social relevance, settlers fear erosion of unfettered exploration.[125]

Regardless of the label, these entrepreneurial actors have been demonstrated to be active in the reframing processes of institutions. In the next section we explore the literature on how strategic management can be used as a powerful reframing enabler in the entrepreneurial/merchant scientist's toolbox.

2.7 Strategy as a Theoretical Lens on Institutional Analysis

At the very initial fact finding stage of this research, well before this author had any ideas as to why and the MRC would undertake the incredibly hard and risky work of institutional change on the scale of reinventing a Research Granting Council, I conducted my first preliminary interview. This interview was with a person who started his career as a research scientist prior to a long and accomplished career as a senior civil servant in provincial and federal departments of health. During his career he also directed teaching hospitals, chaired hospital boards and chaired boards of the powerful health research charities. This person also was directly involved in the early work of the MRC-CIHR transformation before becoming a Board Chair of one of the CIHR's Institutes. This gentleman had a reputation for directing institutions with the precision of a surgeon's scalpel. I also had former dealings with him during my MBA studies. He was keenly interested, and extremely helpful and forthcoming in assisting students to solve complex problems that bear on leadership in the

[125] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.

health sector. I started this research project with a direct question to him and asked 'why and how could the MRC become the CIHR despite the seemingly insurmountable political and institutional obstacles and risks?'. His response was "look to strategy". [126]

His response precipitated the first of many research challenges. Was I to ignore his comment, or could strategy be used in a meaningful way in this research project? As a concept and a practice that evolved out of private sector experiences, an initial research question was "could the literature on strategy be used in a meaningful way to assist in reconstructing the transformational events of the MRC-CIHR?" More to the point, "could 'strategy' assist us with a theory-based analysis of an institutional transformation, given that the demise of the MRC and the emergence of the CIHR is fundamentally about the federal government approving a proposed 'new' institutional model to support the national health sciences research agenda?" These questions will guide the analysis that follows.

"Strategy is an elaborate and systematic plan of action".[127] Using this definition, any action-oriented intention can be generalized as a strategy. Although this definition is accurate, it does not distinguish the proposed strategic event – the transformation of the MRC to the CIHR – from any other planned action, such as a war campaign or a mission to the moon. At the mid level of an institutional analysis, broad definitions of strategy, although accurate, are not helpful. To get at the deeper meanings of strategy, its drivers, and how it shapes

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[126] Confidential Interview A1, January 2004.
[127] <www.cogsci.princeton.edu/cgi-bin/webwn>

agendas and impacts on decision-making, strategy must be considered within an institutional context.

The term and concept of "strategic management" applies strategy to organizations and institutions. In this instance, strategy can be understood to be a, "managerial process of forming a strategic vision, setting objectives, crafting a strategy, implementing and executing the strategy, and over time initiating whatever corrective adjustments in the vision, objectives, strategy, and execution are deemed appropriate".[128] In this sense strategy becomes, "an organization-wide task involving both the development and implementation of strategy and demands an ability to steer the organization through strategic change under conditions of complexity and uncertainty".[129]

These definitions capture the mainstream views and norms within management literature and the management practitioner community. They also provide dimensions to strategy that speak to its scope, its long-term directions, and how it can be used by a merchant scientist, such as Dr. Friesen, as a methodology and tool to direct institution-wide actions in a purposeful way.

To the serious student of policy or management studies, the experience of reviewing mainstream literature on strategic management (and other business instruments, techniques and approaches) can lead to frustration. Popular literature coming from business community gurus rarely satisfies the analytic conventions of social science. To be fair, this is not the intended audience for this work. Nonetheless, policy and institutional scholarship does need to address

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[128] <www.highered.mcgraw-hill.com/sites/0072443715/student_view0/glossary.html>
[129] <www.wps.prenhall.com/wps/media/objects/213/218150/glossary.html>

the broad-based issues precipitated by the recent, large-scale, and widespread, uptake of private sector concepts and conventions applied into the public and not-for-profit sectors.

Still, simply because strategic management exists as a practice within the public sector, it does not necessarily follow that it is an appropriate lens from which to build a theory based analysis of institutional change. One must look to more critical sources to construct an analytical approach that considers the transformation of the MRC to the CIHR within the context of `strategy`.

The literature of public policy, public administration and political science documents indicated that advanced economies were rapidly adopting private sector-styled managerialism no later than the mid 1980s. Within this literature the sources of the new public management (NPM) are various (Pal 1997, 2000; Borins 2002) but generally thought to have emerged conterminously with the principles of liberalization. Canadian scholars have made substantial contributions to this literature. A sample but not exhaustive list includes: Peter Aucoin, Sanford Borins, Leslie Pal, Donald Savoie, Denis St. Martin, Paul Thomas, David Zussman, and others.

A review of this literature suggests that some scholars consider the use of business tools to be a misplaced practice outside of a competitive, profit-maximizing environment. Others see these ideas and practices as an ideologically-driven agenda applied in a context-free, one-size-fits-all, cut and paste of business concepts directly into public sector services and programs. They conclude that the application of business tools creates an intended,

insurmountable, hurdle to public investment, compromising public interests in favour of powerful, private ones. Rather than providing support for non-partisan objectivity based on a detached, rational decision-making process, they argue that the fiction of efficiency and effectiveness has been swapped for the value of equity.

As a term and a concept, New Public Management (NPM) is as broad and diverse as its literature (Pal 2000). This makes it difficult to draw conclusions on an institutional transformation where the fingerprints of a specific managerial concept and practice – e.g., strategic management – were used to organize and direct institutional change in a purposeful way. Given the specifics of the case under consideration – the MRC/CIHR transformation – critical literature on strategic management offers original insights and a fresh perspective for analysis. However, in the American and Canadian context, with few exceptions, (Lindquist 2000) scholars of public sector studies have not deconstructed strategic management. A reasonable question then is, "Can one isolate a thin section of private sector based business practices for analysis? If so, what does this literature have to say about the possibilities underlying the event of institutional transformation?"

To strip strategic management away from the plethora of business instruments that have become dominant in the public sector in the last few decades, one must turn to the work of (predominantly) British scholars. Within this work there is a rich and growing body of literature – (Whittington 2001; Pettigrew 1992; Calori 1998; Cummings & Wilson, 2003; Ferlie 2002; Stoney

1998, 2001) – that provides a reflexive analysis of the field of strategic management, its intellectual history, its underlying theoretical assumptions, and its application into the public sector. For the student of policy, this work is important because of all the instruments of managerialism, strategy arguably bears most directly on the field of policy and institutional studies. Both strategy and policy, as concepts and as practice, are about executive level decisions based on problem / solution definitions contrived at the highest levels in private organizations, public institutions and by politicians. Often in the literature there is fluidity about discussions of policy and strategy. As an example, to draw attention to the importance of the intentional aspect of decisions in policy development and problem definitions, (Pal 2000, p.4) uses Mintzberg and Jørgensen (1987, p.216) to make the point that from the classical perspective, "policy or strategy is formulated consciously, preferably analytically, and made explicit and then implemented formally".

Although hardly a scholar of public policy, in Chandler's 1962[130] seminal text on strategy, he refers to strategy as policy. Neither of these brief examples is intended to suggest that the concepts and practices of policy and strategy are synonymous. Rather, they are mentioned simply to make the point that, in some sense, strategy and policy are related.

Reviewing critical work on strategy one can conclude that the roots of strategic management trace back to American business traditions of the 1950s and 1960s. The initial practice was focused around a group of US-based

[130] Chandler, AD Jr. 1962, *Strategy and structure: chapters in the history of the industrial enterprise*, MIT Press, Cambridge.

consulting firms such as McKinsey, BCG, and Bain who eventually became world leaders in developing and diffusing the language and techniques of strategy. Within the scholarly work on strategy, (Whittington 1993, 2000, 2002; Knights & Morgan 1991; Alvesson & Willmott 2003) among many others, note that a weakness in the field has been its lack of critical reflection. Whittington (2002) speculates that a reason for this weakness is that the practitioner community of strategic management has little concern, or even patience, for academic deconstruction.

We are all familiar with the large body of 'how-to' business manuals that arm managerialisms with charts, tables and graphs, silver bullets and preach on the flavour of the month business practices. Less referenced is an accumulating stream of critical work on strategic management. Reflective literature in this area continues to grow and to cut across disciplinary boundaries (Cyert & March 1963; Porter 1980; Williamson 1991; Mintzberg 1987, 1994, 1998; Cummings & Wilson 2003; Whittington *et al.* 2002; Ferlie 1996, 2002).

Within this literature, some look to industrial economics as the discipline that speaks to the foundations of strategy. Others would argue that psychology, history, and political science are more useful disciplines to grasp the meanings of strategy (Cummings & Wilson 2003, p.3). A more recent phenomenon is work that deliberates on strategy within a political economy context. This literature digs deeply into the epistemological and ideological features behind strategy, about the role of power in strategy formation, and how discourse and narratives

can privilege dominant economic interests (Stoney 1998, 2001; Knights & Morgan 1991; Alvesson & Willmott 2003).

Much can be said about (and learned from) the heated debates between those that take various theoretical perspectives on strategy. Some see it as a necessary response to the exogenous variables of globalization and technological change. This group would be inclined to conclude that it is a value-free instrument that provides a means to incorporate efficiency, reduce waste, improve transparency and militate against political agendas. This is particularly important to those that see strategic management as a response to deficits and tapped out taxpayers. Others take a less deterministic position, looking to dominant economic interests as the explanatory variable for the proliferation of strategy as important to institutional scripts.

These debates are important but the specifics of these discussions are not the avenue to pursue for present purposes. Rather, the fact that these debates are being conducted within an emerging body of critical work supports the view that strategy can provide a valid theoretical lens to consider events within a public sector. Further it clearly offers an organizing tool for reframing institutions, regardless of the ideological perspective that this reframing is based in.

In chapter 6, we will discuss in more detail how having identified strategic themes through broad consultation in the early years of his mandate as President of the MRC, Dr. Friesen persistently pursued their implementation during his mandate. It took nearly ten years to convince the federal government to provide more funding for health research, but the protracted debates and consultations

around the strategic directions for the MRC assisted in building consensus (or at least tolerance) within the health research communities on Dr. Friesen's vision and strategic plans. Two Canadian researchers who have studied the various uses and roles of strategy as applied to the voluntary and public sectors concluded that no matter how inefficient, the process of strategy builds comfort with a new language and develops subtle control effects that internalize top-managers' objectives in a way that they would be hard pressed to impose directly (Langley 1988, 1991; Oakes, Townley & Cooper 1998).

2.8 Ideas on Science Policy and Innovation and on the Production and Translation of Knowledge

In this section, to make sense of the specifics of the MRC-CIHR transformation, we come back to the concept of ideas. This time we look more specifically at the nature of ideas regarding science policy and innovation and the production and translation of knowledge. Such ideas have been impacting on knowledge-centred realms and have a bearing on the structural arrangements of science institutions. In essence, just below the level of shifting paradigms such as the KBE and toward the market oriented concepts of liberalization, are the ideas that propose how science should be organized and why.

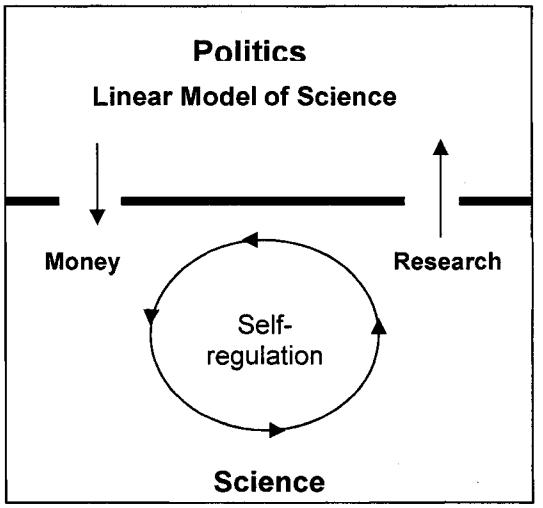
2.8.1 THE LINEAR MODEL

Vannevar Bush, an engineer, former president of the Massachusetts Institute of Technology (MIT) and head of the wartime U.S. Office of Scientific Research and Development (OSRD), is often recognized as politicizing the social

contract for science. The metaphor of a social contract as a freestanding system of universal norms that underpins moral authority has often been used to express "important but incomplete themes in science policy".[131] However, these general themes provide useful historical benchmarks from which to assess changes in the relationships of science and society.[132] In a government document titled *In The Endless Frontier* (1945) Bush expressed the view that the post-war social contract for science was based on self-regulatory science and the linear model.

Figure 2

Self-Regulatory Science and The Linear Model



Source: Guston, D 2000, Between politics and science: assuring the integrity and productivity of research, Cambridge University Press, New York. p.70

[131] Guston, DH 2000, *Between politics and science*, Cambridge University Press, Cambridge, p. 51.
[132] For extensive discussions on science policy and the nature of the social contract, consult David Guston`s work: Guston, D 2000a, *Between politics and science: assuring the integrity and productivity of research*, Cambridge University Press, New York; Guston, DH & Keniston, K 1994, The fragile contract: university science and the federal government, MIT Press, Cambridge; Guston, D 2000, *Issues In Science and Technology: Retiring the Social Contract for Science* <http://www.issues.org/index.html>. For the Canadian context see Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto, chapter 2.

The principles were straightforward. The state would fund basic science because society derived benefits from scientific discoveries. Funding would be reserved for the 'best' scientists. These scientists would be recognized and identified based on their previously-established productivity. Since scientists understood the fundamental laws of nature, were trained and skilled in the practices of science, and had the responsibility for the creation of scientific knowledge, determining the best scientists was a matter for scientists themselves to decide. Under this model, governments had no role in evaluating or measuring science, scientists, or in tracking the outputs of research. The state's responsibility was to support researchers (often university based) with the resources they needed to conduct research activities. Under this view of science and society, separating the state from science avoided tainting the innovation process from political influences or priorities. The linear model of innovation linked basic research conducted at autonomous universities to eventual, but completely unpredictable, socio-economic returns. Even if it was not possible to predict when the eventual technological and social spin-offs from basic science would be realized, the open dissemination of research results was a necessary pre-condition to producing them. Left alone, without state controls, the autonomous researcher would provide the basic elements for innovation that, at a distance, would become the raw material for practical ends. Basic research was to be performed without consideration to practical ends. Indeed premature consideration of application would contaminate the pursuit of fundamental inquiry

and the vigor of its creative edge would be lost. The sole purpose of basic research was to contribute to an understanding of nature.

The dominant metaphor of the linear model was the pipeline. Fundamental discoveries produced from basic research were at one end of the pipe. As these discoveries moved through the various stages of development, marketable innovations would emerge from the other end. The concept of market failure provided the linear model with a powerful argument for state support for fundamental research. Basic sciences were understood to be public goods and as such public financing was necessary to sustain the processes of innovation. Innovations produced wealth and fueled economic growth, which in turn generated taxes back to society.[133]

From Post WWII until the late 1970's when the social contract for the integrity and productivity for science and the linear model began to break down,[134] these arguments provided the rationale for state support for science and research in the developed world.

2.8.2 Iterative Concepts of Knowledge Production

Although the simplicity of the linear model, "has yet to be replaced with a more complex and realistic appreciation of the way in which knowledge flows between universities and industry",[135] newer models of knowledge production

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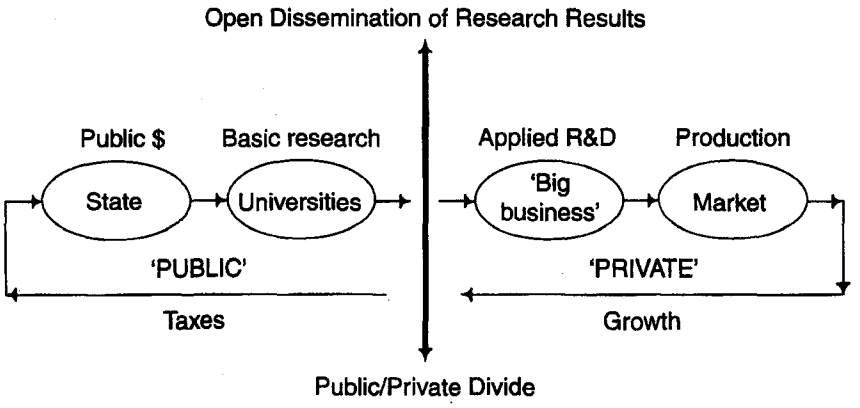
[133] Adapted from Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto, p. 20.
[134] Guston, D 2000, *Between politics and science: assuring the integrity and productivity of research*, Cambridge University Press, New York.
[135] Wolfe, D 2005, 'Innovation and research funding: the role of government support,' in *Taking Public Universities Seriously*, F Iacobucci & C Tuohy (eds), University of Toronto Press, Toronto, p. 323.

have thrown into question its fundamentals. Mode 2 and the Triple Helix postulate that the relationship between publicly funded research and the processes of innovation are more complex than those proposed by the linear model. Both of these models argue that separating fundamental and applied research creates an artificial boundary between the search for solutions to practical and technical problems and the quest for basic understanding. Second, they cast doubt on the role of universities as autonomous places for basic inquiry upstream of the processes of commercialization.

Figure 3

The linear model of research: The Second World War to the mid-1970s



Source: Atkinson-Grosjean, J 2006, Public science private interests: culture and commerce in Canada's networks of centres of excellence, University of Toronto Press Incorporated, Toronto. p. 20.

In terms put by Gibbons and his colleagues (1994)[136] Mode 1 is academic, investigator-initiated and discipline-based knowledge production that generally takes place in universities. In contrast, in Mode 2 the university is no longer the

[136] Gibbons, M et al. 1994, *The new production of knowledge: the dynamics of science and research in contemporary societies*, Sage, California.

primary site of knowledge production.[137] It is characterized by a large number of knowledge producers working on problem-focused research. Disciplinary boundaries are blurred. Multidisciplinarity is the new norm as the 'context-driven'[138] 'post-academic'[139] 'post- disciplinarity'[140] phenomenon takes over.

Mode 2 does not replace Mode 1 as some have suggested; rather Mode 2 supplements Mode 1. There is a pattern of co-evolution between these two Modes.[141] Systematically explained, the purposes of Mode 2 are:

- To serve as a bridge and linkage between scientific basic research at universities and the general interest of the economy and society in knowledge-based problem solving;
- Relies on principles that both emphasize the importance of university/business networks in R&D or S&T and practically support the establishment of an effective university/business networking; finally,
- To provide feedback to the university and even influence on and changes in how basic university research (Mode1) is being performed and organized.[142]

The notions of Mode 1 and Mode 2 knowledge production has attracted considerable attention, but it has not been universally accepted. Etzkowitz and Leydesdorff[143] argue that Mode 2 is not a new system of knowledge production. In their view Mode 2 is it is the original organizational and institutional basis of science, consisting of networks and invisible colleges before its

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[137] Delanty, G 2001, *Challenging knowledge: the university in the knowledge society*, Society for Research into Higher Education and Oxford University Press, Buckingham, p. 3.
[138] Limoges, C 1996, *L'université à la croisée des chemins: une mission à affirmer, une gestion à reformer*, Actes du colloque ACFAS.CSE.CST, Ministère de l'Éducation, Gouvernement du Québec, pp. 14-15 describes context driven as 'research carried out in a context of application, arising from the very work of problem solving and not governed by the paradigms of traditional disciplines of knowledge.
[139] Ziman, J 2000, *Real science: what it is and what it means*, Cambridge University Press, Cambridge.
[140] Giddens, A & Turner, J (eds) 1987, *Social theory today*, Polity Press, Cambridge.
[141] Gibbons, M et al. 1994, *The new production of knowledge: the dynamics of science and research in contemporary societies*, Sage, California, pp. 14-15, 17.
[142] Campbell, DFJ 2006, 'The university/business research networks in science and technology: knowledge production trends in the United States, European Union, and Japan', in EG Carayannis & DFJ Campbell (eds), *Knowledge creation, diffusion, and use in innovation networks and knowledge clusters – a comparative systems approach across the United States, Europe, and Asia*, Praeger, Westport, p.92.
[143] Etzkowitz, H & Leydesdorff, L 2000, 'The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations, *Research Policy*, vol. 29, pp 109–123.

institutionalization by the academy in the 19th century. Mode 1 came later and was constructed in order to justify autonomy for science, especially in an earlier era when it was still a fragile institution.

In the same article Etzkowitz and Leydesdorff use the notion of the triple helix of the nation state, academia and industry to explain innovation, the development of new technology and knowledge transfer. Etzkowitz & Leydesdorff argue that 'The Triple Helix' overlay provides a model at the level of social structure.[144]

With regard to Mode 1 and 2, and also Triple Helix, one certainly could question whether these knowledge concepts primarily reflect empirical trends or whether they also emphasize a normative component by placing an interest in how research should be carried out. Nonetheless, with the triple technological revolution in biotechnology and information and communications technology, a major technological revolution was taking place. This meant that not even the largest corporations, the most advanced public research centres, or one university could master all the eclectic dimensions of research. The speed and uncertainty associated with such rapid technological change was dramatically increasing the cost and risk of research and experimental development, and of getting that research translated into innovative products and processes. This was causing a major shift in how the science model was perceived. These circumstances were in large part driving the ideas of the Innovation Agenda and its relation to knowledge-centred realms. The idea of the lone researcher toiling

[144] Ibid. p. 118.

at the research bench was rapidly falling out of favour, replaced with multi-sector alliances between the private and public sectors and universities. Clearly, in the right hands, the ideas and metaphors of these models became very powerful ingredients in reframing the national biomedical and health sciences research agenda and in legitimizing new structural arrangements in support of these activities.

2.9 The Conceptual Framework

The theoretical framework discussed and elaborated in this chapter allows us to move forward into the empirical analysis considering the MRC-CIHR transformation in light of neo-institutional theory. The objective of this chapter was to: consider in detail the processes that propel change forward in the political economy; the effects of these changes on institutional stasis and change; and to better understand the role of agency as actors (state and other) that influence how new ideas can be conveyed into institutional and policy contexts.

Figure 1: Context: The Changing Nature of Ideas Impacting on Knowledge–Centred Realms

- A techno-economic paradigm shift based on Information technology and the rise of the KBE
  - Economic Ideas on best fit structural arrangements to support the production and adoption of innovation

NEO-INSTITUTIONAL THEORETICAL

Conceptual Core Historical Institutionalism

- A theory of ideas within the context of institutional (and policy) change and continuity
- However, HI does not explain factors in the political economy that come to bear upon science institutions and it lacks consideration of agency e.g., how state and non-state actors impact on institutions

KBE

Factors that explain shifts in the political economy that bear on science and innovation policy and on science institutions particularly those sciences affecting the techno-economic paradigm

Science Policy and Innovation

- Ideas on Science Policy and Innovation and on knowledge productions and translation

Sociology of Institutions

- ***Agency*** – an action oriented theory of how state and non-state actors are both determined by and producers of history
  - ***Merchant scientists*** – an identifiable group of change agents in the field of science and research

Strategic Management

- A powerful instrument of institutional and policy reframing used by actors

SCIENCE POLICY & HISTORICAL LINKAGES

Aspects of Science, S&T and Innovation Policy and new ideas on best-fit structural arrangements

Linking publicly supported Biomedical, Clinical and Health Science Research to aspects of Science, S&T and Innovation Policy

EMPIRICAL DIMENSIONS

1960-1970	Transformational Pressures on the MRC 1980-97	MRC/CIHR Transformation 1998-2000
• 1960 the MRC is founded but remains under the NRC framework until 1969 while debates take place on science policy and the place of health research in Canada's emerging publicly funded system. • Biomedical and clinical research does not have a high policy priority in science policy nor does the MRC. • The MRC inherits a legacy of decentralized and distributive arrangements (research is conducted in universities). • Its core function continues to support building capacity in biomedical and clinical research and research excellence. • Beyond research excellence, by the 1960s its mandate is being pushed towards health policy. • Its funding grows in the 1960s and is stable during the 70s but its programs are strained due to demand. • Its leadership is low profile and reactive.	• Generally biomedical and clinical research (and the MRC) retain a low policy priority but by the late 1980s the federal government is increasingly interested in their commercialization potential (NCE Program). • The MRC's core mandate remains biomedical and clinical research but its objectives are broadening from health to economic aspects of health research policy. • This corresponds to changes in the science model and economic 'best fit' structural arrangements (emphasizing networked, multi-disciplinary/sector arrangements particularly applied and commercializable research). • The MRC's research programs are heavily affected and under pressure due to the emerging techno-economic paradigm. Despite research in new technologies and attempts to adjust its program structure, it retains a compact, discipline-based peer review structure. • By the mid 1990s the MRC is in a funding crisis (increased demand plus reduced funding is straining its ability to manage the national research agenda). • Since the 1990s it has had an active and strategic President trying to increase the MRC's policy priority and profile in Canada's national science agenda. Initial attempts were unsuccessful.	**The demise of the MRC and the creation of the CIHR.** • Other institutions have emerged (i.e., NCE, CFI) that are considered more appropriate to the 'new economy. • Dr. Friesen proposes a new institutional model for 'health sciences' based on a restructured MRC. • These structural arrangements fit with the new techno-economic paradigm of the KBE. • The CIHR and its 13 thematic Institutes are a network of university-based institutes that support multi and trans-disciplinary research based on the four pillars of biomedical, clinical and health science research. • An explicit objective of the CIHR is the commercialization of health research. • Its funding levels move from $250 – 500 million and are expect to reach $1 billion annually by 2010. • Its peer review panels triple and are very complex.

The research framework presented is largely derived from Historical Institutionalism's theories of institutional stasis and change because, first and foremost, this dissertation is focused on the study of an institutional transformation. This literature discussed concentrates our attention on how ideational innovations and institutional legacies join with the discursive construction of meaning to create strategic opportunities that enable reframing of policies and their supporting institutions. These theories are augmented and enriched by theories of the knowledge-based economy (KBE), which highlight more precisely the nature of changing economic and political organization, which then came to bear on institutional paths and outcomes. This literature is central in explaining forces in the political economy that collided with science and the supporting research institutions. Of significance is that during the techno-economic shift of the KBE, which was caused by the discovery and application of new technologies, biomedical and clinical sciences became economically as well as socially important.

Techno-economic paradigm shifts have other consequences. Their diffusion is the source of major structural crises causing social and institutional changes to bring in a system of social management that is better suited to these emerging technologies. In the case of the CIHR, the adjustments heralding the knowledge-based economy established the groundwork for an institutional transformation as new ideas were proposed as solutions to address the emerging conditions.

However, the fact that these conditions exist did not necessarily mean that an institutional response based on new ideas would develop or that it would be successful. We argue that these new ideas were forcefully propelled into the institutional context of the MRC by the strategic and entrepreneurial behaviour of Dr. Friesen. Therefore we incorporated literature from organizational sociology to more precisely focus on the methods and processes that actors use to promote institutional conformity to emerging conditions. This literature assists us in understanding how a new paradigm, such as a techno-economic paradigm shift and the policy response in Canada of the Innovation Agenda, opened up strategic opportunities to Dr. Friesen. As an institutional actor, Dr. Friesen took advantage of these opportunities in very specific ways to achieve his goals affecting the institutional outcome of the CIHR.

We have also argued that an explanatory analysis of institutional change requires more than consideration of the contingent bearers of political and institutional amendments. It also requires sensitivity to historical antecedents. This allows us to identify the time of transformation and the magnitude of change so that the broader social, political and economic meanings of transformation can be brought under scrutiny.

A challenge in this research has been teasing out the transformational differences between the MRC and the CIHR. This is because the CIHR has been portrayed as an institutional experiment on a quest to better address the conditions of a new economy. Yet the historical record demonstrates that public support for biomedical and clinical research in Canada was always conducted in

the triple helix of government, university and private sector. These arrangements existed well before these concepts became part of the techno-economic paradigm shift heralding in the 'new economy' and further supported by revisions to the science model.

Understanding why, initially, these arrangements and characteristics of biomedical and clinical research were accompanied by a low policy priority, and why (and how) this changed during the period of transformation, provides invaluable clues as to the true nature and time of the MRC-CIHR transformation. We argue that a key aspect of transformational change can be attributed to how the emergence of new technologies connected the national biomedical research agenda to the economic interests of governments. The distributive structural elements of the CIHR were incubating in the MRC and the MRC's programs had been building a university-based capacity for decades. The CIHR was then able to quickly build from this base through its virtual institutes, and to organize research capacity into thematic and strategic research programs better suited to the ideas under the KBE. The arrangements of the MRC were augmented and significantly amplified in a new model supported through increased funding for biomedical, clinical and health research. More important, during the period of transition, a new mandate for publicly supported health sciences embedded different purposes and values into the national research agenda. We argue that, taken together, this is the true nature of transformation in this case.

2.10 Conclusions

In this chapter we elaborated on literature relevant to a theoretical framework that allows us to fully consider the MRC-CIHR transformation. The focus of this chapter was to develop a framework that separates the legend of the event and the event makers from the nested conditions and process that over time can cause transformation. This chapter drew on literature from historical institutionalism to focus our attention on how the fundamental ideational underpinnings of economic and social organization can change. This literature assists us to consider how ideational innovations and institutional legacies join with the discursive production of meaning creating narratives and opportunities that enable reframing.

Organizational sociology provides a theoretical vehicle to examine the processes and methods of change once the crisis narratives generated by a paradigm shift begin to reflect new notional solutions of the emerging (or dominant) world view. Within this context, we examined the role of agency from the perspective of how actors are both determined by and are producers of history. This then allowed us to bring into the discussion how state and non-state actors can become change agents embedding new world views into institutional and policy settings. Often used to accelerate the process is the transposition of existing models and practices into different institutional contexts. In knowledge-centred realms of research institutions, a particular group of change agents have been identified with distinguishable characteristics. They have variously been referred to in the literature as star, capitalist or merchant scientist.

Finally we examined the nature of the ideas underpinning knowledge-centred realms such as the former linear science model versus contemporary ideas, which are iterative and multidisciplinary in nature. These new ideas have bearing on best-fit structural arrangements in producing and translating discover into usable innovations.

These are the key features of the research framework. They will be used to organize the empirical research over the core empirical chapters. We argue that this framework permits us to reflect more fully on the nature of the change initiative between the MRC and the CIHR and the deeper social, political and economic meanings of this transformation.

In the next chapter we continue with the groundwork of setting a historical context for biomedical and clinical research in Canada. This is necessary so that we can more thoroughly move toward a deeply set analysis of the conditions, events and meanings of the MRC-CIHR transformation. Building from the research conducted in the Aucoin dissertation published in 1972, in Chapter 3 we identify several key characteristics specific to biomedical and clinical research. We then propose these as the legacy paths though which these sciences progressed towards the latter decades of the last century up until the point in time where the MRC-CIHR transformation took place.

CHAPTER 3

The Expansion of Biomedical Research (1946-1959)

Introduction

In this chapter, we move this analysis forward and consider how public, private and not-for-profit support for biomedical and clinical sciences continued to evolve in the aftermath of WW II. The timeframe under consideration is from 1946 to 1959, a period of explosive growth in science and research. Biomedical and clinical sciences and their research activities experienced a similar period of rapid growth.[145]

The objective of this chapter is to identify and describe the secondary set of characteristics, which significantly affected policy developments and the structural support for biomedical and clinical research for many decades to come. These influences included:

- A history of complex and varied funding arrangements among public, private, and not-for-profit partners in matters related to support for biomedical and clinical research.
- Tight connections between basic and applied (although not necessarily mission-driven) research due to the empirical nature of biomedical and clinical research; and,
- A legacy of decentralization in policy development and the structural arrangements supporting publicly funded biomedical and clinical research in Canada.

To further develop the argument that these characteristics set historical trajectories in this group of sciences, in section 3.1.1 we first look at the decision

[145] Aucoin, P 1972, 'Health scientists and the making of health science policy in Canada', PhD Thesis, Queen's University, Kingston.

of the NRC to continue with a decentralized approach to support biomedical and clinical research under the Division structure. Apart from jurisdictional issues, this was also a response to the ever-increasing complexity of funding associated with these sciences and their research activities. In sub-section 3.2.1 we consider provincial involvement in various aspects of this research, which certainly includes funding alliances for medical research. We also highlight the complication of federal-provincial jurisdictional issues in this research area, which, much to the consternation of the research community, led to the incorporation of political decisions as inputs other than 'research excellence' into the national biomedical and clinical research agenda. In sub-section 3.3 we address the granting structure of the NRC Division of Medical Research and the locations of these research activities, which were largely conducted in universities.

In sections 3.4 and 3.4.1 we look specifically at the university sector. This was and remains the site of most of the research activities mentioned above and brought into the equation an additional issue to be addressed by the national biomedical and clinical research program – geographic equity in funding and building a national research capacity.

Section 3.5 and 3.6 highlights the complexity of coordinating a national biomedical and clinical research agenda under decentralized, multi-institutional, multi-sector and jurisdictional conditions. In this section we also discuss the emergence and role of the very powerful health research charities. This is

followed by an illustrative case of multi-sector and even multi-national alliances in research alliances for a specific disease, arthritis.

Finally in section 3.7 we briefly discuss how the university sector began pressuring the federal government for Canada's first research granting council, the Medical Research Council of Canada. The universities sought to remove responsibility for biomedical and clinical sciences from the granting component of NRC and place it in an autonomous Council modeled after the NRC. Chapter 4 discusses in more detail how these lobbying efforts coincided with a decrease in political and bureaucratic support for the NRC's approach to supporting a national science program. This contributed to the rethinking of the relationship of science and science policy to society. These themes, and how they impacted on the development of Canada's national biomedical and clinical research programs are picked up and elaborated on further in Chapter 4.

3.1 Sources of Funding and Demands

3.1.1 Post-War Support for Medical Research

In 1946 the National Research Council (NRC) replaced its Associate Committee structure with Divisions.[146] With all the research conducted and technologies developed during WWII, as well as the huge investments in infrastructure to support these efforts, the Divisional structure was considered better suited to public science. The NRC was resolved to continue and expand its support for biomedical research and so the Associate Committee of Medical

[146] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.

Research became a Division. The first Director of the Division of Medical Research was Dr. J. B. Collip with Dr. G. Harold Ettinger as Assistant Director. The Division's initial budget was $160,000.00, or almost a four-fold increase in just under ten years. By 1949-50 the Division of Medical Research's budget was just under $2 million, or another 10-fold increase in less than 15 years.

Like its predecessor, the Associate Committee of Medical Research, the Medical Research Division differed from other NRC Divisions. The NRC had established well-equipped national laboratories to support the activities in many of the traditional chemically-based and physical sciences. Similar to the traditional sciences, biomedical and clinical research required facilities, equipment, and technically-trained support staff. However, the NRC continued with a decentralized approach in developing Canada's biomedical research programs and in building scientific capacity in these scientific communities. This embedded within the NRC's centralized agency framework a decentralized program for biomedical and clinical research, which was a nearly autonomous structure of non-directed grants and scholarship programs. Nonetheless, the anticipation within the medical research community was that the Division of Medical Research would do for biomedical and clinical science what the NRC's Committees had done in supporting growth and building capacity in other scientific disciplines.[147]

The Medical Research Division had only a small permanent secretariat to assist its Advisory Committee, which was responsible for awarding and

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[147] Farquharson, RF 1959, *Report of the Special Committee Appointed to Review Extramural Support of Medical Researchers*, Government of Canada, p. 22.

administering the rapidly increasing number and dollar value of grants awarded to medical researchers. One of the drivers of increased demand for biomedical research was returning ex-service men seeking to continue their medical degrees after their military experience or those interested in medical education as a way to resume their civilian lives. On the advice of the Royal College of Physicians and Surgeons of Canada, candidates preparing for the examinations of the College were encouraged to spend a graduate year in one of the basic sciences. To accommodate the increasing enrollment in graduate programs and research training, the Department of Veterans Affairs assisted returning veterans by providing educational credits to reflect their military training and experience.

The increased demand for medical research following the Second World War strained the resources of medical school laboratories. In turn, universities and researchers pressured the NRC for more and larger assisted research grants. Within the first year of the Division, Medical Research Fellowships awards went from $1,000 to $2,400 per annum. Sixteen appointments were made in the first year, thirty in the second. But even as the budget of the Medical Research Division was increasing, there were numerous requests for greater federal assistance to support research activities.

While Canada was vastly improving the conditions for conducting medical research, federal support for biomedical and clinical research remained modest and late in coming. In consequence, medical researchers wanting to pursue advanced studies often did so in other countries.[148]

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[148] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston. pp. 132

3.2 The Survey of Biomedical Research in Canada 1948

In 1948, the Advisory Committee on Medical Research recommended to the Privy Council, through the President of the NRC, that a committee be set up to investigate the research needs of Canadian medical schools and other medical research institutions. A committee was duly established, chaired by Dr. C.B. Stewart, Professor of Epidemiology and Nursing Education at Dalhousie University, who had conducted a similar survey with Frederick Banting ten years earlier.

The survey conducted later that same year revealed that most medical research in Canada was being performed in medical schools. While several large centers were fully engaged in research, small centres or large ones with inactive research programs needed assistance. Research was also being conducted in laboratories maintained by pharmaceutical houses, in a few hospitals, and other institutions that were not part of medical school complexes in provincial and federal health laboratories. As well, the special establishments that had been set up by the Department of National Defense during the Second World War continued with their biomedical research programs after the War.

The Stewart Committee reported that, in 1948 there were:

> 955 persons engaged in medical research at the Canadian universities. Of these 278 were technicians and 315 graduate students. Fifty-one scientists with professional qualifications devoted all their time to research, and 311, mostly teachers, gave part of their time. In addition to these numbers, there were men and women in government laboratories, pharmaceutical laboratories, and in establishments under the Defense

Research Board, active in medical research. The total for Canada would probably reach 1,200.[149]

An analysis of funding sources for biomedical research showed that the funding mix was getting much more complex. Financial support for biomedical research varied but could be roughly categorized into six primary sources.

Table 1

FUNDING SOURCES	
Federal and provincial governments	Federal and provincial sources included the NRC, the Department of Health and Welfare's (DH&W) Public Health Research Grants, Veterans Affairs, the Department of National Defense, and provincial granting bodies.
Universities	University sources included the universities` current revenues and special endowments from private donations (such as philanthropy).
Not for Profit	The Connaught Medical Research Laboratories at the University of Toronto. The Institute of Microbiology and Hygiene at the University of Montreal.
Private Sector	These were contributions donated to universities and their researchers from private sector sources.
Voluntary Health Research Charities and their Foundations and Societies	These funds were mostly donated to universities and their researchers.
American / International Sources	These funds could come from either public or private sources but most of the funds came from American sources.

Source: The information in this table is a summation of data that can be found in Ettinger, GH 1950, Report of the Royal Commission on National Development in Arts, Letters, and Sciences, The Massey Commission Studies, pp. 32-43.

[149] Ettinger, GH 1950, *Report of the Royal Commission on National Development in Arts, Letters, and Sciences,* The Massey Commission Studies, p. 41.

Apart from funding research, universities lobbied the federal government on matters related to science policy, typically through their presidents. A few of the more politically active foundations also needed to be considered in the federal policy process due to their ever-increasing financial support for biomedical research. These foundations included the National Cancer Institute and local cancer societies, the Ontario Cancer Treatment and Research Foundation, the Canadian Society for Disseminated Sclerosis and the Canadian Arthritis Association. Large corporations were less visible participants in science and research policy decisions, but they did make sizable donations to research areas of interest to them, such as The Banting Research Foundation. These gifts were not trivial. The Canadian Life Insurance Officers Association's made "gifts" to biomedical research in 1948 amounting to $55,500 increasing in 1949 to $60,000.00.[150]

In addition to these funding sources there were grants and gifts from international (but mostly American) sources. The National Foundation for Infantile Paralysis, the U.S. Public Foundation for Infantile Paralysis, the U.S. Public Heath Services, the Sugar Research Foundation, the Life Insurance Research Fund, the Rockefeller Foundation, and several pharmaceutical firms all made contributions to Canadian biomedical research.

Biomedical researchers had access to approximately $1.5 million of funding from both private foundations and public funds. Of the approximately

[150] National Research Council of Canada 1946, *History of the Associate Committee on Medical Research, 1938-1946*, report prepared by GH Ettinger, National Research Council of Canada, Ottawa, p. 15.

$1.3 million from Canadian sources, $500,000.00 was contributed by the NRC's Division of Medical Research. The National Cancer Institute contributed an estimated $235,552.00, and approximately $203,000.00 came from public health grants.

Table 2

Sources of Funding for Biomedical and Clinical Research 1949	
Federal Sources	
• National Research Council	500,000.00
• Public Health Research Grants (DH&W)	203,000.00
• Mental Health Grants (DH&W)	25,000.00 (estimate)
• Defence Research Board	108,670.00
• Defence Research on Aviation Medicine	50,000.00 (estimate)
Subtotal 886,670.00	
Voluntary Health Charities	
• National Cancer Institute	235,552.00
• Cancer Research Society	13,500.00
• Ontario Cancer Treatment and Research Foundation	81,501.00
Subtotal 330,553.00	
PRIVATE SOURCES	
• Banting Research Foundation	23,732.00
• Canadian Life Insurance Officers Association	60,000.00
• McConnell Fund	10,000.00
• Charles E. Frosst & Co.	9,400.00
Subtotal 103,132.00	
AMERICAN / INTERNATIONAL SOURCES	
• National Foundation for Infantile Paralysis	34,140.00

Sources of Funding for Biomedical and Clinical Research 1949	
• Life Insurance Medical Research Fund	33,800.00
• Sugar Research Foundation	10,000.00
• Rockefeller Foundation	10,000.00
• U.S. Public Health Services	76,303.00
• Markle Foundation	10,000.00
• Squibb Institute for Medical Research	5,000.00
• Commonwealth Fund	30,600.00
Subtotal 209,843.00	
TOTAL 1,530,198.00	

Source: The information in this table is a summation of data that can be found in Ettinger, GH 1950, Report of the Royal Commission on National Development in Arts, Letters, and Sciences, The Massey Commission Studies, pp. 32-39.

When the 1949 survey was conducted the Committee had no difficulty in learning the actual sources and amount of funds received by the smaller medical schools. However, it was not possible to get complete information from the larger universities. Nor was it possible to get precise figures on university budgets and private gifts – or revenues generated from not-for-profit sources such as the Connaught Labs. Another complication was accounting for the time-value estimates of university teachers who were conducting research 'on their own time'. The proportion of university departmental budgets and overhead directed at supporting these research activities was not included either. By the end of the 1950's, it was even more difficult to get precise figures on the actual contributions for biomedical research from all sources. Reliable figures for federal

contributions showed that the federal government allocated roughly $5.5 million to support research in biomedical, clinical and public health fields.

Table 3

Federal Government Funds for Extramural Research ($ Thousands)

YEAR	MRC	DIVISION	DNH & W[151]	DRB[152]	DVA[153]	TOTAL
1946-47		158	-	-	-	158
1947-48		271	-	-	-	271
1948-49		357	150	40	-	547
1949-50		498	326	113	-	937
1950-51		539	720	179	1	1439
1951-52		578	959	542	-	2079
1952-53		617	1248	357	2	2224
1953-54		642	1639	380	356	3017
1954-55		652	1600	365	367	2984
1955-56		693	1554	404	352	3003
1956-57		849	1740	419	375	3383
1957-58		894	1937	373	383	3587
1958-59		1523	2000	409	303	4235
1959-60		1970	2640	414	328	5353

Source: The information in this table is a summary of data that can be found in the following sources: MacFarlane, JA et al. 1965, *Medical Education in Canada*, Queen's Printer, Ottawa. p.163; Aucoin, P 1972, 'Health scientists and the making of health science policy in Canada', PhD Thesis, Queen's University, Kingston. p 209 - 219; Medical Research Council 1968, *Canadian Medical Research: Survey and Outlook*, no.2, Queen's Printer, Ottawa. p. 339

The United States' govern-aid program, delivered through the National Institutes of Health (NIH) contributed another $1 million.[154]

[151] Department of National Health and Welfare had two major research committees – PHRAC (Public Health Research Advisory Committee and National Health Grants Committee

[152] Defence Research Board.

[153] Department of Veterans Affairs (the Advisory Board on Medical Research of the DVA)

An accurate reflection of financial support would require figures from the Canadian voluntary foundations and private domestic sources. Since the data for these groups was sketchy and scattered it was not included in the survey.

With multiple funding sources and research activities being conducted across the country, coordination of these efforts was both critical and challenging. To prevent overlapping medical research programs, it was necessary to maintain a reasonably clear definition of the field of each organization was necessary. Leadership in this area fell to the National Research Council through the Division of Medical Research and the Department of National Health and Welfare. During the latter half of the 1940's and the first half of the 1950s, the executive officers of these organizations scrutinized applications for research grants and fellowships coming to the various bodies on which they had representation. The peer review process was used to re-route research requests if applications were determined to have come into the wrong organization. Even before the end of the 1950's, given the increasing volume in research requests, this was no longer a practical solution and other methods for coordination were found. Annual conferences were held with representatives from the NRC's Division of Medical Research, the Defence Research Board, the National Cancer Institute, and the Public Health Research Grants Committee.

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[154] These were the estimates of the Royal Commission on Health Services, see Royal Commission on Health Services 1964, *The Royal Commission on Health Services*, vol. 2, no. 7, Queen's Printer, Ottawa, pp. 104-106.

3.2.1 Federal- Provincial Support for Public Health Research

Demonstrating the complexity of coordination among diverse institutions and research programs, factors besides science excellence had to be considered. In 1948, the federal government announced the establishment of annual Public Health Grants, to be used by provinces to support the development of their public health programs. In the first year, the amount announced was $100,000, which was to increase annually by $100,000 up to the fifth year. By the third year, 1950-51, the Public Health Grants Committee budget was $300,000 or over half the amount that the Division of Medical Research spent on grants-in-aid for all medical research. In that year the Minister of National Health and Welfare announced to Parliament that an additional $68,855 had been awarded for research in public health.

Applications for grants were referred to the Dominion Council of Health, which appointed a Public Health Grants Committee to referee the application. It soon became apparent that the distribution of this money was not easy. Not only did refereeing have to be done with an eye for scientific and research excellence, provincial capacity and politics needed to be considered as well. Before the Public Health Grant Committee could consider an application they had to be approved by the local Provincial Department of Health. This presumably was to ensure that the provinces had some knowledge of what public health research was being conducted so they could confirm that investigations were compatible with provincial health plans or programs. In effect this provided the Provincial Minister of Health with veto power and the responsibility of approving applications

and handing them to the Public Health Grants Committee for refereeing. This pulled public health research into the political realm and cause delays: "The Committee had to consider hints from 'higher authorities' whether or not it was advisable to make certain awards."[155]

The Committee was also sensitive to geographic equity when making provincial allocations. From this perspective, the notion of the equitable distribution of money across provinces (by whatever formula used to derive equity) was often seen in conflict with the best interest of science. Not all provinces had the same laboratory capacities or the availability of scientifically trained personnel to conduct research.

An additional concern of the Division of Medical Research was that the large sums of money made available for public health research were generating demand to conduct research. Previous to the Public Health Grants being established, the Division of Medical Research had received few applications each year for assistance in research in the field of public health. In the first year of the Public Health Grants Program, the applications that came to the Committee for review exceeded its budget of $100,000.

In addition to the Public Health Research Grants, the Dominion-Provincial Health Grants provided funds for the improvement, extension and development of program for the prevention and treatment of:

- Crippling conditions in children;
- Mental illness;
- Tuberculosis; and
- The control of cancer and venereal disease.

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[155] National Research Council of Canada 1946, *History of the Associate Committee on Medical Research, 1938-1946,* report prepared by GH Ettinger, National Research Council of Canada, Ottawa.

It was within the discretionary powers of the provincial Departments of Health to make recommendations for research grants in any of these fields.

Political inputs into the selection of research for funding would lead to a legacy of conflict and frustration between the biomedical research community and the science bureaucracy of the federal government as captured in the Farquharson Report discussed in the next chapter. This report led to the inception of the Medical Research Council (MRC) in 1960, Canada's first Research Granting Council.

3.3 The NRC's Grants Structure for Medical Research

During the war a great deal of research was directed at selected or named problems in specialized areas. After the war there was a desire to return to the earlier emphasis on fundamental research. Under the Division of Medical Research, the plan for the work, equipment, and assessment of assistance required was completely left to the individuals wishing to undertake a particular research project. The applicant would apply for a funding amount assessed to be sufficient to permit the investigation of their described problem. Grants could include requests for special equipment, consumable supplies, animals and their care, and technical assistants. The applicants, however, were not paid a stipend from the grant program for personal or living expenses. The assisted research programs were largely carried out in universities, their teaching hospitals, and associated foundations.

The peer review function for "thoughtful, dispassionate and unbiased consideration of applications for assistance" fell to the Medical Research Division's Advisory Committee on Medical Research.[156] This Committee scrutinized the research proposals and, once approved, continued their oversight role by monitoring the progress of the research projects.

On the advice of the Division of Medical Research, the National Research Council appointed the members of the Advisory Committee. Members almost always were selected from Canada's medical schools and were appointed for three years terms. The ex-officio members were: the President of the National Research Council, Deputy Minister of National Health and Welfare, President of the Royal College of Physicians and Surgeons of Canada, and the Director and Assistant Director of the Division of Medical Research. The Advisory Committee's terms of reference was to "initiate, stimulate and coordinate medical research in Canada". The Council Members served without remuneration, except for travel expenses.

Each application for a grant-in-aid was examined by at least one member of the Advisory Committee who was knowledgeable in the field of the proposed research, with outside experts consulted as and when necessary. Once the applicant's proposal was reviewed, referees documented their recommendations and submitted them to the Advisory Committee for consideration. On the advice of the Advisory Committee, the National Research Council almost always

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[156] Ettinger, GH 1958, 'The Origins of Support for Medical Research in Canada', *Canadian Medical Association Journal*, April 1, vol.78, no. 7, pp. 471- 474.

accepted the recommendations of the referees, unless in unusual circumstances these recommendations ran counter to the Council's policies and procedures.

3.3.1 Fellowships and Grants

Most of the money available to the Division was spent on research fellowships and grants-in-aid of research. There were two types of fellowships – ordinary and senior. The ordinary fellowship was available to any graduate of an approved medical school who had spent a year in graduate training and who wished to spend another year of research under an approved supervisor in one of the fundamental medical sciences. These renewable fellowships were for training in biomedical research, not for clinical instruction or experience. While it was typically preferred that the training be conducted in Canada, fellowships could be used to support studies outside the country if the intended training was not available in Canada. It was understood that the fellowship could involve "financial liability" to the supervisor, and so the supervisor could be compensated through an assisted research grant. An early assessment of the fellowship program by the Division considered it a successful tool in supporting biomedical research and capacity development, with one measure of success that former National Research Council fellows were often accepted into junior staff appointments in university departments.

Senior Research Fellowships were made available in 1949. These grants went to graduates in medicine who were trained in research, considered capable of doing independent work, and who could direct the work of others interested in a career in medical research. Applications for this award came from the

President of the university in which the proposed candidate intended to work, and successful Senior Research fellows were given honorary teaching posts on the medical faculty. Fellowships were expected to attract qualified candidates from research positions abroad who wished to pursue a research or medical career in Canada. It was intended that the fellowship program would also stimulate medical research in universities. Four fellows were appointed in 1949, followed by five in 1950. Some of the appointees had previously held ordinary graduate medical research fellowships, which was considered an indicator of the success of this program.

3.3.2 Consolidated Research Grants

By the late 1940's, the Advisory Committee recognized that for a few laboratories and institutions, the period of "initiation and stimulation was past".[157] Their programs were stable and of very high quality, with their expenses generally constant and their reputations as centres for research established. Rather than provide financial support to these established laboratories through a group of grants-in-aid, the decision was taken to provide the director of these centres with a consolidated research grant. Directors of the research programs had complete discretion on how these funds were distributed to support the research activities in these laboratories. The amount of the grant was fixed and annually recurring. This popular new form of grant was applied to the:

- Montreal Neurological Institute (Dr. W. Penfield, Director),

[157] Ettinger, GH 1950, *Report of the Royal Commission on National Development in Arts, Letters, and Sciences,* The Massey Commission Studies, p. 34.

- University Clinic, Royal Victoria Hospital, Montreal (Dr. J. S. L. Browne, Director),
- Banting and Best Department of Medical Research and Department of Physiology, University of Toronto (Dr. C.H. Best, Director) [158], and
- Collip Medical Research Laboratories, University of Western Ontario (Dr. J. B. Collip, Director).[159]

This approach was considered an effective and "economical administration" of research funds.[160] It also followed the approach already established by the National Cancer Institute, which was making significant contributions to various research units in this manner.

3.4 Medical Research in Universities

The first purpose of a medical school was teaching. As a result the early medical research activities of most teachers were often carried out in their "leisure hours", or even in secrecy in situations where the universities did not approve of these activities.[161] Not only did this contribute to difficulty for the Steward Committee in quantifying the actual dollar value of research efforts, it also meant that young men and women interested in research, or senior fellows who conducted research, were most likely to favour the few established medical research programs that had laboratories primarily dedicated for research purposes. This created a situation where most biomedical and clinical research

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[158] Initially called the Banting Research Foundation it was established when a group of Toronto business collected a "large sum of money" to establish the foundation. National Research Council of Canada 1946, History of the Associate Committee on Medical Research, 1938-1946, report prepared by GH Ettinger, National Research Council of Canada, Ottawa, p. 2.
[159] Ettinger, GH 1950, *Report of the Royal Commission on National Development in Arts, Letters, and Sciences,* The Massey Commission Studies, p. 35.
[160] Ibid.
[161] Ibid.

in Canada was largely conducted and advanced through large research complexes.

> There are "Medical Research" departments, staffed by men and women who have few or no teaching responsibilities. At the University of Toronto there is the Banting and Best Department of Medical Research, whose Director is Professor C. H. Best; at the University of Western Ontario there is the Collip Department of Medical Research, who's Director is Dean J. B. Collip; and at the University of Manitoba, the Department of Medical Research, directed by Professor J. Doupe.
>
> In two of these departments the director is also the head of the Department of Physiology. In the third one, of the full professors is also the Professor of Physiology. The programs in each department are well integrated in the fields of physiology, biochemistry, and experimental pathology, including cancer research.[162]

These laboratories, as well as the medical school complex around them were a strong attraction for medical researchers. Smaller universities with less active research programs had difficulties in acquiring the skilled resources they needed to maintain and grow their biomedical research programs. This led to the early emergence of the classic Canadian problem in supporting biomedical science and clinical research – geographic equity.

Under these conditions, it was not surprising that the administrators in some of the small universities were vigorously suggesting that research foundations and granting bodies make contributions directly to universities rather than to university-based researchers. Smaller universities could use research funds to supplement professors' salaries or to meet their expenses in maintaining administrative and overhead costs associated with conducting research.

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[162] Ibid.

Two laboratories were "in a class completely on their own".[163] These two laboratories were the Connaught Medical Research Laboratories at the University of Toronto and the Institute of Microbiology and Hygiene at the University of Montreal. These labs produced and sold biological products for therapeutic and research purposes (i.e., sera, vaccines, liver extract, and hormone preparations). The University of Toronto's School of Hygiene and its various departments involved in basic, applied, and developmental research were not only housed in the same building as the Connaught Medical Research Laboratories, they also derived a considerable portion of its budget for its biomedical research programs from Connaught Labs.

Neither the Connaught Medical Research Laboratories nor the Institute of Microbiology and Hygiene were expected to generate huge profits in the traditional commercial sense. Rather, they were established to perform a function that was absolutely critical to advancing biomedical and clinical research in Canada. These labs produced essential biological research materials "as near to the price of production as possible" with "some small profit" to support additional research.[164] On top of this, the Connaught Research Laboratories were also conducting very important work in virology in their own right.[165]

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[163] Ibid. p. 38.
[164] Ibid.
[165] Ibid.

3.5 *Early Illustrations of Multi-sector Alliance – The Research Charities*

3.5.1 NATIONAL CANCER INSTITUTE OF CANADA

Under the stewardship of the Division of Medical Research, the National Research Council had "a remarkable public confidence". The NRC was recognized as fully able to give advice and guidance on the:

- Purpose of medical research;
- Policies to conduct this research;
- Distribution of funds for research purposes;
- Quality of the research being conducted; and,
- Use of drugs or other research inputs that were rare or whose properties were imperfectly understood. [166]

This meant that the NRC, through the Division of Medical Research along with the Department of Health and Welfare, had a leadership role coordinating the activities of the growing number of players involved in biomedical and clinical research.

As an additional illustration of how this role worked,[167] near the end of the Second World War there were several organizations involved in cancer research, but no coordination mechanism for their provincially based research programs.[168] The federal government was interested in finding ways to connect their efforts. In 1946 the Department of National Health and Welfare held a conference for

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[166] Ibid. p. 30.
[167] See section 3.2.1 for a discussion of the Department of National Health and Welfare's Public Health Research Fund.
[168] At the time the Canadian Cancer Society already existed. This Society was chiefly interested in educating the public regarding cancer. The provincial branches of the society were dedicated to raising money for research and treatment. Ontario had the Ontario Cancer Treatment and Research Foundation, which had an established research program. In other provinces, various small investigations were going on without a broader knowledge of the big picture of research being conducted in this area.

organizations participating in cancer research and treatment. The end result was the organization of the National Cancer Institute of Canada (NCI). This Institute undertook the coordination of cancer research across Canada and provided financial support for graduate training in cancer research through the provisions of grants. The conference participants also agreed that the Advisory Committee on Medical Research would advise the Institute on its research program and would accept responsibilities for reviewing all the applications submitted to the National Cancer Institute.

In 1947, during its first year of operation, the National Cancer Institute granted twenty-eight awards amounting to $84,111.99. In 1949 this doubled with fifty-seven awards, and the appointment of six research fellows. Dalhousie University established a cancer research laboratory and paid the full-time salary of a staff member so they could focus on cancer research. The NCI also gave generous support to the newly formed Institute for Special Research and Cell Metabolism at the Montreal General Hospital.

As soon as the National Cancer Institute was able to give grants for cancer research, the National Research Council left this field of inquiry to the new organization.[169] An unanticipated feature of the emergence of the NCI was the rapid increase in interest in cancer research. Under the NRC very few applications for research in the area of cancer were submitted for consideration. Only two awards were given out in 1946. Within a year of the establishment of the NCI, forty-eight applications were awarded amounting to $359,107.63.[170]

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[169] Ibid. p. 12.
[170] Ibid.

One reason given for the rapid rise of interest in cancer research was the more liberal interpretation of what constituted research in this area.[171] Another was that the publicity around the new organization caught the attention of scientists interested in conducting work in this area. An additional thought was that the rapid growth in cancer research under the NCI coincided with the expansion of research facilities in the universities. Quite simply, with more research capacity, more research could be done.

A side effect of this awakening of public interest and support for medical research in cancer was that interest in research on other common diseases followed. Again, upon request, the Department of National Health and Welfare arranged a conference. This time the focus was on arthritis, likely due to the encouraging results that American researchers were having on investigating this disorder and developing biologics to combat this disease. In 1947, organizations involved in problems related to arthritis were invited to participate. As a result of the Conference, the Canadian Arthritis and Rheumatism Society was formed with the objective of establishing clinics for treatment, conducting research on the cause and rehabilitation of arthritis, and training rheumatologists.

The Canadian Arthritis and Rheumatism Society followed the practice established between the Advisory Committee and the National Cancer Institute where the NRC acted as scientific advisory by assessing research applications. The acceptance of the National Research Council as an advisory committee for

[171] Under the National Cancer Institute cancer research became opened to botanists, zoologists, and biochemistry, as well as to experimental pathologists, physiologists, cytologists, and virologists.

these new organizations was an indication of the acceptance and approval of the Division of Medical Research's leadership in biomedical and clinical research.

3.5.2 Arthritis Research - An Illustrative Case

Biomedical research could involve the participation of researchers across sectors and even across the international community. The role of coordination for the research activities was typically left to the communities themselves. At other times, simply due to the nature or urgency around the specific research area, there could be a very important public role of coordination either at the national or international level. SARS and AIDS are well known recent examples of this type of effort. But this was observable even in the earliest stages of development and organization of publicly supported biomedical and clinical research. Certainly the research efforts around WWI and WWII were periods of considerable international coordination. After the wars, the reasons for and focus of coordination changed but the need for such a national role remained. What follows in this section is an overview of how this function was conducted through the NRC's Division of Medical Research with the case of arthritis used for illustrative purposes. This example also serves to demonstrate the importance of public-private alliances in the area of biomedical and clinical research as well as the empirical nature of medical research.

The impressive results of biomedical and clinical research on insulin and the resulting reductions in deaths and suffering excited interest in research on all manner of chronic conditions. As noted briefly in the previous section, the Division of Medical Research, the government of the day, and the general public

were interested in investigating remedial treatments for the crippling effects of arthritis. Despite widespread interest in this disease, few Canadian researchers were coming forward with applications for research projects. In 1948, the NRC review reported that it had only received one application. In that same year, Dr. Hench and his co-workers at the Mayo Clinic found that a hormone produced by the adrenal gland, initially called compound E, and later cortisone, was capable of vastly improving the condition of rheumatoid arthritis. Eventually they were awarded a Nobel Prize for their efforts in this area of biomedical and clinical research.

Cortisone was immediately prescribed on an experimental basis for many chronic and for a few acute conditions. Its therapeutic qualities were astounding but the reason for these effects could not be explained on the basis of what was known at the time about the physiology of the adrenal gland. This drew serious attention and interest into what was then a new area of empirical medicine, endocrinology.

In a healthy body, cortisone is produced naturally by the adrenal cortex. The pituitary gland produces a protein called adrenocorticotrophic (ACTH) which stimulates the adrenal cortex to produce cortisone. Through experimentation it was discovered that animals would produce an excessive discharge of cortisone if they were injected with ACTH. Following the discovery of the therapeutic effects of cortisone, it was a natural step to test the effects of ACTH in clinical conditions. The results were as dramatic as those with cortisone.

The therapeutic usefulness of these two natural products raised several serious questions that typify biomedical and clinical research. The first was how to get a supply of cortisone and ACTH so further experimentation could be conducted. The second was the margin of safety (or level of danger) in using these two potentially therapeutic products.

What was known about both substances was that they were produced in the bodies of all mammals and stored in limited quantities in glands. Dr. Lewis Hastings Sarett synthesized cortisone in 1946. Subsequently it was made available through a costly production process in the laboratories of Merck & Co. Inc. of Rahway, New Jersey. In 1949, a gram of cortisone, which, depending on circumstances, could provide up to ten doses, sold for $200 per gram. Merck & Co. supplied cortisone for experimental purposes only, under the condition that experiments be fully reported on. It was given to scientists and physicians who were trusted to make carefully controlled and reported observations. The hope at the time was that with increasing knowledge and experience in manufacturing cortisone, the yield would increase and the price would drop.

For ACTH however, there was no method available for its synthesis. Supplies depended on its efficient recovery from animals, usually pigs. In 1933, Dr. J.B. Collip at McGill University derived a method to extract ACTH from pituitary glands. Through his methods, quite pure concentrations of ACTH were available to researchers without the accidental inclusion of various extra substances that might have unwanted effects on other organs.

In 1948 the commercial production of ACTH was mainly in the hands of Armour & Company of Chicago. Its supply was much more limited than that of cortisone but its price was the same, $200 per gram. Most of the ACTH from Armour & Company went to American scientists and clinicians.

In 1949 the National Academy of Sciences in Washington set up a committee to advise Merck and Co. on the distribution of cortisone for experimental purposes. The NRC was invited to appoint a representative to the committee. Merck & Co. agreed that until December 31, 1949, it would only sell cortisone to those persons in the United States and Canada whose applications had been approved by the cortisone committee. Careful experimentation soon revealed that while the early indications of therapeutic promise were reliable, caution was required in their use. There was a danger of toxic effects, which were potentially more dangerous than the illness being treated.

> Obviously much careful investigation must precede open sale of the substances. The leaders in scientific and governmental circles in Canada recognized great opportunities and obligations. Representatives of the Department of National Health and Welfare and of the National Research Council conferred in October 1949, and decided to take steps to extract ACTH from hogs slaughtered in Canada and to make it available for research purposes. Dr. R.D. Defies, Director of the Connaught Medical Research Laboratories in Toronto, agreed to collect pituitaries, and to commence extraction. He realized that he might initially collect more pituitaries than he could process, and he made arrangements with Armour & Company that they would extract the surplus and return the product to Canada. The cost of this program was met by the National Research Council and the Department of National Health and Welfare. Canadian packinghouses provided willing cooperation.[172]

[172] National Research Council of Canada 1946, *History of the Associate Committee on Medical Research, 1938-1946*, report prepared by GH Ettinger, National Research Council of Canada, Ottawa.

In December 1949, in a similar fashion to the American research system, the President of the NRC appointed an Advisory Committee on ACTH and Cortisone. This committee advised the President on a distribution policy for ACTH and cortisone for research purposes. They also investigated sources of financial support for the work. It estimated that in 1950, $300,000 would be needed to purchase supplies of cortisone and ACTH and to assist researches involved in their use.

The Minister of National Health and Welfare announced in the House of Commons in December, 1948, that the Department would find funds to purchase ACTH and cortisone for research purposes in Canada. The research program would fall under the direction of the NRC.

Applications for grants for supplies of the hormones and for research assistance were invited from the staff of the Canadian medical schools, with an immediate response. The Department of National Health and Welfare provided most of the budget for this work from the Provincial Health Grants Program. By June 1950, the Division of Medical Research had received two hundred and four request for grants for cortisone and ACTH for clinical and fundamental research, and total commitments exceeded $400,000.

3.7 Demands for an Autonomous Medical Research Council

By the latter half of the 1950s the deans of Canada's medical schools, working through the Association of Canadian Medical Colleges (ACMC), organized and began to pressure the federal government to review how medical research was supported in Canada. To address their concerns, the federal

government established the Special Committee Appointed to Review Extramural Support of Medical Researchers. In 1958, the Committee examined the state of medical research and its financial support. The Committee, chaired by R. F. Farquharson of the University of Toronto, submitted the Report of the Special Committee Appointed to Review Extramural Support of Medical Research by the Government of Canada, November 12, 1959. This report strongly urged the creation of a council dedicated specifically to medical research. The work of the Commission played a prominent role in the activities leading up to the creation of the Medical Research Council (MRC) in 1960.

In the next chapter we look at the story of the MRC's creation in 1960, its ambiguous relationship to the state throughout the decade, and its failure in 1969 to become an autonomous granting council based on the NRC model.

3.8 Conclusions

The objective of this chapter was to provide historical context for the main periods of analysis, which comes later in the dissertation, and to identify and describe the secondary characteristics of biomedical and clinical research. Together these historical factors and the characteristics of these sciences significantly affected policy development and the arrangements for these sciences. As noted these influences included:

- A history of complex and various funding arrangements among public, private, and not-for-profit partners in matters related to support for biomedical and clinical research.
- Tight connections between basic and applied (although not necessarily mission-driven) research due to the empirical nature of biomedical and clinical research; and,

- A legacy of decentralization in policy development and the structural arrangements supporting publicly funded biomedical and clinical research in Canada.

We also propose these characteristics as early legacy paths through which public support for these sciences progressed throughout the early and latter parts of the research period under consideration.

Although these research inquiries were empirically driven, with the exception of WWII this research tended not to be mission driven. There were very few non-science inputs into the national research agenda, even if consideration had to be given to political or geographic equity based considerations.

Illustrative cases were used to make these points. For example, in the last chapter we discussed the discovery of insulin and its production through private sector institutions. In this chapter the linkage between basic and applied research was discussed again through the discovery of cortisone and its effect on arthritis research, which also led to a Nobel Prize for the American research team. This case is also instructive in how biomedical and clinical research programs required or led to international agreements that crossed the private and public sectors to ensure: reporting of research results; access to scarce and expensive biologics necessary in conducting these kinds of research programs and activities; and arrangements at the international level to ensure the safest possible use of research drugs and hormones with unknown therapeutic (or adverse) effects on human populations. We also discussed how the need for and use of biologically based research inputs led to the establishment of the

Connaught Laboratories at the University of Toronto's health research complex, which subsequently became an important source of funding for the University of Toronto's biomedical and clinical research programs. This allowed the University of Toronto's health research complex to grow and develop away from the scrutiny of public funders and without consideration to accommodating a national research agenda's for biomedical and clinical health which would become a more important policy priority during the 1960s.

In the next chapter we address the formation of the MRC. The critical mass in biomedical and clinical research meant that a growing number of prominent university based scientists began lobbying for their own research institution modelled after the NRC's autonomous structure. The MRC came into existence in 1960 during a decade of Commissions that considered science policy and its place in society. By the end of the decade, when its reporting channels were formalized, science policy was operating under different ideas. The ideas and techno-economic paradigm shift of the KBE were almost 20 years away but this decade was an important one in science policy. Federal policies were becoming more direct regarding public expectations on publicly supported research and the place of science in society.

Part 2: THE EMERGENCE AND EVOLUTION OF The MEDICAL RESEARCH COUNCIL

CHAPTER 4

An Agency for Medical Scientists – the MRC in the 1960s and 1970s

Introduction

Having addressed the historical context for biomedical and clinical research in Canada and developed a research framework we begin to move toward the empirical core analysis of this dissertation. In this chapter, the central theme is the story of formation of the Medical Research Council (MRC) during a decade of Commissions. In 1960 the Division of Medical Research became the Medical Research Council. It remained within the institutional infrastructure of the NRC until 1969 due to the debates during the 1960s between the scientific community producing science and the non-science community developing science policies. These debates captured the discussions of changing ideas governing the national science and research agenda. Mainly, these deliberations centred on focusing the federal objectives for publicly funded research and determining the best ways to achieve these objectives.

The ideological underpinning of these debates was located in the interpretive frameworks of the welfare state. This forged a connection between

biomedical and clinical research and the development of Canada's national health care system. There was no concerted attempt to tie these sciences to economic goals. This would not happen until the ideas, principles, and arrangements of the welfare state came under question as a new techno-economic paradigm shift emerged. Nonetheless, regardless of the policy priorities, the 1960s mark the first time that the outputs of publicly funded biomedical, clinical and health research were directed at a broad-based agenda at the federal level. This frustrated the scientific community because in their view this contributed to non-science inputs being placed on national research programs. The majority of researchers simply wanted to conduct research focussed on scientific excellence, not on specific directions and objectives being set at the national level. A concern was that setting directions and conditions for research proposals would depreciate the results of research inquiries. These themes will be brought out throughout this chapter.

In the first section, we consider how an influential group of prominent university medical researchers in the late 1950s began pressuring the federal government for their own research institution. The conceptual model proposed for this institution was based on a tradition of decentralized structural arrangements supported by the NRC, combined with an autonomous reporting structure directly to the Privy Council. This would side-step bureaucratic involvement in the national biomedical and clinical sciences research agenda. However, the recommendations of the Special Committee Appointed to Review

Extramural Support of Medical Research almost immediately collided with the science versus the science policy debates of the 1960's.

In section 4.1.2 and sections 4.1.3 we discuss the nature of these debates, which were famously formalized in the report of the Glassco Commission. Coterminous with these higher profiled discussions and debates, was the ongoing discovery process around one of Canada's greatest social experiments – the development of a publicly funded, universally accessible personal health services system. The initial deliberations on Canada's health care system were less famously captured in the report of the Hall Commission. In part, this Commission was instructed to contemplate the place of biomedical science within a broader health system. Although generally it is considered that neither of these Commissions were immediately influential, they did introduce new ideas on how science and research should be organized in Canada, and why.

In section 4.1.4 we consider the formalization of the MRC's in 1969. The Deans of Canada's medical schools convinced the federal government in 1960 to dedicate an institution to biomedical research. However, given the science debates of the time, they were less successful in their arguments that this institution should be autonomous. The decision on the MRC's reporting structure was postponed for a decade, leaving it in legislative limbo until new directions in science and health sciences research policy was formulated. In section 4.2 we discuss the MRC of the 1970s. During this time federal governments continued to load non-science objectives into the national biomedical and clinical research

agenda. Meanwhile the medical sciences were becoming more sophisticated and technical as this group of sciences evolved and was affected by the emergence of new technologies in communications, biology, and advanced materials. The emergence of new technologies not only affected medical science and research. They also began to collide with the institutional development of the MRC and placed new demands on its programs and granting structure.

By the end of the 1970s new discussions were emerging on the place of science in society. These were brought on by the techno-economic paradigm shift as new technologies pervaded not only the knowledge-centred realms but also moved into society at large.

4.1 Perspectives on Institutional Autonomy for Medical Research - the 1960s

As discussed in Chapter 3, the early and sustained successes of biomedical research in the late 19th and early 20th centuries firmly fixed science and research in the practice of modern western medicine. At the same time, the application of scientific methods into medicine increased the complexity and sophistication of education and training, and the importance of research in developing competent medical practitioners. The increasing demands for and on these sciences and their research activities, as well as the complex arrangements in supporting a national biomedical and clinical sciences research agenda, led the deans of Canada's medical schools to pressure the federal government to review how medical research was being supported. To address their concerns, the federal government established the Special Committee

Appointed to Review Extramural Support of Medical Research in 1958. Under the Chairmanship of R. F. Farquharson of the University of Toronto, the Committee was instructed to examine the state of medical research and its financial support. The Committee submitted their Report – more commonly referred to as the Farquharson Report, to the government in November 1959. In the report attention was drawn to the lack of suitable conditions for medical and clinical investigations in Canada. The Committee strongly urged the federal government to make major increases in both capital and operating expenditures.[173]

The recommendations of the Farquharson Report advocated the creation of a council dedicated specifically to medical research and called for this council to be a purely scientific granting and advisory agency. Members were to be "chosen on the basis of their interest and experience in medical research".[174] The aim was to set up the Medical Research Council (MRC) as:

> The senior body of medical science, [which] could provide leadership and cooperate closely with the other government departments and agencies supporting medical research. It would also command the respect and support of such bodies as the Canadian Medical Association, the Royal College of Physicians and Surgeons, the Canadian Federation of Biological Societies and the Association of Canadian Medical Colleges.[175]

The Committee also expressed a preference to continue with decentralized structural arrangements for the support of these sciences. The Committee unanimously agreed that funds for medical research be directed

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[173] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston, pp. 185-191.
[174] "Farquharson, RF 1959, *Report of the Special Committee Appointed to Review Extramural Support of Medical Researchers*, Government of Canada, pp. 23.
[175] Ibid., p. 22

primarily towards universities rather than to any intramural government laboratories.[176] The Commission cited two reasons for this. First, their belief was that authoritative instruction proceeds from experience. Teachers active in a research field continually add to knowledge and techniques that are eventually demonstrated to medical students. In turn, medical students and physicians subsequently apply these innovations into medical practices. A close connection between research and teaching would ensure high-quality education and would persuade some students inclined towards research to carry on with graduate training and possibly a career in research. Training medical professionals and future scientists however, was not a function performed by government in-house research establishments. Based on this argument, the conclusion reached in the Farquharson Report was that research should be centred in universities, medical schools and teaching hospitals.

Second, the United States was experiencing a shortage of biomedical and clinical scientists. Offers were frequently being made to Canadian researchers to work in well-equipped and well-funded laboratories. The concern expressed in the Report was that unless medical schools provided opportunities and facilities to allow teachers to plan and develop their ideas through medical research, attracting and retaining talented young graduates would be impossible. The concern expressed in the Report was that the result would be that medical teaching and medical practice in Canada would deteriorate.

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[176] Medical Research Council of Canada 1985, *The establishment of medical research in Canada*, MRC Newsletter, Ottawa.

Another objective of those in the medical research establishment, who wanted an autonomous Medical Research Council taking the leadership role in providing support for and advice on medical research, was to reinforce that research was a serious career choice. Farquharson especially was trying to distinguish the worlds of research and teaching by insisting that the idea of conducting research in one's 'leisure time' be put to rest for good: "intensive research in medicine is no longer a field for the amateur to which the well educated physician may turn at will."[177]

The position articulated by Farquharson on the design of the proposed Council's leadership highlighted a traditional dislike for what many in the medical research community considered to be interference of lay people, politicians and bureaucrats with grants programs. This view was commonly held within the scientific community at the time and was expressed as an elitist "expert knows best" view of science and research stewardship. Federal departments, especially those of the Department of National Health and Welfare, were singled out for criticism.[178] The conventional wisdom of researchers at the time was that only an active scientist had an appreciation for the best way to meet the needs of the research community. The reason given was simple: non-scientists did not understand how to objectively prioritize and grant proposals, or how to manage

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[177] National Research Council 1964, *Annual Report 1963-64*, report of the Chairman of the NRC, National Research Council, Queen's Printer, Ottawa, p. 30.

[178] Farquharson, RF 1959, *Report of the Special Committee Appointed to Review Extramural Support of Medical Researchers*, Government of Canada, ch. 7. In Chapter 3, there was a brief discussion of the Department of National Health and Welfare's Public Health Research Fund. The inclusion of non-science inputs into research decisions frustrated the medical research community. Similarly, capital funds for research often came from the Department of National Health and Welfare. Often these investments were delayed and postponed by what were referred to as bureaucratic arrangements, further frustration a research community that relied on this equipment or facilities. These are often cited as reasons for the "expert knows best" view of science and research stewardship. Also see Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston.

science projects. Their conclusion was that selecting participants from the research community to evaluate and manage research provided the best approach in serving the broader interests of society.

The Farquharson Committee went even further by recommending that departmental agencies develop research advisory subcommittees. These subcommittees could be composed of working scientists. They would be responsible for setting the priorities for research programs and to evaluate science proposals. It was contended that actual research experience and expertise, rather than distinctions derived from other activities, best supported science.

Not surprisingly, Farquharson's proposed solution was for an autonomous medical research institution where politicians, bureaucrats, and other laymen were excluded from the policy-making processes that impacted on research. In fact, although reluctant to publicly criticize fellow medical academics, medical practitioners or professional administrators, the leadership of the biomedical research community felt that the responsibility for medical research should be allocated to those who understood the scientific activities of the medical sciences. The ethos within the scientific community of the time was that decision-making was to be given to those who possessed the appropriate knowledge of science. The idea of non-specialists having any control over the ranking of research projects and the awarding of research grants, thus interfering

with the panel system of peer groups, was an anathema to the research scientist.[179]

For the most part the government accepted the views of the Farquharson Committee and in 1960 the Medical Research Council was established. The Council was composed only of medical scientists with at least one representative from each medical school in the country. However outside the Medical Research Council sphere the Commission's recommendations had little effect. The Department of National Health and Welfare, the Defense Research Board, and the Department of Veterans Affairs continued to select their advisory committee personnel on a more heterogeneous basis, which included their own and other departmental staff.

The elite views expressed about biomedical and clinical science and voiced in the Farquharson Report were generalizable across the scientific community *writ large*. On various levels, they also represented the very attitudes that had begun to raise concern in the government and within the bureaucracy, contributing to a rethinking of science's place in policy and more generally, the relationship between science and society. Apprehension was emerging at the political and bureaucratic level as to how and even if public investments in scientific endeavors were achieving their desired policy outcomes. For some time federal support for chemical and physical sciences was mostly centred on using research to assist industrial sectors considered important to the economy. But the federal government was not at all convinced that the ever-increasing

[179] Aucoin, P 1972, *'Health scientists and the making of health science policy in Canada'*, PhD Thesis, Queen's University, Kingston, pp. 188.

sums of public investment directed at science and research were having the desired effect in primary, secondary and infant industrial sectors.

It was equally true that federal government's aspirations for biomedical and clinical sciences and research were not yet fully thought through or articulated in any clear way. Nonetheless, these sciences were becoming of more interest and importance to policy makers – but for different reasons that for those of the traditional sciences groups. Biomedical and clinical sciences had no direct relationship to the economic goals of various federal governments, but they were becoming a much more important factor in building a capacity to deliver a national publicly-funded but provincially-based health system. This positioned these sciences closer to social rather than economic policy, thus they still were not the federal government's top priority for investments in science and research. Based on the discussion of historical factors presented in Chapter 1, biomedical and clinical sciences still did not connect to the economic interest of the state, thus they continued to have a secondary status in science policy and to fly under the radar of most science policy analysts. This would not begin to change until the 1970s.

The Royal Commission on Government Organization (more commonly referred to as the Glassco Commission) was struck in 1960. This Commission was directed at the organization of government, but it also dealt with science institutions and science policy. A second Commission, the Hall Commission, was struck in 1962. It was focused on the delivery of health services, but dedicated one chapter to the place of medical research within the broader social and

economic objectives of the federal government in regards to personal services and public health systems.

Since biomedical research was to be included in these deliberations, a decision was taken by government to postpone formalizing the MRC's reporting structure. As a result, throughout the 1960s the MRC remained a decentralized institution cocooned within a centralized and increasingly isolated NRC.

4.1.1 Policy Debates on Science's Place in Society

Science in the post war era had been assuming a level of importance previously unparalleled in Western societies.[180] Canada was no exception. Between 1939 and 1959 federal expenditures for research and development grew from an estimated $5 million to over $200 million.[181] Not surprisingly, the growing level of public investments in science and research was attracting attention.

During this period of growth in Canada's research establishment, with few exceptions such as biomedical and clinical research, universities in general were not focused on research. Immediately after the war, universities were preoccupied with teaching returning war veterans and other undergraduates.[182] There were a few established health research centres on university complexes,

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[180] Galbraith, JK 1968, *The New Industrial State*, Signet Books, New York. and Apter, DE (ed.) 1964, *Ideology & Disconnect*, The Free Press, New York, pp. 15-43.

[181] Lamontagne, M et al. 1970, *A science policy for Canada: report of the senate special committee on science policy, vol. I - a critical review: past and present*, Queen's Printer for Canada, Ottawa, pp. 64.

[182] See W.P. Thompson, Graduate Education in the Sciences in Canadian Universities (Toronto, 1963) cited in Phillipson, DJC 1991, Building Canadian science. *Scientia Canadensis* (special issue) p. 91. "The logically first priority in 1946, just as in 1919, was to train more researchers because the Canadian supply did not yet meet Canadian needs. The NRC took up this second rather than first, since universities were in the postwar years under funded and crowded with returning veterans. University expansion began only in the late 1950s, after the federal government began making capitation grants (proposed by the Massey Report, 1951). The number of NRC scholarships grew from 141 in 1946 to 423 in 1961m worth 1.2 million.

but these were conceptually connected to medical education, even if the impacts from their activities were much, much broader than just on medical education.

Gradually as post secondary education became more of a policy priority in the aftermath of WWII, the importance of research on university campuses also became more important. Research was becoming seen as intrinsically connected to the quality of higher education. [183]

At the federal level, hard questions were being asked about the economic goals and social values associated with the ever increasing investments being made to support science and research. The advent of the science policy era had arrived. Not only was it being argued in political and bureaucratic circles that science investments needed to more effectively serve the federal government's agenda; it was also felt that the formulation of science policies should be public and visible to the political community at large.[184]

Much of this early period of reconsideration coincided with the presidency of Dr. E.W.R. Steacie who ran the NRC from 1952 until his death in 1962. With few exceptions, during the postwar era neither universities nor industries demonstrated leadership in discovering and exploiting new knowledge. This convinced Steacie that the only way for the NRC to adequately support industry was to do so indirectly. He believed this could best be achieved by funding central laboratories at the national level. These labs could then be directed at the research needs of fragmented or infant sectors of the economy. Another strategy

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[183] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston.

[184] Doern, GB 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal.

pursued by Steacie was to support the development of university-trained professional scientists as a core requirement in building a national science capacity that could address the needs of both universities and industry. He felt this was best done through the NRC's grants structure and by supporting university-based scientists by making available limited, expensive facilities such as nuclear reactors.[185]

> Thus, unexpectedly, it was state science that moved ahead fastest, 1945-60, mainly because its top managers had the available funding (if not always the manpower) and [few] in industry or academe objected. By 1955-57 the whole of federal state science had been reconstituted and was humming along nicely. Expansion and reorganization of NRC academic grants 1950-60 allowed top planners to suppose academic science was now in good shape. (Phillipson correspondence). [186]

Thus Steacie focused the NRC on stabilizing and building research capacity in universities and industry, and on producing skilled researchers. In his view the role of government science was to fill in the gaps in these areas.

His approach in coordinating the national science agenda and in promoting research in Canada was legendary in that it was somewhat controversial, even when judged by the conventions of the time.

> The important thing is that in any well run laboratory there must be a conscious and continuing effort to reduce organization and planning to a minimum, to have as few committees as possible, to write reports as infrequently as possible, and to regard 'co-ordination' as a dirty word![187]

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[185] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.
[186] Atkinson-Grosjean, J, House, D & Fisher, D 2001, 'Canadian science policy and public research organizations in the 20th century', *Science Studies: An Interdisciplinary Journal for Science and Technology Studies,* vol. 14, no. 1, p. 9.
[187] Steacie, EWR 1965, *Science in Canada. Selections from the speeches of E.W.R. Steacie*, JD Babbitt (ed.), University of Toronto Press, Toronto, p. 132.

Steacie's broad interpretation of how the NRC could best meet industry's needs for research and development did not impress the Glassco Commission. Established in 1960 to assess the efficiency and economy of all government departments, the Glassco Commission seemed focused on science.[188] The section of the Report on government science became a condemnation of how the NRC was acting on its mandate. Following the Glassco Commission's recommendations, a Science Secretariat was established in 1964, and the Science Council of Canada began operations in 1966. By the end of the decade, the Glassco Commission's main criticisms of the NRC – that too much research was being conducted in government labs away from the practical and technical matters of industry, were echoed in several other policy documents, including the Science Council of Canada's 1968 report, *Towards a National Science Policy for Canada.* The scientific community were unsatisfied with the results, but this position was reinforced with international pressure. The OECD had conducted an extensive survey on Canada's science and technology infrastructure. Their assessment largely came to the same conclusions. Too large a percentage of Canada's public support for research was conducted away from industry. This was substantiated with figures that showed the percentages of research funding allocated to universities, industry and government compared across industrialized nations. Canada was reported to have the highest percentage of in-house government science. These findings caused considerable controversy within the scientific community who saw their role as researchers not policy inputs.

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[188] Doern, GB 1972, *Science and politics in Canada*, McGill-Queen's University Press, Montreal.

The consensus at the political and bureaucratic level was that the NRC was not adequately responding to its mandate to support industry. Nor was it adjusting to emerging pressures and new ideas about the social and economic role of science. Despite the NRC's intention of building the capacity of universities and industry through support for research activities, a particular criticism stated in the Glassco Report was that too much science was being conducted in the NRC's laboratories. Worse, supposedly these research activities were based on the curiosities and interests of the NRC's researchers, not on the objectives of the federal government and its science policies. The research inquiries of the NRC were felt to be far removed from the practical matters of industry and the quest to resolve technical problems.

In fairness to the NRC, Canada's science capacity had been greatly improved under its stewardship. It was also making adjustments in its strategy and approach to supporting the science, technology, research, and experimental development needs of industry and public science. Rather than keeping matured parts of its research portfolio within its institutional framework, it had even begun to spin them off into their own agencies and boards. These self-governing bodies could then undertake their own research programs as they saw fit. An early list of new organizations developed within the NRC's institutional framework were:

- **1947** – Defence Research Board (DBR) was created to take over defence research from NRC;
- **1952** – Atomic Energy of Canada Limited (AECL) was created to take over NRC's atomic energy program;
- **1960** – Medical Research Council (MRC) was created to take over NRC's granting role in supporting biomedical and clinical research.

The NRC innovated its programming as well, with the 1962 inception of the Industrial Research Assistance Programme (IRAP). Although over the years this successful experiment has been meet with various criticisms, a testament to its overall value has been its longevity. In fact, it is still in operation today.[189] The program was established to provide direct expert advice and financial support to industry. The experts providing advice were not government employees but instead were active through regionally based networks of researchers who enjoyed good connections with industry. It was quickly realized that this was an effective and flexible way to move science and science advice closer to the needs of industry and industrial researchers.[190]

Despite shedding matured sections of its research portfolio and introducing program innovations such as the IRAP, the National Research Council was out of favor and in a period of decline. It was unable to traverse the shifting focus of publicly supported science and research. With ever more resolve, policy makers were convinced that the role of publicly supported science was to foster industrial innovation and economic expansion. The NRC was assessed to be out of step with the stronger emphasis on these strategic directions. In an ironic twist of history, it was generally felt that the NRC was too focused on the advancement of knowledge.

However, as a crown corporation reporting to the Privy Council, the NRC was beyond direct political and bureaucratic interference, or as it was perceived

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[189] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto, ch. 8.

[190] For further information see Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science'*, PhD Thesis, University of British Columbia, British Columbia.

in the Glassco Commission, beyond control. It was felt that the best way to rein in this institution was to systematically strip away its budgets and responsibilities. Over time these were transferred to other more subordinate agencies. In 1971, a Ministry of State for Science and Technology (MOSST) was created as both Glassco and later the Lamontagne Commission recommended; this replaced the then existing Science Secretariat. By the mid-1970s, the government's policy directions were clear: wherever feasible, intramural research in federal laboratories would be devolved to labs in the private sector and universities.

The findings and frustration expressed about the NRC in the Glassco Commission had consequences for the eventual formation of the Medical Research Council. The growing dissatisfaction with the NRC came just at the time when the MRC was setting out to become an autonomous biomedical research institution modeled after it.

4.1.2 The Formation of the MRC during the Decade of Commissions

Even though the National Research Council's Division of Medical Research and its predecessor the Associate Committee of Medical Research were within the institutional framework of the NRC, they were regarded as independent parts of the federal government's science machinery. Not surprisingly, when the Farquharson Committee recommended the creation of the Medical Research Council, it stated that the Council, "should have the same independence and flexibility in the use of funds as the National Research

Council, and should report to the Committee on Scientific and Industrial Research of the Privy Council, rather than to a Department of Government."[191]

However, when the Council was founded in 1960, it was not formally established as an independent agency reporting to the Privy Council Committee on Scientific and Industrial Research as recommended by Farquharson, its first chairman. Neither was it placed under the aegis of a government department. Rather, it continued to exist under the National Research Council. Besides the Glassco Commission, another reason for this temporary delay respecting the formal establishment of the MRC was the Hall Royal Commission on Health Services. The Hall Commission's main concern was the establishment and organization of a publicly funded health care delivery system but included in its term of reference was an inquiry into the roles of biomedical and clinical sciences within the broader health system. Specifically Hall studied:

> the relationship of existing and any recommended health care programs with medical research and the means of encouraging a high rate of scientific development in the field of medicine in Canada.[192]

When the reports of the Hall Commission were released in 1964 and 1965 they contained a few recommendations that were quite similar to the Farquharson Commission. Analogous to the Farquharson Report, which mirrored the dominant views and values in the biomedical research community,[193] the Hall Royal Commission laid bare the insufficient funding allocated to biomedical and clinical research. This was done through a

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[191] Farquharson, RF 1959, *Report of the Special Committee Appointed to Review Extramural Support of Medical Researchers*, Government of Canada, p.22.
[192] See the "terms of reference" in Royal Commission on Health Services 1964, *The Royal Commission on Health Services*, vol. 1, Queen's Printer, Ottawa.
[193] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston, p. 126.

comparative analysis with the level of support provided for these research activities in other countries. The Hall Commission also noted that considerable support for Canadian biomedical research was coming from American sources. These sources were chiefly (but not exclusively) from the Department of Health, Education and Welfare's National Institutes of Health (NIH). It was further noted that American contributions to Canadian biomedical research were not being curtailed or reduced. The ad hoc committee of the Board, therefore, felt it was "evident to everyone that there . . . [was] an urgent need for a greatly expanded programme of government support of basic research in the biomedical sciences."[194]

Specifically in Volume 1, Hall recommended that the federal government increase allocations to medical research by two million dollars a year for five years.[195] In Volume 2, it increased this rate to three million dollars annually.[196]

The Hall Reports also recommended that the Medical Research Council report to the Committee of the Privy Council on Scientific and Industrial Research in a manner similar to the National Research Council. The Commission argued this was necessary because:

> One essential aspect of the organization is to ensure its independence with respect to the many institutions, agencies and governments now in the health field. If the Council is objectively to evaluate health programmes, whether public or private, the activities of individuals,

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[194] Ibid., p. 22. "It should be added that concern was also expressed for the support of those biological sciences not included within the organizational framework of the biomedical sciences, e.g., those biological sciences covered by the National Research Council". Ibid. p. 126.
[195] Royal Commission on Health Services 1964, *The Royal Commission on Health Services*, vol. 1, Queen's Printer, Ottawa, p. p.81.
[196] Ibid., p.131.

> whether scientist or administrator, and health institutions, whether voluntary, government or otherwise, it must be independent.[197]

The Farquharson Commission and the Hall Commission were similar in their prescriptions for reporting channels and for significant increases in federal government allocations for research. In most other aspects however, the Hall Reports called for radical innovations. Similar to the Glassco Commission's recommendations on general science policy machinery,[198] the Hall Commission argued for a new approach to health science policy-making. Several of these innovations bear remarkable similarities to the eventual rationales supporting the formation of the Canadian Institutes of Health Research (CIHR) some forty years later – with the notable exception of the commercialization of biomedical, clinical and health sciences research (supporting the idea of paradigm shift where an important ingredient is time). At the time of the Hall Commission, the mid 1960s, commercialization of biomedical sciences was yet to become a policy priority.

The Hall Commission recommended a continuation of the traditional activities of the Medical Research Council (and the Division of Medical Research previously) in support of biomedical research. But it went further by recommending a role for the newly formed Council in both the emerging fields of applied "health sciences" and the actual application of these sciences. By health sciences Hall was referring to the emerging sciences of population and public health, as well as traditional social sciences now directed at various health issues which subsequently became a thematic pillar of science under the CIHR.

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[197] Ibid., p. 125.
[198] Privy Council Office 1964, *Report to the Prime Minister on Government Science 1964*, by CJ Mackenzie, Privy Council Office, Ottawa.

These recommendations were completely opposed to the positions of those who subscribed to the views found in the Farquharson Report. There was no desire in the biomedical research community to give the Medical Research Council a larger role in policy-making or to expand in any substantive way the research activities to include the emerging fields in health sciences that were outside the biomedical or clinical fields. Nonetheless, in the words of the Hall Commission:

> In the past, health research was by and large synonymous with medical research, but today we cannot ignore the many problems of a social, economic, administrative, and purely technical nature which confront our health services. All these must be evaluated if the health services of the future are to be as effective and efficient as we want them to be. Medical research is and will remain an essential and basic part of any health research programme. But it is no longer the only area of investigation. All of this means that a host of new disciplines has been added to the traditional health team: the social scientist, the social worker, the architect, the administrator, the statistician, to mention a few, all must participate in the study of health and health services.[199]

In the second Volume, the Hall Commission set out the following role and functions for the Medical Research Council:

1. Be responsible for the administration of research grants in the health sciences.
2. Conduct, and provide grants for research in the medical, dental, biological and related sciences, basic drug research, public health and any other scientific research, including research in the social sciences relating to health, and the publication of research results.
3. Conduct and provide grants for research into alcoholism and drug addition, including psychological and social research.
4. Provide an increased number of research fellowships, research associateships and assistantships in medical, dental, pharmacy, public health and university nursing schools.
5. Support research concerning the most effective training and use of health workers.

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[199] Royal Commission on Health Services 1964, The Royal Commission on Health Services, vol. 1, Queen's Printer, Ottawa, p. 79.

6. Participate in developing and maintaining a continuing system of health statistics in Canada, including a dental health index and specialty studies for the assessment of current health problems and their trends.
7. Carry out medium-term and long-term projections of Canada's needs for health personnel, facilities, research and organization on behalf of the Health Planning Council of Canada.
8. Evaluate intramural research conducted by departments of the Government of Canada in the area of medical and related scientific research.
9. Conduct or provide grants for research studies evaluating the effectiveness of the various elements of the health services programme as a way to improve the quality of health care Canadians receive.[200]

Point 8 was similar to the recommendations of those in the Farquharson Report. However, Hall went even further in its recommendations. In addition to evaluating the intramural research programs of the federal government, Hall's conclusion was that the Council should assume responsibility for the Public Health Research Grant program of the Department of National Health and Welfare. In addition, the Council would evaluate not only health science and health service programs, it would establish priorities in these fields as well.[201] The rational for this proposal was quite different from that of the Farquharson Report. Farquharson made this recommendation based on ensuing scientific excellence in research. Hall was more concerned with relevance of research as an input into a rapidly growing area of social policy, the health care system.

It was unmistakable that the proposed `Health Services Research Council` pictured by the Commission was to be a comprehensive body. It would provide advice and guidance to the federal government on the expanding fields and inclusive term of "health sciences" which included the biomedical and clinical

[200] Ibid., pp. 126-127.
[201] Ibid., p. 91, recommendation 197 (c).

sciences. The new proposed role and direction for this all-inclusive Health Services Research Council included:

> planning and support of health research and the allocation of research funds [and also to make] its services available to provincial governments, voluntary health associations, and universities".[202]

The main reason for this vastly expanded role was to end the fragmentation of advice being put forward to the federal government from various departments and agencies.

The Medical Research Council, while not agreeing with every aspect of the recommendations of the Hall Commission in respect to the proposed composition and responsibilities of the Council, strongly endorsed the principle of a separate agency reporting to the Privy Council. In a major survey of medical research in Canada, the MRC stated:

> It is our conviction, that responsibility for the main body of federal support for extramural medical research should be divorced from operations of any one department. Extramural research embraces many fields and there is need to cut across the boundaries of the areas of interest of mission-oriented departments. The wise apportionment of research funds requires the existence of a Council or a Commission with power to make grants after peer assessment of applications; the rights and responsibilities of such a Council or Commission are different from those of a division of a department.[203]

The Council, however, saw itself as a scientific body dealing exclusively with technical matters. It did not view this work as an adjunct to the nation's health department and, for the most part, the MRC's biomedical research activities had no linkage to the goals of the DNH and W. Moreover, the Council supported fundamental curiosity research almost exclusively. There was little

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[202] Ibid., p. 80.
[203] Medical Research Council, *Canadian Medical Research: Survey and Outlook*, pp. 32-33.

connection to the mission orientation of the department, nor was any desired. In fact, with a great deal of community support for the position, the Council wished to avoid the procedural and administrative difficulties that had been experienced throughout the previous two decades with the department's handling of the Public Health Research Grants program.[204]

The MRC also differed with the Hall Commission's proposal on the integration of the emerging health sciences under the institutional framework of the MRC. First, the MRC felt it risked conflict with other health science agencies. Second, it was feared that it would be forced to choose priorities between research activities in biomedical sciences versus the health sciences transferred from other agencies as recommended by the Commission. Therefore, Council members preferred the traditional stance within the biomedical research community of maintaining a review system that reflected the prevailing scientific paradigms accepted by the medical school complexes.

As might be expected, these views mirrored the values and dominant attitudes of most biomedical scientists.[205] For this reason there was apprehension about potential changes that could impact on the evaluation of research proposals. The overriding concern was that some criteria other than scientific excellence would influence research policies. Before the Senate Committee on Science Policy, Dr. Brown[206] stated:

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[204] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston, pp. 226.

[205] This was the major reason impressed upon this writer (Peter Aucoin's dissertation) by those members of Council who had knowledge of the programs or policies of the nation's health department. (Confidential Interview)

[206] Dr. G. Malcolm Brown was the President of the Medical Research Council from 1965-1977

> It has been the view of the Medical Research Council that [operations research on the delivery of health care] would be best carried out by the Department of National Health and Welfare, which has the executive responsibility, in the federal government, in its field. Here we disagree slightly with the tone of the recommendations of the Royal Commission on Health Services. The commission suggested that this field of research be under the Health Science Research Council, the name they gave to the Medical Research Council. We rather disagree, because we think the capacity to do this, and the real potential for developing the expanded capability to carry on operations research lies with the Department of Nation Health and Welfare.[207]

The Council's major study of health science policy was in line with this reasoning and recommended: "That government departments with responsibilities in the health field continue to have funds at their disposal for the support of extramural research related to their particular sphere of interest."[208] And specifically: "That the Department of National Health and Welfare give increased support to operations research, both intramural and extramural."[209]

At the end of the day, neither the Glassco nor the Hall Royal Commissions were exclusively or even predominantly concerned with science policy.[210] In fact, neither Commission was considered to be highly influential at the time that they produced their findings and recommendations.[211] Nevertheless, both of

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[207] Senate of Canada, *Proceeding of the Special Committee on Science Policy*, No. 8, Senate of Canada, p. 160.
[208] Medical Research Council, *Canadian Medical Research: Survey and Outlook*, pp. 32-33
[209] Ibid., p. 41
[210] The Glassco Commission reports included a section on Scientific Research and Development while the Hall Commission had one chapter devoted to Health Research. See Royal Commission on Government Organization 1963, *The Royal Commission on Health Services 1963*, vol. IV, no. 23, Queen's Printer, Ottawa, pp.183-322 and Royal Commission on Health Services 1965, *The Royal Commission on Health Services 1965*, vol. 2, Queen's Printer, Ottawa, ch. 4, pp. 87-130.
[211] Dufour, P & de la Mothe, J 1993, 'The historical conditioning of S&T', in P Dufour, and J. de la Mothe (eds), *Science and technology in Canada*, Longman Press, London, pp. 6-22.; Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.

these Commissions initiated discussions and introduced new ideas on the scope and organization of science.

In another interesting twist of history, Hall recommended integrating support for traditional bio-medical and clinical research with emerging health sciences in one granting institution. These recommendations went to the highest political levels for consideration but did not generate much interest. Of course this was prior to revisions in the science model toward a general acceptance of an integrative research agenda. It was also prior to these sciences having much interest to the government's economic agenda. As we shall see in the next chapter, this started to rapidly change in the 1980s.

However, even if the recommendations of Hall and Glassco were only considered to be moderately influential during their time, they did introduce new ideas on the purpose and organization of science. They also stalled and subsequently influenced the reporting relationships established for the Medical Research Council. However, the concept of autonomy introduced in 1960 was changed in subtle ways by the end of the decade. The initial issues had been about institutional autonomy but subtly at first, by the end of the decade and certainly by 1970, autonomy meant something quite different. It meant the MRC's ability to control its research agenda in the pursuit of research excellence versus research relevance in the sense of policy goals. Throughout the 1970s this shift would continue to gain momentum but for different reasons then envisioned in the Hall Report.

4.1.3 FORMALIZING A VERY DIFFERENT MRC BY 1969

According to the Hall Commission Report, the MRC was rather obviously excluding certain types of research. But even if the Commission was accurate in pointing out the critical relationships between health sciences and health care, its assessment of the extent to which the scientific community recognized these relationships in research practice was somewhat optimistic. The Commission ignored the very real differences and conflicts that existed between those in the biomedical sciences and the small (but growing) number of the researchers in disciplines of public health and preventive or social medicine. In essence, the Hall Report's recommendations on a comprehensive format for integrating medical and health sciences with the health care complex were considered rather idealistic.[212]

The Medical Research Council however, did not need to deviate much from its traditional conceptions around biomedical and health science. The position it took on its relationship to the other federal health sciences agencies remained the policy of the federal government. The legislation establishing the MRC in 1969 as a corporate agency of the Department of National Health and Welfare excluded "public health" research from the terms of reference of the Council. The legislation also retained the name of the Council even though the Council itself had not opposed the Hall Commission's suggestion that it be renamed the Health Science Research Council.[213] Gradually the term health versus medical research began to be used with greater frequency. It was not

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[212] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston.
[213] Medical Research Council, *Canadian Medical Research: Survey and Outlook*, p.33.

long before the term health science largely replaced the traditional term of biomedical research by incorporating all health related sciences within this one term.[214]

The Council even sought to resist the Hall Commission's recommendation of accepting responsibilities for dental and pharmaceutical sciences. Up until then, responsibility for dentistry and pharmaceutical sciences fell under the sponsorship of the National Research Council.[215] Changes in sponsorship were formalized when the Council extended its terms of reference to include these two fields of health science – the pharmaceutical sciences in 1968 and the dental sciences in 1969.

When the MRC took responsibility for dentistry and pharmacy, the procedures for reviewing research proposals for these two new fields were similar to the approach taken for all the biomedical and clinical sciences. Research projects were reviewed by a panel of scientists drawn from their respective disciplines or, in some cases, closely affiliated disciplines. Some direct promotion to develop these new fields was necessary, thus an exception to its general policy of research excellence was made. Typically, research applications in all disciplines or fields competed across-the-board for research funding. In recognition of the stage of development of these two research fields, minimum percentages of MRC resources for grants-in-aid were made available.

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[214] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston

[215] Cf. K. J. Paynter, *Dental Education in Canada*, Chapter 7, pp. 61-74, and Medical Research Council, *Canadian Medical Research: Survey and Outlook*, Part 1, B, pp. 27-30.

This policy was not considered permanent, but rather "a temporary boost for development".[216]

Despite or perhaps because of a decade of continuous reflections on how best to support and organize biomedical and health sciences, and to what purposes these sciences should be directed, the MRC remained in a rather curious legislative position. In 1967, the Chairman of the Council went before the Ontario Committee on Health Arts and stated: "We are cocoons...The final authority...administratively speaking is the National Research Council, but this is a paper device to quite an extent."[217]

During this time, the position sought by the MRC and advocated in the Hall Commission was that the MRC should be self-governing. Having been allowed to function as an autonomous agency throughout the 1960s, the Council reasonably assumed that enabling legislation would soon formalize this arrangement. This seemed a reasonable assumption because draft legislation had been prepared to place the MRC under the Privy Council as an independent agency.

In the summer of 1968, much to the surprise of the medical research community the reporting channels of the Council were redesigned. The MRC was put under the authority of the Minister of National Health and Welfare, but in a direct way, thus sidestepping the departmental bureaucracy. An order-in-council severed the MRC's connections with the National Research Council.

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[216] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston.
[217] Quoted in J. W. Grove, *Organized Medicine in Ontario*, p. 270.

Permanent legislation followed in the spring of 1969 when the MRC became a corporate agency of the department.

The position taken on the MRC by the government in 1968 did not meet with the approval of the Council or its research community. However, it did reflect the general ideas expressed in the Glassco Commission although not the Hall Commission's recommendation on this specific issue. The Glassco Commission had been highly critical of the perceived policy isolation of the National Research Council and recommended significant structural and administrative adjustments in the organization of science. Consistent with the theories of Historical Institutionalism and the tendencies of institutional stasis, many scholars have observed that these recommendations were not immediately influential on the NRC. [218] However, they did influence the government's position on the autonomy sought by the MRC.

4.2 The MRC in the 1970's

4.2.1 Mandate and Grants Structure

By the mid 1970's, policy makers for medical research in Canada had to take into account a few basic facts. Canada was approaching the end of a twelve-year period during which the output of medical schools had doubled and the schools of dentistry and pharmacy had increased their output by more than 50%.[219] There were no large national medical research institutes and the

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[218] On the Glassco Report recommendations respecting the NC, see Doern, GB 1970, 'The National Research Council: the causes of goal displacement', *Canadian Public Administration/Administration publique du Canada*, vol. 13, no. 2, pp. 140–184.

[219] Medical Research Council of Canada 1975,*The Medical Research Council of Canada 1974-75*, The Report of the President, Medical research Council Of Canada, Ottawa. Also see, Medical Research Council

research efforts in the pharmaceutical industry were still relatively small. Although the university sector remained responsible for medical research performance in Canada, university programs were under increasing pressure and funds for research from universities were limited.[220] The issue of regional disparity in the level of research activity in the medical schools across Canada remained a cause for concern.

In 1969/70 the MRC's Grants Program Committee's were classified based on disease, organ or technology based designations. The fifteen Committees were:

1. Biochemistry
2. Physiology & Pharmacology
3. Microbiology & Infectious Diseases
4. Immunology & Transplantation
5. Pathology & Morphology
6. Metabolism
7. Endocrinology
8. Neurological Sciences
9. Clinical Investigation
10. Heart & Lung
11. Cancer, Growth & Differentiation
12. Pharmaceutical Sciences
13. Dental Sciences
14. Behaviour Sciences
15. Biomedical Engineering

Seventy percent of extramural funds for medical research activities came from the federal government through its various agencies and departments. By the end of the decade this had increased to 80%. Almost three-quarters of federal funds were provided through the Medical Research Council. The

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of Canada 1979,*The Medical Research Council of Canada 1978-79*, The Report of the President, Medical research Council Of Canada, Ottawa, pp. 19-21 for main objectives.

[220] For a comprehensive discussion on Canadian Universities see Cameron, D 2002, 'The challenge of change: universities in the 21st century', *Canadian Public Administration*, vol. 45, no. 2, pp. 145-74.

remainder of the extramural funding came from provincial governments, voluntary agencies, and the United States.

Working in this setting, the main features of the MRC's objectives in 1975/76 were to:

- Improve the application of scientific principles to health care;
- Ensure an adequate research base for education in the health sciences;
- Support the training of investigators in the health sciences;
- Support research contributing to new knowledge in the health sciences.[221]

The MRC sought to achieve these objectives through programs that made a variety of types of support and assistance for basic, applied and clinical research available. In designing its programs the MRC recognized that its first and major role was to support the research projects and programs of individual investigators or teams of investigators who had identified and chosen their own problems. This was done chiefly through the Grants Program, which was by far the largest component of the MRC's operation, accounting for 63% of its expenditures in 1974/75. [222]

Applications from investigators on the staff of Canadian universities and affiliated institutions were considered three times each year. The basis for consideration remained peer assessment. Each application was reviewed through one of 17 grants committees by external referees who were considered to be experts in their fields. Each committee was composed of eight to ten senior investigators drawn from universities, government, and industry.

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[221] Medical Research Council of Canada 1975,*The Medical Research Council of Canada 1974-75*, The Report of the President, Medical research Council Of Canada, Ottawa.
[222] Ibid.

Recommendations for approval of research applications from the committees were forwarded to the Council. Funds for successful applications were approved based on the level of funding available to the MRC. The majority of awards were made for two years, but on occasion a research program needed a stable level of expenditure for a longer period. In such special cases support could be granted for up to five years. Grants were provided for the operating costs of approved programs and for special research equipment. They were not used for the remuneration of the investigator.

In the assessment of applications for grants, no preferential treatment was given to the field of research. However, the MRC did use methods to increase the number of grants coming in from research areas, which for a variety of reasons might be considered important. The Council was quick to point out that these methods did not involve the adjustment of research standards.

4.2.2 Framework Policies Instructing Granting Councils

By the end of the 1970s the MRC was joined by two other Research Granting Councils. In 1977, the NRC's responsibility for supporting university research through its granting functions was transferred to a new research granting council called the Natural Sciences and Engineering Research Council (NSERC). The mandate of NSERC was and remains:

> to promote and assist research in the natural sciences and engineering other than the health sciences, and advise the Minster in respect of such matters relating to such research as the Minister may refer to the Council for its consideration.[223]

[223] Natural Sciences and Engineering Research Council Act, 1976-77. c. 24.

Before long, NSERC was pioneering university-industry research programs.

In 1977, the Social Sciences and Humanities Research Council (SSHRC) emerged as a granting body from the former Canada Council.[224] It was and still is mandated to: "promote and assist research and scholarship in the social sciences and the humanities."[225]

Administratively the authority for these new Research Granting Councils fell to the Ministry of State for Science and Technology (MOSST). Both institutions reported to Parliament through the Minister of what is now called Industry Canada. Similar to the MRC, they were not part of the departmental bureaucracies.

In the aftermath of the 1960s and the debates on science, new directions to support research were formalized in the 1970s. New institutional mandates were constructed to carry out this work. The federal government adopted formalized principles for financing university research. These principles were to:

- Encourage university programs to conduct research in areas of national concern;
- Continue the support of basic research, and
- Develop research-trained manpower to provide both for the continued health of scholarship and for the expanding needs of the economy of the future.[226]

These guidelines also provided the underlying principles for the government's approval of the 'Rationale for the Medical Research Council

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[224] Following the Glassco's recommendations, a Science Secretariat was established in 1964, and the Science Council of Canada began operations in 1966. The Canada Council was Canada's first organization in to fund social sciences and humanities research. When the Canada Council was reorganized in 1978 its responsibilities for social science fell to SSHRC.
[225] SSHRC 1979, First Annual Report 1978-79, p.10.
[226] The Medical Research Council of Canada 1978-79, *The Report of the President*, Medical research Council Of Canada, Ottawa, pp. 19 – 21.

Programs and Funding of University Research'. To reflect this new philosophy, the Council developed the following sub-objectives:

- To support research in the health sciences with excellence as the major criterion for approval;
- To encourage vigorous and thoughtful efforts to apply the results of basic research in all appropriate areas, and
- To correct regional disparities in order to assure adequate resources for health care delivery and medical education across Canada.[227]

Over the next several years, the Council began to develop programs to support research based on this philosophy. By the end of the 1970s, the MRC's Grants Programs accounted for almost 80% of the budget. The sole criterion was based on scientific excellence as assessed through peer review.[228]

An additional principle motivating the MRC was the vigorous effort made by the Medical Research Council to see to it that the results of basic research were applied wherever possible.

> Obviously the clinical application of research results is an integral part of the spectrum of research effort in a given field. The rapid assimilation of new knowledge stems, in large part, from the active participation of clinicians and, perhaps even more, from the collaboration between clinical researchers and scientists of other disciplines. Within Canada's health professional schools, basic and clinical research is closely integrated, with the result that the problems of technology transfer which may characterize some other sectors do not arise.[229]

4.2.3 Pressures for Relevance

The early 1970s saw the enthusiastic introduction of planning into departments and agencies. In the case of the MRC, this function was largely frustrated by the continuation of public debates on scientific research. Reaction to these debates was further complicated by the first wave of restraint on science

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[227] Ibid., p. 20.
[228] Ibid.
[229] Ibid.

expenditure. The federal government was attempting to regain a measure of control over its finances in the face of tight fiscal circumstances caused by the economic shocks of the early 1970s. By the latter part of the decade, the MRC was coping with 'surprise' but welcomed additional funding as the government reacted to international concern that Canada's investments in research and development where comparatively low with respect to other developed nations.[230]

Clearly the MRC had no control over its external operating environment but it had to respond to it. To retain its institutional legitimacy, the MRC was doing its utmost to adapt to the changing ideas on the role of health science and research, while also responding to the evolving research requirements of these emerging disciplines. The Council faced the difficult task of organizing its activities to demonstrate to its stakeholders and political masters that it was effectively using its resources to support research and to coordinate the efforts of a large number of provincial and voluntary agencies. Where possible its research programs were also tasked to support the Canadian economy while conforming to new public sector management practices and reporting requirements.[231]

For the MRC to be truly successful, it had to balance its external legitimacy, which was focused on meeting the rising expectations placed on its research programs, against the risk of alienating the research communities its programs served. These researchers were not only focusing their efforts on new health problems and issues arising from modifications in lifestyle and social

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[230] Ibid.

[231] Medical Research Council of Canada 1979,*The Medical Research Council of Canada 1978-79*, The Report of the President, Medical research Council Of Canada, Ottawa, p. 19.

organization. The MRC also had to find ways to effectively provide program support to medical and clinical scientists who were deeply immersed in dealing with the rapidly emerging technologies in biology, communications and new materials that were also dramatically affecting the organization of research activities. These research activities were being advanced mostly in loosely organized, semi-autonomous networks in universities, medical schools and foundations.

The MRC's Grants Program was under pressure. It was often felt that these grants were contributing funding to support individual researchers "working in isolation" on curiosity-driven inquiries. This was seen as a deterrent to teamwork and to the development of research centres of excellence, both of which were becoming more thematic in science policy.[232] The 1970s marked the Council's first attempts to use its grant structure to not only promote the development of biomedical and clinical sciences, but also to shape their direction in specific ways. The MRC began to experiment with its grant structure.

In part to address these concerns, and in part to support new requirements based on the evolving science and research environments, new programs were introduced by the MRC. These were:

- ***Subject Research Development Grants*** – encouraged special support for collaborative research in areas of national concern.
- ***Program Grants*** – sought to encourage collaborative research by investigators of various disciplines in one university or in several different institutions.
- ***Development Grants*** – designed to assist in the correction of regional disparities.

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[232] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto.

- ***MRC Groups*** – were to provide the mechanism for the support and encouragement of centres of excellence engaged in multidisciplinary research.

The idea of concerted or directed action was not new to biomedical research. Research had been directed on specific problems during WW II. As well there was the coordination role taken up by the NRC's Division of Medical Research to help establish the health research charities, which sought to organize and fund research on various diseases. However, using the Granting Council system to directly achieve specific policy outcomes had rarely been done in Canada.[233]

Meanwhile, biomedical and clinical sciences continued to become more complex and integrative pursuits. As illustrations of this new directions, during the 1970s physicians and PhDs joined forces to resolve certain health problems with specialists who had formerly been considered non-health scientists, such as bioengineers.[234] The most common arrangement was bioengineers working with physiologists or biophysicists to address health issues, or with receptive clinical divisions in cardiology or surgery to develop new instrumentation.[235]

For its own purposes, the MRC was in the process of developing programs for teams to provide a "more effective framework in which to discuss

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[233] Medical Research Council of Canada 1975, *The Medical Research Council of Canada 1974-75*, The Report of the President, Medical research Council Of Canada, Ottawa. See also, Medical Research Council of Canada 1979,*The Medical Research Council of Canada 1978-79,* The Report of the President, Medical research Council Of Canada, Ottawa.
[234] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston. p. 11.
[235] Rushmer, RF & Huntsman, LL 1970, 'Biomedical engineering', in *Science*, vol. 167, p. 840.

policy and strategy" but their views were somewhat different than those expressed in science policy.[236]

> MRC teams were groups of researchers who brought related skills to bear on a problem or a succession of problems, each of which is soluble in a short or moderate period of time if things go well. The attitude and plans of the members of the team is the significant thing here and not geographic location or method of financing". [237]

Perhaps somewhat defensively, the annual report went on to say that teams were supported under either MRC Groups or under the Grants Programs.

> MRC has been gratified by the increased number of high quality teams in recent years, characterized, as good teams are, by accomplishments not to be expected from non-collaborative work. These are supported either under the Grants Program or as MRC Groups and we hope and expect to see more develop as a result of various steps, which have been taken.[238]

> More good research teams are supported through the Grants Program than are supported as MRC Groups, the program labeled for all to see as fostering team efforts in research, which was described in some detail in last year's Report.[239]

Centres of excellence were different. For its purposes, the MRC saw these "encompassing a number of things which relate and interact".[240]

> As a rule it is larger than a team for it must encompass several major disciplines, each of itself exhibiting the characteristics of excellence. Any lesser grouping will not exhibit the prime and easily recognizable feature, which is leadership, regional, national and international and this over a front of considerable breadth. A centre of excellence is above all excellent, a feature which distinguishes it from the other creation with which it may be confused, as a centre of specialization.[241]

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[236] Medical Research Council of Canada 1973, *The Medical Research Council of Canada 1972-73,* The Report of the President, Medical research Council Of Canada, Ottawa, p. 21.
[237] Ibid.
[238] Ibid., p. 21.
[239] Ibid., p. 23.
[240] Ibid., p. 22.
[241] Ibid., p. 23.

Amazingly, despite the long-term existence of the Toronto, Montreal and Winnipeg biomedical research centres, the MRC expressed that it had:

> no centres of excellence, that is not to say we are not heavily engaged in their support. Several meet the criteria set out above...There exists in these situations strong leadership which has a disdain of what is second rate....[they went on to say in a way to explain no designated centres of excellence] ...organic collaboration comes not from administrative fiat but from the give and take of experts who are getting things done and proud of it...centres of excellence, upper case or lower case, it matters not which.[242]

This researcher attributes this statement to the continued disdain within the biomedical and clinical research communities for what they considered to be government interference on the 'organic' nature of science, research and discovery. The idea within the research community of the time was that 'research centres of excellence' come from the skills and talents of "experts who get things done and are proud of it". They did not from "administrative fiat" or policies directed at artificially building centres of excellence out of context of the natural dynamics and processes of research excellence, driven by curiosity.

Another possible reason for this statement, but this is more speculative, is that the research complexes in Toronto, Montreal and Winnipeg were autonomous from the MRC. They did not have the same reliance on federal funding as did smaller less-developed programs. As discussed in Chapters 1 and 3, biomedical researchers in these complexes had funding sources coming from the voluntary and private sectors, from philanthropy as well as the their 'not -for-profit' labs that produced biological inputs into medical research. Two of these centres had revenues from the patented discovery of insulin. Presumably

[242] Ibid., p. 24.

by this time, other discoveries had been patented that contributed to their revenue streams. This speculation is supported by the fact that in the medical survey conducted by the NRC after WW II (see Chapter 3, section 3.2) the NRC was unable to get accurate figures on the total funds available to these researchers centres. They simply did not want to share this information with the NRC and there was nothing compelling them to do so. Given that these centres had been largely autonomous for at least three decades it is hard to imagine that they would suddenly want to fall under the MRC's fledgling 'research centres of excellence' program. If they choose this route, by default their programs and activities would come under the scrutiny of federal polices and be reported on in annual reports. This speculation is further confirmed in the same annual report, which noted that the MRC's leadership believed that the extensive decentralization of the health research system had led to a situation where it was difficult to "identify national centres in which to initiate concerted action".[243]

The more accurate description of this situation was that the MRC knew it was impossible to control the established research complexes falling under the then contemporary understanding of the term 'centre of excellence'. Although the MRC was keenly aware of their existence and influence, in a general sense they remained under the radar screen of the federal government's general science policy directions. Meanwhile smaller universities with medical programs did not have the capacity or clout to warrant the MRC's attention or resources to 'artificially' grow these centres.

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[243] Ibid.

To help compensate for what the MRC referred to as the "missing part in the medical research infrastructure"[244] – e.g., the lack of identifiable national centres of excellence that could be pulled under the MRC's institutional infrastructure, they took a different route to support their relevance. For instance the annual report discussed the field of cancer research which had a four agency -coordinating committee: the Medical Research Council, the National Cancer Institute of Canada, the Ontario Cancer Treatment and Research Foundation and the National Health Research and Development Program of Health and Welfare Canada. In the field of heart research, the MRC discussed the lengthy consultations with the Canadian Heart Foundation before the MRC established its program for further development of this area of research.

The MRC Groups were considered as acceptable examples of concerted action, because each group consisted of several investigators with different expertise working collaboratively on a common theme. By the end of the 1970s the Council supported eight formally constituted MRC Groups across the country whose work was internationally recognized.[245]

The MRC's continued focus on its role as a coordinator and funder of research, rather than as a national body directed at growing 'research centres of excellence' is consistent with the theories of historical institutional and institutional stasis. To be discussed in Chapters 5 and 6 is how the emergence of a techno-economic paradigm shift caused by new technologies, and the attending rise of the KBE, made stasis an impossible option if the MRC was to

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[244] Ibid.
[245] Medical Research Council of Canada 1979, *The Medical Research Council of Canada 1978-79*, The Report of the President, Medical research Council Of Canada, Ottawa.

continue to be Canada's premier research institution. As biotechnology and the pharmaceutical industry became more important to Canada's economic growth agenda, somehow these already-established medical research complexes would have to come closer under the control of a national institution – which would not necessarily be the MRC. In Chapter 5 when we discuss the emergence of networked science institutions and their appearance into the empirical mainstream we will see how this pressured the MRC for a response in order to remain relevant.

4.2.4 Changing Legislation on Research

Several key pieces of legislation were introduced during the 1970s, which affected the organization of the MRC. The first was the Government Organization (Scientific Activities) Act 1976. This act was officially put into effect in May, 1978, altering the Medical Research Council Act by removing the limitation on the MRC not to support "public health research". For thirty years, this part of the health sciences had been the responsibility of research programs of the Department of National Health and Welfare. This changed with the introduction of this Act:

> By virtue of a statement approved some years ago by the Minister of Health and Welfare through whom MRC also reports to Parliament, the division of responsibility between the Council and the Department remains unchanged even though the new legislation leaves the way open for a re-alignment of terms of reference should such an action ever be considered wise. [246]

[246] Ibid.

This Act set the conditions for the MRC, and in particular of its successor, the CIHR, to become a much more integrative research council in the years to come.

The Canadian Human Rights Act was passed into law in March, 1978. This Act had serious implications for the operation of Council's programs and the peer review system on which they are based. It had always been the Council's practice to provide applicants, on request, with the constructive comments of those who review their research proposals. This was considered a valuable adjunct to the assessment process, even though the names of the reviewers in question were withheld from the applicant. Under the terms of the new Act, Council was required to give applicants access to any information bearing on the adjudication of the research proposal, including the names of reviewers. The Council was gratified by the way in which the scientific community, reviewers and applicants alike, had by and large adapted to the new requirements.

> The old system in which confidentiality was maintained is certainly regarded by many as more comfortable; but the apprehensions about the effect of the new system on peer review have not thus far been realized. The situation is being watched closely so that anomalies are avoided and peer review in its new format works as well as it has in the past.[247]

4.3 Conclusions

This chapter focused on the emergence of the MRC, its early development during the 1970s and how it adjusted to new ideas on the relation of science to society. As we saw, throughout the 1960s the MRC's relationship to the state remained ambiguous with its supporting legislative arrangements and reporting

[247] Ibid.

relationships not made official until 1969. Its relationship to its scientific community was unequivocal, however.

The medical research community considered the MRC to be a legitimate, if not an already autonomous, agency temporarily housed within the NRC's organizational framework.[248] The expectation of the leadership of the medical research establishment was straightforward. The MRC, at least from a governance perspective, would be modeled after the NRC and have unfettered control over its research agenda. The key inputs into decisions to support (or not) research would be excellence. In a surprise last minute move in 1968, the responsibility for the MRC fell to the Minister of Health, although notably not under the bureaucracy of the health department. The final arrangements infuriated the medical research community but more frustrations were yet to come.

The 1960s and 1970s were decades of evolving and changing ideas about the relationship of the scientific enterprise to the objectives of the state. Initially in Canada, the reports of the Glassco Commission, the Science Council of Canada, and the OECD substantially contributed to the decade-long deliberations. Somewhat later came the Senate's Special Committee on Science Policy, chaired by economist Maurice Lamontagne from 1968 to 1977. By the end of the Lamontagne review, the relationship of state and science was becoming complicated by the emergence of new technologies as the techno-economic paradigm shift began. This set into motion a new dialogue on the role

[248] Aucoin, P 1972, '*Health scientists and the making of health science policy in Canada*', PhD Thesis, Queen's University, Kingston.

of science in advanced economies. Lamontagne was enthusiastic about the whole business of planification – economic forecasting and planning – and its potential for fostering *innovation*. The latter word entered Canadian policy discourse around the mid 1970s.[249] Enthusiastic about the emerging ideas circulating around the international communities interested in science policy, the Lamontagne Committee accepted new views on science policy, which were becoming 'quasi-economic'.[250] The MRC responded to new and emerging pressures on the national biomedical and clinical science research agenda by adjusting its grant structure.

Throughout the 1980's the MRC would continue to adjust to demands and pressures by tweaking its grants structures. These pressures and demands from the external environment including a technological revolution in science, cast doubt on the linear science model in favour of more iterative approaches. On top of this, these new pressures include changing ideas in the political economy on broader social and economic purposes for national science programs based on the emergence of the KBE paradigm and pressures from globalization as economies and markets open up.

In the area of knowledge-centred realms, these new demands and pressures were evolving beyond consideration of adjusting existing institutional structures. They were giving way to full blown discussions on best-fit structural arrangements and experiments in design. Eventually these models would

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[249] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.
[250] Phillipson, DJC 1991, Building Canadian science, *Scientia Canadensis* (special issue).

provide Dr. Friesen with an opportunity to transpose these concepts and principles into the conceptual representation of the CIRH. These discussions and their institutional consequences are the focus of the next chapter.

CHAPTER 5

The MRC in the 1980's: Bringing Networked Science into the Empirical Mainstream

Introduction

In the last chapter we considered the formation of the MRC in the 1960's during the initial debates on science in policy and how they affected the final result. A key feature of this discussion was that they introduced new ideas and concepts that started to change the national science agenda and the national agenda for biomedical and clinical sciences. These higher order dialogues were still within the context of the principles and established practices of the post World War II welfare state. By the 1970s however, the concepts and rationales of the post World War II welfare state and related interventionist industrial policies were in dispute and decline. In the 1980's new ideas on state, society and science were coming into play. These were based on liberalizing views and market concepts applied to the goals and administration of the state, and in response to pressures from globalization as economies became more open under the KBE. In knowledge-centred realms, this combined with a revolution in the area of new technologies, notably biotechnology and communications technologies, changed the ideas and concepts of the science model as a linear 'pipeline' from basic enquiry and discovery to development and product commercialization in markets. Innovations, it was felt, would be encouraged by

adopting a more interactive approach to the generation and translation of knowledge. Collectively, these factors were contributing to new approaches for the organization of the science enterprise, which could be used as models or transposed as institutional alternatives that presumably conformed better to these emerging conditions.

The evolution of these models in Canada is discussed in this chapter. We briefly review three models:

- The NRC's Industrial Research Assistance Program (IRAP) from its inception in the 1960s through to its renewal during the 1980's;
- The Canadian Institutes for Advanced Research (CIAR); and
- The National Centres of Excellence Program (NCE).

We begin this chapter with a look at the advisory functions and internal control processes of the MRC as an executive and an advisory body of the federal government at the beginning of the decade. This diversity of controls, and multiplicity of sources of input into the orientation and operation of MRC, bore witness to the decentralized and inherently complex nature of the medical research system in Canada.

In section 5.2 and 5.3 we consider developments at the federal political level that were introducing liberalized views and market concepts into knowledge-centred realms. These pressures as well as new ideas in the organization of science led to several early experiments with programs, institutional designs, and approaches that were intended as a response to these curious emerging conditions and pressures.

In section 5.4 we discuss how the pressures outlined in the previous sections were leading to new demands, which strained the ability of the MRC to respond. We discuss why the 1980's was a decade of struggle for the MRC, and how inconsistent funding raised havoc on planning and executing a strategy for the national biomedical and clinical research agenda. These challenges came at the same time that its grants structure and programs strained to adjust to rapidly emerging technologies, new ideas on how the scientific enterprise should be organized, and the more market oriented ideology under the KBE/S.

5.1 The MRC's Authorities and Control

The Medical Research Council was an executive and advisory body. As an arm of government it was not autonomous or beyond scrutiny.[251] Four levels of authority controlled the Medical Research Council's operations and activities.

- At the ***political level*** the government of the day needed to be assured that the MRC was carrying out its assigned mandate in support of medical and health sciences research.
- At the ***level of Council,*** its individual grants and contributions programs were reviewed and revised on an ongoing basis to assess how well they were addressing current and emerging medical and health research and federal policy issues.
- The MRC's ***expert review committees*** were responsible for evaluating the merit and quality of the hundreds of research proposals submitted to the Council each year.
- Finally, at the level of ***Council's secretariat***, there was an ongoing evaluation of the MRC's procedures to ensure the appropriate level of control on resources was in place without imposing unnecessary restrictions.

[251] Medical Research Council of Canada 1979, *The Medical Research Council of Canada 1982-83*, The Report of the President, Medical research Council Of Canada, Ottawa.

5.1.1 THE POLITICAL LEVEL – THE STATE MACHINERY FOR SCIENCE

At the ***political level***, the legislative authority governing the MRC was derived from the Medical Research Council Act, which formally established the Council in 1969. According to the Act, the Council's mandate was: to promote, assist and undertake basic, applied and clinical research in Canada in the health sciences; and to advise the Minister in respect of matters relating to such research.

Parliament could amend this legislation at any time as deemed necessary. Cabinet determined the direction of federal science policy and the level of funding available to Council each year to achieve these objectives. Determining policy in this area was iterative and complex. Elements of science policy relevant to medical and health research involved the Privy Council, the Science Council, and the National Advisory Board on Science and Technology (NABST), which came later. Occasionally these entities would comment on programs and documents originating from the Medical Research Council.

Provincial and voluntary agencies also developed research programs to meet special needs or to serve local interests. From the perspective of the federal government, ideally these programs were constructed with federal policies and programs in mind. At the very least, the MRC and the federal agencies responsible for policy needed to be aware of research activities and initiatives at the provincial level and advise the federal government accordingly.

On the recommendation of the Minister of Health, Cabinet appointed the President of Council and the members of Council. The President of Council

reported to Parliament through the Minster of Health at the end of each fiscal year. The government required detailed auditing of the MRC's accounts by the Auditor General on an annual basis. Additional information about Council's activities could be requested at any time while Parliament was in session. Additional funds could be requested from the Council through the Minister of National Health and Welfare. These had to be defended and evaluated in parallel with the needs and demands of other federal instruments for funding research and social programs. Besides the Department of National Health and Welfare, at least three other departments were directly concerned with the analysis and assessment of the MRC's programs: the Ministry of State for Science and Technology; the Ministry of State for Social Development; and the Treasury Board.

The Ministry of State for Science and Technology had the responsibility of advising government on matters of science policy and on the performance of the three federal granting councils. The Ministry of State for Social Development was interested in the MRC's programs due to its responsibility for funding new or existing initiatives considered within the realm of social affairs, including some elements of medical research. Finally, the Treasury Board was concerned with the budget required to maintain the Council's on-going programs and to ensure that resources allocated to the MRC were used in accordance with the government's administrative guidelines.

5.1.2 THE COUNCIL, PEER REVIEW PANELS, AND THE SECRETARIAT

The second, third and fourth level of authority – the Council's responsibility for its programs, the expert review committees responsible for the merit and quality of the research funded through the MRC, and the MRC's administrative competencies – spoke directly to the MRC's sense of institutional autonomy. The Council was responsible for:

- Ensuring appropriate methods for the evaluation of research proposals submitted to its review committees, and
- Maintaining a secretariat competent to administer its programs.

These were key to the Council's ability in executing government policy on biomedical research.

Exercising its advisory role, determining the necessary programs to execute policy, and communicating these priorities through strategic and operational plans, was largely dependent on the Council's accurate assessment of:

- Current and emerging health problems and issues;
- The availability and readiness of Canadian expertise to address these research problems and issues; and
- Its knowledge and surveillance of the related activities of its many partners who worked in support of medical and health research at the international, federal, provincial and local levels.

The accuracy of these assessments reflected directly on the Council's leadership and on the scientific and technical competence of its members.

Similar to the twelve Grants Programs Committees of 1969/70, the classification structure was based on disease, organ or technology. In 1980/82 there were twenty-two committees. These Committees were:

1. Behaviour Sciences
2. Biochemistry
3. Biomedical Engineering
4. Cancer
5. Cell Physiology
6. Clinical Investigation
7. Clinical Trials
8. Dental Sciences
9. Endocrinology
10. Experimental Medicine
11. Genetics
12. Heart & Lung
13. Immunology & Transplantation
14. Metabolism
15. Microbiology & Infectious Diseases
16. Neurological Sciences
17. Pathology & Morphology
18. Pharmaceutical Sciences
19. Pharmacology & Toxicology
20. Program Grants
21. Maintenance
22. Equipment

The peer review system was the cornerstone of Council's procedure for the identification of proposals of high quality and ensured that experts in the appropriate fields considered each application for Council funds in detail. Members were nominated by a special advisory committee of Council and, as recognized experts in their disciplines, were trusted to provide the expertise required to assess the scientific merit of the many different proposals submitted to Council.

Before being referred to the appropriate Council committee, each proposal was first sent to external referees working in the research field concerned. Their comments were made available to the Grants Committee and to the two members assigned to lead discussions on each proposal. Scientific Officers who

served Council on a part-time basis facilitated the evaluation procedures. They did not have any role in developing recommendations to Council on individual applications. Rather, their responsibilities were to make certain that the review Committees in their jurisdiction had the necessary information to do their work in compliance with the policies of Council. Following the evaluation of the scientific merit of each successful proposal, the committee would arrive at a budget to permit the work to move forward.

The fourth level of control over Council's activities was exercised by the secretariat. The directors of the major sections (i.e., administration and finance, grants, scholarships, communications, and special studies) assisted the President in translating the decisions of Council and implementing them. They also shared an overall responsibility to ensure that the review committees followed the guidelines set by Council. In collaboration with officials in the universities and their affiliated hospitals and institutes, they were responsible for the appropriate administration of funds for approved projects.

These varieties of mechanisms for controls, and the vast array of sources of input into the orientation and operation of the MRC, highlight the decentralized and inherently complex nature of the biomedical, clinical and health research system(s) in Canada.

5.2 The Quest for Innovation - New Ideas and Policy Shifts

By the time the Liberal government came to the end of its long mandate, science policy had been gradually inching its way higher up the political agenda. Nonetheless, despite the dialogues and debates on science policy during the

1960s and 1970s, and the greater attention being paid to public investments in science, Canada still did not have an overall science strategy. Several countries with advanced industrialized economies had started to directly link science policy to economic growth.[252] Of particular interest, and perhaps concern to Canada, was that in the United States and Britain these linkages were part of an overall regime that was markedly moving policy frameworks towards more market-oriented approaches.

At the first G7 summit meeting in 1982, it was revealed that Canada had the lowest R&D investment in the group.[253] To stimulate investment the Liberals introduced a Scientific Research and Experimental Development (SR&ED) tax credit. It was far from a perfect instrument and required a number of revisions to correct deficiencies and abuse but it did mark a major science policy innovation.[254] As a result of the changes introduced, Canada established and still has the most generous R&D investment and tax climate in what are now the G8 nations.[255] Momentum towards a national science policy was beginning to accelerate.

In 1984, a Progressive Conservative government came to power shifting Canada to the right of the political spectrum. Around the same time, the Industrial Research Assistance Agency and the Ministry of State for Science and

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[252] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto. p. 47.
[253] This remained a chronic problem for some time. Only Italy has a lower ration of R&D to GDP. Finance minister, Paul Martin, made increasing the ratio a key commitment for the 2001-3 fiscal periods.
[254] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto.
[255] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto. p. 47.

Technology (MOSST) introduced funding to establish technology transfer/academy-industry liaison offices (TTOs/ILOs) on university campuses.

Even before the mid 1980's and the Mulroney government's negotiations of the Canada-US Free Trade Agreement, the traditional approach taken by the federal government to industrial, regional, and trade policies was increasingly less practicable or desirable. Under the unyielding conditions of opening global markets, all advanced economies had a stake in the early processes of globalization, but no one had control. Exactly what would replace the then familiar policy frameworks of industrial policy was not yet apparent but the stakes were high as new relentless threshold issues began taking hold, including:

- Economic liberalism;
- Rapid technology changes particularly in the fields of biotechnology, information, and advanced materials; and
- The even more rapid international movement of people, information technology, and capital through international markets as communication technologies improved and trade barriers continued to fall. [256]

All these new conditions were imposing policy responses - which were often experimental, sometimes controversial - but given the interdependencies of market oriented capital systems, highly susceptible to convergence. The early and accepted reply based on the covenants of liberalism was to rein in huge fiscal deficits, to promote even more open markets, and to amend the weaknesses of institutional structures built for the circumstances of yesterday. Initially of particular interest were the banking and regulatory sectors. Eventually this moved toward new approaches to support scientific research, technology,

[256] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era,* University of Toronto Press, Toronto, p. 18.

and experimental development to ensure competitive economies in hotly contested international markets.[257]

An early initiative of the Conservative government, given the emerging political and economic climate, was to improve Canada's economic international competitiveness by directly linking publicly funded science to better meet the needs of business. As part of the plan to do this, in 1986, the Conservative government introduced a policy of matching funds, which required the Research Granting Councils to work in partnership with the private sector to increase the level of university-industry collaborations.

After an intense period of federal/provincial consultation, in December of that same year, an agreement was reached on the general components of Canada's first federal science and technology policy. The Ministers responsible for federal, provincial, and territorial science and technology signed the agreement in March 1987. In the following month details of the $1.5 billion package under InnovAction were released. MOSST would be replaced by a new super ministry for the micro economy called Industry, Science and Technology Canada (ISTC).

The combination of portfolios under ISTC clearly indicated the alignment of science and commerce. The mandate of ISTC was to improve Canada's international and technology-based competitiveness.[258] The former policies of subsidizing weaker industries or trying to 'pick winners' were abandoned. Economic growth and industrial competitiveness would be promoted through:

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[257] Ibid.
[258] Ibid.

- Careful assessment of the sectors where Canada had a competitive or comparative economic advantage;
- A more concerted effort to support research and experimental development by emphasizing public-private partnerships and collaborations; and
- The dissemination of knowledge.[259]

By the mid to late 1980s, the policy approaches gaining favour to address these new, and thus far still emerging conditions, were innovation policies. As a policy direction the embryonic framework of innovation had in a general sense superseded traditional industrial policy.[260] Much like the term innovation, which 'is not easy to grasp', these policies raised (and still do) important questions about how "this overall policy direction would affect a wide range of stakeholders, institutions, and policy fields." [261]

As part of this strategic alignment of science and commerce, legislation provided $240 million for a new flagship policy approach through the Networks of Centres of Excellence (NCE) Program. Under the same legislation, even though the NRC itself was out of favour with the government, NRC's Industrial Research Assistance Program (IRAP) remained popular. Under the same legislation, additional funding was also allocated to the IRAP to support and grow its existing networks, which already reached across the country. For the Conservatives the IRAP and NCE programs became two key instruments in a successive and experimental innovation policy framework that was committed to serving the

[259] Doern, GB 1995, *Fairer play: Canadian competition policy institutions in a global market*, C.D. Howe Institute, Toronto.
[260] Ibid., p. 18.
[261] Ibid., p. 18.

research needs of industry, and furthering Canadian competitiveness in a global economy.

Throughout the terms of the Mulroney government, competitiveness and innovation and the policies that support these objectives were high priorities. When the Chretien Liberals took power back from the Conservatives in 1993, they made innovation the central concept in its micro-economic policy in the policy paper *Building A More Innovative Economy.*[262] This document reflected the need for an even greater knowledge role under the emerging paradigm of the KBE. But it was also very diverse about just what this role was to be and about what was meant by the term "continuous innovation". [263]

5.3 From Thought Experiments and Models, to Implementation

As the first products and processes of the revolution in molecular biology were being patented in the late 1970s, the isolation of the closed laboratories was losing appeal. The triple technological revolution in biotechnology, information and communication technologies meant that not even the largest corporations could master the eclectic dimensions of the major technological revolution-taking place. The speed and uncertainty associated with such rapid technological change dramatically increased the cost and risk of research and experimental development. Gaining competitive advantage by acquiring rivals to assess technology or technical competencies was not at all certain either.

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[262] Industry Canada 1994, *'Building a more innovative economy'*, Minister of Supply and Services, Ottawa; Doern, GB 1995, *Fairer play: Canadian competition policy institutions in a global market*, C.D. Howe Institute, Toronto.

[263] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto, p. 18.

Merging corporate cultures to promote knowledge transfer was notoriously difficult and frequently led to less than optimal results.

In the eternal drive for corporate advantage through continuous innovation, research and technical cooperation started to become more appealing. A program of cooperation was much more flexible, less expensive, and less risky than the outright acquisition of rivals or suppliers. Organizing research and development initiatives through strategic multi-organizational alliances to promote, innovate on, or trade knowledge and technology, was not just a passing fashion. These alliances were the most important innovations in organizing and conducting research in modern government and business. [264]

Meanwhile, in the international policy discourse of the time, the phrase 'centres of excellence' reappeared with ever increasing regularity. The idea came out of dissatisfaction with existing arrangements and a more realistic sense of the way knowledge works based on revisions to the linear science model. Support for publicly funded science was adjusting to the complicated multi-disciplined and sometimes trans-disciplinary research issues of new technologies. Clearly, this was not the end of the task. The challenge of how best to introduce these policy programs and even institutionally designed interventions met with the additional complexity of new ideas on knowledge exchange and translation.

Most new initiatives in science and technology partnerships saw their beginnings around this time. Canada's provincial and federal governments

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[264] Niosi, J 1995, *Flexible innovation: technical alliances in Canadian industry*, McGill-Queen's University Press, Montreal & Kingston, preface.

launched more than 100 intersectoral research partnerships during this period.[265] At the provincial level, Quebec's Programme d'Actions Structurantes began in 1984-85 with forty networks of public-sector laboratories. Also, in 1987, Quebec pioneered the Centre d'Initiative Technologue de Montreal (CITEC) at McGill University. Ontario's Centres of Excellence were established in 1986-7.

At the federal level, besides Industry Science and Technology Canada (later to become Industry Canada), both the National Science and Engineering Research Council (NSERC) and the Medical Research Council (MRC) were actively supporting collaborative, targeted research. NSERC started to fund 'big science' networks in the early 1980's – in the earth sciences (Lithoprobe) and integrated circuit design (Canadian Microelectronics Corporation). During 1987-88, 15 % of NSERC's total budget[266] and 15% of the MRC's budget[267] went to targeted research programs.

The following year saw the establishment of the Network Centres of Excellence Program (NCE), conceived as 'institutes without walls'. The Network Centres of Excellence were among the first concerted public sector attempt to link universities, public laboratories, and businesses in new and untested ways through various financial, technical, or commercial networks. In a similar fashion to how the early biomedical and clinical research programs under the NRC had gotten around issues of federal-provincial jurisdictions in the area of health, this

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[265] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto. p. 48.

[266] Ibid. See also, Friedman, RS & Friedman, RC 1990, 'the Canadian universities and the promotion of economic development', Minerva, vol. 28, no. 3, Autumn, pp. 272-293; Niosi, J 2000, *Canada's national system of innovation*, McGill-Queen's University Press, Montreal.

267 Atkinson-Grosjean, J 2006, Public science private interests: culture and commerce in Canada's networks of centres of excellence, University of Toronto Press Incorporated, Toronto. p. 48.

program was designed to sidestep issues attending to Canadian federalism around education by building networks that would link outstanding researchers in institutions across Canada.[268]

5.3.1 Industrial Research Assistance Program (IRAP)

The practices of distributed research networks had been pioneered in other institutional contexts before the National Centres of Excellence program, and certainly well before the CIHR. The history of the IRAP dates back to the Technical Information Service (TIS) founded by Mackenzie in C.D. Howe's Department of Reconstruction and Supply in 1945. The purpose of TIS was to give 'knowledge subsidies' to industry in the form of technical advice.[269] The President of the NRC, E.W.R. Steacie, had a challenging task in creating programs designed to encourage industrial science. This went beyond the issue of bolstering Canada's science capacity in universities and industry as previously discussed in Chapter 4. In the aftermath of WW II, manufacturers and producers had little incentive to conduct research given the quantity of technology already available in the quickly growing consumer markets. [270]

The program innovation that would change this situation by encouraging industry to conduct research was the Industrial Research Assistance Program (IRAP). The program was revitalized again in the aftermath of the Lamontagne report. In 1987, the President of the NRC recruited Keith Glegg of Marconi to

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[268] Atkinson-Grosjean, J 2006, *Public science private interests: culture and commerce in Canada's networks of centres of excellence*, University of Toronto Press Incorporated, Toronto. p. 48.

[269] Doern, GB & Levesque, R 2002, *The National Research Council in the innovation era*, University of Toronto Press, Toronto, p. 117-118.

[270] Phillipson, DJC 1983, 'Steacie Myth and the Institutions of Industrial Research', *Scientia Canadensis*, vol. 7, no. 25

serve as Vice President of Industry and Technology Transfer. He also merged IRAP and TIS under the IRAP name.

The IRAP program provides an early example of a peculiarly Canadian solution to geographic problems and federally equitable solutions for industrial research. Rather than hire technically trained civil servants to give hands-on advice to industries in various sectors in every region of the country, IRAP created a mechanism for borrowing science resources. Approximately two-thirds of IRAP's 270 field agents were locals, co-opted from industries and universities.

The proposal was to set up the IRAP as a granting program for industrial research. This represented a strategic reinterpretation of NRC's mandate for industrial relevance by moving the emphasis from discovery to use. In a similar fashion to the manner in which the NRC provided grants to support public research in universities, cash subsidies were made available to industry. According to Phillipson, the idea of giving public money to private industry "was such an extraordinary precedent that it took a year's preparation by the Advisory Panel on Scientific Policy and required Treasury Board and Cabinet approval." [271]

Under the IRAP a 'field army' of Industrial Technology Advisors (ITAs) was enlisted to support the research needs of small and mid-sized enterprises (SMEs). Successful candidates had between ten and twenty years' of industrial science experience. They were comfortable in either an academic or industrial research culture, and brought with them the definition of industry research as

[271] Atkinson-Grosjean, J, House, D & Fisher, D 2001, 'Canadian science policy and public research organizations in the 20th century', *Science Studies: An Interdisciplinary Journal for Science and Technology Studies,* vol. 14, no. 1, pp. 3-25. p. 16

"anything a firm has to do to frame the question that technology has to answer."[272]

About one-third of the ITA's came from the NRC but to get regional coverage and intellectual diversity IRAP looked outside the federal government. ITA's were recruited from

> provincial public research organizations, university-industry liaison offices, associations of consulting engineers, community colleges and technical institutes, federal agencies, engineering faculties, and from the NRC itself.[273]

The NRC-IRAP maintained offices in every province and pioneered concepts of field (or distributed) networks and technology transfer. Non-NRC staff were paid by their own institutions, which then received salary support from IRAP to release them from their positions. To help industries across the country meet their research needs, the ITA's had delegated funding authority of up to $100,000. Through its Technical Advisors, IRAP responded quickly and with first-hand knowledge of the difficult and risky world of the industrial entrepreneur. They did not need permission from higher authority in order to take action on behalf of a client.

Over the years, but not without the occasional controversy, the IRAP contrasted favorably with other departments responsible for industry (then MOSST and DRIE) who were "trying to connect with industry by dropping leaflets from the 20th floor of an Ottawa skyscraper."[274]

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[272] Ibid., p. 17.
[273] Ibid.
[274] Ibid., p. 18.

IRAP was considered a successful model of how to deliver effective innovation by maintaining a strong client-focused culture. In assessing services and subsidies to industry, the government's 1985 Task Force on Program Review concluded that IRAP worked and suggested that the government consolidate its technology transfer efforts within it.[275]

MOSST decided to reinvent the wheel taking the in NRC-IRAP concept and "turning it on its head" formulating a new program called "Networks of Centres of Excellence".[276] The NCE was clearly based much more directly on liberalized concepts infused into a national science and research program as well as new concepts of science based on a more iterative model of innovation and translation.

5.3.2 Dr. Fraser Mustard and The Canadian Institute for Advanced Research

The distributive networking model of the IRAP became a model of sustained success for the federal government. Similarly the Canadian Institute for Advanced Research (CIAR), launched in Ontario in 1981 by the distinguished medical scientist Dr. Fraser Mustard, also used a distributive networking model. Its underlying assumptions were quite different though. CIAR was and is a non-governmental body dedicated to knowledge for knowledge's sake. Its emphasis was on long-term collaborative research conducted by senior scholars in areas of relevance to the Canadian and global community. The idea for the CIAR came out of a realization that addressing complex problems in emerging fields,

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[275] Ibid., p. 18

[276] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.

generating new knowledge, and promoting the exchange of information required a different kind of institutional structure better suited to how knowledge is generated and transferred. "These connections are often serendipitous, always unexpected, and result in theories, ideas, and advances that exceed anything a traditional research environment could produce."[277]

The proposed solution was simple. The chosen option was a virtual institutional design that invested in people and linked outstanding researchers in virtual networks across Canada. Membership was (and is) by invitation and consists of senior scientists drawn from universities and research agencies throughout Canada.

The mandate of the CIAR would be to pursue fundamental knowledge in a limited number of fields where Canadian researchers were elevating the overall pool of knowledge through global leadership. It was acknowledged that making original contributions in emerging fields would certainly benefit industry in the long run. In fact, the CIAR has a history of raising funds from private sources as well as the federal and provincial governments. However, there was no concern for immediate applications of its research. Industry was viewed as a user of the knowledge but not a collaborative or strategic research partner.

Funds available to CIAR members underwrote networking exchanges and bought researchers' time at their home universities. The criterion of success was also simple "Five years from now you're (researchers) going to be reviewed by

[277] CIAR website (now CIFAR) <www.cifar.ca.>

an international panel who will see if you have shifted the world community on how it views that question, in terms of its understanding."[278]

5.3.3 The Federal Networks of Centres of Excellence Program

Fresh from the structural and mandate innovations of the CIAR, in 1986, Dr. Mustard became co-director of the committee instructed to design Ontario's Centres of Excellence program. The revitalized program was launched in June 1987. Its primary function was to drive economic prosperity and growth for Ontario by creating regionally vital industries to accelerate the commercialization of innovations. This was done by connecting industry with Ontario's leading-edge researchers to revolutionize "the path from idea to income".

> OCE's programs in Research, Commercialization and Talent focus on sectors and technologies key to the province's economic strength and future vitality. And the OCE team brings a unique combination of scientific, business and entrepreneurial expertise to the commercialization process.[279]

Mustard's prediction was that these intentionally designed research centres would draw in researchers from across the country to Ontario universities and research centres. With the best researchers migrating to Ontario, universities in other parts of the country would have great difficulty in retaining the integrity of their research programs.[280]

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[278] Ibid.
[279] Ontario Centres of Excellence web site < www.oce-ontario.org/>
[280] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.

Next, Dr. Mustard and Dr. Patricia Baird, an associate from CIAR, were recruited onto the newly appointed National Advisory Board on Science and Technology (NABST).

In late 1987, delegates to the National Forum on Post-Secondary Education raised the idea of centres of excellence that would emphasize interdisciplinarity and involve networks of researchers across Canada. In 1988, the Science Council of Canada advised that prosperity depended on integrating the university and the marketplace. Reinforcing this central theme, in the same year the National Advisory Board on Science and Technology (NABST) recommended that greater emphasis be given to funding pre-competitive research and university-industry research consortia. This host of complex initiatives and recommendations helped provide a platform for the January 1988 launch of the NCE program.

In 1987, NABST recommended that the federal government create a CIAR-like national network in the fundamental sciences as a counter weight to Ontario's inventiveness. Technologies in fast-moving, competitive fields with good prospects for commercialization in the short run would be targeted. It was different from the final version of the NCE Program because direct links to industry were not proposed as part of the plan. The rationale was that effective strategic or applied research programs required a solid basic research base first.

It was evident that the federal government considered it necessary to balance the Ontario initiative, and the NABST recommendations were of great interest. "The idea of building 'virtual' CIAR-type networks, rather than 'fixed'

Ontario-type centres, was an attractive, lower-cost alternative to creating dozens of new centres around the country."[281]

Although interested in the network model, the Ministry of Industry Science and Technology was not at all convinced that concentrating on *excellence* in fundamental research was superior to *relevance* with respect to technology transfer to industry. The alternative chosen by IST was to develop a nationally based program that could bring together the government's concerns for commercial *relevance,* with the researchers' goal of scientific *excellence.* The approach taken was a hybrid of two influential models of distributed research networks. One was a governmental model associated with industry (i.e. IRAP), while the other would allow the federal government to gain access to universities and their researchers (i.e. the non-governmental model of CIAR). The result was the federal National Centres of Excellence initiative (NCE).[282]

The NCE would invest in researchers rather than bricks and mortar in universities and hospitals. [283] This provided the federal government with an institutional instrument to promote partnered integrated research, to override disciplinary barriers, and to circumvent the usual problems associated with science policy – i.e., the provincial jurisdiction over education and health, and the

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[281] Ibid., p. 74.

[282] Another outcome of the NCE was a sustained bureaucratic struggle to capture control of the NCE initiative. The battle between the ministry and the research councils was so fierce that J. W. Pullen quickly turned it into a case study for the Canadian Centres for Management Development – the federal civil service training institute Atkinson-Grosjean, J 2001, 'Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science', PhD Thesis, University of British Columbia, British Columbia, pp. 52.; Pullen, JW 1990, *Centres of Excellence*, Report prepared by the Canadian Centre for Management Development, Ottawa.

[283] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia, pp. 52. "Note that although NCE funds flowed to the networks through university financial systems, the university was only an intermediary. This remains the case in later iterations of the model, such as Genome Canada, where funds filter through a series of 'private' intermediaries before reaching the researcher. The university merely provides the final bank account in the series".

tradition of university autonomy, balanced against the federal obligation for geographic equity in matters related to building a national research capacity.

5.4 Changing Mandate and New Pressures – The MRC in the 1980's

During the 1980s, biotechnology emerged as a significant, horizontally-enabling technology. This new science discipline offered important potential benefits for health, but was also part of the next wave of technologically driven economic growth.[284] As noted in Chapters 1 and 2, and reiterated in Chapter 6 from the MRC's President Report, simply due to the applied nature of biomedical research, it has a tendency towards a more rapid assimilation of new knowledge due to the (often) empirically driven nature of scientific inquires. These inquiries often result in interdependent connections between researchers in the lab and the clinical application of research results. Under these conditions, biomedical research was pushed even more toward multi-disciplinary, multi-sectoral, and team-based research projects. However, the policy reasons for supporting these research activities and their connections were changing. These scientific and research pursuits were becoming important for economic reasons. Now these research realms situated with a key historical conditioner noted in Chapter 1, which generated federal interest in supporting research and generating science policy, that being, of course, economic relevance.

[284] Canada started investing in biotechnology research in the 1980s and developed its first biotechnology strategy in 1983, the National Biotechnology Strategy (NBS).

Throughout this period the Council considered itself fortunate. Since 1982, with the exception of 1986, its overall budget had enjoyed increases despite the cumulative cost of inflation. [285] However, the Council struggled with inconsistent funding, which raised havoc with planning and executing a strategy for the national biomedical and clinical research agenda. These circumstances came at the same time that its grants structure strained to adjust to rapidly emerging technologies, new ideas on how the scientific enterprise should be organized, and the more market oriented ideology of liberalism.

Due to the efforts of the last Liberal Minister of National Health and Welfare, the Honourable Monique Begin, in 1983 the MRC received a substantial increase in its budget. But it came with a warning. The Minister made it clear to the Council and to medical researchers that it would be necessary in the future to supplement government funding for medical research by finding ways to collaborate with the private sector.[286] The next Minister of Health was the Conservative Member of Parliament, the Honourable Jake Epp. With considerable effort, in 1985, he was able to reinstate $30.9 million of the MRC's base budget from $127.1 million back to $158 million. This allowed the Council to remain at the same funding level for research activity under its grants and contributions programs as in the previous fiscal year. He underscored the message of the Honourable Monique Begin but emphasized the importance of transferring new knowledge to industry by working in research partnerships.

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[285] Medical Research Council of Canada 1988, *The Medical Research Council of Canada 1987-88*, The Report of the President, Medical research Council Of Canada, Ottawa.
[286] The Medical Research Council of Canada 1983, *The Medical Research Council of Canada 1982-83*, The Report of the President, Medical research Council Of Canada, Ottawa.

Under the Conservatives, science and technology remained a high priority. These policies were driven by an urgent sense that the results of research would promote the Canadian economy and ensure its longer-term growth through commercialization. The Conservatives retained the well-publicized tax incentive programs implemented by the Liberals, and then went further. In February 1986 in the Budget Speech the Minister of Finance announced new elements of how and why the federal government supported research through the Granting Council's structure. A matching grants program was aggressively directed at promoting industry-university research alliances to promote the transfer of research outputs into the private sector. Under this policy, for the next five years the base budget of each Council was to remain at the 1985-86 levels without provisions for inflation. The government would increase the Granting Council's base but this amount would be equivalent to private sector contributions to industry-university research conducted in the previous year.

The MRC interpreted this new program as evidence of a significant shift in policy directions for biomedical and clinical research. It was not a particularly welcome imposition on its ability to set research priorities.

> A simple analysis of the new situation reveals a significant change in government policy vis-à-vis the Council. The Government is demonstrating a clear intention of playing an active role in selecting Council priorities in the programs for funding research. This is the first time that such a situation has occurred since MRC was created 27 years ago. It is obviously too early to determine the effects of this on the future of biomedical research in Canada.[287]

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[287] Medical Research Council of Canada 1987,*The Medical Research Council of Canada 1986-87*, The Report of the President, Medical research Council Of Canada, Ottawa, p. 7.

As intended, a result of the matching funds policy was that the granting Councils had to find ways to encourage and increase private sector contributions in university research. The stakes were high. If they failed, the research funding available to Canadian universities would shrink at a time when demands for resources were escalating.

Other factors emerged during the 1980's that had not been envisioned by the Council but that were also shifting it away from its expected and intended path. The growing financial constraints on many universities translated into reduced recruitment of new faculty. This meant that universities needed more external financing for promising young and even experienced investigators. Meanwhile the voluntary and provincial health research funding agencies were placing more emphasis on training personnel and salary support. This decreased contributions to research from sources other than the MRC. By 1984-85, funding pressures were increasing across all the MRC's grants programs.

On top of this, progressive change had been occurring in the type of research proposal funded by the MRC. MRC-supported researchers had been directly and indirectly involved in industrial research for years but usually this was for clinical trials. In such cases, trials were considered extensions of their original research programs. The Council felt no need to establish a university-industry program to support them.[288]

The situation changed dramatically by the early 1980s with the rapid advent of new technologies. There was an ever-increasing number of proposals submitted to Council for developmental research or research with the potential for

[288] Ibid.

commercial applications. Due to the accumulation of these circumstances, the MRC's peer-review committees found requests for research funding to be progressively more difficult to evaluate. An absence of clear policy statements from Council on how best to address the rapid changes in the science environment combined with an uncertain financial climate putting the peer-review committees in a tenuous position.[289]

Meanwhile as part of the government's thrust towards the commercialization of research, around the same time as the Matching Program for university-industry research was announced, the government also changed the Patent Act. Council, through its Standing Committee on Priorities and Planning, discussed these issues in depth and in 1986 approved a new grants program. In 1987 the MRC's University-Industry Program began. Special guidelines were published for this program just as researchers in universities began to seek industrial collaborations and industrial researchers were looking for partnerships with universities. In the spring of 1988, the MRC organized a special symposium where university biomedical researchers could exchange ideas with researchers in the pharmaceutical and chemical industries. Council also began publishing a special newsletter to inform academic and industrial researchers of the MRC's activities in funding University-Industry programs.

By the end of the decade, over two hundred MRC grantees were involved as principal investigators in university-industry research programs either through the MRC University-Industry Program or through their own arrangements with

[289] Ibid.

industry. The total research expenditure was approximately $23 million, half of which was provided by the private sector or industry.

Based on its initial pessimistic reaction to university-industry alliances, the MRC was astonished with the uptake of this program by the private sector. In fact, the MRC had to go back to the federal government in the first year for additional funding to support this program. It simply could not keep up with the volume of private sector funds that required matched funding from public sources. Augmenting this success in March 1989, Council approved a new salary support program for established investigators of university-industry collaboration in research.

In 1988-89 a number of agreements were made between the MRC and pharmaceutical companies. The MRC also made an agreement with the Pharmaceutical Manufacturers of Canada (PMAC) for the joint support of research trainees. While Council was encouraged with the success of this expansion, it expressed that its continued success was dependent upon the strength of the MRC-funded research base. According to the President's report of 1987-88, the Government had decided to increase the MRC budget by $61 million over the next five years, starting with $6 million in 1988-89. The Council expressed gratitude for the additional funds, which were "certainly timely" given the demands on the MRC's grants programs.

5.5 Conclusions

The focus of this chapter has been the evolution of the MRC during the 1980s. The debates on the social and economic purposes of science as the

forces of the KBE and globalization were emerging created pressure for new policy-driven outcomes in the knowledge-centred realms. These dialogues included innovative ideas on the structural best-fit arrangements of the research enterprise to better suit the technological revolution under way. This opened up opportunities to experiment with programs and organizational designs to accommodate the current and emerging conditions. These experiments were not to achieve mainstream status until the 1990s when they began to attract policy attention and resources. However, the success of these early experiments provided models that were considered worthy of emulation by science institutions trying to keep pace with rapid changes in policy, science and research.

In the next chapter we will consider the relentless pressures on the MRC throughout the 1990s at time when its funding was cut as part of the Liberal strategy to control national deficits and debt. The MRC's path would not only be pressured by the dynamic external events that continued to unfold in science and innovation policy and the research environment. Pressures for a new approach to national support for a broadened health sciences agenda were building within the Council itself. These internal pressures were generated by an activist institutional change agent and 'merchant scientist' Dr. Henry Friesen, the MRC's new President. Dr. Friesen arrived at the MRC at a time when it was in decline and in danger of becoming irrelevant. Dr. Friesen came armed with a model on which to base revisions to the MRC and a relentless drive to deliver some variation of the MRC into the new millennium as Canada's premier research institution for 'health sciences'. He also had the tools to forge a consensus to his

internal and external stakeholders through the practices and rituals of strategic management.

CHAPTER 6

THE 90s – A DECADE OF TRANSFORMATION

Introduction

In this chapter we examine the last decade of the MRC. During the 1990's a key challenge for the MRC was to respond systematically rather than reactively to new conditions emerging in medical and health sciences research. Given the expanding range of sciences directed at health, and the growing number of research partners in various sectors involved in this work, the MRC attempted to adjust its mandate, programs and approach. It was not entirely successful because of the tight fiscal climate of the 1990s. This raised concerns among the biomedical and clinical research communities that expanding the mandate of the MRC would simply dilute their research budgets. The result would be diminished funding and research opportunities. Meanwhile, outside the medical and health research communities, other questions were being asked by policy makers. Was the MRC really supporting the requirements of the new economy?

A key question to be addressed in this chapter is why these broad influences, which were effecting all knowledge centred realms, led to such dramatic results in the organization of medical sciences, when these same influences netted less striking results in other science based institutions. Empirical data suggests that the practices of strategic management in the hands of a 'merchant scientist', Dr. Henry Friesen, bore directly on the transformational

events that subsequently led to the emergence of the CIHR in June 2000. Having identified the transformational pressures on the MRC building throughout the 1980s and continuing into the 1990s, the objective of this chapter is to consider the event of transformation through a more theoretical construct. This allows us to develop a deeper understanding of the transformation of the MRC to the CIHR.

6.1 Ongoing Adjustments to the Granting Structure and Programs

By the 1990's the MRC's organization and granting structure had evolved considerably from the early 1960s, when it had a part-time President but a full time Secretary, to 1990 when it had a full-time President and a 53-member Secretariat. The Secretariat was comprised of the Office of the President, Programs, Science Evaluation, University-Industry Programs, Corporate Management, and Communications. Under the direction of the President, the Secretariat served the Council, Executive Committee, and all the Council's committees. The MRC was located in Ottawa and had a budget of $184 million.[290]

The stated objectives of the MRC were:

> With no laboratories of its own, MRC is responsible for supporting research and research training in health sciences in universities, and their affiliated hospitals and institutes. The MRC also has a further objective: to promote cooperation between industry, universities and health care institutions in order to enhance the development of knowledge and its

[290] Medical Research Council of Canada 1990, *The Medical Research Council of Canada 1989-90*, The Report of the President, Medical research Council Of Canada, Ottawa.

application. In addition, the Council administers the health-related grants awarded under the Network Centres of Excellence Program.[291]

In 1991 the MRC had a twenty-one member Governing Council. Members were drawn from the scientific and lay community. They served without remuneration and, like the President; appointments were made by the Governor-in-Council. The Council's membership also included three associated members who represented the other federal granting agencies and the (then) Department of National Health and Welfare.

The Executive Committee, composed of at least six other Council members besides the President and the Vice-President, carried out executive powers and functions under delegation from the Council. Standing Committees assisted in formulating policies and procedures for communications, ethics and experimentation, priorities and planning, and research and personnel funding.

In 1969/70 the MRC had fifteen Grants Programs Committees. In 1980/82 there were twenty-two committees with three that were not directed at biomedical research (i.e., program grants, maintenance costs and equipment). The classification structure in these years was based on disease, organ or technology.

Thirty-seven committees of scientists reviewed applications for research projects and awards, evaluating their scientific merit. Some 350 researchers provided part-time unpaid input into the activities of the standing and review committees and related undertakings such as on-site visits.[292]

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[291] Ibid.
[292] Ibid.

This Grants committee structure changed after the strategic planning exercise in the early 1990s. The new classification was based on scientific discipline abandoning the disease, organ or technology based designations. This reduced the number of overall committees to eleven. A key word search of the reclassification structure against the former structure reveals that the activities of these committees were generally the same between 1981-82 and eleven years later in 1992-93. The Committees were:

1. Behaviour and Neural Sciences
2. Cardiovascular Sciences
3. Pharmaceutical & Pharmacological Sciences
4. Endocrine & Metabolism
5. Molecular Genetics & Biochemistry
6. Immunology and Microbiology
7. Cell Biology, Growth & Differentiation
8. Pathology & Organ Physiology
9. Skeletal & Connective Tissues
10. Clinical Trials
11. Biomedical Engineering & Medical Physics

The MRC achieved its objectives by supporting investigators in medical, dental, nursing, pharmacy or veterinary schools and affiliated institutions. Its granting programs were varied and consisted of research grants for the direct costs of research. These programs included the Personnel Support Program, which provided direct support for research personnel or research trainees and Collaboration Research Programs. Other Grants such as Operating Grants were made available to support projects directed toward defined research objectives. Teams led by an investigator or several investigators conducted these projects. These grants could be active for six months or up to five years depending on circumstances.

Since the early 1970's Council had been using its grants and contributions structure in various ways to support individual and team based-research. Collaborative Research Programs were instituted in 1970's in response to the expressed need of providing support through a single grant application for teams of researchers with common interests in laboratories within the same institution or even in different geographic locations. The initial program response to accommodate team-based research came as a result of researchers at the University of Manitoba who were interested in a collaboration with a group of researchers at Queen's University in Kingston, Ontario. Neither team was large enough to apply for a Group Grant, but Council at the time was interested in exploring programs designed to combine research teams from different universities for this kind of association.[293]

Collaborative Research Programs included two major categories: Medical Research Council Groups[294] and Programs Grants. The main difference in these programs was size. The MRC Groups provided for larger teams and larger grants (up to $1.5 million a year) and include salaries, which Programs Grants did not. A Program Grant could be thought of as a small Group without salary support.

By 1990-91 the numbers and funding of grants for Collaborative Research Programs had grown considerably. Forty Program Grants totaling $11.8 million and thirteen Group Grants totaling $14 million were underway. However, this

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[293] Medical Research Council of Canada 1991, *The Medical Research Council of Canada 1990-91*, The Report of the President, Medical Research Council of Canada, Ottawa.
[294] Medical Research Council of Canada 1987, *The Medical Research Council of Canada 1986-87*, The Report of the President, Medical Research Council of Canada, Ottawa.

simply reflected overall growth in the MRC's total budget. Funds allocated to the MRC had increased from $50.8 million in 1976 to $215.5 million in 1990. Throughout this period, the fraction of the budget that Council contributed to team-based and partnered arrangements remained at roughly 15 percent of the base. This despite the fact that by the end of the 1980's, a central theme of government support for science was team and partnered research. This did nothing to quell the concerns in government circles that too much of MRC's funding was assigned to individual, investigator-driven research projects. This approach to research was considered an impediment to the more productive processes and outcomes of integrated multi-disciplinary research.

As part of their regular review process, Council conducted an evaluation of the Program Grants. The conclusion drawn was that this program had not developed as originally planned. According to the assessment, even where the reasons for collaboration remained, researchers preferred to work within their own grants. The determination presented to Council was that although much could be accomplished through e-mail and fax, in the end, when it came to making some research decisions, researchers needed to talk to each other face to face. The requirement for constant travel caused practical difficulties such as additional expenses, time taken from busy work and research schedules, and fatigue. As a result, Program Grants evolved. Despite difficulties in the formative years, the Program Grants remained flexible and were assessed to be a good overall tool for the promotion of interdisciplinary research approaches. Because of the growing popularity of these approaches, the Council felt the

Program Grant also provided an excellent opportunity to train graduate students in these types of research associations. However, for practical purposes in the day-to-day work in a research laboratory, administrative aspects were more workable with an association of teams rather than with a synthesis of teams.[295]

As well as efforts to support team-based research, the MRC itself entered into partnerships with other institutions. The National Health Research and Development Program (NHRDP) of the Department of National Health and Welfare offered a joint program designed to develop research in Schools of Nursing. Its University-Industry Programs created opportunities for collaboration between Canadian companies and researchers conducting research in Canadian universities or affiliated institutions.[296]

In 1992, a number of important new partnerships with industry and other private, government or non-profit organizations were introduced with the aim of increasing the number of grants and awards for training and other forms of salary support to scientists. The programs were:

> ***Merck-Frosst/University of Guelph/MRC*** programs were for training in molecular biology, biochemistry, cell biology, pharmacology or physiology in the Faculty of Biological Sciences at the University of Guelph.
>
> ***Pharmaceutical Manufacturers` Association of Canada-Health Research Foundation (PMAC-HRF)/MRC Graduate Research Scholarships in Pharmacy*** provided research training for graduate students in medicine and therapeutics.
> The Council also funded Special Projects outside the regular programs as deemed appropriate.

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295 Medical Research Council of Canada 1991, *The Medical Research Council of Canada 1990-91*, The Report of the President, Medical research Council Of Canada, Ottawa.
296 Medical Research Council of Canada 1990, *The Medical Research Council of Canada 1989-90*, The Report of the President, Medical research Council Of Canada, Ottawa.

The Canadian Hypertension Society/MRC Fellowships was designed for research training in the pathology, treatment and epidemiology of hypertension.

The Muscular Dystrophy Association of Canada/MRC Fellowship offered for basic and clinical research training related to disease of muscle, nerve and the neuromuscular junction.

The National Health Research and Development Program (NHRDP/MRC AIDS) research postdoctoral fellowships supported research training in AIDS and AIDS-related retroviruses.

The Eco-Research Program, jointly established by Environment Canada, the Natural Sciences and Engineering Research Council (NSERC), the MRC and the Social Sciences and Humanities Research Council (SSHRC) to provide for support for research grants, faculty chairs and fellowships. The basic aim was to strengthen Canadian research and training focusing on environmental issues with particular emphasis on developing greater understanding of critical interactions between humans and the environment, and how best to deal with these interactions.

6.2 Escalating Demands on Medical and Health Sciences

One of the striking features of advanced economies during the last three decades of the 20th century was the strong growth in demand outside universities for university research and graduates. This trend was considered as evidence of how advanced, industrial nations, including Canada, had transitioned toward the KBE. Under these conditions formal education, lifelong learning, and research are seen as central themes in economic and social progress.[297] Corresponding to this, a prominent focus of the Liberal government after their election victory in 1993 was the policy priority given to accelerating Canada's transition to the KBE through investments in research and experimental development.[298]

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[297] Davenport, P 2002, 'Universities and the knowledge economy', in D Laidler (ed.), *Renovating the ivory tower*, C.D. Howe Institute, Toronto, pp. 39-59.
[298] Liberal Party of Canada 1993, *'Creating Opportunity: The Liberal Plan for Canada'*, Red Book, Liberal Party of Canada.

The leadership of the MRC was encouraged by these broad policy signals. Initial progress toward realizing the 1993 commitments to R&D were stalled by the higher priority placed on achieving a balanced budget during the Liberal's first mandate. Fiscal restraint led to major expenditure cuts in the 1995 federal budget. Many of these cuts affected key programs in the MRC.

Balancing reduced funding and increasing demand for (and on) health sciences research continued to push the MRC toward partnered funding arrangements with the private sector and the very powerful health research charities. At the same time, the Liberal federal government continued with the policy of encouraging all three Granting Councils and the NRC to pursue jointly funded partnered science projects. An additional rationale for collaboration was the need for more effective alignment of the resources allocated to the national research agenda with the requirements of their research partners, notably with industry.

Despite the difficult and changing conditions of the 1980's and 1990's, the MRC retained an internationally respected reputation for research. Highlighting Canadian research excellence, the University of British Columbia's Dr. Michael Smith, a long-term recipient of MRC funding, won a Nobel Prize in 1993 for his contributions to the development of methods within DNA-based chemistry.

With the economy returning to a stronger fiscal position in 1997, R&D programs were reinstated, new spending was committed, and the first of several new science based institutions were created – e.g., the Canada Foundation for Innovation (CFI), Genome Canada, Canada Health Infoway, and the Canadian

Health Services Research Foundation (CHSRF).[299] The objectives of these institutions were to implement science policy in industrial, medical and health sciences and university research and development in order to support the development of research infrastructure, and university scholarships. These new structures were also responsible for administering the growing allocation of public funds allocated to these purposes. Funds were also increased for the Granting Councils, the National Research Council, the Networks of Centres of Excellence (NCE) and Technology Partnerships Canada (TPC). Funding to the Canadian Space Agency was stabilized.[300]

Despite what appeared to be positive conditions, by 1998, the MRC's official publications began to reflect a growing concern.[301] The issue was that exciting, continuously evolving conditions in the realms of biomedical and health sciences research had ostensibly rendered the bureaucratic arrangements and siloed sciences of the MRC obsolete.

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299 There were others but these particular group was set up as independent foundations. Department of Finance 2005, *Accountability of foundations, Backgrounder*, Department of Finance, Canada, <www.fin.gc.ca/toce/2005/accfound-e.html>.
For a thorough discussion of several issues, particularly accountably issues in respect to Parliament of these institutions and institutes see Aucoin, P 2005, '*Accountability and coordination with independent foundations: a Canadian case of autonomization of the state*,' paper presented to the International Political Science Association, Stanford, Stanford, 1-2 April.

300 Wolfe, D 2002, 'Innovation policy for the knowledge-based economy: from the red book to the white paper,' in B Doern (ed.), How Ottawa Spends 2002-2003: The Security Aftermath and National Priorities, Oxford University Press, pp. 137-50.

301 Medical Research Council of Canada 2000b, Where health research meets the future, the final report of the Interim Governing Council of the Canadian Institutes of Health Research, Medical Research Council of Canada, Ottawa. Also see Canadian Institutes of Health Research 2000a, The Interim Governing Councils Working Papers Series – Proposed Institute Creation for the CIHR; Health Research Institutes; Clinical Research within the CIHR; The Ethics Mandate of the CIHR; Implementing a Transformative Vision; Partnership and Commercialization; Peer Review in the CIHR, Ottawa.

6.3 *Factors Influencing the MRC-CIHR Transformation*

In various ways the MRC-CIHR transition was a response to the changing nature and source of demands placed on the national health research agenda as the techno-economic shift diffused throughout society and the economy. These conditions powerfully embedded new meanings, purposes and values into Canada's publicly funded national science programs and into the institutions tasked to implement these policies. In the case of medical and health services research, it was expected that investments in research and experimental development would both maintain and improve the performance and sustainability of Canada's national public health and personal health services systems. This would be achieved through the creation and adoption of product and process innovations, which could also contribute to economic prosperity when, if deemed appropriate, these discoveries were commercialized.

Beyond adjustments to the public and private purposes of these sciences, other sources of change were driving the perception that the MRC's hierarchical structure was an outmoded impediment to advancing this growing area of investigation. Health sciences are a rapidly expanding continuum of a nebulous group of diverse sciences generally directed at health and health issues. They include the traditional bio-medical sciences that have been significantly impacted by advances in biotechnology, and the newer sciences of health systems and services, in both the public and personal health services domains. They are also established social sciences and humanities that recently have become directed

at broader ethical, social, political and legal complexities of health, health practice and outcomes, and health policies.

New sciences such as genetics and biotechnology have been revolutionizing our understanding of the biomedical and genetic determinants of health. These horizontal enabling sciences and technologies are also leading to breakthroughs in nanoscience and nanoengineering that open up new possibilities in, among other areas, regenerative and nano medicine. Downstream of these scientific pursuits is the health regulator who will be dealing with the approval of products and process based on technologies that barely existed 15 years ago.[302]

At the same time, a deeper appreciation of how social, cultural, economic and environmental conditions affect health has fundamentally changed our understanding of wellness. Health is no longer considered to be the absence of disease. Much more emphasis is being placed on the prevention of disease and injury rather than simply focusing on the cure. Health is being defined ever more broadly. Health and well-being include social and psychological factors that can affect individuals and groups. This relatively new understanding of health comes from research on the social, cultural, economic and environmental conditions that effect health and can make certain populations vulnerable. As the continuum of health related sciences expands, so too do the possibilities to use these sciences to pursue broader health, social and economic purposes.

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[302]Murphy, J 2006, Multi-Level Regulatory Governance in the Health Sector, in B Doern & R Johnston (eds), *Rules, Rules, Rules, Rules: Multilevel Regulatory Governance,* University of Toronto Press, Toronto, pp. 305-324.

On another level of analysis, the MRC was dealing with the emergence of what is referred to as the Health Research Enterprise (HRE). The HRE is understood as complex, interrelated and interdependent arrangements used to conduct and fund medical and health sciences. The linkages and extensions of the HRE cut across scientific boundaries, political jurisdictions, and organizational mandates within the public, not-for-profit and private sectors. Although medical sciences have typically taken place in decentralized interdisciplinary arrangements, as discussed in Chapter 5, the demand to `structurally engineer` the science enterprise escalated with new models of how to generate and translate knowledge – particularly into commercializable products and processes.

The funders and performers of research within the Health Research Enterprise (HRE) were also rapidly growing. These are the science departments and agencies of the federal and provincial governments, universities, numerous private institutes and private foundations, the powerful Canadian health research charities such as the Canadian Cancer Society and Heart and Stroke Foundation of Canada (whose activities are largely supported by private donations), the national and international influential research projects of the American National Institutes of Health (NIH) and the Howard Hughes Medical Institute (HHMI) (to name a few American examples). There are also the multinational public and private research consortia of the genome, and the many clinical research projects of the pharmaceutical, bio-pharmaceutical, bio-diagnostic, and medical devices sectors. Supporting these projects is an amalgamation of researchers, research

partnerships and venture capitalists. Eventually these research and experimental development projects become clinical trials conducted in association with universities and teaching hospitals, and in accordance with the regulatory approval requirements.

6.4 Merchant Scientist

Although the pressures mounting on and for biomedical and health science research had clearly been there for some time, many of these pressures were generalizable, to lesser degrees, across the science and research communities. All scientific endeavors were under pressure to adjust to the new models of science and knowledge production and policy pressures to link this work more closely to enhancing the competitiveness of the economy. Amongst its peers, NSERC and SSHRCC, the response of the MRC was unique. Its adjustment to these pressures by transforming into the CIHR was a change initiative on a massive and untested scale.[303] This raises the question, why was it that the same pressures and demands on science generally lead to such dramatic changes in biomedical and health sciences research. A way to appreciate this is to understand the leadership of the MRC at the time.

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[303] To get a sense of the scale and magnitude of the CIHR transformation in comparison to its peer Councils see: Doern, GB 2008, 'The Granting Councils and the research granting process: core values in federal government-university interactions', in GB Doern & C Stoney (eds.), *Research and Innovation Policy: Changing Federal Government-University Relations* (Manuscript being peer reviewed at University of Toronto Press) chapter 4; Murphy, J 2007, 'Transforming health sciences research: from the Medical Research Council to the Canadian Institutes of Health Research', in GB Doern, (ed.) *Innovation, Science, Environment: Canadian Policies and Performance 2007-2008*, McGill-Queen's University Press, Montreal & Kingston, ch. 12.; LaPointe, R 2006, 'The Social Sciences and Humanities Research Council: from a granting council to a knowledge council', in GB Doern, (ed.) *Innovation, Science, Environment 2006-2007: Canadian Policies and Performance*, McGill- Queen's University Press, Montreal & Kingston, pp-127-148; Lopreite, D 2006, 'The Natural Sciences and Engineering Research Council as a granting and competitiveness-innovation body', in GB Doern (ed.), *Innovation, science, environment 2006-2007: Canadian policies and performance*, McGill-Queen's University Press, Montreal & Kingston, pp. 105-126.

As Chapter 2 has shown, various sociological studies have proposed heuristics to describe the phenomenon of a small but distinguishable group of scientists who readily straddle the worlds of academia and commercial enterprise. With sophistication and entrepreneurial flair these scientists actively concern themselves with "all stages of the pipe" - contract research, clinical trials, raising venture capital for spin-off companies, scaling up, and product promotion.[304]

In studies on the pioneering molecular biologists who established the biotechnology industry in the United States, Lynne Zucker and Michael Darby identified an elite group 'star scientists.'[305] This is a cadre of scientists who excel in both the profit-making sector and the academic. They are 'extraordinarily creative, innovative, and productive individuals' with the 'vision and genius [to] consciously change the boundaries of what is possible.'[306]

In the higher education literature, Sheila Slaughter and Larry Leslie use the term 'academic capitalists' to describe the same phenomena amongst researchers. In their research, academic capitalists saw no conflict in having the state subsidize their commercial interests.[307] Since these scientists ``define market values as contributing to the advancement of science and the public

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[304]Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia, pp. 169.
[305] Zucker, LG & Darby M R 1997, 'Individual action and the demand for institutions', American Behavioral Scientist, vol. 40, no. 4, pp. 502-14.
[306] Ibid., p. 503.
[307] Slaughter, S & Leslie, LL 1997, *Academic capitalism: politics, policies, and the entrepreneurial university*, Johns Hopkins University Press, Baltimore.

interest``, financing their research from the public purse posed no conflicting issues.[308]

Like a star scientist or academic capitalist, the 'merchant' scientist referred to in Janet Atkinson Grosjean`s research represents an elite performer. The credibility of the merchant scientist is grounded in peer recognition. They are intellectually at the top of their league with exceptional records of publication, promotion, grants and awards. In her doctoral thesis, Atkinson-Grosjean proposed that their 'reputational capital' confers a 'halo effect' on their non-scientific activities as well.[309]

A common theme throughout all of these studies is that the majority of academic researchers choose not to engage in commercial enterprises. Rather they pay, "lip service to current policy...just enough to meet the strategic requirements of their grants."[310]

For them, the potential cost to academic freedom when engaging in science for economic or social purposes is simply too high. The non-merchant scientists are established in free intellectual inquiry and the open exchange of knowledge.[311]

As a group, non-merchant scientists are concerned about changes in their academic havens. In their view, the quest for profit is tedious and distracts from

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[308] Ibid., p. 179.
[309] Atkinson-Grosjean, J 2001, *'Adventures in the nature of trade: the quest for 'relevance' and 'excellence'* in Canadian science', PhD Thesis, University of British Columbia, British Columbia, pp. 170.
[310] This has been referred by Rip as 'reluctant accommodation.' Rip, A 2000, 'Fashions, lock-ins, and the heterogeneity of knowledge production', in M Jacob & T Hellstrom (eds), *The future of knowledge production in the academy*, Open University Press, Buckingham, pp 28-39.
[311] Atkinson-Grosjean, J 2001, '*Adventures in the nature of trade: the quest for 'relevance' and 'excellence' in Canadian science*', PhD Thesis, University of British Columbia, British Columbia.

the pursuit for fundamental knowledge. Non-merchant scientists value their intellectual freedom and see that it flows from their privileges as university researchers. While merchant scientists embrace new expectations of commercial and social relevance, settlers fear erosion of unfettered exploration.[312]

The heuristics of star scientists, academic capitalists or merchant scientists establish a recognizable group in the science literature that act as institutional change agents. This minority group of elite scientists embed new ideas about why science is undertaken and new rationales in how science is organized to achieve the intended results. Of considerable assistance to them in their missions are the relatively new institutional scripts and rituals of management practices. These practices are invoked as the often-used, and thus legitimized, processes and paths through which institutions can be moved in intended new directions. As institutions shift, along with them come their communities of practices. In the next section we will look at how strategic management provides merchants with a powerful tool kit for defining options in the reframing processes of institutions and policy.

6.5 Strategic Management as a Lever for Reframing

Empirical evidence suggests that the practices of strategic management bear on the transitional events that subsequently led to the emergence of the CIHR in June 2000. After guiding the Council during the turmoil decade of the 80's, Dr. Pierre Bois retired in 1990. He was replaced by the charismatic Dr.

[312] Ibid.

Friesen who is an elite performer by any standard. Henry G. Friesen, CC, OM, MD, FRSC is a Canadian endocrinologist and a distinguished professor emeritus of the University of Manitoba. He discovered prolactin, a hormone that stimulates lactation. In addition, his research on prolactin helped to develop the drug bromocriptine, used for the treatment of infertility, and his research on growth hormones in dwarf children helped in developing a therapy for the treatment of dwarfism.

Besides his research accomplishments, he was the President of the Medical Research Council from 1991 until 1999, the period of its transformation into the Canadian Institutes of Health Research. Dr. Friesen has also been the President of the National Cancer Institute of Canada and President of the Canadian Society for Clinical Investigation. More recently he became the founding chair of Genome Canada.

Documentation from the MRC indicates that in the early 1990's, under the direction of the then new President, Dr. Henry Friesen, the concepts, techniques and language of strategic management were enthusiastically introduced into Canada's former premier health sciences research institute.[313] A strategic planning process began in 1991 involving consultations and workshops with more than 4000 members of the health research community. Subsequent to consultations, a strategic plan was drafted in 1993 – "Investing in Canada's Health". The main strategic themes from the plan were:

[313] Medical Research Council of Canada 2000a, *A legacy of excellence: 1960 – 2000: 40 years*, Medical Research Council of Canada, Ottawa.

- First, funding support would be extended to include the full range of health research, including psycho-social factors related to health, population health, health services and health care delivery.

In effect, MRC set out to become a broad health research council much like that envisioned by the Hall Commission.

- Second, alliances and partnerships with a variety of organizations, including the private sector, would become a key strategy for attracting urgently needed new resources to support research across the country.[314]

Although the 1993 strategic themes divined from the initial 1991 consultations have a close resemblance to the mandate given to the CIHR through an Act of Parliament in 2000, a protracted time-line exists between these two events. Further evidence is required to connect the demise of the MRC to the use of strategic management, particularly given that this approach was applied to a public sector organization – a domain that was by no means the natural habitat of strategic management in 1991.[315]

Within the documented record the evidence continues in that, having identified strategic themes through broad consultation, Dr. Friesen rigorously and relentlessly pursued their implementation during his mandate. Consistent with Healey's observations that, "strategy does not just lie in the text of some plans. It lives in the minds of actors in policy communities"[316] secondary research indicates that many health researchers, politicians and senior public sector officials believe that Dr. Friesen's leadership and his "strategic approach"

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[314] Ibid., p. 16.
[315] Ring, PS & Perry, J 1985, 'Strategic management in public and private organizations: implications of distinctive contexts and constraints', *Academy of Management Review*, vol. 10, no 2, pp. 276 - 286.
[316] Healey, P 1997, '*Developing a strategic framework: from rhetoric to reality*', Urban Regeneration and Strategic Plans Seminar, LEPU, South Bank University, London, pp. 4.

contributed to a transformation in government support for publicly funded health research.[317]

6.5.1 The MRC's Strategic Responses, Choices and Constraints

An important question to address is, "Is it possible to identify the choices and constraints on decision-making in the MRC arising from the use of strategic management practices?" and "Is it possible to reconstruct the cause or drivers that invoked the MRC's strategic responses?" On the surface of the issue there are the articulated crisis narratives of at least one of the MRC's strategic themes: the necessity to access "urgently needed" resources for an expanding health research agenda during a time of fiscal constraint. In a kind of pre-scripted or deterministic fashion, these drivers led to the decision to further pursue partnerships and alliances to expand the resource base available to health researches and to support the MRC's broadening health research agenda.

Additional benefits from alliances and partnerships between the MRC and the private sector were identified as health benefits derived from the discovery of new health products and processes, which could be rapidly translated through the commercialization of innovations.[318] Although the economic rationales situate closely to the economics of innovation, other articulated benefits of alliances are aligned to the text book rationales for strategic management – i.e., coordination of not-for-profit and public sector organizations to address fragmentation of various administrative structures (Hutchinson, 2001). This particular logic of coordination is found in the discourse supporting the MRC's

[317] Initial interviews for my Dissertation research.
[318] Medical Research Council of Canada 2000a, *A legacy of excellence: 1960 – 2000: 40 years*, Medical Research Council of Canada, Ottawa.

strategic plans.[319] This short list of strategic drivers, and the choices and constraints, situate remarkably well with seamless, classic lines of rationality. However, there are other paths of analysis.

The first path stays on the surface of the issue. Here, empirical evidence supports that the stated strategic drivers invoked a strategic response – need for resources, coordination of the research agenda, and the like. The analysis would then move on to discuss decision-making choices and constraints to best address these needs. An assessment of the problems and opportunities presented would be based on an evaluation of the institutions external and internal environment. Here we would find that the tight-fisted fiscal policies of the government were straining the MRC's ability to manage its mandate, at a time of growing demand for health and life science research projects and funds, and international competition for Canadian health researchers. The environmental scan would then logically lead the leadership of the MRC to conclude that other sources of revenue were necessary. Thus, partnered funding arrangements were pursued to access funds no longer available through traditional government sources.

From this perspective, strategic management is seen as an objective process in which, "rigorous analysis of industry conditions and company capabilities (Porter 1980, 1985) leads to evaluation of options, decision making, implementation, followed by monitoring and control." (Levy, Alvesson, Willmott 2003, p. 5). They continue, "Scholars firmly established within the strategy field

[319] Ibid., p 39.

have also critiqued this rational, logical approach, though for somewhat different reasons".

These alternative path(s) of the analysis of strategy move away from the instrumental emphasis on technique and the logical, linear process of analysis, planning and implementation as first studied by Ansoff (1965); Andrews (1971); and Chandler (1962). The more revealing considerations of strategy look to the nature of strategic management itself. Not surprisingly, here we find controversies in the literature.

Stepping back from the "transparency" of the MRC's strategic themes, can we say without doubt, or even with a degree of probability, that the stated strategic drivers are what invoked the strategic response towards transformation? We argue that determining the strategic drivers, as well as the opportunities and constraints, depends on the approach to analysis. Staying on the surface of the issue leads in one direction – which is to accept the statements from the MRC's leadership at face value. At a deeper level of analysis, the underlying assumptions of strategic management become the more significant object of analysis. Here we are led to different conclusions about what motivates strategy.

Clearly, central to a critical analysis of strategy, within the context of the MRC/CIHR institutional transition or of any other strategic event, one must ask again, "What is strategy – and does it matter?"[320] and importantly, "How does strategy matter?" Whittington (2001) makes the point that theories of strategy are important because they contain the basic assumptions about key relationships that guide actions and behaviour. In his view, it is important to actively confront

[320] Whittington, R 2001, *What is strategy – and does it matter?,* 2nd edn, Thompson, London.

the underlying assumptions of theories lest we become prisoners to a theory without even being aware of it. From his perspective, the search for strategic drivers shifts away from the empirical evidence of the event, toward a more thorough consideration of the theoretical context and underlying assumptions that 'frame' the event.

6.5.2 Embedding New Ideational Constructs into MRC's Institutional Context

Based on a theoretical reconstruction of strategic intentions and boundaries, the choices available to the MRC's leadership were not simply constrained by the tight fisted 'value for money' ideas of the 1980's and 90's. As observed by Brunsson, organizational strategic choices are always bound by the need to generate `legitimacy` in order to survive.[321] In this way, in order for the MRC to be perceived as institutionally legitimate, their strategic options were constrained by the need to conform to the emerging ideas guiding science policies and the structural arrangements of the research enterprise.

Although constrained by emerging ideas on the purpose and organization of publicly funded research, strategy also provided the MRC's leadership with a powerful tool to promote the adoption of these ideas into the communities of medical and health sciences practice by shaping the "face of the issue"[322] through setting the agenda of the strategic planning exercise. In this way the "merchant scientist", Dr. Friesen, was able to direct the choices presented to the MRC's communities of practice and interest through the scripts, language, and techniques of strategic management.

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[321] Brunsson, N 1989, *The organization of hypocrisy*, Wiley, London, pp. 4.
[322] Allison, GT 1971, *Essence of decision: explaining the Cuban missile crisis*, Little Brown, Boston.

The practices and scripts of strategic management allowed the leadership of the MRC to forge a path that legitimized a new science agenda to both its internal and external audiences. Implementing the strategic plan shifted the institution strongly in the direction of state policy priorities around innovation-commercialization, which as a merchant scientist, Dr. Friesen was comfortable in supporting.

From the perspective of organizational sociology as discussed in Chapter 3, strategy can be understood as routine institutional script due to the proliferation of public management practices. The application of strategic management during the 1990s assisted the leadership of the MRC to recast largely existing institutional modes into the discourse of innovation. The same institutional scripts or "rituals" were used to reframe and legitimize biomedical and health sciences and to loosely organize diverse interests within these research communities around ill-defined but deterministic notions of innovation and preparedness for the new economy. The rationale, delivered through crisis narratives, was that adopting the principles of innovation would open up new opportunities to the research communities that embraced them – those that did not, would be left behind.

Langley and Oakes have studied the various roles of strategizing in the Canadian voluntary and public sector. Their conclusion is that no matter how inefficient the protracted debates around strategy formation can be, they serve to release tension, strengthen camaraderie and build consensus. In this way, the processes of strategy afforded Dr. Friesen with a way to build comfort within the

medical and health research communities with a new language (e.g., innovation, commercialization, efficiency, effectiveness, scientific excellence and relevance, and the like). The introduction of these concepts develops subtle control effects that internalize these objectives in a way that would be hard to impose directly (Langley 1988, 1991; & Oakes, Townley & Cooper 1998). This approach also was a tool to loosely organize the expanding communities of medical and health research practice around new strategic options.

In an extraordinary and at least partially symbolic demonstration of a strategically brokered conformity to the rules of the new economy, the MRC was replaced with new institutional construction - the CIHR. To seal the new economic and social expectations for medical and health sciences research, the state has generously provided funds for this research agenda. By 2010 the CIHR alone will have close to one billion dollars in funding, in addition to the funding available through other sources such as the Canadian Foundation for Innovation for equipment and facilities.

6.6 The Demise of the MRC and the Transformation into the CIHR

After the Liberals announced the budget for the Research Granting Councils in 1998, Dr. Henry Friesen actively sought to convene a special Task Force to develop a new model for biomedical and health research. Dr. Friesen's concern was that the old funding model for the Research Granting Councils was still in place despite significantly higher dollar values going to support the national research agenda and its programs. His observation was that the percentages of

allocations to the Granting Council remained the same year after year. These percentages were based on the MRC receiving 53% of the NRC's budget and SSHRC receiving 50% of the MRC's funding allocations. With the expanded mandate for biomedical and health research Dr. Friesen strongly believed that this arrangement was unsustainable in the medium and longer terms. His idea was that the only way to change this situation was to develop a new model for biomedical and health research which would attract additional resources.[323]

The MRC-CIHR transformation was an institutional resettlement that was brokered through strategic planning. It was also somewhat symbolic in that the biomedical and health sciences were already operating through decentralized science and research arrangements. Where public funds were allocated to these pursuits they generally were conducted in universities, their teaching hospitals, and foundations. Setting up a Task Force to develop a new model for these scientific endeavours was also a response to address the new conditions and demands on these sciences in order to retain a legitimate institutional solution for publicly funded support for medical and health sciences research.

In 1998, a Task Force under the guidance of the MRC put forward to the federal government a radical concept model for organizing and funding Canadian biomedical and health research. The proposed structural arrangements for the CIHR were cast as a unique "made in Canada" solution and approach. The Task Force argued that the use of virtual institutes would move biomedical and health sciences research beyond the organizational limits of a traditional granting council. In the 1999 federal Budget, the Government of Canada announced the

[323] Interview with Dr. Henry Friesen August 23.

intent to create the CIHR and begin to significantly increase funding for health research.[324]

After the 1999 Budget, an Interim Governing Council (IGC), made up of 34 researchers and experts, was tasked to consider how best to create key elements of the CIHR as a modern revolutionary institution for biomedical and health research in Canada. The IGC created several sub-committees to consider specific issues related to legislation for establishing the CIHR, Institutes Design, Institute Creation as well as Knowledge Management, Ethics, Peer Review, Partnerships and Commercialization. The work of the IGC and its sub-committees resulted in an operational framework that laid out the CIHR's structural and functional instruments. Some of the elements of this framework are stated in the CIHR Act. Others are set out in the IGC working papers that were submitted to the Ministers in June of 2000. What follows in the next chapter is a summary of the vision of the CIHR as set out in the IGC working papers which largely reflects how the CIHR is structured and how it operates today. We also discuss post-transition issues.

6.7 Conclusions

In this chapter we examined the last decade of transformation of the MRC to the CIHR. During the 1990s, a key challenge for the MRC was to respond systematically to new conditions emerging in medical and health sciences research. The MRC was increasingly concerned about the challenges of fiscal

[324] Medical Research Council of Canada 2000b, *Where health research meets the future, the final report of the Interim Governing Council of the Canadian Institutes of Health Research*, Medical Research Council of Canada, Ottawa.

constraints, and about concerns within the biomedical and clinical research communities that expanding the mandate of the MRC would dilute their research budgets. Meanwhile, outside the medical and health research communities, other questions were being asked by policy makers. Was the MRC really supporting the requirements of the national biomedical and clinical research program under the new ideas of the KBE? Once Dr. Friesen realized that significant funding increases were directed to institutions and programs that had adopted newer approaches to manage and support research, a drastic plan was devised – the conceptual model of the CIHR. No doubt the MRC considered this model based on the plethora of institutional experiments that were now underway and by the end of the decade demonstrating success – at least in accessing funding.

A key question addressed in this chapter was why these broad influences led to such dramatic results in the organization of medical sciences, when these same influences netted less striking results in other established science based institutions and programs. The argument presented in this chapter is that Dr. Friesen's 'merchant scientist' style and his adoption of the practices of strategic management bore directly on the transitional events that subsequently lead to the emergence of the CIHR in June 2000.

In the next chapter we look at the results of the MRC-CIHR transformation. This chapter is not an evaluation of the CIHR but rather considers some of the challenges that have been faced by this 'new' institution in the first several years post transformation.

CHAPTER 7

Scaling Up – Post Transformation 2000 - 2007

Introduction

In the last chapter we examined the transformation of the MRC into the CIHR. Specifically, we looked at the role of Dr. Henry Friesen as a merchant scientist and change agent who drove and managed the events of transformation leading to new institutional directions and outcomes. We also discussed how the tools and practices of strategic management facilitated the reframing process.

In section 7.1 of this chapter we look at the details of the change initiative through the organization of the CIHR. In section 7.2 we discuss how well the CIHR fits with the model of networked science. In section 7.3 we consider the transformation of the CIHR through a review of recent literature on the kinds of challenges faced by the CIHR and other science institutions under the new rules of publicly supported science and research. These challenges include the complexity of evaluating multidisciplinary research.

In section 7.3 we look at some of the post-2000 transformation challenges faced by the CIHR. This starts with an assessment by the Auditor General of the CIHR's grants programs. In section 7.3.2, we conduct a brief literature review on the complexity of assessing the impact of science and research outputs. Next in section 7.3.3 we look at the complexity of integrating the continuum of health

sciences, which again, was a key reason for the transformation of the MRC to the CIHR. This is followed by conclusions.

7.1 The CIHR

As with the MRC, the CIHR reports to Parliament through the Minister of Health but the CIHR Act formalized different institutional objectives for the CIHR from those of the MRC. The MRC's mandate focused primarily on promoting, assisting and undertaking basic, applied, and clinical research in Canada and acting as an advisor on health research to the National Minister of Health.[325] However, the CIHR has a much broader mandate. The objective of the CIHR is to promote the dissemination of knowledge and the application of health research, to forge an integrated health research agenda across disciplines, sectors and regions, and importantly, to facilitate economic development through health research through the commercialization of health research.

Specifically the CIHR Act tasks the CIHR:

> To excel, according to internationally accepted standards of scientific excellence, in the creation of new knowledge and its translation into improved health for Canadians, more effective health services and products and a strengthened Canadian health care system.[326]

By executing its mandate, the CIHR is expected to support the transformation throughout Canada's health system and industries. This is the

[325] Medical Research Council of Canada 1991, *The Medical Research Council of Canada 1990-91*, The Report of the President, Medical research Council Of Canada, Ottawa.
[326] Canadian Institutes of Health Research Act, 2000.

largest knowledge-based enterprise in Canada with over $120 billion in total expenditures each year.[327]

The CIHR supports the work of approximately 10,000 researchers and trainees in universities, teaching hospitals, and research institutes across Canada. This figure has almost doubled since 2000 when it supported 5,500 researchers and trainees. Its responsibilities include developing high-quality people, promoting scientific excellence science, and training the next generation of health researchers. The focus of the research conducted under the CIHR's programs is to:

- Improve Canadians' health, health care system and quality of life; and
- Foster commercialization, moving research discoveries from an academic setting to the marketplace.[328]

To assist in making the MRC-CIHR transformation happen, considerably more funding has been allocated to the CIHR. In its last year of operation the MRC's budget was $250 million. The target set in 2000 for the CIHR's annual budget was that by the year 2010 the CIHR would be directing one billion $ annually to support its researchers and research programs.[329] It has been rapidly reaching this figure having had over $850 million allocated to its programs in 2006/2007.[330]

The CIHR's research funding is divided into two pools: strategic initiatives (30%) and investigator-driven (70%). Investigator-driven research comes from

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[327] Canadian Institutes of Health Research 2004-05, Planning and Priorities
[328] Canadian Institutes of Health Research website: <www.cihr-irsc.gc.ca/>
[329] Canadian Institutes of Health Research 2005a, presented at the Standing Committee on Finance pre-budget hearings by Dr. Allan Bernstein, Canadian Institutes Of Health Research, Ottawa. <http://www.cihr-irsc.gc.ca/e/29565.html.>
[330] Canadian Institutes of Health Research 2006-07, Annual Report.

university-based researchers, and the funding support available includes operating grants, salary awards, training awards, and equipment grants.

Working under the overall strategic direction of the CIHR, the thirteen virtual Health Research Institutes and their Advisory Boards are anticipated to be key elements in making the CIHR one of the most innovative medical and health research institutions in the world. The Institutes provide a focal point for research conducted in their various thematic areas of health research. They are intended to shape a multi-disciplinary, integrated national health research agenda that pertains to all aspects of health, including medical and clinical research, research respecting health systems, health services and the health of populations, and research into the societal, cultural and environmental dimensions of health. The CIHR and its Institutes are involved in research partnerships across the public, private, and voluntary sectors and within these sectors, with health practitioners, policy makers and consumers. It was argued that this approach to scientific inquiry would allow the CIHR to accelerate discovery, broaden our understanding of health, create new knowledge, and through partnerships and networks, go beyond the organizational limits of a traditional granting council.

The CIHR has a full-time President and Governing Council of unpaid members who exercise overall governance. The *President* has a very powerful position. He is the Chief Executive Officer as well as the Chair of the Governing Council. [331] He is aided in the day-to-day leadership and management of the CIHR by a Secretariat. The *Secretariat* provides corporate services, such as

[331] Canadian Institutes of Health Research website: <www.cihr-irsc.gc.ca/>

human resources, finance, and information technology to the Governing Council and its Institutes. The Secretariat also manages and operates the peer review process. The CIHR has 13 virtual Institutes managed by Scientific Directors and the Advisory Board.

As with the CIHR Governing Council, the Advisory Boards draw on membership from across the health research community, including lay members. This representation brings about opportunities for diverse input into the CIHR and the Institutes' strategic planning process, which is open to the views of researchers, institutes, government and interested citizens.

7.1.1 THE GOVERNING COUNCIL

Upon the recommendations of the President, the Governing Council has the responsibility to establish the suite of programs that are available to the Institutes. The Governing Council's sub-committee structure focuses attention on corporate and strategic concerns such as governance, programs, strategic initiative development and evaluation, peer review, ethics, audit and evaluation. This structure includes an Executive Committee and a committee to monitor the incorporation of the four crosscutting themes including bio-medical, clinical, health systems and services, and population health, as mandated by the CIHR Act.

The Governing Council approves the establishment of the peer review process used to determine funding for research under the CIHR. It also approves funding for research, the use of CIHR corporate instruments and structures (e.g., offices and committees), and approves the Strategic Initiative

Fund, which supports special activities designed to fill gaps that ordinary research funding and other programs cannot.

The Governing Council sets the strategic directions, goals, and policies for the CIHR. It oversees and evaluates each Institute from their creation to the articulation of their mandate as well as their budgets and plans. It appoints and establishes policies with respect to Scientific Directors and the Advisory Boards and their Chairs.

7.1.2 THE PRESIDENT

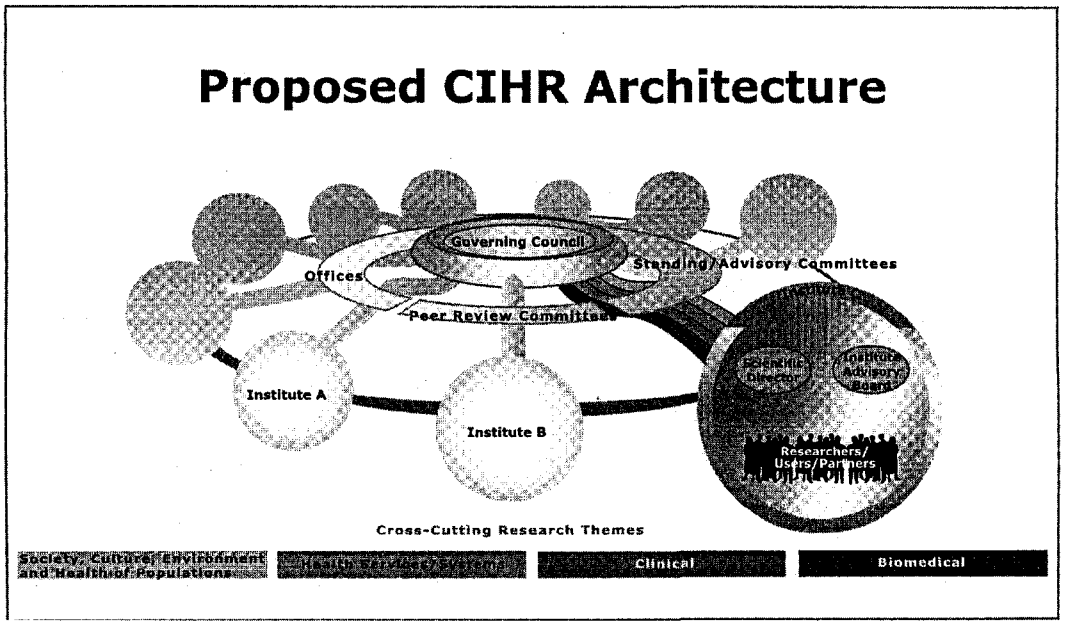
The President is responsible for day-to-day leadership of the CIHR, articulating its vision and strategies, and coordinating activities to build a consensus among researchers and other stakeholders. The President establishes the CIHR's management structure and implements the programs and policies approved by the Governing Council. In addition, the President can create dedicated staff functions to promote crosscutting research policies and activities, including monitoring the incorporation of key crosscutting themes in CIHR's work. This can involve establishing an Office to incubate underdeveloped and emerging areas of research or to address areas of immediate strategic concern that are so essential to all aspects of health research that they are fully embedded in all of the CIHR's Institutes.

The President provides an essential coordination role by building cooperation and consistency with the strategic orientation of CIHR and its Institutes, their Scientific Directors and Advisory Boards, and with other funders and performers of research.

7.1.3 THE INSTITUTES

Institutes were proposed as the core mechanism to achieve the CIHR's objectives. In fact, the creation of Institutes and their cross-thematic research agendas are the unique "made in Canada" solutions to move the CIHR beyond the organizational limits of a traditional granting council. The expectation expressed by the Interim Governing Council, given the projected budgets of the CIHR, was that each Institute, when fully developed, would support a research program in the order of $20 to $80 million per year, and would fund between 200 and 500 researchers. It should be noted that in the original plans for the CIHR, the Institutes were to have a greater responsibility for peer review in their areas of responsibility, but this has not been the case in practice.

Figure 5



Source: Working Paper Health Research Institutes within the Canadian Institutes of Health Research November 22, 1999 p. 7

The eventual composition of the Institutes is as follows:

Table 4

CIHR and the Virtual Institutes
Supported by a Corporate Organization Based in Ottawa

INTEGRATIVE SCIENCE THEMES

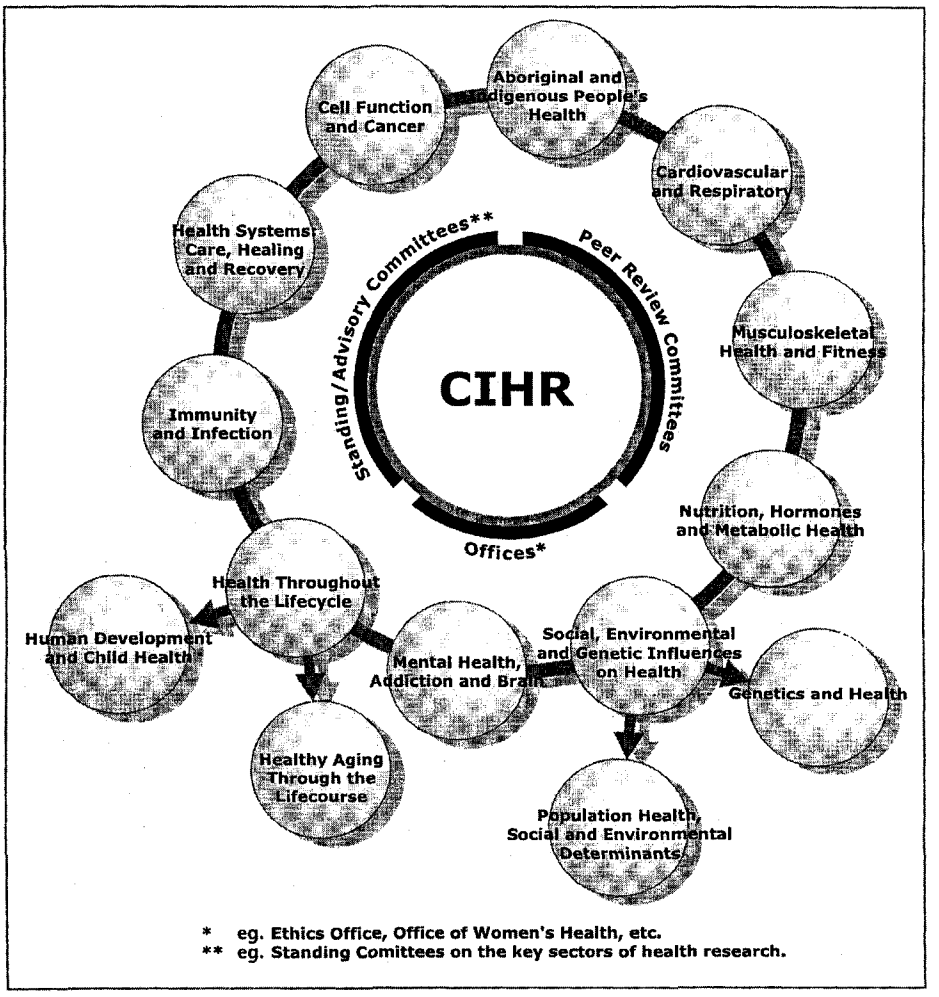
BIOMEDICAL SCIENCE	CLINICAL SCIENCE	HEALTH SYSTEMS AND SERVICES	SOCIAL, CULTURAL AND OTHER DETERMINANTS OF HEALTH

Institute of Aboriginal Peoples' Health
Institute of Aging
Institute of Cancer Research
Institute of Circulatory and Respiratory Health
Institute of Gender and Health
Institute of Genetics
Institute of Health Services and Policy Research
Institute of Human Development, Child and Youth Health
Institute of Infection and Immunity
Institute of Musculoskeletal Health and Arthritis
Institute of Neurosciences, Mental Health and Addiction
Institute of Population and Public Health

Source: Adapted from Investing in Canada's Future: CIHR's Blueprint for Health Research and Innovation, 2003/04 – 2007/08, Canada 2002 p. 10

Figure 6

Initial Institutes Proposal for Consideration by the Governing Council of the CIHR



Source: Proposed Institute Creation for the Canadian Institutes of Health Research – A Working Paper of the Institute Creation Sub-Committee presented to the Interim Governing Council of the Canadian Institutes of Health Research June 2000 p. 14

An International Committee of Peers, which reviewed the CIHR in 2006 as originally planned at the time of the transformation, heavily criticized the CIHR for its failure to have the Institutes play a larger role in their areas of scientific

responsibility. The report also indicated that there was a budding competition between the 'core' institutes and the corporate functions of the CIHR. This tension was discussed with me in an interview just prior to the release of the International Committee report [332] which was only briefly made available on the CIHR website.

The CIHR's approach to peer review was also noted as a reason for the very complex panel system within the CIHR structure that has resulted from attempts to accommodate the vastly expanded and integrated health research agenda.

Each of the CIHR's 13 virtual Institutes is directed at a specific health area such as Aboriginal people's health, aging, cancer research, genetics, health services and policy research, to name a few. Each of these Institutes is also expected to conduct research across the four pillars of health sciences inquiry – bio-medical, clinical, health systems and services, and population health. The cross-cutting nature of health research is another aspect of the CIHR that makes its approach to research unique, even somewhat experimental. The idea behind this multi-disciplinary structure is to promote the production and translation of innovation across health researches various communities of practice.

A Scientific Director and an Institute Advisory Board lead each of the Institutes. It is anticipated that the Institutes will become powerful networks of expertise, leadership, participation and partnership. They are expected to

[332] Interview A8, 11 June 2006. Prior to the release of this much anticipated report I discussed the situation between the CIHR and the Institutes with a highly placed member of the CIHR with responsible in the area of grants. The view of the CIHR at the time was that the International Committee would likely recommend repatriating all the peer review responsibilities back to the CIHR including the Institutes' responsibilities for strategic research themes. The tone of the interviewee was such that it was clear there was competition and competition in this regard between the CIHR and its Institutes.

support knowledge creation at the highest standard of excellence as well as to provide leadership in promoting research related to specific health priorities.

The Institutes connect researchers from universities, government departments, hospitals and other research centres. They are responsible for encouraging research that crosses traditional boundaries, integrating contributions from all sectors of health research, including ethics. They function in partnerships among researchers in Canada and abroad. The translation and exchange of knowledge is a high priority for the Institutes. The flexibility of the Institute's structure is intended to allow them to respond to pressing health emergencies such as the appearance of infectious diseases in Canada as demonstrated by their response to Severe Acute Respiratory Syndrome (SARS).

Scientific Directors and Institute Advisory Boards work closely with representatives from other Institutes to pursue opportunities for joint work. The advocacy of a consultation approach was intended to ensure that all Institutes move in directions that complement each other and minimizes duplication.

The concept of Institutes was planned to provide researchers with an opportunity to align their research strengths to priority areas. The Institutes are expected to assist researchers to meet many of their goals through a structure of grants for basic and applied research under the CIHR's 'core' peer review system, as well as through their own programs for strategic science through the Institutes. In this way, the Institutes' strategic research grants assist the CIHR in shaping the forward motion of the research environment.

Through the organization of the Institutes' structure there are two paths to research. One path is for well-developed fields of inquiry, and the other is to develop emerging fields within health research. Institutes with well-established and well-organized research communities can more easily identify and promote key strategic initiatives. The flexibility to support strategic initiatives allows the Institutes to address the priority needs of their researchers and stakeholder communities in a responsive, rather than reactive, way. Some researchers, however, even within well-developed areas of research, may choose to support efforts to build a research base in emerging aspects of these fields. Under the CIHR structure, it is preferable that multidisciplinary research teams are engaged to support these strategic initiatives. Institutes in research fields that are underdeveloped or have a small research base are responsible to encourage the development of accomplished and experienced investigators.

Strategic planning is the organizational tool to coordinate the direction and efforts of the various Institutes with the overall vision of the CIHR. Annually, each Institute submits a revised multi-year strategic plan to the CIHR detailing a proposed mixture of strategic grants. Once approved by the Governing Council, the Institutes receive a direct allocation to support strategic initiatives and can also receive special funding for development initiatives.

All Institutes count on a minimum level of research funding to support their core research programs. The Institutes' budgets also indirectly accrue funding from the investigator-initiated researchers that are assigned to it by the CIHR. Moreover, Institutes have the budgetary flexibility to invest more money in

research that is relevant to their approved strategic plan – above and beyond their allocations from the CIHR pool.

7.1.4 PEER REVIEW

The initial expectation was that Institutes would be the organizations through which researchers normally received their funding. However, the peer review process for determining and allocating research grants would operate at the central level through the CIHR as follows:

- CIHR will hold periodic, peer reviewed competitions for research funds, including strategic programs presented by the Institutes;
- The competitions will be open to all health research proposals, recognizing that those proposals submitted to strategic programs will be tailored to the program's mandate;
- The competition will identify the significance of the proposed research, the rigour and adequacy of the research approach and method (feasibility and efficiency), the degree of innovation, investigator qualification and experience. The quality of the relevance of strategic grant proposals will also be an important factor;
- Each successful project will then be allocated to the specific Institute whose strategic vision and mandate suggest the best fit, or to the specific Institute that runs the relevant strategic grant program.[333]

The Interim Governing Council (IGC) believed that retaining the peer review process within the CIHR would ensure consistency and equity across all Institutes. The process was designed so that the Institutes would continue to benefit from the highly skilled, experienced experts, not only in Canada but also around the world who assess proposals. In this way, all CIHR-funded research would continue to meet the standard international tests of excellence as established under the MRC. What would be different was:

[333] Medical Research Council of Canada 2000b, *Where health research meets the future, the final report of the Interim Governing Council of the Canadian Institutes of Health Research*, Medical Research Council of Canada, Ottawa.

> The Governing Council will organize peer review panels in a manner that ensures comprehensive coverage of the broad spectrum of research. There will be panels designed to encourage integrative and multidisciplinary research. Where appropriate, panels could draw on a wider pool of expertise. This could mean drawing on knowledgeable users of research to enable the full participation of broad health research community, including women and men, whose expertise is in the application of research to policy, programs and practice. This would create another way for CIHR to encourage excellence and relevance in research.[334]

As part of its commitment to broad, effective participation, the IGC believed that consideration should be given, where appropriate, to the joint operation of the peer review process with other federal and provincial granting councils, voluntary health organizations, and government research.

> To ensure that the highest standard of scientific excellence is achieved for all tax payer supported health research, CIHR should work with Health Canada to exercise leadership so that all government departments use peer review, to the extent possible, in their research decision-making practices.[335]

7.2 Early Challenges in Implementing the CIHR

The proposed structural design was to move the CIHR beyond the constraints of a traditional Research Granting Council. The theoretical underpinnings of the CIHR's structural arrangements, much like the federal National Centres of Excellence program and other institutional and program experiments of around the same period, were expected to conform to very different structural arrangements and institutional approaches. These new

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[334] Canadian Institutes of Health Research 2000a, The Interim Governing Councils Working Papers Series – Proposed Institute Creation for the CIHR; Health Research Institutes; Clinical Research within the CIHR; The Ethics Mandate of the CIHR; Implementing a Transformative Vision; Partnership and Commercialization; Peer Review in the CIHR, Ottawa.

[335] Medical Research Council of Canada 2000b, *Where health research meets the future, the final report of the Interim Governing Council of the Canadian Institutes of Health Research*, Medical Research Council of Canada, Ottawa.

science institutions were broadly influenced by new ideas on the organization of science, which are networked, multi-disciplinary and multi-sector. The ideas behind the transformations are to better support the demands of the KBE and non-linear models of innovation and discovery. They are also proposed to support the expanded social and economic purposes ascribed to public support for these research activities. [336]

In various ways, the distributive traditions of the MRC were not incongruous with the newer science models. Its decentralized approach to support biomedical and clinical sciences as discussed in Chapters 1 and 3 resulted from different historical conditions than those of today. To retain institutional relevance, however, the new ideas driving science and research demanded a response by the MRC. The structural arrangements of the CIHR are proposed as a new mode of virtual and networked organization. The spectrum of health sciences under the CIHR and the scope of its decentralized arrangements for funding and producing research are orders of magnitude larger than under the MRC. The CIHR's 13 virtual Institutes are specifically intended to address thematic, multi-disciplinary research. The use of the CIHR's virtual Institutes has no relation to how science was conducted under the MRC.

The CIHR has many more review panels and a complex peer system due to the interdisciplinary research proposal and the Institutes' strategic research

[336] Dr. Atkinson Grosjean of UBC has researched the acceptance and penetration of these the non-linear model and Mode 2 theoretical perspectives of knowledge production, transfer and translation into the practical work of Industry Canada around the time of the NCE Program's inception. Initially, the adoption of these models were experimental but with the NCE program subsequently being evaluated as `successful` this approach was largely validated.

thrusts. The complexity and growth of the CIHR over the MRC is undeniable and a source of challenge for the CIHR.

> The rapid growth of the CIHR, including the establishment of 13 Institutes, 18 new panels, a range of new strategic initiatives and the ongoing support of four pillars of research activity, has led to an organization that is vastly more complex that its predecessor. This is to be expected after a period of such intense development, but such rapid growth may lead to a lack of research focus and can distract from the primary objective of research excellence. An excess of review panels, different funding opportunities, strategic initiatives and programs can be as bewildering to the scientific community as it can to the organization itself. Complexity is an expected consequence of rapid expansion and growth but it needs to be continuously managed and limited. In research funding, "simple" can often be the best approach. [337]

The International Review Panel (IRP) was made up of 27 scientists and health care professionals. All but one of these individuals was based outside of Canada, most being American. Their expertise covered the full range of activities encompassed by the CIHR mandate, including research in all four pillars, as well as expertise in knowledge translation and ethics. To put their comments in perspective, in 1990 the MRC had thirty-seven committees engaging the expert advice of 350 scientists to review applications for research projects and awards. In 2005/06 the CIHR had over 100 panels and approximately 2500 experts were assisting with this task.[338]

In respect to the administrative functions of the CIHR, review of the MRC and CIHR annual reports clearly indicates that the administration of health sciences research under the CIHR takes a much larger percentage of the annual

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[337] Canadian Institutes for Health Research 2006, *Five Year International Panel Report,* Canadian Institutes of Health Research, Ottawa.

[338] Canadian Institutes of Health Research 2005b, *Planning and Priorities 2004-05*, Canadian Institutes of Health Research, Ottawa.

budget than under the MRC. This relates to the heavily administrative peer review system of the CIHR and its complex structural arrangements of partnership. In the original proposals for the conceptual model of the CIHR, peer review was proposed to be distributed amongst the Institutes.[339]

7.3 External Challenges and Pressures

In its first seven years of operation, new challenges and pressures have been revealed through different studies and assessments of the CIHR's work and management processes. Some of these issues reflect the heavy lifting of implementing a complex institutional design. Others relate to studies dealing with the excellence criteria used when evaluation broadens beyond normal peer-review research, and with the complex undertaking of knowledge transfer. These issues will be discussed in more detail in the sections that follow.

7.3.1 Auditor General Review of the Operating Grants Program

In 2001-02 in order to determine whether the CIHR had adequate control over its operating grants program for research, the Office of the Auditor General (OAG) conducted a review. The assessment examined the management of individual projects under the program and reviewed the design of the programs and the measurement of project and program performance.

The following points outline the criteria used to carry out the detailed audit:

- Comply with authorities;

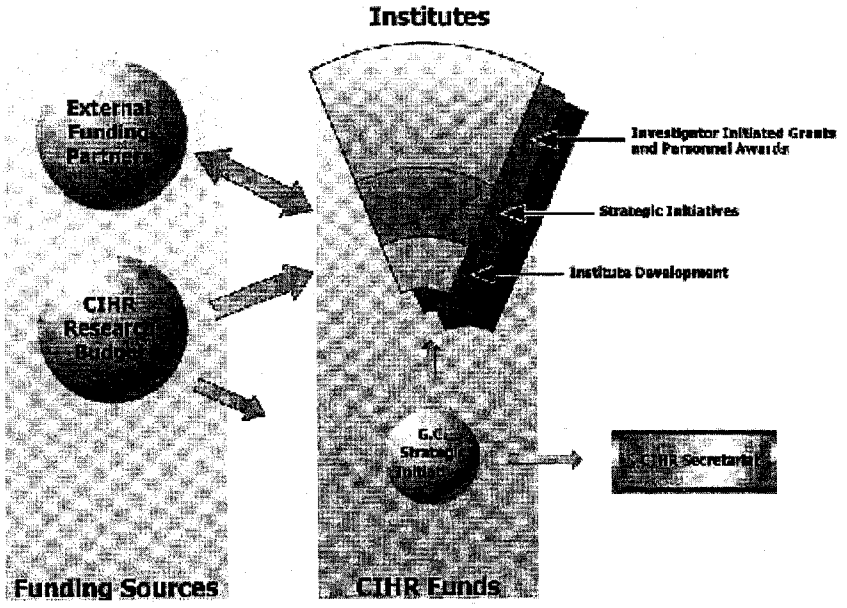
[339] Canadian Institutes of Health Research 2000a, The Interim Governing Councils Working Papers Series – Proposed Institute Creation for the CIHR recommended a decentralized peer review system.

- Ensure that grant and contribution programs are designed to achieve expected results, manage risks, ensure due diligence in spending, and provide accountability for public funds spent;
- Exercise due diligence in approving individual grants and contributions;
- Have reasonable assurance that the funding is used for the purposes intended;
- Know whether programs are achieving expected results;
- Report clearly to Parliament on program performance;
- Reinforce public sector values and value for money attitudes among program staff; and
- Make reasonable efforts to harmonize and coordinate their activities with other organizations delivering similar programs.[340]

The audit was done six months after the launch of the CIHR and its unique funding model.

Figure 7

HOW RESEARCH FUNDING FLOWS TO/THROUGH INSTITUTES



Source: Canadian Institutes of Health Research 2000, Where Health Research Meets the Future, The Final Report of the Interim Governing Council of the Canadian Institutes of Health Research, Ottawa. p. 4

[340] Auditor General of Canada 2001, *Voted Grants and Contributions* – Program Management, Auditor General of Canada, section 3, chapter 5.

At the time the operating grants program totalled $190 million. The findings of the OAG's assessment was that the CIHR's evaluation of applications for operating grants were complete and that its peer review system was rigorous in selecting projects for funding. However, the Auditor-General expressed concern with how well the CIHR monitored how quickly researchers were spending their grants and how it tracked the results of the research it was funding.

Funds provided by CIHR for approved projects are overseen by the business offices of the institutions at which the grant recipients are located—mainly universities, hospitals, and research institutes. Payments from the CIHR to the research institution start two months after the project begins. Regardless of the pattern of expenditures on the research, the CIHR makes regular monthly or bi-monthly payments to these accounts based on the amounts it has approved through the peer review system. The CIHR allows its researchers to use unspent balances that remain in their accounts for two years after funding ends so projects can wind down or other sources of funding can be found. The business offices of the recipient institutions provide the CIHR with annual detailed summary financial status reports on all the CIHR-funded research. These statements show the actual expenditures by each grant recipient.

At the time of the audit, there was no evidence that the CIHR reviewed the account balances to determine the pace of actual expenditures, or to determine if the anticipated progress of the research corresponded to the amount of the research grant awarded. The conclusion of the OAG was that with no monitoring

practice in place, the large unspent balances were accumulating. On March 31, 1999 the total unspent balance was $67 million. By March 31, 2000 it was $95 million. On March 31, 2001 the unspent balances totalled approximately $113 million involving roughly 3,871 projects in 66 research institutions. This figure is substantial given that the CIHR's total budget for grants and scholarships that year was about $370 million.

The overall result of the audit was that the CIHR was encouraged to adopt more rigorous management and reporting practices. Many of these practices comply with ever increasing Treasury Board requirements for financial and management stewardship of grants and contribution programs. Under the revised Treasury Board Policy on Transfer Payments effective June 2000, the specific objectives and results planned for grant and contribution programs over $5 million must be clearly stated in the entity's report on plans and priorities, together with milestones for achievement. Treasury Board evaluation guidelines require four aspects of these programs to be monitored: the program's rationale, impact, achievement of objectives, and alternatives. CIHR management committed to completing an evaluation of the operating grants program in fiscal year 2002-03. This review was published to the CIHR website in 2004.[341]

Based on the OAG's review of the CIHR, it was also encouraged to:

- Develop a formal risk assessment and management strategy;
- Establish an internal audit function for project monitoring and financial monitoring; and
- Improve how it tracked the results of research and assessed and reported on program performance.

[341] Canadian Institutes of Health Research 2004a, *Evaluation Study of the Operating Grants Program*, report by the Evaluation and Analysis Unit. <http://www.cihr-irsc.gc.ca/dgi-bin/primt-imprimer.pl>

The CIHR committed to developing an enterprise-wide risk assessment and risk management strategy to be completed in fiscal year 2001-02. The CIHR requested additional resources for internal audit and program evaluation functions.

The auditor's review of performance reports for 1998-99 and 1999-2000 noted that the program's impact on health and the economy was reported anecdotally, by specific case, rather than as measured by program-wide indicators. The AG recommended improving program performance reporting to Parliament by focusing performance measures on quantitative information on program outcomes and expected results rather than by activities and inputs such as - dollars spent, number of scientists trained, numbers of scientists and projects supported, and number of research publications produced. These are necessary indicators of program performance but alone are not sufficient.[342]

At the time of the audit, the CIHR was developing a strategy for a Results-Based Management and Accountability Framework to systematically collect timely and accurate information on the results of its investments in research. The Framework was expected to identify a best set of indicators for measuring ongoing performance achieved by research that it funds to "deepen and enrich the information base for program management and for CIHR's reporting to Parliament and Canadians".[343]

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[342] Auditor General of Canada 2001, *Voted Grants and Contributions – Program Management*, Auditor General of Canada, section 5, chapter 5, p. 101.
[343] Ibid, Chapter 5, Section 5.103 Agencies Response.

However, refining the outcome measures of evaluation in this increasingly important area is both complex and likely to be contested. Work conducted by Chant and Gibson demonstrates the complexity.[344]

7.3.2 Analysis of Science Impact and Quality

Chant and Gibson researched the level of performance of Canadian universities relative to universities in the United States. They used the numbers of papers published by a university (the quantity) as a measure of the level of research activity at an institution. Their paper measured the impact of research based on the recognition that the research gained from other scholars on a paper-by-paper basis (a widely agreed-on measure of the quality of research).

There were limitations to their study. The paper's assessment measured all citations to a paper equally regardless of whether they occur in well-regarded or lesser journals, and whether they are positive or critically reviewed, all of which can be important indicators of the paper's impact. Their research did not try to account for the relative size of Canadian universities or the resources available to them for research. To correct for size, they would need to know the number of researchers in each discipline at each institution. Such measures are complicated by the fact that many of the disciplines did not necessarily correspond closely to one or even several well-identified departments. For example, their research found that one institution that ranked in the top ten in physics did not have a department in that discipline.[345]

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[344] Chant, J & Gibson, W 2002, 'Quality or quality? Research at Canadian universities' in D Laidler, ed., *Renovating the Ivory Tower*, C.D. Howe Institute, pp. 125-167. Also see the OECD's Frascati Manual(s).
[345] The difficulty of assessing multi-disciplinary science projects is even more complex.

Despite the limits of the analysis, the findings suggested that the top Canadian universities perform reasonably well with respect to the volume of publications in the fields surveyed (this included bio-medical and clinical sciences). However, they lag substantially behind the top US universities in terms of the recognition their research received from other scholars. They conclude based on these findings that the research quality at top Canadian universities is substantially below that of the top US institutions.

They argue that a relevant factor in determining this result is due to the different approach between the two countries in funding research. Canadian science policy stresses criteria other than the excellence of the research itself. In the United States, in contrast, the peer review process under which the National Science Foundation (NSF) allocates research funds is based on two main criteria: the intellectual merit of the proposed activity and the broader impacts of the proposed research.

The concern expressed by Chant and Gibson (and other scientists)[346] is that policy makers may be unaware that when values other then research excellence factor into funding decisions - interdisciplinary, inter-institutional relations, relevance, training and socio-economic impact – they come at the cost of pursuing excellence.

7.3.3 The Complexity of Integrating the Continuum of Health Sciences

Multi and even trans-disciplinary science raises other challenges for the CIHR (and for other granting bodies as well). The analysis in the *Report on the*

[346] Polanyi, J 2000, 'Review: The equation that rocked the planet', *Globe and Mail*, November 4, 2000, p. 6.

Health and Society Research Workshop "The Challenges of Change" January, 2004, discuss several issues that relate to difficulties both perceived and real, in creating, using and integrating Behavioural, Social Sciences and Humanities Health Research (BSSHHR) with the bio-medical and clinical research programs to improve health outcomes. These challenges were demonstrated in the initial difficulties the CIHR encountered when using the peer review system to support and fund the broader spectrum of health research. Other challenges relate to the nature of these groups of sciences themselves.

The overall goal of the CIHR is that all health sciences should be developed as a body of research with a focus on comprehensive and integrated evidence-based interventions to improve health. However, behavioural and social sciences are not necessarily driven by the strategic or mission-oriented "science pillar" approach – e.g., integrating social, behavioural and cultural dimensions of health research as one of the CIHR's four pillars of cross-cutting sciences into the broader national agenda of bio-medical and clinical health research.

A challenge within the BSSHHR research "community" *writ large* is that there are characteristics of different paradigms, methods, epistemologies and ontologies guiding these sciences. This is nested within a larger integration / legitimacy issue where there is a perceived lack of recognition and credibility for BSSHHR in the attitudes of the biomedical and clinical health research community. Within the BSSHHR *community* too, BSSHHR researchers may be just as inclined to be dismissive of beaker and test-tube traditional approaches to

bench-health research under the normal sciences. As the BSSHHR report notes, there are multiple levels of issues and challenges to create, use and integrate BSSHHR within itself let alone to then integrate BSSHR within the broader health research enterprise.

As for some of the structural difficulties noted in the report, they relate to accessing funding, attention and legitimacy for BSSHHR given that the dominant communities within health research enterprise are bio-medical and clinical. Two examples of structural issues sited in the document relate to peer review and the removal of part of Health Canada's science capacity through the merger of the MRC and the National Health Research and Development Program (NHRDP) into the CIHR.

Regarding peer review, grants for research in the CIHR are pooled across the entire health research spectrum.[347] As a result, bio-medical and clinical research compete for funding with social sciences and humanities research on health services and systems. This was recognized by the social sciences communities of practice as a problem for two reasons. First, the methodologies for bio-medical and clinical research are generally set. In social sciences the methodologies, although rigorous, are often contested in terms of the research results they can net. A second and related point is that social scientists tend to be more critical of research proposals than their bio-medical and clinical science peers. This biases the peer review process toward biomedical and clinical research because their peer review committees tend to give higher points than

[347] For a thorough discussion of several issues with the CIHR's initially peer review process, see Thorngate W, Faregh, N & Young, M 2002, *Mining the Archives: Analysis of CIHR Research Granting Adjudications*, Canadian Institutes of Health Research, Ottawa.

did the BSSHHR peer review committees. Since funding was based on research excellence, the lower scores given to social science projects meant that fewer of them were funded. There has been forward movement on reducing the bias towards bio-medical research in the peer review process[348] but at the time of the R*eport on the Health and Society Research Workshop "The Challenges of Change",* it was referred to as preliminary.

Another structural issue raised in the "The Challenges of Change", workshop report results from the merger of Health Canada's $9 million research program, National Health Research and Development Program (NHRDP) with the CIHR. The NHRDP was Health Canada's extramural, investigator-driven, health research program. Since 1975, it had not only provided research support for a wide range of applied health research issues, it was an important link between Health Canada and the Research Granting Councils. Through these linkages, Health Canada drew the attention of the research community to the types of inquiries necessary to further the national health policy agenda. Under the present ideas on the organization of public science, the arrows for the identification of areas for priority based research run the other way. Rather than a department such as Health Canada influencing the types of research done by a Granting Council, in some sense, Health Canada is expected to uptake the research produced by the CIHR and its Institutes to set or further policy. This arrangement disconnects Health Canada from direct interaction with the health

[348] Canadian Institutes of Health Research 2005, *First report on peer review innovations*, Canadian Institutes of Health Research, Ottawa.

research community and has been rather quickly identified as a likely contributor to a health policy capability and capacity problem.

These are a few challenges but there certainly have been others. A 2006 International External Review Panel indicated several weaknesses in the CIHR. Among others, some were noted in the areas of knowledge translation, transfer and commercialization.[349] In fairness to the CIHR, knowledge transfer and the translation of science into intended outcomes have themselves come under close scrutiny.[350] The processes that lead to knowledge transfer, translation and commercialization are now recognized as a much more complex puzzle than originally thought. Recently, the federal government has released a report by an expert panel, which suggests that new approaches, and possibly new funding mechanisms, are required to specifically focus in this area.[351]

7.4 Conclusions

Clearly the revolution in science and technology has made research and experimental development more socially, economically, and politically important. At the same time, it has also made these endeavours more risky, uncertain,

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[349] Canadian Institutes for Health Research 2006, *Five Year International Panel Report*, Canadian Institutes of Health Research, Ottawa.

[350] This complex, stubborn issue has come under scrutiny from various theoretical perspectives and for some time. For examples, see Canadian Institute for Health Information 2001, *Canadian Population Health Initiative*, Canadian Institute for Health Information, Ottawa. Canadian Institute for Health Information 2000, *An Environmental Scan of Research Transfer Strategies*, Canadian Institute for Health Information, Ottawa. Lomas, J 2000, 'Connecting Research to Policy', *ISUMA* vol. 1, no.1, Spring; Landry R, Amara N & Laamary M 1998, '*Utilization of social science research knowledge in Canada*', Group de Recherche sur les Interventions Gouvernementales (GRIG), Quebec. Landry R, Amara N & Laamary M 1999, '*Climbing the ladder of research utilization: evidence from social science research*, Group de Recherche sur les Interventions Gouvernementales (GRIG), Quebec; Canadian Institutes of Health Research 2005, presented at the Standing Committee on Finance pre-budget hearings by Dr. Allan Bernstein, Canadian Institutes Of Health, Ottawa. <http://www.cihr-irsc.gc.ca/e/29565.html>

[351] Industry Canada 2006, Expert Advisory Committee on Commercialization, *'People and Excellence: The Heart of Successful Commercialization – Talent, Research and Capital'*, Final Report, Ottawa.

multidisciplinary and even trans-disciplinary. Scientific enterprises such as the CIHR have reorganized to adjust to these new conditions and demands, and to implement experiments on 'best fit' structural arrangements for developing and deploying products and processes based on new technologies. At the beginning of this decade the CIHR joined a group of networked, virtual, multi-disciplinary and multi-institutional structures that emerged in response to the new ideas in how knowledge is produced, transferred and translated. One result of these structural adjustments is that the organization of the research enterprise has itself become an important element of science policy.

The CIHR has made these structural adjustments while responding to the new demands in biomedical and health sciences research such as:

- The expanding range of biomedical and health sciences;
- Changes to the definition of "health" in advanced societies consider health to be;
- The increasing public and private uses these sciences can be put to;
- Our contemporary belief that how health sciences are funded and supported is a critical element in encouraging the discovery process and in reducing the cycle time of translating innovation and new knowledge into improved social and economic outcomes; and
- Implementing the multifaceted and inherent complexity of arrangements thought necessary to sustain what is often referred to as the health research enterprise (HRE).

Even today, the CIHR must be seen as an evolving institution. Implementing the bold and challenging idea of the CIHR requires the creation of a whole set of new supporting structures, programs and practices. The true test of the CIHR will be judged when over time its impact on scientific output and its effects on the Canadian health research community can be judged. However, there are a few early insights into the effectiveness of the CIHR in managing its

part of the health research agenda in Canada. A key test is the effectiveness of its panel system. It would appear that these arrangements could be simplified, at least judging from feedback from the International Review Panel, the assessment of the peer review structure conducted by Dr. Warren Thorngate (at the request of the CIHR),[352] and the Report on the Health and Society Research Workshop.

Nonetheless, the novelty of the inclusive model of health research based on the CIHR is both wearing out and catching on. Canada is considered an international leader in bringing the different components of health research together. Although it is frequently acknowledged that significant cultural differences remain between research areas, the expectation remains that this model will provide important new research outputs relevant to human health. Its success has been clearly noted in other countries and Britain has expanded their research program along similar, but adapted, lines.

Nonetheless, some seven years into the CIHR's ambitiously expanded research agenda, panel system, and policy objectives, the legend of the event of the MRC-CIHR transformation is being confronted with the realities of contemporary and impatient notions on the evaluation of outcomes. This comes at a time when some of the very notions such as commercialization that the CIHR was based on are themselves coming under scrutiny.

Given the complexity of the CIHR's mandate and of its operating environment and, quite frankly, the difficulty of measuring health science outputs relative to their new economic and social objectives, the CIHR is at risk of being

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[352] Thorngate W, Faregh, N & Young, M 2002, *Mining the Archives: Analysis of CIHR Research Granting Adjudications*, Canadian Institutes of Health Research.

judged a failure by the same inadequate yard sticks that prematurely declared it a success.[353]

CONCLUSIONS

The focus of this dissertation is institutional change. All institutions adjust to continuously evolving conditions. However, decommissioning and replacing one of Canada's three Research Councils, which occurred in 2000, is an unusual and complex event. Our primary aim is an exploration that considers why, despite political and institutional obstacles, the federal government took the extraordinary step of replacing the Medical Research Council (MRC) with the Canadian Institutes of Health Research (CIHR). The task of the newly designed and branded CIHR has been to transform health research in Canada. The purpose of this research is to understand this complex occurrence by developing a deeper sense of how institutional and policy legacies evolve through successor paths to derive new outcomes.

To begin to understand the phenomenon of the CIHR, a nuanced theoretical approach has been necessary. This perspective applied to an analysis of the MRC-CIHR transformation allows us to strip away the legend of the 'event' and the 'event makers' from the multi-layered and nested processes that conjointly influence institutional continuity and change.

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[353] Canadian Institutes for Health Research 2006, *Five Year International Panel Report*, Canadian Institutes of Health Research, Ottawa.

The main contribution of this research is that in the fields of Canadian science and innovation policy analysis, it is the first to examine in depth a more complete policy and institutional story of biomedical and health sciences in Canada. A second contribution is that it offers new insights into how institutional change and transformation can be incorporated into neo-institutionalist theory as they apply to science and knowledge-centred realms of governance.

The main research question explored is:

Within the context of the Innovation Policy paradigm, how can we account for the MRC-CIHR transformation?

This question required us to more fully examine the dynamics and linkages that underlie the event of institutional transition and to grasp a deeper meaning of its social, political and economic significance.

The research framework developed and used is based on neo-institutionalism but considers specifically historical institutional literature combined with strands from literature on the KBE, organizational sociology, strategic management, and ideas on science policy and innovation and related aspects of knowledge production and translation. This integrated approach assists us in understanding why the broad influences at the level of the political economy, and emerging ideas on the science model moving away from linear concepts towards more iterative views of knowledge production and translation, had such a significant impact on the transformation to the CIHR. To complete the analysis, we have to be able to account for why these same influences, which are generalizable across knowledge-centred realms, netted less spectacular

results on other science-based institutions. This question is best addressed through a consideration of agency. In this research framework agency is not proposed in the economic sense, but rather it refers to how state and non-state actors can influence outcomes through their strategic behaviour. This provides a theoretical lens to scrutinizing the actions of Dr. Henry Friesen in proposing the decommissioning of the MRC and reframing the national health research agenda in such a way that the CIHR was accepted as a 'radical' solution to new and emerging conditions in support for biomedical and health sciences.

Three main arguments have been advanced. The first argument is that a change occurred in the relationship of biomedical and clinical sciences to society due to a 'techno-economic paradigm' shift corresponding to the emergence of the 'new economy'. Of special significance is the fact that during the techno-economic shift of the 1980s and 1990s, biomedical and clinical sciences became economically important. Previously these sciences had been socially productive but not of significant interest to federal priorities for economic growth. This changed circumstance set the conditions for an institutional transformation.

The second main argument is that a key factor in the transformation was the MRC's last President, Dr. Henry Friesen, and his entrepreneurial and strategic management behaviour. In 1997 Friesen put forward a conceptual redesign and a new approach for Canada's premier health research institution. It was the idea of a virtual and networked Canadian Institutes of Health Research (CIHR).

The third argument centres on the view that the 'event' of CIHR formation and its structure in many respects was partly a catch-up process to more accurately reflect changes already embedded and evolving in the former MRC and in the very nature of health and medical research and its more decentralized and networked structure. Medical and health research was always different from research in the other natural and social sciences. Therefore both the paradigm first main argument and the merchant scientist strategic leadership second argument are complemented by these embedded fertile inherent characteristics of medical and health research.

Fit Between The Theoretical and the Empirical Components of the Research

The reinvention of a Research Granting Council is not a singular event. It is part of an historical process that joins institutional and policy legacies with broad influences in the political economy. In this manner, an event such as the replacement of the MRC with the CIHR takes its shape and derives its social and political meanings. As the event develops and unfolds, it conjugates with other events. Mapping its origins, interpreting its results or managing its outcomes are necessarily complex undertakings. The demise of the MRC and the emergence of the CIHR among Canada's growing number of institutions directed at research and innovation, is a significant, complex and transformational event that continues to unfold.

The MRC was replaced through an Act of Parliament with the CIHR in 2000. At first glance, the CIHR's virtual, networked, thematic institutions based in

universities seems to be a dramatic break from how the MRC conducted its national research agenda and programs. A challenge in this research has been that the history of biomedical and clinical sciences reveals that these sciences have always been carried out in decentralized, multi-sector, multi-disciplinary arrangements, and largely conducted in universities – many of the very reasons publicly stated for the MRC-CIHR transformation. Is this a contradiction? How can the MRC-CIHR be a transformational change project if the structural differences between the MRC and the CIHR are not in kind but by degrees? On what grounds can the MRC-CIHR be argued to be a transformational change project? To make the argument clear, the transformational pressures and the point of transformation must be analytically separated from normal transitional changes as institutions continuously evolve and adjust to emerging conditions.

We argue that the techno-economic paradigm of emerging technologies and the emergence of the KBE put the relevance of the MRC and its approach to supporting health research into question. Even though the MRC had been producing internationally recognized excellence in health research for more than four decades, the perceived rigidity of its decision making structures and its siloed science were considered incapable of adjusting to the challenges and demands of the KBE and of emerging technologies. These new demands and pressures had apparently rendered the MRC an obsolete institutional solution incapable of adjusting to emerging conditions.

The CIHR was proposed as a dramatic break from the past. The CIHR's encompassing mandate and its unique, virtual institute structure, is intended to

move the CIHR beyond the constraints of a traditional Granting Council.[354] As such, the conceptual representation of the CIHR was cast as a novel institutional construct built to mediate and negotiate these new economic, social and research demands.

Through a well-resourced restructuring, the expectation was that the virtual and networked institutional arrangements of the CIHR would overcome the alleged impenetrable organizational boundaries of the MRC and the NHRDP. The purpose of the proposed network-based restructuring of relations among the growing number of institutions and organizations involved in medical research, was to provide flexible coordination mechanisms for more productive, even more entrepreneurial collaborations. The idea was that, once freed from the constraints of hierarchy, the iterative processes of innovation could take hold.

Since 2000, the task of the newly branded and designed CIHR and its Governing Council has been to transform health research in Canada. Certainly all institutions adjust to continuously evolving conditions, but replacing a Research Council is an unusual and complex occurrence. The focus of this research has been to understand this occurrence by developing a deeper sense of how institutional and policy legacies evolve through successor paths to derive new outcomes. We put forward that to begin to understand the occurrence of the CIHR a nuanced theoretical reflection on Historical Institutionalism greatly assists us in understanding that institutions iteratively take their meaning and derive purpose from broader influences in the political economy. Cumulatively, as

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[354] Medical Research Council of Canada 2000, *Where health research meets the future, the final report of the Interim Governing Council of the Canadian Institutes of Health Research*, Medical Research Council of Canada, Ottawa.

meta-logics are negotiated and set within the political economy, they became broad conveyors of change. Over time they conjugate with the historically set conditions of institutions to set new directions. However, to develop a finer level of analytic granularity about the complex forces of renewal and change exerted on institutions, we blended an historical institutional framework with complementary theoretical perspectives.

When these narratives are compatible with emerging paradigms, the change processes are accelerated. This opens up strategic opportunities that can be exploited by state and non-state actors. Organizational sociology allows us to focus more precisely on the methods and processes of conforming to the emerging paradigms. This perspective provides a theoretical lens on the role of agency and how actors can introduce new scripts and routines into institutions. As part of the processes of reframing, the discourses of the new paradigm become adapted into the institutional context. In this research we examined how the institutional leadership of the MRC used the practices and scripts of management and more specifically strategic management as powerful tools and enablers in the reframing process. The principles of the new political economy merged with the Innovation Agenda and eventually were hardwired into the conceptual model and the operating principles of the CIHR.

This balanced and richer reflection reveals that what at first appears to be a radical expression of institutional change engineered by the activist leadership of the MRC, is also in some sense more incremental in its nature. The conditions for change were set incrementally during the time of transformation. In the

1980's and 90's the evolution in technologies ushered in the KBE and globalization. Through this paradigm shift, new meanings, purposes and values for publicly funded national science programs were embedded into the institutions tasked to promote science, technology and research.

In Canada adjusting to these new conditions was loosely organized through the Innovation Agenda. As the continuum of health sciences continued to expand, often through the emergence of exciting new technologies and their application to health, so too did the possibilities to use these sciences to pursue different, broader public and private purposes. Ultimately the national biomedical, clinical and health sciences research agenda became linked to a core characteristic of the federal government's involvement in supporting a national science program; the importance of the perceived relationship of science to the economic goals.

The emergence of the CIHR is also a radical shift. Its institutional mandate is not the only aspect closely aligned to the principles of the knowledge economy and the Innovation Agenda's models for the production, translation and uptake of new knowledge. The CIHR's virtual and networked design is integral to, and a fundamental expression of, the policies they are mandated to deliver. The CIHR's structural arrangements are as much an instrument of innovation policy as its mandate to commercialize the outputs of its science.

Interpretation of the Evidence

Initially, biomedical and clinical sciences had no relationship to the early economic interests of the federal government. These were largely focused on

nation-building projects, followed by developing an applied research capacity to support growth in secondary industries. The high profile personalities conducting biomedical and clinical research activities, and their high-impact results on reducing death and suffering, generated considerable interest. Well before the federal government supported these sciences, donations to fund research projects came from various sources. These included private citizens and philanthropists, which lead to the early development of the health research charities. Funding also came from the private sector and international sources.

Unlike its approach to the traditional physical and chemical sciences, it made no attempt to take charge in this area of inquiry or to establish national laboratories. Rather, the development of these sciences and the institutional arrangements that supported them were derived more organically. These conditions set paths that led to a tradition of decentralization within the institutional infrastructure supporting medical research. This was demonstrated by the preference for non-directed, extramural grants to health sciences centres in universities and to individual researchers working in universities. A strong sense of autonomy was evident within the research communities the NRC sponsored.

Throughout the 1970's the dialogues and debates on science's place in society and about the relationship of the scientific enterprise to the objectives of the state continued. During this decade the MRC was favoured with significantly more funding but its maturation as an institution coincided with significant pressures on its grant structure. The medical sciences were becoming more

sophisticated and technical as they evolved and were affected by the emergence of new technologies in biology, communications and advanced materials.

By the mid-1980's, early pressures from KBE and globalization shifted the state's objectives for research and development once again. The economic potential of these sciences in assisting Canadian competitiveness began to generate more policy interest in biomedical and clinical research. Given the legacies of decentralized and university-based activities, in some sense this group of emerging sciences were well positioned for the transformation of the 'new economy'. Partnered arrangements were becoming the preferred vehicles for the iterative pursuits for new knowledge and their translation into innovations.

A key challenge for the MRC in the 1990's was to respond systematically, rather than reactively, to the new emerging conditions in medical and health sciences research. Given the growing number of research partners in various sectors and the expanding range of sciences directed at health, the MRC attempted to adjust its mandate, approach and programs. In the tight fiscal climate of the 1990's, it was not entirely successful. Concerns were raised among the biomedical and clinical research communities that their research grants would be reduced if MRC's mandate was expanded. Other questions were being asked outside the medical and health research communities; `Was the MRC really supporting the requirements of the new economy?` These issues, as well as the debates on the social and economic purposes of science under the KBE/S and globalization, opened up strategic opportunities to the last President of the MRC. Dr. Henry Friesen's perspective as a merchant scientist

had a direct bearing on the transitional events that subsequently lead to the emergence of the CIHR in June 2000.

Potential for Further Research

Clearly an area for further research is to develop approaches that allow for less anecdotal evidence in the assessment of the transfer of the outputs of research and experiment into social and economic value. Within this context, an important research opportunity is that the 'new' emerging tradition in science institutions suggests a contradictory mode of institutional control. Large sums of public funding are coming into approximately 15 science-based institutions, which are registered as foundations. As foundations, they are removed from parliamentary accountability[355], which has been a source of concern for the Auditor General.[356] On the other hand, over many years the federal (and other levels) of government have been loading up research programs with mission-oriented objectives. This means that the government exerts tremendous, even unprecedented control of these science institutions through the processes of peer review. Today and for some time, these institutions are expected to achieve both scientific `excellence and relevance'. The evaluation of 'excellence' still resides with disciplines even if it is complicated by multi-disciplinary and even trans-disciplinary research. However, the evaluation of 'relevance' usually resides with

[355] Aucoin, P 2005, 'Accountability and coordination with independent foundations: a Canadian case of autonomization of the state,' paper presented to the International Political Science Association, Stanford, Stanford, 1-2 April.
[356] Auditor General of Canada 2005, *Accountabilty of Foundations*, Auditor General of Canada, Ottawa, chapter 4.

more mission-driven directives based on the priorities of the government. In this way, peer review could be argued to have a centralizing or a control function.

A problem with the introduction of the principle of 'scientific relevance' in either an economic or mission-oriented sense, is that, quite often, pre-ordained ideas on what is or is not relevant do not harmonize with the discovery process of how medical and health problems are identified and pursued. Generally, researchers prefer autonomy in this area. Worse, it can marginalize parts of the research community that the CIHR is mandated to support, such as health sciences situated more closely with social science. These may lack commercial opportunities but can have significantly positive social consequences. Thus the contemporary definition of 'relevance', which tends to be tied to commercialization under the ideas of the KBE, contributes to a second-class standing for some science pursuits. This is reinforced through the peer review process.

As well, it has more recently been acknowledged that an unintended and opposing effect of reducing discovery opportunities for basic research is that applied research opportunities could also be reduced. The 'pipe' might be out of favour but it certainly is not dead or completely replaced.

From an institutional legitimacy perspective, the mission-oriented research of the CIHR may have resulted in favours from the government such as funding, but given that it does not fit well with the vast majority of medical and health researcher communities, this orientation could have an overall destabilizing

effect. Ironically, by increasing the CIHR's institutional legitimacy in the eyes of the government, it could reduce its legitimacy to the communities it supports.

Finally, even if it can be argued that the CIHR situates rather well with its legacy paths, given that the MRC was never really a true hierarchy, the scope and scale of this institutional experiment is unique. Unlike the NCE, as an example, its research agenda is not conducted through a homogenous community of practice. Of all of Canada's three Granting Councils, arguably the CIHR has the broadest responsibilities bearing on the social, socio-health, and economic agendas of the state. Its mandate is conducted through a vast and expanding continuum of medical and health sciences. The diverse scientific communities of the CIHR have different science traditions, cultures and expectations in the conduct of their research activities. In this sense, even if the model for the CIHR was transposed, as an institutional experiment it is on a very grand scale. It is testing the limits of networks as mechanisms of control and coordination.

These aspects of the MRC-CIHR change project are important, and they offer interesting opportunities for further investigation.

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