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DOCTORAL STUDENT EXPERIENCES AT A CANADIAN RESEARCH UNIVERSITY

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

Department of Educational Studies

We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

October 1996

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Date **November 4, 1996**
ABSTRACT

This study examines the experiences of doctoral students at a Canadian research university in four selected departments: Physics, Chemical Engineering, History, and Education. In the context of shifting expectations concerning the role of higher education in Canada, doctoral students operate on the boundaries of the academic professions. Because the PhD degree acts as certification for membership in those professions, an important aspect of doctoral education is professional socialization. A basic assumption underlying this research is that discipline cultures have a significant effect on the experiences of doctoral students, and research into doctoral studies is enriched by studies that examine doctoral student experiences across a variety of disciplines. At the outset of the research, the concepts of professionalism, socialization, and culture were key sensitizing concepts. As the research progressed, the importance of the related concepts of expertise, autonomy, and isolation became apparent.

Ethnographic techniques such as ethnographic interviews and participant observation are employed for exploring students' understandings and interpretations of their experiences. The study examines the ways students across the departments understand and experience departmental enforcement of standards to judge their professional expertise. It also relates students' belief in individual autonomy as researchers to the nature of the discipline in which they are located. Their common sense of isolation is explained in the context of a fragile student culture. The study shows how this isolation works to obscure fundamental contradictions that become apparent in the various departments' enforcement of professional standards and the differing degrees to which students find it important to assert individual autonomy. The promise of professional status and
authority discourages PhD students from developing a sustained critique of important elements of their doctoral education such as the notion of expertise upon which academic professions derive their status and authority. Although students' ability to cope with contradictions is important professional training, this study argues it diminishes their critical commitments in a wider public culture. Reform of the PhD degree is needed that minimizes the role of doctoral education as training for professional expertise, and fosters students' commitments as social critics.
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ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to the PhD students who participated in this study and generously gave me their time and opened their lives to make this research possible.

Many thanks to my supervisor, Dr. Donald Fisher, who was always enthusiastic, generous, and patient. Thank you also to Dr. Kogila Adam-Moodley and Dr. Kjell Rubenson for their helpful suggestions and support.

Finally, thanks to my friends and colleague students in the Department of Educational Studies at the University of British Columbia for their encouragement and support.
CHAPTER 1 INTRODUCTION

Background and Purpose of the Study

Doctoral students inhabit a sensitive border zone in higher education. Like other social institutions, universities have developed organizational and cultural borders which separate the insiders from outsiders, as well as defining legitimate knowledge and discourse. Boundaries serve the critical functions of organizing and separating both people and knowledge in universities, but these boundaries are never static. Borders are constantly being challenged by people and ideas on the margins, and these challenges are met by varying degrees of acceptance or resistance from within. Fisher (1993) points out it is important to study social and knowledge boundaries, not because those boundaries have intrinsic value, but because of the importance people place on their creation and maintenance. Boundary definition, maintenance and challenge are all aspects of power relations in the academy between those people and ideas with academic authority and those seeking legitimacy. Despite their importance for understanding university culture, research in higher education has largely ignored the border zones (Tierney, 1991a). At a time when universities in Canada are in the process of accommodating demands for increased efficiency and accountability (Buchbinder, 1993), doctoral studies occupies a border zone affected by such changes. During a time of transition, tensions and contradictions often become more apparent, providing opportunity for analysis and criticism of the dominant values, norms and practices of a social institution.
The purpose of my research is to study the experiences of doctoral students at a Canadian university to further understanding of their experiences and the institutions in which they operate.

In Canada, the PhD acts as a passport for both people and ideas to cross the border into the academy. Cude (1987, p. 1) explains the importance of the PhD in North America:

"The doctor of philosophy degree is a North American academic credential of almost unprecedented power. Originally intended as the certificate attesting specialized preparation for research in the major scholarly disciplines, it has proliferated in an unchecked fashion throughout our intellectual world, becoming the mandatory qualification for teaching in higher education, employment in research, and advisory work in business and government."

As the major point of access for outsiders to the academic profession, doctoral studies represents a porous area in the boundaries surrounding academe, making it an important site for challenges to, and defence of, academic borders.

Doctoral studies cannot be understood in isolation, but must be seen in the broader context of economic, political, and social relations. Kerr (1972, p. 114) recognizes the increasingly close connection between the modern university and society as knowledge becomes a dominant commodity in the contemporary world:

"It is wanted, even demanded, by more people and more institutions than ever before. The university as producer, wholesaler and retailer of knowledge cannot escape service. Knowledge today is for everybody's sake."

Carnoy (1984) analyses the relationship between the state and economy in capitalist societies, showing how this relationship is constantly changing. In this century the state has played an increasingly important role in national economies. The state is a central focus in social change theory. For liberal theorists gradual change can be accomplished through the normal function of state intervention, and for some Marxist theorists, the state has been seen as an appropriate site for radical change. In this context, universities and higher education command increasing levels
of state support, and are regarded as appropriate sites for initiating and promoting desired social change. The economic crisis of the 1970s and 1980s (Carnoy, 1984, p. 246) raised questions about the legitimate role of the state in national economies as the state itself was seen as contributing to the crisis. The state has increasingly withdrawn from its mediating role between economic interests and individuals in many contemporary capitalist societies, altering the role of state institutions. Dale (1989) identifies periods of major crises of accumulation as ideal times for educational research because contradictions within educational systems are exposed.

The conception and role of knowledge in society is also undergoing important change. Wexler (1987, pp. 186-187) argues public educational institutions have been reorganized, and emphasizes the dominant role of knowledge production at universities:

> With an increased awareness of a relation between knowledge and social production, the boundary between sites of knowledge production, notably the university, and 'society' is penetrated, begins to recede, and instigates further changes in the internal knowledge apparatus of the university - even to the point of putting in question the organization of knowledge as 'disciplines', and then, finally, of doubting the natural and inevitable separation of these disciplines from social practice.

Becher (1987) argues higher education in Britain underwent considerable change from 1960 to the mid 1980s, a change that is not well understood within and outside the institutions. The normative content of central decision making has become progressively more overt, with institutional planning becoming far more explicit in the 1980s. The current trend is away from central state control toward increased dependence on the marketplace. (Becher and Kogan, 1992). Rhoades and Slaughter (1991) identify a struggle in universities surrounding the control and definition of academic work in a time of closer ties between the university and industry. Doctoral students cannot help but be affected by the conflicts and contradictions that become
apparent within Canadian universities during this process. Tierney (1991b) claims previous research in higher education has never grappled with the larger social contexts in which higher education is situated, but defines problems from the perspective of the dominant in the institution. This ignores the reality that educational organizations are a complex mix of dominant and subordinate groups. Different constituencies arrive at the institution with oppositional practices and beliefs. Structural change is not linear, but arises out of opposing forces. Research in higher education often ignores or underestimates the importance of studying doctoral students' experiences to gain insight into their perception of the professional academic communities in which they are studying, and for which they are being prepared as new members.

My interest in doctoral student culture arises from personal experience as a doctoral student in Educational Studies at the University of British Columbia in the context of the changing role of the state in Canadian society and higher education. I entered the program in 1991 and, although I had extensive previous experience as a university student in four different degree programs, the PhD program entailed a radical educational shift, both in the expectations of the institution and faculty and the relationships between students. During my first year of studies I discovered my experience was not unique, and many of my student colleagues were also struggling with their understanding of practices and structures within doctoral studies. Attempts by doctoral students to influence departmental policies and practices were met with surprising resistance, leading students to question the goals and function of doctoral studies. PhD students sensed significant changes in the nature of their educational experiences, but were not always able to articulate those changes. From a student's perspective, relations between doctoral students and faculty were often quite murky and not clearly understood by students, and the extent to which
students accepted this relationship seemed to be a significant element of their satisfaction with
doctoral studies.

For three semesters, in three different academic years, I was Graduate Student Advisor in
the department, a position created to give students an opportunity to discuss problems in their
studies with a sympathetic colleague in the department. I was surprised to find that, in addition to
cconcerns about funding, grades, and meeting other formal program requirements, an almost
universal problem was a perceived lack of respect shown by faculty for the knowledge and
experience they brought with them to doctoral studies. They often felt part of a struggle for
definition and ownership of their ideas. Walford (1983) argues that although there have been
studies of student satisfaction with supervision in Britain, little recognition has been given to the
importance of the actual research done by students. This reflects an attitude that postgraduate
research is largely training for future research, rather than having value in itself. Walford suggests
this attitude may not be shared by students, particularly in view of the trend toward
commodification of knowledge produced at universities and the centrality of knowledge and
information in contemporary society. In my work as Graduate Student Advisor it became clear
documental student identity was closely connected to how students defined their research interests.
They were part of a process that encouraged them to separate an emerging academic identity from
previously-held beliefs and loyalties. Devaluing of a student's conception of what counted as
legitimate research was often felt by students as an unwarranted attack on their personal identity.
A struggle between students and faculty over what counted as knowledge, both in definition and
expression, seemed more important, but less understood, than other tangible issues such as
funding and grades. This struggle was at the heart of doctoral student experience, but was rarely articulated by students except in private.

Student interaction within my department provided an opportunity to analyze and confront some of the issues concerning us, but we recognized we had little connection with doctoral students outside our department or awareness of their experiences. Our understandings of the purposes and common practices in doctoral studies beyond our own experiences were defined primarily through discussions with faculty, not with other students. Even within my own department, PhD students felt considerable pressure to carefully guard their personal beliefs and criticisms of their education, forcing them to separate their private thoughts from their public discourse. The reluctance of successful and articulate people to publicly confront important issues in their lives as doctoral students led to my interest in discovering more about the experiences of doctoral students across the university.

Rationale and Design of the Study

Doctoral student culture has been an almost unexamined area of study in higher education literature. Historically, higher education in Canada has been a relatively under-examined area of the education field (Sheffield, 1981) and remains a less-developed area of the sociology of education (Walford, 1992). Walford suggests this might be due to academics being more reluctant to study themselves and their own institutions than primary or secondary schools, the lack of a ready audience for higher education research, and the methodological difficulties of hiding identities in higher education institutions. Certainly, research in higher education is more plentiful the further it is from the centre of the academic profession. Ethnographic research into
student experience in higher education has been most prevalent at the college, professional and undergraduate level. Becker et al. (1961) examined the socialization process of medical students in the United States, followed by the study of undergraduate life at the University of Kansas (Becker et al., 1968). London (1978) and Weis (1985) conducted ethnographic studies of student culture at urban American community colleges. Holland and Eisenhart (1990) studied the lives of undergraduate women students at two American universities in order to understand what college life meant to women. But in-depth studies of graduate students, and doctoral students in particular, are rare.

Student attrition is the focus of much recent research into graduate student experience. Corman et al. (1992) criticise university attrition research for not addressing serious questions about the role of higher education in society. They claim Canadian research relies heavily on American attrition models which regard institutional retention as their ultimate goal, rather than creating a positive institutional experience for students as an end in itself. Arguing against a narrow, institutional definition of attrition, Corman et al. (p. 25) believe "particular attention should be given to the lived experience of various groups of students over the duration of their college or university experience." McKeown et al. (1993, p. 76) argue research into attrition rates at universities requires a far better understanding of student experience than currently exists:

For social scientists the search is for common patterns of shared meanings out of which general statements can be made about specific empirical situations. The best place to begin is not with educated guesses about what student life is like, and just what kinds of meanings are thought to be generally shared, but rather with seeing those meanings in context.

Current concern with funding and "wastage" have shaped the attrition debate to reflect the concerns of the institutions rather than those of the students.
Student experience has received more attention from researchers such as Eggleston and Delamont (1983) who examined the purpose and conduct of thesis supervision in light of the high failure rate for completion of theses in Education at British universities. They conclude that more attention should be paid to students' research interests at the time of application and a clearer understanding of the student/supervisor relationship is required. Acker et al. (1993) argue there has been little study of graduate thesis supervision despite concern about the number of graduate students who do not complete their dissertations. They create a model for conceptualizing supervision in order to improve attempts to deal with the problem. These studies suggest the existence of considerable disagreement around legitimate purposes and functions of the PhD degree, requiring that issue to be clarified before appropriate models of supervision can be established.

Specific experiences of women in higher education have received some attention, but Stewart (1994) points out such research is on a smaller scale than that devoted to primary and secondary education. Stewart's own research, like that of Holland and Eisenhart, is confined to the experiences of undergraduate women. Clark and Corcoran (1986, p. 40) examine the professional socialization of women faculty in an American context and conclude "the cross-sex nature of most of the advisor, peer, and eventually collegial relationships problematically affects the quality of the relationships in many instances." Holdaway (1994, p. 6) claims "little is known about the characteristics and opinions of Canadian graduate students", but special problems of women and international students in graduate studies have been identified. Insight is gained into the experience of women across disciplines in the academy in Langland and Gove's (1981) collection in the United States and Dagg and Thompson (1988) in Canada. Brookes (1992)
relates her own experiences in a doctoral programme to power relations between men and women in Canadian society. Caplan (1994) discusses the ways implicit rules and expectations in the academy work against women, beginning at the PhD stage. Kerlin (1995, p. 9) suggests the experiences of female students described by Caplan are reflected in his own findings about male doctoral students, and "we need to examine whether broader notions of power and powerlessness are ultimately the root cause of the feelings described by the women in Caplan's research."

Literature dealing with minority student experiences in doctoral studies is confined primarily to the United States. Nettles (1990) discusses racial discrimination on four university campuses in the United States where Hispanic and Black students are offered fewer research and teaching assistantships than White students in their doctoral programs. Turner and Thompson (1993) found minority women were less likely to receive teaching and research jobs, as well as the mentoring and assistance necessary from faculty to promote their future careers. Discussion of international student experience is almost silent about race and ethnicity, focusing instead on issues such as language (for example, Xu, 1991) and stress (for example, Mallinckrodt and Leong, 1992).

My personal reasons for wishing to learn more about doctoral student experiences, combined with the inadequacies of research into Canadian doctoral student experience convinced me of the need for a study of PhD students at a Canadian university. I was particularly interested in student interpretations of their own experiences, and shared the sentiments of Axelrod (1990b, p. 26) who suggests there is more to be learnt from listening to students themselves than from "aging observers who romanticize, denounce, dismiss, or in other ways distort the student experience." Faculty have unique access to both the world of doctoral students and the academic
community, but my personal experience as a doctoral student suggested they often misunderstood or misrepresented the student experience. At the very least, faculty reflections on their own doctoral experiences need to be complemented by the understandings of students themselves. Becker et al. (1968, p. 2) argue "we should study students' views of their own experience because we think it is the best way to find out what influences those features of student behaviour we are interested in."

The scarcity of academic literature on the experiences of doctoral students, particularly across academic disciplines, suggested to me that an exploratory study of doctoral student experience in a variety of departments would be appropriate for my purposes. I decided to carry out an embedded case study (Yin 1989) informed by the theory and practices of ethnography. Limitations on time and resources available for a doctoral dissertation project required that I choose a limited number of departments for my research. All research involves trade-offs between the breadth and depth of knowledge that can be gained from any particular research design, and my desire to examine student experiences across departments affected how far I could explore each department. Departments are the basic organizational unit within universities (Becher and Kogan, 1992), and I assumed, with Cude (1987), that doctoral student experience was likely to vary across departments. As Becher's (1989) classification scheme for studying academic disciplines was used to select departments. I chose one representative department from each of Becher's four categories: hard/pure, hard/applied, soft/pure, and soft/applied.
Organization of the Thesis

Chapter II locates my research in a historical and social context, outlining the historical roots of universities and doctoral education in Canada and some current trends in Canadian higher education. Three key concepts (professionalism, socialization, and culture) that informed my initial entry into the research are discussed, as well as related concepts whose significance became apparent during the course of the research (expertise, autonomy, and isolation). Chapter III sets out the methodological orientation of the study, and explains the methods employed in the conduct of the research. The next four chapters of the thesis are organized around four related themes which underpin the experiences of PhD students, and elucidate critical aspects of the academic professions for which PhD students are being trained. Chapter IV focusses on the issue of standards by which university departments ensure PhD student achieve an acceptable level of expertise to join the professional ranks of their respective academic disciplines. A brief description of departmental backgrounds and structural divisions introduces the discussion of how PhD students in the four departments understand and experience the departmental mechanisms and practices for enforcing these standards. Chapter V examines the nature of student autonomy in the four departments, and relates the extent to which students and faculty value autonomy in each department to students' backgrounds and prior experiences. Chapter VI considers the sense of isolation students describe as a central element in all four departments, an isolation imposed by the demands of the PhD program regardless of discipline. Chapter VII explains how students are discouraged from developing or sustaining a commitment to analyzing the contradictions associated with departments' attempts to enforce standards of good research and students' sense of autonomy, and how learning to cope with contradictions is important training for PhD students'
professional success. In Chapter VIII, I conclude with recommendations for possible reform of the PhD degree, and suggestions for further research on doctoral students.
CHAPTER II BACKGROUND

Universities and Doctoral Education

Higher education has undergone remarkable expansion in the industrialized world in the past century, an expansion which has been characterized by increasing complexity and diversification. This has been accompanied by an explosion in the growth and variety of new forms of knowledge, much of which has been produced from within the domain of higher education and the academic community. The experiences of doctoral students are best understood in the historical context of the development of doctoral studies in English-Canada, which in turn is an integral part of the growth of English-Canadian universities in the past century and a half. Canada has developed its own unique system of university education and research, and the Canadian university is an institution different in many significant ways from university institutions in other countries such as the United States and United Kingdom (Harris, 1976). Universities in Canada responded to the demands of Canadian society, and by the 1960s "Canadian higher education was a well-organized system, with all the facilities needed to fulfil its national, regional, provincial, and community roles" (Harris 1976, p. 603). By the 1970s, however, it became clear to many Canadians that the university was far from the perfect instrument of economic development it had previously been made out to be (Axelrod, 1982). Although Canadian universities have their own unique characteristics, the development of English-Canadian universities has been strongly influenced by developments in university education outside of Canada, and particularly by British and American institutional structures and
traditions. English-Canadian universities combine two traditions in higher education, the British tradition of cultural transmission through strong undergraduate education, and the German tradition (via the United States) of independent research and scientific inquiry.

**Roots of English-Canadian Universities**

The period from 1500-1850 in England was vital and creative, but Ross (1976) argues much of the country's vitality and creativity was outside the doors of England's two great universities, Oxford and Cambridge. Rather than working on the frontiers of knowledge university professors "were encapsulated by narrow religious dogma and antiquated methods of teaching." (Ross, p. 15) Despite the narrow vision of English universities, they developed a concept of undergraduate education that has persisted as a model for universities to the present day. John Henry Cardinal Newman posits an ideal type of university education. He writes in the context of mid-nineteenth century Britain where the university was coming under pressure to allow for increasing research and professionalization. Newman (1947) conceives of the ideal university as a place of learning rather than one of research along the German model. He anticipates emerging trends in higher education, such as the growth of professions which he warns against, but supports the growth of universities as a means of providing refinement for students. Newman regards the university as essentially a place of teaching where knowledge is pursued for its own sake to discipline and refine the mind. The goal of university education is to transmit culture from one generation to the next as opposed to the creation of new knowledge, explaining why scientific developments in Britain often take place outside the great universities.
Scottish universities, which had a direct influence on some Canadian universities, such as Dalhousie (Harvey, 1938), had "a broader and more pragmatic curriculum and outlook than in England," according to Ross (1976, p. 19). Nevertheless, early universities in English-speaking Canada were modelled primarily after the English conception of the university and Ross argues the very slow growth of universities in Canada until after the First World War was due at least in part to the classical nature of the education they provided which had little relevance for the frontier conditions of Canadian life at that time. Canadian universities fulfilled the dual role, according to Harris, of training clergy and future leaders of society, and preserving British (in the case of English-Canadian universities) cultural traditions. For this reason university education remained relatively unimportant in Canadian life. The Canadian Constitution made education a provincial responsibility and most provinces left the funding of denominational universities almost entirely up to private donors. As a result, only a few strong provincially-funded universities developed until well into the 20th century (Ross, 1976). But, unlike the American experience where private universities attained positions of prominence, only McGill University and Dalhousie universities achieved positions of high status on the basis of private donations. Graduate education was largely ignored in Canada, resulting in a "brain drain" to foreign countries, particularly the United States, until the need for trained personnel after the Second World War forced Canadian governments to put resources into the advanced education of Canadians.

The German model of the research university began to have increasing influence on Canadian universities through the Americanization of Canadian universities that occurred in the twentieth century. American private liberal arts colleges had their roots, as did Canadian universities, in England. Harvard College, established in 1636, was the first American College,
and after the American Revolution the number of colleges and universities multiplied rapidly (Ross, 1976). Few of these institutions were engaged in research on any significant scale until after the American Civil War, and Cude (1987, p. 12) explains that American colleges "initially adhered to their medieval traditions", offering curriculum based on Greek and Roman classics to supply the colonies with preachers, lawyers, and physicians. Advocates of curricular reform like Franklin and Jefferson called for college education that would be more relevant to occupations in engineering, business, and industry. Even the traditional professions saw the need for more modern approaches to their education:

Lawyers saw the advantage of modern languages and contemporary history, doctors demanded an exposure to botany, anatomy and chemistry, and even clergymen came to acknowledge the merits of modern philosophy and oratorical techniques. (Cude, p. 13)

The American Civil War revolutionized a country that had already been divorcing itself politically and intellectually from its British roots. The power of science and technology became evident with the modern weapons and techniques of warfare employed during the war, and post-Civil War American education could not meet the demand for advanced education. Ross (1976) argues the United States needed a new model of university education to respond to the demands of industrialization for technology and trained workers, as well as to reflect the change from an authoritarian to empirical mode of thinking in the country. Dissatisfaction with the religious-oriented colleges increased as they seemed unable to respond to the changes of an industrializing society. Cude (1987, p. 14) explains why Germany was the choice of American students seeking graduate studies in the latter half of the nineteenth century:

The local academic institutions were confined to undergraduate studies, the famous British universities required religious tests in the awarding of degrees, and the French graduate schools lagged far behind those of Germany. So off to
In the nineteenth century many American scholars studied at German universities, and on their return to the United States brought back ideas about university education from that country.

In Germany the focus of universities was on research and scholarship, and German influences had a major impact on the development of American universities. Johns Hopkins University (1876) is often described as the first American research university (for example, Clark 1987a; Westermeyer, 1985). Other colleges evolved into universities with the development of graduate departments and a focus on scientific research, and it is their growth that markedly alters the nature of American higher education. According to Westmeyer (1985), the extent of research activity is an appropriate criterion for differentiating between a college and university in the American context. Offering a doctoral degree, together with the research activity that goes along with it, "was the mark that made an institution a university." (Westermeyer, p.90)

Nevertheless, traditional college education on the English model did not die in the United States; the sheer size and dynamism of the growing society allowed for an accommodation of seemingly conflicting traditions. American universities took on a variety of functions in American society during the twentieth century, making it difficult to generalize about "the American model" of the university (Hesseling, 1986, p. 34). American universities increasingly fulfilled the role of providing the location and personnel for scientific training and research to support a rapidly expanding industrial and technology-based society. The emergence of the American "multiversity" and its various uses in American society is described by Kerr (1972) as the resulting accommodation of various traditions. He traces the roots of the American university in its British and German origins, regarding it as a new type of multi-focused institution, differing from the
single community of the past. Modern American universities are comprised of a whole series of communities, according to Kerr, serving a variety of functions, not all educational. Von Blum concurs with Kerr's claim that values other than educational values have come to dominate the American multiversity. He criticizes the entrepreneurial spirit that pervades American universities, manifesting itself in "competition to obtain research money and to generate spheres of scholarly influence and domination." (Von Blum, 1986, p. 14) While Von Blum (p. 14) recognizes a business mentality may be useful in many modern enterprises, he argues it is "inimical to the process of education." Von Blum (p. 15) is critical of the "misguided multiversity":

> When certain lines of intellectual work are encouraged by marketplace forces and others are disparaged or unrewarded, a stultifying environment prevails. It is a negation of the state of free inquiry that should properly characterize the academic enterprise.

The American ability to draw from a variety of traditions is reflected in Canadian universities, and this accommodation has come to dominate our thinking of universities. In a 1970 commission on the relations between universities and governments in Canada, the commissioners Hurtubise and Rowat (1970, p.44) state, "The co-existence of conservative and progressive elements within the university explains its internal tension. Both are inherent to it by nature and must be present." This illustrates the extent to which the fusion of the conservative English undergraduate tradition with the progressive German research tradition has become incorporated in our conception of the contemporary Canadian university. But in Canada, the adoption of German research traditions and the ultimate emergence of the multiversity described by Kerr and Von Blum was somewhat slower than in the United States.
Universities in English-Canada

Although British influences in university education were strong, Canadian universities inevitably followed the lead of other aspects of Canadian culture by increasingly taking on American characteristics. Egerton Ryerson, who was to become Supervisor for Education of Canada West, recommended to the colonial government that elements of the German model of education stressing compulsory education, utilitarian instruction, and non-sectarian schools be introduced at the elementary and secondary level of education in the Canadian colony, but that university education should retain its British sectarian tradition (Cude, 1987). He argued against the creation of a secular, publicly-funded provincial university in Toronto. But Goldwin Smith, who was impressed by the advances in American university education after the Civil War, promoted the creation of a secularized provincial university in Toronto based on American educational ideals. Canadian students, like their American counterparts, went abroad for advanced degrees and brought home foreign influences. For Canadians, the United States was the country of choice by the end of the nineteenth century, and returning students put pressure on Canadian universities, such as the University of Toronto, to adopt American reforms (Noble, 1994). Nevertheless, Canadian universities were slow to adapt to continental pressures until after the First World War. The effects of Americanization of Canadian universities became more pronounced in the years between the World Wars when these institutions began to demonstrate a "peculiar blend of educational philosophies." (Ross 1976, p. 41) Professional education became increasingly a matter of university concern as more than 10 percent of total university enrolment was in engineering and applied sciences by 1921, and degrees were being given in a wide variety of professional disciplines. Axelrod (1990a) argues Canadian universities were responding to the
demands of an evolving capitalist economy in this period. Developments in the natural sciences, the advent of professional schooling, and a more secular continental culture threatened established educational ideals. The unified and coherent 19th century curriculum was being eroded by the utilitarian forces of the marketplace. The Depression years of the 1930s were difficult ones for Canadian universities, with very little expansion and much retrenchment. But, as David Cameron (1991, p. 39) explains, "if few universities were able to expand, it is at least as significant that none was closed." Harris (1976) argues the most significant change to occur at Canadian universities between 1920 and 1940 was the increase in enrolments, and particularly the enrolment of women. The student population almost doubled in the arts and sciences, but Harris (p. 351) identifies another striking trend:

The most striking progress occurred in the programs of special interest to women: education, household science, nursing, social work, library science, physical and occupational therapy, the last mentioned being a field that had not been offered in any Canadian institution at the beginning of the period.

In addition, graduate work outside of arts and science increased ten-fold. But most of these increases occurred in the 1920s, and were halted in the Depression years. Nevertheless, in the interwar years universities were instrumental in developing and expanding a Canadian middle class whose values would continue into the era of expansion after 1945.

The Second World War marked the beginning of serious federal government involvement in university education in Canada. It began first with discovery of the importance of science education and the need for influence over university research in support of the war effort, and continued after the war when the universities looked to the federal government for support in attempts to accommodate the returning war veterans. Veterans were not the only source of increased demand for higher education, and Cameron (1991, p. 45) illustrates this dramatic trend:
But what the veterans' bulge masked was a major increase in civilian enrolment, which showed every sign of increasing. Discounting the veterans, university enrolment in Canada increased from 36,400 in 1941-42 to 61,600 in 1951-52, an increase of almost 70 per cent in 10 years.

For decades Canada had been relying on foreign universities to provide graduate education for Canadian graduates wishing to further their studies or pursue a research career. In 1945 Brebner brought this issue to public attention when he called for much greater support for universities in Canada, and graduate education in particular. He argued Canada needed to keep its brightest young men and women in Canada if it was to hold its own in a competitive world. Bonneau and Corry (1973, p. 8) explain that between the Second World War and 1960 "consciousness of the importance of the scientific estate, and of the application of scientific method to a wider range of inquiries than ever before envisaged, grew rapidly." Increased demand by students for higher education combined with the need for scientific knowledge and expertise put a tremendous strain on Canada's universities.

By the mid-1950s this strain had developed into a crisis (Bissell, 1957). According to Cameron (1991), by 1955 Canadians were awakening to a crisis in their universities, evidence of which was the explosion in enrolments without the facilities to handle such growth. Pilkington (1983) describes the discussions and negotiations between the federal government and the National Conference of Canadian Universities (NCCU) that resulted in significant federal involvement in the funding of universities by the 1950s. Following recommendations made by the Royal Commission on National Development in the Arts, Letters, and Sciences, the federal government began to provide annual grants for universities based on the population of each province, and established the Canada Council to fund scholarships (Fisher, 1991). The federal government's response to the crisis in higher education marked a significant inroad into an area of
traditional provincial responsibility, premised on the belief prevalent in Canadian society by the mid-1950s that universities and a university education held the key to economic growth and individual prosperity. This optimism was shared by the Royal Commission on Canada's Economic Prospects (Preliminary Report, 1956, p. 112) which placed the improvement and expansion of Canadian universities at the heart of its economic development strategy:

What is being suggested in essence is that a deliberate and sustained effort be made to raise the standards and quality of Canadian universities to among the highest prevailing anywhere in the world. It is perhaps not going too far to suggest that no other single course of action would be so likely to have such an important and fundamental effect upon the long-term economic prospects for Canada.

Provincial governments also responded to the perceived need for expansion of higher education. Funding was provided for expansion of university campuses, autonomy for junior and affiliated campuses, transformation of denominational universities into public universities, and the creation of new universities. Funding for this expansion came primarily from the State: both provincial and federal governments. This marked an important shift in Canadian government involvement in university affairs.

At the same time Canadian governments were looking to universities to respond to economic concerns, English Canadians were experiencing a crisis of identity. Universities became intimately connected with an emerging Canadian nationalism and vision for a more just and uniquely Canadian society. Symons (1975), author of the Report of the Commission on Canadian Studies To Know Ourselves, called for a re-examination of the role of Canadian universities and their relationship to their surrounding communities. He argued:

The truth is, the universities are becoming almost the chief institutions of society in terms of both cost and impact. While universities in Canada are provincially-chartered institutions for which the provinces have carried a major responsibility, they are also institutions of national importance. They are, indeed, one of the
country's greatest national assets and, as such, they have an important role to play in serving society at all levels. (Symons, 1975, p. 15)

Universities were to play a critical role in the development of a Canadian identity. But Canadian universities had to rely heavily on American scholars to staff new positions during this period of expansion, and the intersection of increasing Americanization of Canadian universities with a crisis of identity for English Canadians placed the universities squarely at the centre of developing Canadians' vision for the future of the country. The state's role in financing university education in Canada evolved from a minor role prior to the Second World War to a central role by the 1970s. In response to economic and social demands, universities came to be seen as central to national development and the definition of Canadian culture.

Universities in Canada also changed their character in the post-war period, not only becoming bigger but also beginning to stress graduate study and research. But when the oil crisis and subsequent recession battered government finances in the 1970s, serious questions were asked about the new role universities had assumed in Canadian society (Ross, 1976). Kerr (1972) described the modern American university as an unstable institution which could be held together only as long as moderates remain in control. He argued that loss of consensus and tolerance would lead to the kind of conflict later confirmed in the developments of the 1960s and early 1970s. Kerr identified three challenges for the university of the 1960s: growth, shifting academic emphasis, and involvement in the life of society. It was not clear in the 1970s if Canadian universities had met the challenges facing them. For James Cameron (1978) the state had intervened too much in Canadian universities, raising the danger of universities becoming too much the servants of the state. He proposed a balance of power and work within the university: "The university for the advancement of knowledge and thus for the world; the college for the
pursuit of liberal studies by young men and women, the handing on of tradition, and the education of the heart and its affections" (J. Cameron, p.88). Anisef and Okihiro (1982) show how university expansion failed to deliver on some of its promises concerning equality of opportunity. Universities had also failed to rescue the Canadian economy, resulting in a re-evaluation of their recently won status as essential instruments of economic development (Axelrod, 1982).

Enrolments in universities were expected to decline in the 1980s in Canada, but this did not occur as Canadians recognized that individual prosperity in a competitive job market depended on advanced education. Canadian universities found themselves in a squeeze between continued pressure from students for places and demands for increased efficiency and accountability. Shrimpton (1987) warns of this problem in the mid 1980s when he identifies the potential crisis that might occur in Canadian universities as governments pursue policies of higher fees and restricted enrolments at the same time as the public becomes increasingly aware of the importance of accessible higher education. David Cameron (1991) predicts increasing reliance on the private sector as federal transfers decline, and with the projected federal government withdrawal from core funding of Canadian universities. In this environment, Cameron argues business relations become increasingly important, and because governments are generally in favour of this trend, it is up to universities to manage their relationship with the private sector carefully. Newson and Buchbinder (1988) identify changes in government funding that have forced Canadian universities to look in new directions for resources, and changes in academic work processes that have made universities increasingly receptive to new kinds of work organization. Universities are under pressure to serve a corporate agenda stressing excellence and efficiency over accessibility. Newson and Buchbinder are concerned the new vision places
Canadian universities in the service of the narrow interests of the private business sector rather than in more broadly-defined interests of Canadian society.

Canadian universities are not alone in this current predicament of increasing demand for places in a time of government restraint. Boyer (1985) points to a more market-driven curriculum in the United States as accountability in higher education becomes increasingly external. Neave and Van Vught (1991) identify the pressures for higher education to become more efficient in many industrialized countries, and Walford (1991) describes the changing relationship between government and higher education in Britain, arguing the cutbacks of the 1980s amounted to privatization of British higher education. He is concerned about who benefits from these cutbacks, as even business may suffer in the long run if funding for long-term research is sacrificed for short-term practical research. Becher and Kogan (1992) claim values external to institutions of higher education replaced internal values to some extent in the 1980s. After growing under state management in Britain, higher education institutions now rely far more on private support than had been the case in previous decades. Shrimpton (1987) believes the four basic principles under which universities operate - collegiality, institutional autonomy, tenure, and academic freedom; are being threatened by recent developments. Cameron (1991) warns against simply ignoring changes in university relations with the private sector. Doctoral education is an important site for examining the tensions that occur as the state plays a decreasing role in mediating between economic interests and university education. Doctoral students are at the borders of a profession itself under increasing pressure. Becher and Kogan (1992) describe doctoral students as being in the most unenviable position, as they represent the most unequivocal
example of internalist norms and operations at a time when external forces are impinging on the values and practices of the university.

**Doctoral Education**

The influence of the English university model in English-speaking Canada, combined with Canada's relatively slow rate of industrialization before the Second World War, resulted in little importance being given to graduate studies, and doctoral studies in particular, until the post-World War II period. King's College, affiliated with the University of Toronto awarded the first Master of Arts degree in Canada in 1845, soon followed by McGill University (Healy, 1978). Many Canadian universities began to grant MA degrees, but the requirements for these degrees involved no course work. Harris (1976, p. 185) describes the basis for awarding these degrees: "...work done at the bachelor's level, combined with physical survival, avoidance of jail, the payment of a fee, and some evidence of a continuing interest in literary or scientific study." By 1890 the MA was no longer an automatic degree but had to be earned, and the PhD had been introduced at a number of universities, although not in its present form.

Cude (1987, p. 7) claims the modern form of the PhD is "essentially an American phenomenon, deriving much of its strength and appeal from elements characteristic of educational movements in the United States over the past two centuries." The American Civil War had demonstrated to Americans the awesome power of technology and the potential of developing and harnessing new forms of knowledge. But American students who wanted to pursue postgraduate studies were forced to go overseas for most of the nineteenth century. Cude argues American universities were confined largely to undergraduate studies, British universities required
religious tests, and French graduate education was still under-developed. This left Germany as the destination of choice for more than ten thousand American scholars prior to the First World War (Cude, p. 14). Upon their return to the United States, these graduates of German institutions took up positions at colleges and universities and introduced German ideas.

German universities had been influenced greatly by the educational philosopher and founder of the University of Berlin, Wilhelm von Humboldt. He believed universities should be free from state interference, but should receive public support. Simpson (1983, p. 13) articulates the Humboldt principle as follows:

Freedom of teaching, of learning and of research were sacred, and knowledge was most fruitfully extended where it was imparted - teachers made good researchers and good researchers in turn made better teachers.

Simpson describes a higher degree of professionalism among university teachers in Germany than in Britain. The concepts of Lernreiheit (freedom to choose area of study) and Lehrfreiheit (academic freedom) gave protection to university students and teachers to pursue their interests, while state support afforded the university teacher with at least a comfortable standard of living. A profession of learning developed in Germany, and at the top of that profession was the university professor. Promotion for a university teacher to full professor status depended on developing a reputation through published research. Recognized both within and outside the university as an accomplished teacher and researcher, the German professor was sought out by scholars from all over Europe and North America as it became increasingly prestigious to attain the German PhD. Gellert (1993, p. 10) cautions, however, that this success came at a price, as the liberal humanism that had been at the centre of the University of Berlin experiment became instead "a single-minded, almost fanatical commitment to the advancement of knowledge, one that
excluded philosophy, practical applications, and any idea of education for life." Gellert (p. 11) argues the Wilhelmine regime in Germany was able to co-opt university professors all too easily, as "most professors had not only become defenders of Bismarckian politics and German imperialism but also proclaimed within their disciplines authoritarian and expansionist tendencies."

The first American PhD was awarded by Yale University in 1861, and a PhD program was first offered by Johns Hopkins in 1876 (Hesseling, 1986). Gumport (1993, p. 227) explains:

Hopkins especially became known as the "prototype and propagator" of research as a major university function. Coupled with its commitments to scientific research, Hopkins offered merit-based graduate fellowships for full-time study that included state-of-the-art research training.

Geiger (1986, p. 1) suggests "the American research university assumed something like its present form in the half-century prior to 1920." At first, graduate instruction was very informal at American universities, but over time it became increasingly structured with prescribed curricula and requirements for certification. This change had many critics and Hesseling (p. 6) states "some criticized the graduate school also as rigidifying intellectual pursuits and forcing candidates into conformity with narrow criteria of scholarship, and stifling creativity." Nevertheless, the development of graduate education in the United States was to revolutionize university education in that country, not only with the emergence of independent graduate schools like Johns Hopkins and the University of Chicago, but with the addition of graduate programs to important undergraduate colleges such as Harvard, Yale and Princeton (Cude, 1987, p. 14). By the turn of the century there were two new dimensions in American higher education, according to Walters (1965, p. 15):

College teaching became a career for which the instructor was specifically trained at a university; and the college curriculum became segmented into subjects or disciplines resembling those in which the teachers had done their graduate study.
Related to these developments was the increasing interest in science and the scientific method, the founding of professional societies, and the creation of learned journals.

The PhD functioned very differently prior to its proliferation in the United States in the last half of the nineteenth century. Before PhDs certified professional academic status, they were used not as an award for advanced intellectual effort but "as honorary awards, or granted to any possessor of a bachelor's degree in good standing who satisfied a time requirement and paid a small fee." (Cude, 1987, p. 18) American universities began awarding both the masters degree and the doctoral degree for successful graduate work, but regarded them initially as being of equal merit. The masters degree was awarded for approximately two years work leading to certification as a college teacher, and the doctorate was based on a program of equivalent length, qualifying the holder to begin advanced research. Cude (p. 19) claims the masters degree became subordinate to the doctoral degree only because of the vanity of academics and universities:

All prospective college teachers of whatever innovative ability wanted to posture before the public as being among the elite capable of original research, and all universities and colleges of whatever stature wanted to posture before the public as possessing a teaching staff composed largely or exclusively of such elite thinkers. Within a decade or two, the mastership had become subordinate to the doctorate, something acquired on the way through graduate studies and retained as a consolation prize by those not finishing the now-senior degree.

This resulted in the alteration of the research degree to accommodate the far greater number of students who were primarily interested in teaching but needed a doctoral degree to become a college teacher. The degree became the subject of criticism despite its increasing popularity in the United States. The notion that original thinking could be certified by a degree was derided by President A. Lawrence Lowell of Harvard University, who believed actual results were a better standard for judging thought than prior training (Walters, 1965, p. 17). The most sustained
criticism of the degree has been its perceived inadequacy in preparing graduate students for their teaching careers by focusing too much on specialized research.

The number of PhDs exploded in the United States over the course of the twentieth century. In 1900 American universities produced just 239 PhDs, but this number increased to 2,000 in the year 1930 and 3,600 in 1941 (Hesseling, 1986, p. 35). After the Second World War growth of doctoral studies accelerated with 10,000 degrees awarded in 1960. The expansion of doctoral studies was enormous: the number of PhDs tripled to 32,000 in the United States by 1971. Small personal academic departments gave way to large, heterogeneous collections of individuals with diverse values and interests, making it "difficult to discern any central purpose or vision" at American research universities (Hesseling, p. 35). New areas of study competed with older established fields for legitimacy, developing graduate programs that demanded equal status. This has been the source of further criticism of the PhD degree, as the proliferation of PhD programs in fields with questionable methodologies has called into question the standards by which the degree is granted (Cude, 1987; Hesseling, 1986; Walters, 1965).

Canadian universities were somewhat slower than those in the United States to emphasize the importance of doctoral studies. Harris explains that the 1890-91 calendars of just three Canadian universities had PhD programmes listed: Mount Allison, New Brunswick, and Queen's. Still, there had been no earned PhDs awarded by this date. American universities, on the other hand, offered PhDs at 50 different institutions by 1900 (Healy, 1978, p. 35). In 1884 the President of the University of Toronto, James Louden, succeeded in establishing the first doctoral degree at the university, the DPaed (Doctor of Paedagogiae) (Noble, 1994, p. 18). Three years later the university approved the PhD, but the number of doctoral students that could be enroled
was constrained by the limited number of graduates who could be employed at Canadian universities. The first PhD degrees awarded in Canada were conferred on three male students at the University of Toronto in 1900 and two female students in 1903 (Noble, p. 18). At the first Conference of Canadian Universities, held in 1911, the problem of Canada's under-developed graduate programmes was one of the matters discussed and, at the second Conference in 1915, a working committee was struck to look into the condition of graduate work at Canadian universities (Harris, 1976, p. 307). Its report the following year showed the situation for PhD studies in Canada was inadequate, with only McGill and Toronto offering earned doctorates. The requirements for the PhD at these universities reflected the pattern adopted by American universities after the establishment of Johns Hopkins University (Harris, 1976, p. 312). Other universities complained their graduates could not find places at those two institutions, and that better libraries and scholarships in the United States enticed gifted students out of the country, but efforts initiated at the Conference were hampered by the war effort.

According to David Cameron (1991), the period following the First World War in Canada was one of growth and prosperity for universities. In the 1920s enrolments increased by 50 percent and graduate education became a significant activity at some Canadian universities for the first time (D. Cameron, 1991, p. 33). In 1922 the first school of graduate studies was created at the University of Toronto (Healy, 1978, p. 35), and a total of 24 PhDs were awarded at Canadian universities Harris, 1976, p. 428). Although the number of PhDs doubled by 1930, and increased again to 75 by 1940, Canadian universities remained primarily undergraduate institutions until after the Second World War. This was true even at McGill and Toronto where graduate studies were the most developed.
The post-Second World War period was one of tremendous expansion for universities in both the United States and Canada. The increased enrolments due to returning veterans did not abate even when the veterans had gone through the university system. Part-time instructors and increased teaching loads had been employed to meet the needs of the veterans, but when it became clear the expansion was permanent measures had to be taken to deal with the crisis. Approximately 6,000 full-time faculty were teaching in Canadian universities in 1954-55, and projections for the next ten years called for a doubling of that figure (D. Cameron, 1991, p. 60). Yet the total number of doctorates awarded by Canadian universities in 1955 was 266, less than half the number needed simply to fill the openings for new instructors.

Canada's neglect of graduate studies was strongly criticized as early as 1944 by a committee of the National Conference of Canadian Universities (NCCU) on post-war problems of Canadian universities. In its Report on Post-War Problems the NCCU attempted to direct attention to the "serious state of advanced graduate work" (NCCU Proceedings, 1944, p. 27). It had the following goal for graduate education in Canada:

To maintain existing post-graduate work in certain fields and extend it to other fields so that training may be offered comparable to that given in the leading universities of Great Britain, France, and the United States, would tend to check the drain of some of the ablest of our graduates to universities outside Canada and to make more secure our cultural contribution to western civilization. (NCCU Proceedings, 1944, pp. 27-28).

In an appendix to the report of the committee, Innis (1944, pp. 58-59) expressed particular concern for the depleted teaching staff in the liberal arts following the concentration on the natural sciences and professional courses during the war. Brebner (1945) argued for an expansion of graduate studies to meet this need. In 1946, the NCCU Committee on Graduate Studies (NCCU Proceedings, 1946, p. 36) described the situation in Canadian graduate studies as an emergency,
with intolerable demands being placed on faculty to deal with increased enrolments at the undergraduate level.

Despite the concern of the NCCU (and its successor organization, the National Conference of Canadian Universities and Colleges [NCCUC]), the problem remained acute for a number of years, and Healy describes graduate studies in Canadian universities at that time as little more than a "peripheral activity" (1978, p. 43). "The unsatisfactory state of graduate studies in Canada was emphasized at the 1961 NCCUC Special Conference", according to Harris (1976, p. 552). The conference recognized that financial support from the National Research Council had a direct influence in the expansion of graduate work in the natural sciences, but that similar growth had not occurred in the social sciences and humanities. "Of the 305 earned doctorates awarded in 1960-61, two-thirds were in the sciences, 59 were awarded in the humanities, and 45 in the social sciences" (Harris, p. 553). The establishment of the Canada Council in 1957 improved the funding of research in the humanities and social sciences, but the contrast with support for research in the natural sciences remained "striking" (Harris, p. 560).

Dramatic expansion of graduate studies at Canadian universities occurred in the 15 year period between 1960 and 1975. During this expansionary period 16 new universities were established, and the number of universities offering graduate programmes increased from 28 to 47 (Healy, 1978, p. 44). Healy argues numbers alone do not describe the changes occurring at Canadian universities at this time with regard to graduate studies. The increased importance of graduate studies was changing the nature of university education in Canada. Changes in undergraduate programs, for example, allowing increased specialization at an earlier stage were a response to demands for better preparation for graduate study (Healy, p. 46). Students were
offered more choice of courses, but these courses were more specialized than in the past and were more likely to reflect the professor's particular research interests. Healy (p. 47) emphasizes the social context in which these changes were occurring:

The transformation of the Canadian university must also be seen in a broader context. Until the 1950s Canadian universities seemed to be playing a relatively minor social role. They provided undergraduate and professional training and governments were prepared to help finance this training; it must be remembered that even then governments were the major source of university funds. During the 1950s, however, the attitudes of governments changed. They were committed to expansionist policies and they saw universities as making a significant contribution to economic growth, both by the training of students which, it was believed, would increase productivity, and by research, which was important for defence but which was also expected to improve Canada's competitive position in the world economy.

The federal government increased its support of graduate studies through research grants and operating grants to facilitate expansion, and the provincial governments increased financial assistance to universities, often with financing formulae which encouraged the expansion of graduate education.

The economic crises from the 1970s to the present have led to a questioning of the legitimate role of the state in our society, and this has been reflected in a rethinking of the role of research and graduate studies in Canadian universities. Increased reliance on private funding, whether from students themselves through higher fees or from reliance on corporate-university linkages, has been encouraged by governments looking to solve their budgetary problems. Currently, Buchbinder (1993) sees a consolidation of these processes that developed in the 1980s toward more and more university policy being budget-driven. Efforts to link universities with private sector enterprises have their roots in "a climate of globalization where efficiency and competitiveness are the slogans underlying the practice" (Buchbinder, p. 334). This has resulted
in an ethos of the marketplace, where "the goals of research and the development of knowledge are more and more linked to the production of marketable products rather than social knowledge" (Buchbinder, p. 334-335).

Despite significant increases in enrolments at Canadian universities in the past 15 years, they have suffered from consistent underfunding. This, in turn, has been the impetus for much of the recent concern about "wastage" in universities, and the high attrition rates in doctoral studies in particular. Smith (1991) points out that this problem is of particular concern in social sciences and humanities where half the doctoral students in Ontario fail to complete their programmes, and the time for completion of a humanities PhD averages more than 9 years. Despite the dismal record of PhD programs, students continue to enrol because the degree is increasingly required in North America for both students and universities:

Without the PhD degree, one cannot now hope to be permanently employed as an instructor at most of the tens of thousands of institutions of higher learning on this continent, even in the teaching of junior undergraduates. Without the PhD degree, one cannot now hope to become involved with formal research in most fields at any level higher than that of technician or research assistant. And without the graduate school that grants the PhD degree, a university itself must accept a lower ranking in the hierarchy of institutions, with a diminished academic reputation and a reduced income from government and private funding. (Cude, 1987, p. 1)

The perspective of much of the research on attrition and graduate studies is from an institutional perspective, focusing on inefficient use of resources, rather than on the effects on students of the doctoral studies process (Corman et al., 1992). Doctoral students find themselves at the border of an academic profession that is feeling significant pressure to change. The transformation involves an entrepreneurial, individualistic, and private ethos (Buchbinder, 1993) which may be inconsistent with student expectations. It may also be inconsistent with a vision of higher education as a location for critical analysis and reflection on dominant social, economic,
and political forces. Doctoral students are under increasing pressure to conform to institutional demands for increased efficiencies, yet very little is known of how students perceive these changes, and the ways students come to accept or reject their place in an evolving academic profession. The tremendous growth of doctoral studies in the United States and Canada in this century has complemented the perceived need for trained producers of specialized scientific knowledge. As society appears to have lost confidence in experts to solve persistent social problems, and the state is increasingly unwilling to fund their training, the strains of an advanced education system undergoing change are manifested in the experiences of doctoral students.

**Key Concepts**

The growth and importance of doctoral studies in Canada in this century is intimately related to a belief in professionalism and reliance on professional expertise in our society, and doctoral students themselves undergo a process of professionalization during the course of their studies. A key concept for understanding how this professionalization is accomplished, and its effects on the doctoral student, is the concept of socialization. Socialization involves acceptance by the individual student of both explicit and implicit values, beliefs and practices of the academic community. Culture, as it has been used in an academic setting, is central to current research on student experience, and provides a conceptual framework for examining the interaction of PhD students with each other and with other academic workers. Professionalism, socialization, and student culture are key concepts which shaped and focused my study of doctoral student experiences.
"Professionalism"

Doctoral education is often understood as training to gain admission to the academic profession, but the world doctoral students are being prepared for is often misunderstood by both members of that community and those on the outside. Clark (1987b, p. 258) describes the academic profession as being "at once the easiest to approach and the most difficult to understand." To gain insight into doctoral student experience, some understanding of the professional nature of academic work and how the academic profession has evolved in our society is essential.

Perkin (1989, p. 2) argues we live in an increasingly professional society, and between 1945 and the early 1970s professional society "reached a plateau of attainment." Whereas preindustrial society was based on land, which is essentially passive property, and industrial society was based on actively managed capital, contemporary society, or professional society is based on human capital. This human capital is created by education, and those who possess capital seek to exclude those who do not. "Modern society in Britain, as elsewhere in the developed world, is made up of career hierarchies of specialized occupations, selected by merit and based on trained expertise," according to Perkin (p. 2), but this does not mean modern societies are true meritocracies. Perkin admits society has never actually reached the state where merit, social efficiency and social justice are dominant criteria in practice. He argues instead that modern societies came to accept the principle of meritocracy:

In principle...ability and expertise were the only respectable justification for recruitment to positions of authority and responsibility and in which every citizen had the right to a minimum income in times of distress, to medical treatment during sickness, decent housing in a healthy environment, and an education appropriate to his or her abilities. (Perkin, p. 405)
The notion of expertise lies at the heart of the ideology of professionalism, and the expertise of the professional is based on mastery of skills arising out of an accepted body of theory. Greenwood (1966, p. 11) emphasizes this essential element of professionalism: "The skills that characterize a profession flow from and are supported by a fund of knowledge that has been organized into an internally consistent system, called a body of theory." The internal consistency of the theoretical system underpinning professional skill provides the authority of expertise. Clark (1966, p. 285) reinforces the importance of expertise as an essential element of professionalism, particularly with respect to the professional academic:

In his specialism, modern academic man is a case of professional man. We define "profession" to mean a specialized competence with a high degree of intellectual content, a specialty heavily based on or involved with knowledge. Specialized competence based on involvement in knowledge is the hallmark of the modern professor. He is pre-eminently an expert.

Conceiving the professional as an "expert" is central to understanding the role of the PhD in credentialing students to enter the academic professions. The concept of autonomy is also intimately connected to expertise and professionalism. Being in control of the special knowledge and skill of an expert, the professional commands and expects a high degree of autonomy in the application of that expertise. Clark (1966, p. 286) claims professional academics demand a particularly high degree of autonomy:

Academic man is a special kind of professional man, a type characterized by a particularly high need for autonomy. To be innovative, to be critical of established ways, these are the commitments of the academy and the impulses of scientific and scholarly roles that press for unusual autonomy.

Professionals achieved authority and status in a society that respected the theoretical systems at the heart of professional expertise and autonomy. Perkin claims professional society flourished after the Second World War as long as it could meet the demands placed on it for rising standards
of living and social security. This was possible for a quarter of a century in much of the Western world due to booming economies and high employment.

Bledstein (1976, p. 90) describes the importance of professionalism in the United States:

For middle-class Americans, the culture of professionalism provided an orderly explanation of basic natural processes that democratic societies, with their historical need to reject traditional authority, required. Science as a source for professional authority transcended the favouritism of politics, the corruption of personality, and the exclusiveness of partisanship.

Professionalism is often credited with permitting the autonomy needed for critical examination of conventional theoretical systems, but it also has conservative consequences as individuals with years of training and lifetime membership affiliations protect their privileges. "The autonomy of a professional person derived from a claim upon powers existing beyond the reach or understanding of ordinary humans," according to Bledstein (p. 93), and the use of special ceremonies and rituals cultivates an elitist attitude among professionals. Clark (1987b) describes professions as groups that develop their own strange patterns that both command and isolate a particular domain of work. This is accomplished through a process of mystification where insiders gain access to specialized training that allows them to communicate with other members of the group in a shared language, but the process also acts to keep outsiders mystified and excluded. Brint (1994, p. 209) argues professions have been "transformed by the culture of expertise", causing them to "decline as a source of collective moral force in public life."

Perkin (1969, p. 1) identifies university teaching as the "key profession" of the twentieth century:

In a world increasingly dominated by the professional expert, on whose competence, reliability and integrity not merely the functioning of our complex industrial society but the very survival of civilization, if not of the human race
itself, has come to depend, university teachers have become the educators and selectors of the other professions.

Freidson (1994, p. 177) describes the academic profession as resembling "the ideal model of professionalism." Perkin (p. 10) finds it interesting that although university professors are the embodiment of all that professionalism stands for, "of trained intelligence and the competitive education on which it rests," and even the "custodians of the selection process", they are the least studied of the professions. Clark (1987b, p. 258) attributes this partly to the nature of the profession itself, particularly the "two-way differentiation" of the profession. Unlike other organizations where one might typically find one or two professional groups within a particular organization, universities can have as many as 50 "clusters" of experts (Clark, 1966, p. 288). Academics identify most strongly with their academic disciplines, and only secondarily with the over-all academic profession, creating a variety of expert communities that are a complex subject for inquiry.

Clark maps three stages in the development of the academic profession in the United States. Until the latter half of the nineteenth century, Clark (1987b, p. 258) claims that in the first stage faculty were "clearly pre-disciplinary and preprofessional, not yet given to specialization." After the 1870s, the academic specialist triumphed over the generalist and university departments were the site of occupational development centred around the academic disciplines in a second stage of professional development. This coincided with the growth of other professions in the United States. Larson (1977, p. 104) identifies the American Civil War as marking the beginning of the period where professions came of age, a time when "economic, administrative, and political power were consolidated and centralized." In the universities, discipline-centred professions became dominant, but the relatively small scale of the academic world allowed "a lingering sense
of oneness" (Larson, p. 104) that enabled members of the various disciplines to regard themselves as belonging to an over-arching academic profession.

Professionalization of the academic world has had important consequences for universities in contemporary societies. Friedson (1994, p. 176) thinks professionalism has nurtured "intellectual innovation - the development of new knowledge, skills, and ideas." He argues the insulation of professionals from the need to be immediately responsive to the demands of those outside the profession allows the professional to "go beyond the status quo and so depart from received opinion as to be revolutionary." But Friedson admits critical thinking and the creation of new ideas and knowledge, the functions of intellectuals, scholars and scientists, do not fit comfortably within a professional model. For Friedson, the separation of the professional academic from direct political and social control have provided an environment conducive to original and critical inquiry not equalled in any realistic alternative models for organizing intellectual work. Only professional institutions tied to universities can provide the material support required to support the disinterested pursuit of knowledge. Bledstein (1976) does not share Freidson's optimism, and argues universities in the United States have functioned to contain controversial issues which at one time might have torn apart entire communities. This is accomplished by reducing problems to scientific or technical terms, thus removing them from the realm of politics:

Universities quietly took divisive issues such as race, capitalism, labor, and deviant behavior out of the public domain and isolated these problems within the sphere of professionals - men who had learned to know better than to air publicly their differences. (Bledstein, 1976, p. 327)

Ideas have not only been segregated from the public by the university through increased professionalization in American society, but have also been increasingly compartmentalized within
the university with the development of new departments and specialisms. By emphasizing the unique qualities of its own subject, including particular use of language and methods of research and investigation, ideas have been segregated within universities themselves. Professionalism within university departments has made it more difficult for academics to speak to one another as they become increasingly specialized. Clark (1966, p. 289) argues academic professionals increasingly measure their authority in terms of money under their control, and the phenomenon of "professor-entrepreneur" increases the segmentation and individualization of the academic profession. Slaughter (1990, p. 244) rejects the current trend toward an "entrepreneurial ideology of expertise" that serves to "reproduce the culture and class relations of the dominant class."

Altbach (1989) describes the academic profession as somewhat reformist in social issues, but conservative in academic issues. Bourdieu (1988, p. 36) provides some insight into this somewhat contradictory orientation of the academic profession in his discussion of the social space occupied by its members:

As authorities, whose position in social space depends principally on the possession of cultural capital, a subordinate form of capital, university professors are situated rather on the side of the subordinate pole of the field of power and are clearly opposed in this respect to the managers of industry and business. But, as holders of an institutionalized form of cultural capital, which guarantees them a bureaucratic career and regular income, they are opposed to writers and artists...

Not surprisingly, professionalism is intimately connected to the growth of doctoral studies. Silva and Slaughter (1984) argue academics as experts provide a connection between the economy and the state, and the rise of graduate schools in this century is linked to the need for an increased number of professionals to serve the interests of the state and economy. Attainment of the PhD plays an important role in maintaining professional culture.
In order to further their control over a discipline, professionals particularized and proliferated the possibilities for investigation in a field. The more technical and restricted the individual areas of investigation, the more justifiable it became to deny the public's right to know or understand the professional's mission. (Bledstein, 1976, p. 328)

Special rituals, including many of the activities formalized in doctoral studies, reinforce the mysteriousness of the professional's knowledge and methods. Cude (1987, pp. 49-50) argues the main elements of the PhD are relatively uniform across disciplines and universities: a two year residency period including coursework, a language requirement, a comprehensive examination, and a dissertation "defined as a book-length treatment of an original contribution to the field." The time required to complete these tasks normally extends well beyond the two or three years originally considered sufficient for a PhD, rewarding "endurance, obedience and caution" (Cude, 1987, p. 52). The PhD dissertation is an exercise not only in scholarly method, but in human endurance and delayed gratification, discourages potential academics and helps maintain a clear boundary around the academic profession (Bledstein, 1976).

Since the 1960s, Clark (1987b, p. 260) argues American universities have experienced a reversal in the professionalization process. Differentiation of academic fields has taken a "quantum leap" at the same time the influence of university administrations has increased dramatically. This has resulted in the third stage of the profession: a movement toward deprofessionalization of the professoriate.

In this latter period, though disciplinarians remain much in charge at the top of the hierarchy of institutions, consuming students and responding managers take charge in the non- and slightly selective institutions. The triumph of the clientele has been institutionalized in the administrative (and faculty) responses that have put one-third of the professoriate on part-time assignment. A large share of the profession has crawled back under the control of trustees and administrators, with the unionization response adopted as the new road to an adversarial unity of academic workers. (Clark, 1987b, p. 261)
The current weakening of the academic profession is part of a broader lack of confidence in professional society. Since the 1970s, the West has been less able to meet the expectations of increasing wealth and social security, leading to questioning of professional culture from all sides. Perkin (1989, p. 472) claims: "The reaction was not confined to economic policy, although that formed the cutting edge. Underlying it was a much more general backlash against professional society in all its aspects." This backlash has encouraged a withdrawal of the state from funding of universities, and increased direct influence of private and corporate interests. Buchbinder (1993) shows that Canadian universities are not immune from these developments, and have been caught up in the trend.

Doctoral students in the 1990s are bound to be caught in the middle of potentially conflicting expectations of the faculty whose role it is to train students to enter a discipline-based and over-arching academic profession, and the university administration who are under pressure to streamline doctoral studies and have less commitment to maintaining professional authority than faculty. Students themselves may see their future in the ranks of Clark's (1987b, p. 261) "gypsy scholars," and have little interest in a seemingly irrelevant professionalization process. On the other hand, students may feel a strong need to maintain the "internalist" (Becher and Kogan, 1992) values of the profession at a time when these values are increasingly under attack. Doctoral student experiences at the border of an academic profession in transition is an important focus of this study.
"Socialization"

Doctoral students come to accept the customs and values of their academic profession through a process of socialization. The reaction of students to the process, and the power relations involved in accomplishing the socialization of students to their professional roles, is also an important aspect of this research. Reynolds (1992, pp. 637-638) explains that socialization "refers to the process by which an individual acquires the norms, values, and behaviors of the group." Kuh and Whitt (1988) describe socialization as the period when newcomers begin to integrate their own needs and goals with those of the institution. For academics, anticipatory socialization occurs during doctoral studies, a time when prior experiences and self-images must be modified. Clifton (1976) views doctoral studies as just one aspect of a continuous socialization process that begins in Kindergarten and ends with a completed PhD programme.

Socialization in education occurs through both the explicit curriculum and the "hidden curriculum". Clearly defined educational expectations and demands do not compromise the rational autonomy of adult PhD students, but a socialization process that remains hidden or obscured to students is more problematic. Much discussion of the hidden curriculum has focused on the experiences of elementary and secondary school students, with functionalists arguing the process of socialization that is at the heart of the hidden curriculum is a positive process that imparts a common set of values, norms and beliefs, preparing the student to participate effectively in a functional social group (Baksh, 1990). Parsons (1959, p. 297) explains:

From the functional point of view the school class can be treated as an agent of socialization. That is to say, it is an agency through which individual personalities are trained to be motivationally and technically adequate to the performance of adult roles.
Radical theorists such as Apple (1988) and Giroux (1988) argue schools socialize students into the norms and values of a social system that works against the interests of many students. These norms and values are implicit in the assumptions and practices of the educational systems, so students are often not conscious of them, or even able to conceive of an alternative. But students are not entirely passive in this process, and Willis (1977) describes how male adolescents create oppositional sub-cultures in response to the values and norms of an educational system that does not promote their interests. Awareness of socialization processes is essential for teachers and educational theorists whose goal is to guide educational and social change, but also for adult PhD students if they are to fulfil their roles as intellectuals and critics, while maintaining the autonomy valued by professional academics.

Becker et al. (1961, p.4) describe the socialization process of medical students and describe it as the "the longest rites of passage in our part of the world." The authors treat the socialization of these students as largely unproblematic, consciously adopting a male model because the profession at that time was predominantly male. The authors concentrate less on the variations in student experience than on what was common to all but the "deviants", and they operate under the assumption that all medical students come to medical school in order to be changed. PhD students are in a similar situation; they stand to gain individual status and authority by accepting the values, norms, and practices of their academic professions. Gerholm (1985, pp. 1-2) argues PhD students are required to become competent in the tacit knowledge of both the academic discipline and the student sub-culture if they are to succeed:

Any person entering a new group with the ambition of becoming a fullfledged, competent member has to learn to comply with its fundamental cultural rules. This applies to academic departments. To function smoothly within the group of teachers, fellow students, and secretaries, the student needs a considerable amount
of know-how. Most of it will be acquired through the interaction with others and without anyone making a deliberate effort to teach the newcomer the rules of the game. Nonetheless, the failure to comply with these implicit rules will undoubtedly affect the student's standing within the group.

Clark and Corcoran (1986, p. 30) focus on the experiences of women academics, and discuss the accumulative disadvantage of women faculty during their professional socialization:

The basic forms and functions of graduate education are similar across disciplines, but the actual processes vary among disciplines and departments, and even within departments among pairs of students and advisors. This situation is certainly true for men as well as women, as our interview data attest. The result is that different environments and contexts for learning are experienced and that little is known of this variety even by academics themselves.

Egan (1989) disputes the generally held perception that professional socialization in graduate school is best described as developmental, and argues instead that it is a process of resocialization. She believes graduate education is distinct from other levels of education in this respect because of its goal of professionalization. Individual student responses to the pressures of the resocialization process will depend on the extent the student anticipates and desires such changes. Those who voluntarily submit themselves to an alteration of their values, roles and self concepts will not be unduly concerned about the process. On the other hand, Egan (p. 204) argues:

Students who enter graduate school expecting a continuation of the developmental socialization present in their earlier education may react negatively to the awareness that a major focus of their training is a resocialization process designed to ensure that they adopt a new, predefined professional self.

Hartnett (1979, p. 68) describes a somewhat different problem, where doctoral students complain of a feeling of prolonged adolescence. Hartnett discusses the strategies employed by PhD students to deal with the strains of a process of adult socialization.

Clark and Corcoran (1986) identify the students' relationships with faculty as key to understanding their experiences in the socialization process, and Reynolds (1992) argues that to
understand the socialization and acculturation processes, we must analyze the newcomer’s experiences with others in the culture. I am particularly interested in how PhD students interact with one another to create their own understandings of the socialization process in which they are immersed, and develop alternative meanings to critically examine those of the dominant academic culture. As developing intellectuals, PhD students should be well equipped to analyze and offer alternatives for their own educational experiences.

"Culture" in an Academic Setting

The concept of culture pervades the social sciences, and anthropologists have played a central role in its development (Billington et al., 1991). Tylor (1976, p. 18) provides the classic nineteenth century definition of culture: "that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society." In this century anthropologists have conceptualized culture as not just the sum total of the activities of individuals, but rather a unique social entity. Kroeber (1976) regards culture as more than a biological inheritance, being learned and transmitted through social interaction. How culture comes into existence becomes central to understanding culture. Cassirer (1976, p. 21) argues, "That symbolic thought and symbolic behavior are among the most characteristic features of human life, and that the whole progress of human culture is based on these conditions, is undeniable." Kluckhohn (1976) emphasizes the importance of structure in the understanding of culture. Explicit cultural forms are readily recognized and understood by participants in a culture, but implicit organized patterns independent of individuals in society give structure to cultural systems. He stresses the shared and normative nature of culture that functions to integrate
individuals in society. Goodenough (1964, p. 11) argues conceptions of culture can be located in two different "orders of reality," the phenomenal order and the ideational order. Within the phenomenal order, certain patterns persist over time, and are independent of individuals in the community:

An observer can perceive this kind of statistical patterning in a community without any idea whatever of the ideas, beliefs, values, and principles of action of the community's members, the ideational order. The phenomenal order is a property of the community as a material system of people, their surroundings, and their behavior. (Goodenough, p. 11)

Goodenough (p. 11) describes the ideational order as "a property not of the community but of its members." He explains how members of a community make sense of their experience within the ideational order:

It is their organization of their experience within the phenomenal order, a product of cognitive and instrumental (habit formation) learning....As an organization of past experience, the ideational order is a means for organizing and interpreting new experience. (Goodenough, pp. 11-12)

Geertz (1973) pays little attention to structure, stressing the creative nature of culture and the importance of human agency in interpreting the world and searching for meaning. "For Geertz, culture became a semiotic code for reading virtually everything else (anything can be a cultural system), but he never confronted the issue of power." (Dirks et al., 1994, p. 22) Williams (1967) explicitly integrates power issues into the cultural realm by demonstrating how the notion of culture in modern nations such as Britain has developed in a context of increasing division of labour in industrial society. He examines the politics of cultural production, respecting human agency while recognizing the structures of power in society. Inevitably, cultural study involves a tension between recognition of the role people play in the creation and re-creation of their culture, and the influence of class relations in structuring culture. Williams (1982, p. 13) regards culture
as "the signifying system through which necessarily (though among other means) a social order is communicated, reproduced, experienced, or explored."

The complexity of academic disciplines, combined with the diversity of interests of academic professionals, requires appropriate conceptual frameworks to facilitate effective analysis of the academic world. Attempts to develop a framework for the discussion of academic disciplines often start with the opposition between the sciences and the humanities described by Snow (1959). New techniques for mapping the disciplines have been inspired by ethnographic methods in sociology and anthropology, and in particular by the works of Geertz. His concept of "thick description" (Geertz, 1973) has been employed in research on university cultures. Geertz (1983) argues academic disciplines are cultural frames in which attitudes are formed and lives conducted, more than simply sets of vocational tasks and vocational obligations. Furthermore, "most effective academic communities are not that much larger than most peasant villages and just as ingrown" (Geertz 1983, p. 157), a description that has supported his insight that cultural metaphors can illuminate many of the activities and conditions of academic life. Van Vught (1989, p. 102) states:

Innovations in higher education can be studied as specific processes in disciplines and fields, when these are seen as social communities with their own identity, their own history, their own language, and their own values and norms.

Clark has utilized the concept of academic culture extensively in his work, and identifies four levels of academic culture: the discipline; the profession; the enterprise; and the system (Clark, 1980). He argues that despite the increasing fragmentation and deprofessionalization in academe, culture continues to be a relevant concept as "integrated academic culture becomes the many cultures of the conglomeration" (Clark, p. 25).
At the core of any understanding of culture is the concept "meaning". Martin (1990, pp. 315-316) identifies three basic assumptions behind any cultural study, arising from the tradition of symbolic interactionism:

First, there is the assumption that people act toward things (including persons, places, material objects, values, systems, norms, and behaviors) on the basis of the meanings which those things have for them....Second, there is the assumption...that there is nothing inherent in an object that determines its meaning....A third assumption is that meanings which people have for social objects are developed, modified and remodeled through the process of interaction.

In the context of school cultures, Martin argues the meanings students attach to all aspects of their school experiences come from their interactions with one another. Williams (1967, p. 334) explains that culture is never complete, and is constantly evolving and undergoing modification by its members:

A culture, while it is being lived, is always in part unknown, in part unrealised. The making of a community is always an exploration, for consciousness cannot precede creation, and there is no formula for unknown experience.

The concept of culture is broad and malleable, but for the purposes of this study I conceive of culture as both the process and product of human interaction that provides meaning for lived experience.

The concept of culture has been employed in a wide range of research in higher education, and is prevalent in the area of university organizational management. Fetterman (1990) describes ethnographic auditing as the application of ethnographic or anthropological concepts and methods to the appraisal of administrative controls over organizational resources. Austin (1990) argues universities should recognize and build on the several and sometimes conflicting cultures that affect members' values and behaviours. For Kuh (1990), existing cultural elements of students must first be understood if we are to encourage student culture to adopt expectations, attitudes,
and values that are consistent with the educational purposes of the institution. The use of culture in the context of organizational management is largely from a functionalist perspective, assuming the norms, values and assumptions of the institution need not be called into question.

Becher (1989) illustrates how mixing geographic and cultural metaphors such as tribes and territories, population density, and rural and urban can be used to study the relationship between people and ideas in the academy. He focuses on the internal dynamics of academic fields as opposed to their relationships in a broader social context. Becher depicts the knowledge domains using classifications developed by Biglan (1973) and Adams (1976): hard or soft, and pure or applied. Hard disciplines are characterized by convergent and relatively undisputed knowledge domains, around which there are clearly-defined borders. The natural sciences are typically considered to be hard disciplines. Soft disciplines, typically in the humanities and social sciences, are characterized by contestation of knowledge claims and permeable borders. Applied disciplines concern themselves with the practical application of theory, whereas pure disciplines focus primarily on theoretical development. Becher (1989) develops a corresponding framework for classification of the social nature of the individuals engaged in academic work within disciplines. He sets out a convergent (tightly-knit) and divergent (loose) duality to describe different modes of communication and patterns of relationship, and utilizes the conception "urban" and "rural" communities to explain the social interaction of researchers. Becher describes interaction of members of urban communities as typically frequent, intense, and competitive, whereas rural communities normally exhibit less frequent and competitive patterns of interaction. The hard/soft duality of the knowledge domains and the urban/rural duality of the social relationships of academics are intimately connected, according to Becher (1989). Becher argues the ties binding
fields of inquiry and academic cultures have been underplayed. At a time when there appears to be increasing fragmentation of academic fields with the growth of specialisms, he argues for a common language for understanding academic culture so academics will be better able to communicate and understand each other across fields and specialisms. He suggests the following framework for further study of academic disciplines and cultures:

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<td>hard applied</td>
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<th>Academic Cultures</th>
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<td>convergent urban</td>
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<td>convergent rural</td>
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Becher's subsequent work develops a model for studying connections between the work of academics and their social, economic, and political context (Becher and Kogan, 1992). Becher and Kogan develop a framework for discussing process and structure in higher education, which they set in the context of government withdrawal from the field in favour of market forces. Again, Becher and Kogan explicitly claim to be focusing on the internal structure of British higher education, but the framework they develop makes a direct connection with political developments occurring in Britain at the time. This model allows the researcher to study how values external to higher education institutions have been impinging on internal values.

Horowitz (1987) provides a broad historical account of undergraduate student cultures in the United States from the end of the eighteenth century to the 1980s. She identifies three general categories of university students: college men and women; outsiders; and rebels. Horowitz claims these three ways of being an undergraduate student are always present and form contending cultures, but in any particular era one category seems to dominate and catches the public eye.
The concept of culture in discussions of student experience in higher education is also employed by Becker et al. (1961) in their study of the socialization process of medical school students. The authors draw on the perspective of symbolic interactionism which stresses the more conscious aspects of human behaviour and relates them to the individual's participation in group life. They employ the cultural metaphor of "the rite of passage" to describe the process by which young medical students become physicians, and because the authors view medical school as an organization with unusual single-mindedness of purpose, they feel confident using methods adapted from the study of industry to an educational setting. The authors' stated purpose is not criticism, but observation and analysis, and they emphasize their attempts not to bias their analysis and conclusions. Using the concepts of student culture and organization, Becker et al. look for those aspects of student culture that are held in common. Despite isolated instances of deviance the authors see no evidence of alternative collective perspectives as the students form a community of fate.

Cultural concepts have been employed more critically to understand student life by London (1978), Weis (1985), and Holland and Eisenhart (1990). London carried out an ethnographic study of a community college in a predominantly white working class American community in the academic year 1973-74. By studying the student culture, London finds the "cooling out" process of community colleges identified by Clark (cited in London, 1978) is actually not as painless as previously suggested. He finds concerns of social class and personal responsibility weigh heavily on many students, illustrating how social conflict impinges on student life at the community college. Weis also employs cultural metaphors in her study of a community college in a predominantly black urban community in 1979-80. She argues the culture produced
by students in the community college contributes to the maintenance of an unequal social structure. Culture is not free-floating, but takes its shape and form from the existing distribution of power and wealth. Holland and Eisenhart (1990) conducted an ethnography at two American universities between 1979 and 1987. They find women at the universities acquiesce to the social structures of male privilege largely through the peer system of romance, but they take an active role in negotiating their way through the system. This study provides a critical awareness of how social relations of power play themselves out at the university, although these particular power dynamics occur largely outside the institutional structures.

Tierney (1992) criticizes the integrationist stance of researchers such as Tinto (1988) who use the cultural metaphor of rite of passage, especially when discussing Native experience in higher education in the United States. He claims it is an inappropriate metaphor because students share few of the characteristics of initiates into a culture. From a critical theory perspective, Tierney argues it is vital for the researcher to frame research questions so they do not result in practical implications that are harmful for racial and ethnic minorities. For Tierney, the purpose of theoretical models is not just to describe the world but to change it. Therefore we must be careful in choosing our metaphors. Tierney prefers the use of multicultural metaphors, and concludes that critical and feminist theories are appropriate models for reconceptualizing student participation at universities.

Kuh and Witt (1988) attempt to clarify concepts related to culture and higher education, and document the wide variety of ways culture has been used in the field. These authors suggest cultural studies can be seen as incompatible with the myth of organizational rationality, and prefer to view culture as "an interpretive framework for understanding and appreciating events and
actions in colleges and universities rather than as a mechanism to influence or control behaviour" 

(Kuh and Witt, p. 3). They explain:

Descriptions of faculty and student cultures have often reflected naive, simplistic understandings of the diversity of attitudes, values, structures, rules and cultural artifacts (language, symbols, stories) common to various groups. (Kuh and Witt, p. 109)

A good illustration of problematic cultural metaphor is found in Taft's (1984, p. 17) history of the University of Saskatchewan:

No one is born in this village. In fact, although certain of its members seem somewhat immature while others are well into their second childhood, there are few children within the walls of academe. The university is a most exclusive village where becoming a villager is not a simple matter of birthright. Citizenry must be actively sought, and acceptance as a fellow villager is far from automatic. One need only stand outside the Memorial Gates to see the symbolism of this structure, for it lets all travellers know that entrance is - at least symbolically - at the pleasure of the insiders.

Taft shows how the use of cultural metaphors to discuss universities tends to obscure the exclusive nature of the university. Kuh and Witt also caution against the sloppy use of cultural metaphors, and explain that some categories of students do not qualify for subculture status because they lack sufficient interaction. Bergquist (1992) stretches the concept of culture too far when he equates culture with a common outlook, a kind of reified lens used to make sense of the world, rather than as the product of a constantly evolving process of negotiation among people. His four cultures are shared by people who may actually have no contact with one another.

The importance of student interaction became apparent as this study progressed, as the extent of interaction among doctoral students was an indication of their ability to create understandings of their experiences independent of, or alternative to, the more dominant culture of the university department. The purpose of this study is to learn more about PhD student
experiences using methods commonly employed for cultural research, but it is not primarily a study in search of a PhD student culture. In other words, when I was confronted with the choice of focusing my attention exclusively on those few students who had close interaction in their departments, or looking beyond them to the more typical experiences of students who had much less interaction, I chose the latter. The social and professional forces that discourage interaction and weaken PhD student culture are crucial for understanding doctoral student experiences, and students who are isolated from the core of departmental activities provided access to a deeper understanding of those forces. Culture is a useful concept for study of PhD student experiences as long as its use does not obscure the exclusive and divisive aspects of those experiences. As my study progressed, isolation emerged as a common theme discussed by students across all four departments, impacting on my understanding of the nature of doctoral student culture.

The concepts of professionalism, socialization, and culture focused my thinking throughout this study. As my research progressed, the related concepts of expertise, autonomy, and isolation emerged to shape my understanding of doctoral student experiences.
CHAPTER III METHODOLOGY

Research Traditions

Research in Higher Education

Social Research serves three broad functions: it increases the researcher's understanding of how subjects interpret and understand their own experiences and societies; it allows the researcher to make a truth claim about subjects' experiences or society that goes beyond the everyday understanding subjects have of their own lives; and it promotes desired social change. It is my position that all three of these objectives are at play in the course of any research project. Researchers draw from a variety of research traditions in a pragmatic and rational attempt to create meaning for understanding and action in their world, but the functions and goals of these various traditions are to some extent incommensurable. To achieve particular goals, the researcher creates a "working harmony" (Dewey, 1950, p. 196) of beliefs, values, and practices, but can never completely reconcile them. Research traditions or paradigms place particular stress on one of these research functions, reflecting the dominant goals of that research community. Foster (1991) outlines three research paradigms for social researchers in higher education: positivist, constructivist, and critical. Researchers who have a positivist conception of

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1At this basic level of categorizing research paradigms, various terms such as positivist, realist, and empiricist are used by researchers to refer to knowledge claims based on the assumption that a reality exists separate from the researcher, the nature of which can be known or discovered by the researcher. I have not made finer distinctions between these traditions because this level of analysis is sufficient to illustrate the incommensurability of research paradigms which promote different research goals, and students interviewed in this study spoke in terms of these three
knowledge assume it is possible to discover truths about social reality that can be objectively understood by anyone employing proper methods. The goal of the positivist researcher is to strip away those social conditions that obscure the aspect of social reality of which the researcher is most interested. Research from a positivist paradigm allows authoritative truth claims to be made to others who share these assumptions. Assumptions behind constructivist research conflict with those of the positivists. Constructivists reject the notion that social truths are discoverable, but assume that social constructions themselves are the object of inquiry. Rather than stripping away the everyday meanings people adopt to understand their social reality, it is the goal of the researcher to understand and display them. Research from a constructivist paradigm allows the researcher into the world of the subject, but makes no particular claim to a universal truth. Positivist and constructivist research have different goals, and therefore different standards for judging the value or success of particular research projects. Critical researchers do not privilege truth or understanding, but have a moral commitment underlying their research to promote social change, and Foster (1991) argues they make pragmatic use of research methods that promote the change they desire. They draw on the authority of positivist and constructivist traditions, as advocated by Alcoff (1989), to make a persuasive case that advances their moral or political commitments.

My own position comes out of the pragmatist tradition of Dewey (1929) that recognizes the social construction of values as well as knowledge to meet particular human needs, which are also constructed (Putnam, 1989). Dewey (1950, p. 196) argues "rationality is the attainment of a working harmony among diverse desires." The construction of needs and standards for achieving broad research categories.
success is constrained by a real world and the need to co-ordinate action (Habermas, 1984 & 1989) with others in that world in a meaningful way. I reject positivist notions of universal claims to truth, but recognize that positivist assumptions are deeply embedded in the cultural standards by which I share practical judgements about truth with others. Although I reject the universalism of positivism, I depend on a consensual cultural standard of truth that relies on positivist assumptions and methods for pragmatic purposes. Universal truth claims are so deeply ingrained in academic practice that even the most relativistic theorist cannot escape them. Constructivist research most closely reflects my theoretical understanding of social constructs and provides insight into the cultural forms that provide meaning for members of a society. But insight has no value without purpose. Foster (1991) is right in advocating recognition of the moral foundations on which all research is conducted, and promoting a pragmatic approach to knowledge and research in pursuit of particular shared needs or goals. Social actors develop meaning and judge truth according to constructed standards to achieve those goals. It is my position that social researchers, like all people, adopt a variety of somewhat conflicting strategies to arrive at a pragmatic understanding of social reality for particular purposes.

The notion of operating from a variety of distinct research paradigms can be unsettling, and there is pressure in the academic world to locate research within one particular paradigm, privileging a particular research function or set of goals. Professional academics attain their expertise from the consensual standards of a particular paradigm, and to deny the authority of a particular research tradition is to undermine the researcher's expertise. Researchers who are committed to a positivist conception of knowledge, for example, may explicitly choose to employ survey research whose results are quantifiable, with the goal of arriving at a truth that can be
universally understood. But the need to arrive at a shared understanding of how experiences are interpreted by the research subjects is implicit in the research design in order that meaningful questions may be framed for the survey, as is an implicit social purpose for carrying out the research. On the other hand, researchers who reject the possibility of universal social truths and whose primary goal is the promotion of desired social change may explicitly reject research projects whose "truths" undermine their goals. Nevertheless, the ability of such research to carry weight and convince an audience depends on some implicit claim to truth. It is my position that the appropriate choice of method for any research project is a pragmatic decision that involves the researcher's values and goals, the social context in which the research is to be conducted, and the standards of inquiry which carry authority in the researcher's academic community. Kuhn (1970) argues there is no algorithm for judging between various competing scientific paradigms, and my position is that, similarly, there is no universal standard for deciding on the appropriate balance of competing research paradigms to be employed in a particular research project. This is a practical, ethical, and moral decision for which standards of expertise are only consensual; without consensus, there is no standard.

Research in higher education has been strongest in the "old" sociology of education, relying primarily on quantitative methods arising out of a positivist conception of knowledge borrowed from the natural sciences. Within this paradigm the researcher attempts to uncover social truths that are hidden from the individual social actors themselves, but capable of being unmasked by the researcher through the rigorous application of methods that strip away unnecessary information or gather information beyond the scope of ordinary people's experiences. Walford (1992, p. 196) criticizes higher education's reliance on quantitative methods. Surveys,
for example, are useful when the issues to be analyzed are relatively simple and straightforward, and the researcher can be confident all participants share a conceptual framework. They have been employed to assess campus climates and thus inform organizational decision makers (Baird, 1990), but McKeown et al. (1993, p.83) suggest "universities and college campuses are complex social locations, which have been thought about and studied often but which, in important ways, remain largely unexplored." They argue theories about student attrition, for example, "should be more firmly grounded in an examination of the worlds of the actors than is the current practice."

Bogden and Biklen (1982) suggest that education as a general field of study has been slow to embrace qualitative methods in part due to education's historical link with measurement and experimental design, but higher education seems to be even more conventional. Nevertheless, higher education research in the past decade has begun to reflect the increasing importance of qualitative work. Walford (p. 197) identifies three strands of research that need to be done in the area of sociology of higher education, one of which would involve "a great number of case studies and more qualitative investigations of the lives of those involved." He specifically refers to the need for a better understanding of student experience. This is an interpretive study and draws from a variety of research traditions to increase our understanding of doctoral student experiences. I will discuss issues from the traditions of ethnography and case study that impact on my study, and then discuss their implications for this research.

Ethnography

Ethnography has its roots in anthropological research and is particularly suited for cultural studies, but has increasingly been adopted in sociological research in recent decades. Kirk and
Miller (1986, p. 9) describe qualitative research as "a particular tradition in social science that fundamentally depends on watching people in their own territory and interacting with them in their own language, on their own terms." Wolcott (1985, p. 190) defines ethnography in terms of the ethnographer's goals: "The purpose of ethnographic research is to describe and interpret cultural behaviour." Hammersley (1992) identifies two competing strands in ethnographic research. Older ethnographic research is based on a realist conception of the social world that allows for the possibility of uncovering social truths. More current ethnography is based on a constructivist conception of the social world that denies the possibility of going beyond the social constructs themselves. Both of these strands are evident in ethnographic literature.

Spradley (1979, p. 3) describes ethnography as the "work of describing a culture," and "the essential core of this activity aims to understand another way of life from the native point of view". He points out that ethnography means "learning from people" rather than "studying people", and identifies two major purposes of ethnographic research: understanding the human experience and serving the needs of humankind. As language functions not only as a means of communication, but also to create and express a cultural reality, describing a culture in its own terms is considered the primary goal of ethnography. Lofland and Lofland (1984, p. 3) explicitly identify themselves as belonging to a "naturalistic" tradition, one that "has acquired the connotation of minimizing the presuppositions with which one approaches the empirical world." In this tradition relations of power are largely ignored, and the meanings and concepts held by the informants in the culture under study are accepted by the researcher as being largely unproblematic (Anderson, 1989). Hammersley and Atkinson (1983, p. 6) explain: "Naturalism proposes that, as far as possible, the social world should be studied in its natural state,
undisturbed by the researcher." Wolcott (1985, pp. 199-200) agrees, and cautions against the misuse of ethnography in educational research when it is used as a tool to justify reform and not just interpret culture:

They [ethographies] help us understand how particular social systems work by providing detailed descriptive information, coupled with interpretation, and by relating that work to implicit patterns and meanings which members of that society (or one of its subgroups) hold more or less in common. Such accounts do not, however, contain the basis for judging systems to be good or bad, effective or ineffective, except as people within the group being studied express those judgments or reveal frustration in achieving their own purposes, or as the people conducting such studies impose judgments of their own. In and of themselves, ethnographic studies do not point the way to how things can or ought to be improved.

Naturalistic ethnographers are reluctant to explicitly impose their own values or moral commitments on the subjects of their studies.

No single model of ethnographic method exists, and appropriate methods for any research project are defined by the particular context of that research. Ayers (1989, p. 11) argues:

There is no simple mechanism of ethnography, no ready recipe of ethnographic inquiry, no methodological machine that, once started, runs itself. Rather, ethnography is as dynamic and complex as the human beings it undertakes to study....ethnography is unquestionably intuitive, idiosyncratic, and improvisational.

Nevertheless, Lofland and Lofland (1984, p. 7) identify four main steps in conducting any qualitative social research: gathering data, focusing data in a social scientific manner, analyzing data, and guiding the consequences of the research. They argue it is important for researchers to start where they are: to make meaningful linkages between their own "extrasocial science" concerns and the "codified concerns of social science." It is essential for research to be personally meaningful to the researcher so the researcher becomes emotionally engaged.
Gathering data is central to all research, and Lofland and Lofland (1984, p. 11) consider the overall objective of social research to be the collection of the richest possible data. They emphasize "direct observation and apprehension of the social world," which includes face-to-face interaction and participating in the minds of research subjects, and their preferred methods are participant observation and intensive interviewing. Participant observation entails the researcher establishing and maintaining "a many-sided and relatively long-term relationship with a human association in its natural setting for the purpose of developing a scientific understanding of that association" (Lofland and Lofland, p. 12). Bernard (1994, p. 136) describes successful participant observation: "It involves getting close to people and making them feel comfortable enough with your presence so that you can observe and record information about their lives."

Lofland and Lofland (1984) discuss the importance of intensive interviewing, a process of guided conversation that allows the researcher to elicit rich, detailed materials from the interview subject that can be used in qualitative analysis. Bernard (1994, pp. 209-210) describes four interview situations, based on the amount of control the researcher wishes to assert over the responses of informants: informal interviews, unstructured interviews, semistructured interviews, and structured interviews. Informal interviews are characterized by almost complete lack of structure and control, and are typically used as the first in a series of interviews where the researcher wishes to learn "the lay of the land". Unstructured interviews are not informal, and Bernard describes them as "based on a clear plan that you keep constantly in your mind, but are also characterized by a minimum of control over the informant's responses." Unstructured interviews are utilized in situations where time is not a constraint, and subjects are available for multiple interviews. Semistructured interviewing is based on an "interview guide" that sets out
the topics and questions needed to be covered. This type of interview is usually used when the opportunity exists for only one interview with each subject. Structured interviews involve a series of almost identical questions for each subject conducted in similar environments. The choice of interview characteristics depends on the researcher's goals and the context in which the research is conducted.

Lofland and Lofland (1984) emphasize that participant observation and intensive interviewing are mutually supportive activities, and that selecting appropriate sites for these two activities is essential. Research locations must be evaluated for both access and ethics, and Hammersley and Atkinson emphasize that access is more than just a physical presence. Ethnographers produce a cultural description by working together with informants (Spradley, 1979, p. 25):

An ethnographer seeks out ordinary people with ordinary knowledge and builds on their common experience. Slowly, through a series of interviews, by repeated explanations, and through the use of special questions, ordinary people become excellent informants.

Werner and Schoepfle (cited in Johnson, 1990, p. 31) argue most ethnographic sampling is opportunistic:

At first, one interviews those people who are easily accessible. Then, ethnographers use the help of this first batch of people to introduce them to a widening circle of friends and relations. The "networking" label derives from the fact that ethnographers utilize the personal networks of their earliest contacts to expand the sample.

Lofland and Lofland (1984, p. 46) describe "data logging" as "a receptive, almost passive, approach to amassing data." Spindler (1982, p. 7) agrees that good ethnography requires that "inquiry and observation must disturb as little as possible the process of interaction and communication in the setting being studied." Documentary evidence is also often an important
aspect of ethnography, especially if documentary materials help to explain everyday activities of members of the culture. (Hammersley and Atkinson, 1983). Documentary evidence provides authority for validity claims in ethnographic research, as the researcher can confirm the observations of informants through a process of triangulation. Wolcott (1985), though, cautions against focusing too closely on particular ethnographic methods, as the intent of the researcher to interpret culture is the key to ethnographic research.

As ethnographers conduct their research, they must determine effective methods of focusing data collected. Various social settings suggest different ways of organizing the researchers' observations of events, and Lofland and Lofland (1984, p. 71) call these "units" of social settings, with units occurring on various scales of social organization. It is important for the researcher to select appropriate units of analysis and to ask questions relevant to those units. Spradley (1979) suggests that both questions and answers in an ethnographic interview should come from the informant. By listening for the ways people within the culture ask questions, the researcher can ask the most appropriate questions for discovering what is culturally meaningful to those people. Hammersley and Atkinson (1983) argue appropriate methods of recording and organizing data depend on the purposes and financial resources of the researcher, and the setting of the study. Fieldnotes are the traditional method of recording data, but use of tape recorders has become widespread in recent years. Bernard (1994) stresses the importance of the permanent record tape recordings provide of an interview, and argues most subjects can become comfortable with the use of a tape recorder if they have some control over its operation.

Identification of categories is central to the process of data analysis, but a naturalistic commitment tends to keep the process implicit and underdeveloped (Hammersley and Atkinson,
Lofland and Lofland (1984) argue for the integration of data collection and analysis of that data, and Spradley (1979) agrees that ethnographic research requires constant feedback between one stage of the process and another. Nevertheless, a final stage of data analysis comes at the end of the data collection process, when final order is given to previously developed ideas (Lofland and Lofland). Spradley (1979, p. 92) describes ethnographic analysis as "a tool for discovering cultural meaning," and consists of analyzing field notes to identify cultural symbols and then discover relationships between those symbols. This latter stage is crucial from the perspective of a relational theory of meaning because "the meaning of any symbol is its relationship to other symbols" (Spradley, p. 97). Wolcott (1985, p. 193) emphasizes the important role of the ethnographer in defining the culture under study:

The ethnographer attempts to make explicit and to portray in terms of social interaction among many individuals - the micro-culture of the entire group, the collective propriostics² - what it's various members know only tacitly and understand individually.

The ethnographer plays the unique role of being a person able to enter the culture under study, but also capable of stepping out of the culture to gain a perspective unavailable to most insiders.

The purpose of carrying out research and the consequences of reporting results should inform all research activities. Lofland and Lofland (1984) argue consideration of the consequences of the research should not be left until the end of the research process, but the effects of the report should be considered from the very beginning. Spradley (1979) emphasizes the importance of an awareness of the audience for whom research findings are intended, as this will influence every aspect of an ethnography.

²Wolcott adopts Goodenough's concept of "propriostics" describing individuals' personal versions or theories of their own cultures.
Grounded Theory

Grounded theory refers to the "systematic generating of theory from data, that itself is systematically obtained from social research" (Glaser, 1978, p. 2). According to Strauss and Corbin (1994, p. 273),

Grounded Theory is a general methodology for developing theory that is grounded in data systematically gathered and analysed. Theory evolves during actual research, and it does this through continuous interplay between analysis and data collection.

Assumptions upon which grounded theory is based are similar to those of naturalistic inquiry. Glaser (1978, pp. 2-3) argues:

The first step in gaining theoretical sensitivity is to enter the research setting with as few predetermined ideas as possible - especially logically deduced, a priori hypotheses. In this posture the analyst is able to remain sensitive to the data by being able to record events and detect happenings without having them first filtered through and squared with pre-existing hypotheses and biases. His mandate is to remain open to what is actually happening.

Glaser points out that all stages of the research project, from entry into the field, through collection and codification of data, to the construction of theory, are all guided and integrated by emerging theory. The researcher should be committed to constantly refitting categories of analysis and theory to data as they emerge. He describes the grounded theory approach to research as transcendent, taking "those relevant variables from competing theories that fit and work, while always trying to raise their conceptual level by reducing them to a higher level smaller set of concepts" (Glaser, pp. 14-15).
Case Study

The case study is often associated with organizational and institutional research, and in higher education is frequently considered most appropriate for studying university culture, and student culture in particular. Hammersley (1992, p. 185) contrasts case study research with survey and experimental research: "It involves the investigation of a relatively small number of naturally occurring (rather than researcher-created) cases. Stake (1994, p. 236) argues "case study is not a methodological choice, but the choice of object to be studied." Nevertheless, case studies are often associated with qualitative research. According to Yin (1989), a case study can be used for three main purposes: exploratory, descriptive, or explanatory research. He stresses the importance for the researcher to be aware of the purposes of the case study at the outset of the project. Yin suggests the case study is best suited for research that focuses on contemporary events rather than past events, does not require control over behavioral events in the study, and is most interested in answers to research questions that are expressed in terms of "how" or "why".

The design of the case study can be either holistic or embedded. A holistic design is most appropriate when no logical subunits of the case can be identified, and the embedded study can be used when to ignore subunits would deprive the study of sufficient depth of understanding. Yin warns that in an embedded study the researcher should not become lost in the subunits, and must return to the original unit for a final stage of analysis.

Yin (1989) identifies six sources of possible data for a case study: documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts. He states that collection of data from a variety of sources is important for developing "converging line of inquiry" (Yin, p. 97), or the process of triangulation. In addition to using multiple sources
of evidence, Yin stresses the need to create a case study data base to organize and document the
data collected, and to maintain a chain of evidence so the reader of the study can "follow the
derivation of any evidence from initial research questions to ultimate case study conclusions"
(Yin, p. 97). He stresses the importance of remaining aware of the purpose of the case study
investigation, and understanding its theoretical and policy issues. This encourages the researcher
to focus on relevant data and identify issues that might need to be clarified with further inquiry.

According to Yin (1989), analysis of evidence collected in a case study is a little developed
but very difficult aspect of case study research. He advocates a strategy for analyzing data based
on either theoretical propositions or a basic descriptive framework, but in the absence of such a
strategy at the beginning of analysis he encourages the researcher to experiment with the data in
order to develop such a strategy. Final composition of the case study report should be oriented to
its potential audience.

Validity and Reliability in Ethnography

The validity and reliability of an ethnography are contested issues. Kirk and Miller (1986)
argue objectivity is a goal of qualitative research, and reliability and validity of observations are
the concepts through which the objectivity of a piece of research is judged. Sanjek (1990b, p.
395-404) stresses the importance of validity as opposed to reliability in ethnographic research. He
proposes three "canons" for assessing the validity of ethnographic work: theoretical candour, the
ethnographer's path, and fieldnote evidence. Sanjek argues all ethnographic fieldwork involves a
series of choices that arise out of theoretical commitments, and the significant theories informing a
researcher's choices should be made explicit to establish validity. The ethnographer's path refers
to the linkages between contacts and informants created during the course of research, and Sanjak proposes making these linkages explicit. Fieldnote evidence provides a direct link between the voices of the research subjects and the account given by the researcher, and is preferred by Sanjek, even though it may interfere with a fluid style in reporting results. Yin (1989) identifies four criteria for judging the quality of research design: construct validity, internal validity, external validity, and reliability. Construct validity refers to the ability of the research design to actually account for key components of the research question. Yin proposes three tactics to increase construct validity: multiple sources of evidence, establishing a chain of evidence, and having key informants review the draft case study report. Internal validity refers to the ability to conclude causal relationships in research, and if a particular event has not been directly observed by the researcher an inference must be made about that causal relationship. Yin suggests pattern-matching is a good way of addressing questions of internal validity. Questions of external validity, on the other hand, deal with the generalizability of research findings. Yin argues case studies should be generalizable to theory. In general, validity is increased through the practice of fieldwork (Kirk and Miller, 1986), and Hammersley and Atkinson (1983) emphasize the importance of collecting data from different sources and also the possibility of respondent validation.

The goal of reliability is to eliminate error and bias as much as possible, according to Yin (1989), and complete documentation is the best way to increase reliability. Kirk and Miller (1986, p. 72) agree that "for reliability to be calculated, it is incumbent on the scientific investigator to document his or her procedure". They emphasize that decisions internal to the research project must be made apparent, and that the reader of the research results is entitled to know what
preparations were made for the research, how data was collected, and the method of analysis. Sanjek (1990b) minimizes the importance of reliability in ethnography, as there is almost no chance of ever being able to effectively test the reliability of an ethnographic study. He argues validity is the true test to be applied to ethnography: "Does it say what I claim it does?" (Sanjek 1990b, p. 395)

Critical Ethnography

Critical theorists question the atheoretical and ahistorical stance of naturalistic ethnography. Set in the context of a broader attack on positivist methods in social research, critical theorists reject the possibility of objective, value-free knowledge. Critical theorists also reject the relativism inherent in constructivist paradigms (Foster, 1991; Alcoff, 1989) arguing moral and political commitments underpin any research project. Clifford (1988, p. 10) describes ethnographic texts as "orchestra\tions of multivocal exchanges occurring in politically charged situations", and Dardner (1994, p. 24) recognizes that institutional relations of power are always at work in the manner in which traditional research is defined, implemented, and utilized within educational environments." Critical theorists criticize the minimization of human agency in the structural accounts of neo-Marxists such as Bowles and Gintis (1976), as they look for ways to better understand the relationship between social forces and human agency. Friere (1983) asserts the possibility of the oppressed to intervene critically in their situation, and to take part effectively in the struggle for their own liberation, arguing they do not have to be paralysed by the oppressive structures in which they live.
In the late 1970s and 1980s reductive neo-Marxist explanations of education and society came under attack by both feminist (e.g. Holland & Eisenhart, 1990) and race relations theorists (e.g. McCarthy, 1990). "Feminist scholars of gender and schooling arrived at the position that conflict and resistance had to be incorporated into their analyses, as had Willis and others writing on class hierarchies" (Holland and Eisenhart, p. 33). Holland and Eisenhart develop the notion of "practice theory" to overcome the dangers of social reproduction theories. While recognizing the meaning systems that groups produce in response to structural constraints, they also pay attention to internal divisions and struggles within groups. McCarthy (1990, p. 63) emphasizes that in the political arena, social theorists find many groups mobilize around "distinctly non-class agendas." This forces a rethinking of previous reproduction models, a rethinking that gives education a more active mediating role between the economy, society. Individual actors such as students contribute to the production of culture and are potential agents of desired change.

Willis (1977, p. 3), in his ground-breaking study of working-class adolescents in Britain, explains the importance of ethnographic methods:

The ethnographic account, without always knowing how, can allow a degree of the activity, creativity and human agency within the object of study to come through into the analysis and the reader's experience.

But Willis, unlike many ethnographers in the traditional anthropological tradition, does not ignore structural constraints, and contributes to a theory of resistance or cultural production where oppressed people are more than mere victims of false consciousness. They see through some aspects of their oppression and resist the dominant culture. Holland and Eisenhart (1990, p. 42) integrate theory and ethnographic method in their own study of undergraduate women:

In our own research we began with questions from production theory and previous ethnographic studies of women and schooling, as well as with questions from our
previous work on peer groups. As our analysis proceeded, we found it necessary to incorporate practice theory and to pay attention to internal divisions among the women. 

Woods (1985) argues the time has come in ethnographic research to give more attention to the kind of "mental states" of researchers conducive to the production of theory rather than the collection of data. He believes ethnography will only reach its full potential with "the frames of mind, the circumstances, the resources that promote the creativity and originality that go into theory construction" (Woods, 1985, p. 74). Scott (1985, p. 116) emphasizes the need to know the "positions, attitudes and emotions" of the researcher, as well as the history of the research process. Critical theory involves a complex interaction of social structure and human agency, and critical ethnography combines naturalistic methods with critical theory. Critical ethnographers employ structural constraints such as class, gender, and race to inform their cultural accounts of human activity.

The alliance of ethnographic methods with critical theory is not without its problems. Anderson (1989, p. 252) claims "this uneasy alliance raised serious questions about the compatibility of theory-driven social agendas on one hand and phenomenological research methods on the other." He identifies "the validity issue" as the most important methodological challenge critical ethnography has had to confront, with accusations that critical ethnography is too theory-driven and therefore biased (Anderson, p. 252). "Educational researchers, using qualitative methods have, over the years, had to work hard to legitimate their methods to the educational research community" (Anderson, p.252), and the legitimacy of the practice of ethnography in anthropology depended to large extent on its naturalistic assumptions, and the mixing of this tradition with critical theory threatened to undermine this legitimacy. At the same
time anthropologists were experimenting with new approaches to ethnography, some educational ethnographers were doing their best to avoid accusations of mere story-telling by "moving to systematize ethnographic research in an attempt to make it more scientific, often even invoking the language of positivism to do so" (Anderson, p. 252). Kirk and Miller (1986, p. 13), for example, have a clear commitment to objectivity.

Anderson (1989) claims critical ethnographers do, in fact, share a concern for the validity of their research and engage in what are considered to be standard ethnographic practices for trustworthiness. It is in their questioning of informants' constructs that they sometimes differ from a naturalist approach. Naturalists tend to accept the constructs of informants as unproblematic, without due recognition that these constructs are themselves reconstructions of social reality. Critical ethnographers distrust traditional analytic categories in social theory, such as "family", "property", "stratification", etc. and more specifically in education, call into question categories such as "giftedness", "dropouts", and "effectiveness". They believe part of their role is to highlight the ideological aspect of these concepts. Conducting ethnographic research informed by social theory allows the researcher to deconstruct meanings informants hold which tend to sustain their powerlessness in conditions of unequal power relations. Anderson (p. 254) explains that critical ethnographers believe "the ideological nature of knowledge resides in the embeddedness of commonsense knowledge (and social science knowledge as well) in political and economic interests." It must be kept in mind, according to Van Maanen (p. 5), that "ethnography irrevocably influences the interests and lives of the people represented in them - individually and collectively, for better or for worse." This makes the political and theoretical stance of the researcher of critical importance. Roman (1993, p. 306) rejects the automatic equation of
ethnographic methods with feminism, arguing "what makes any methodology feminist is its actual challenge to the material and ideological practices of different forms of oppression." For Roman, it is the utility of the research rather than its adherence to a particular methodological approach that determines its value.

Tierney (1991b) applies the use of critical theory to inform educational studies specifically in higher education, and criticizes the underlying assumptions of much of higher education research. Instead of trying to neutrally describe an institution of higher education in order to improve its "effectiveness", Tierney prefers to think of the organization of the institution as a social construction of society. "The role of the critical theorist is to explain the organizational world, criticize it, and empower its audience to overthrow it", according to Tierney (p. 42), and "the critical theorist's explanation of the organizational world is rooted in both the interpretive understandings of the participants and the researcher." Tierney applies these principles to his own case studies of two public state institutions of higher education to examine the ways in which participants at the institutions understand institutional ideology. Foster (1991, p. 117) proposes a model for postgraduate agency, where one role of postgraduate education is "to engage in the active development of agents, individuals working within a moral context to achieve those goals valued by their particular programs." This conception of postgraduate education invites the kind of study preferred by critical ethnographers who share a commitment to the transformation of moral agents.

Critical reflexivity is an important component of critical ethnography, according to Anderson (1989), as this reflexive process guards against the possible rigidity of the researcher's critical framework. He argues reflexivity is a two-fold process, involving self-reflection on the
researcher's own biases, and also "on the dialectical relationship between structural/historical forces and human agency." (Anderson, p. 254) Hammersley and Atkinson (1983) consider attempts to eliminate the effects of the researcher in the naturalistic tradition to be futile, and researchers should instead set about trying to understand their effects. They argue:

All social research is founded on the human capacity for participant observation. We act in the social world and yet are able to reflect upon ourselves and our actions as objects in that world. By including our own role within the research focus and systematically exploiting our participation in the world under study as researchers, we can develop and test theory without placing reliance on futile attempts to empiricism, of either positivist or naturalist varieties. (Hammersley and Atkinson, p.25)

Reinharz (1979) recognizes the importance of not only asking questions about the substantive area of the study, but also the methods used in the study. She identifies a tripartite set of goals for any research: insight into the person, problem, and method. Anderson claims, unfortunately, little in-depth study has been made of particular practices ethnographers can employ to ensure reflexivity occurs in their studies. Nevertheless, he points to practices such as collaborative and action research methods, and negotiation of research outcomes between researcher and researched as useful beginnings to a better incorporation of reflexivity into ethnographic methodology.

Implications for this Research

Attempts to reconcile positivist, constructivist, and critical research paradigms are futile, as are attempts to confine research to just one paradigm. All research paradigms are underpinned by assumptions about knowledge claims, legitimate research goals, and moral commitments that are contested and irreconcilable. But researchers can draw on a variety of research traditions to
achieve practical goals. Blumer (1969, p. 27) emphasizes the "obdurate character" of the empirical world, and that "reality exists in the empirical world and not in the methods used to study that world." He advocates using "any ethically allowable procedure that offers a likely possibility of getting a clearer picture of what is going on in the area of social life." (Blumer, p. 41) In the conduct of my research I borrow from various qualitative research traditions in a pragmatic attempt to achieve three main goals: to further my understanding of how PhD students understand their own experiences; to look beyond the understandings of those individual students to make claims about experiences of doctoral students they did not perceive; and to contribute to the positive reform of PhD programs. In the reporting of my research I need to convince members of my research community of the validity or truth of my claims, according to standards both explicit and implicit in that community. These goals sometimes complement each other, but at other times are in conflict. The resolution of conflict is, in Dewey's words, a pragmatic and rational attempt to create a "working harmony" (Dewey, 1950, p. 196).

Critical ethnography assumes as a central goal of good research the transformation of the social world being studied by the researcher. Because no understanding of the world can be neutral, and no social activity can be divorced from the implications of unequal power relations, research always has political or moral implications. But the conclusion of critical ethnographers that for these reasons all research should make as its primary focus the advancement of a political or moral goal does not follow. Political and moral implications are a reality in all research, but it is a specific research decision to make these implications the fundamental standard by which the research will be judged. Alcoff (1989, pp. 98-99) argues feminists must make their decisions
about appropriate methodology in the debate between positivist and constructivist paradigms on

the basis of which tradition best promotes emancipatory politics:

For after all, the emancipatory potential of feminist theory and social science
remains an important motivation for research and criterion for methodologies. If
we choose a model of theory choice which undercuts relativism at the same time
that it deflates the persuasiveness of our conclusions this emancipatory potential
will be lost.

Alcoff wants to reject positivism in favour of constructivist social science which she finds most
convincing, but realizes the rejection of positivism means abandoning the authority positivist truth
claims carry in advancing feminist political goals. She advocates a flexible approach which
combines a constructivist theory of knowledge with the authority of positivist truth claims. The
contradictions are apparent to Alcoff, but inescapable. Her primary commitment to emancipatory
politics guides her practical choice of research methods arising out of incommensurable research
paradigms.

Research can have legitimate goals other than emancipatory politics, particularly if the
subjects of research are not clearly a marginalized group in society. This does not deny the
political and moral implications of all research, but allows alternative goals to be the primary
focus of a research project. Roman (1993, p. 307) discusses the possibility of "studying up", or
examining the lives of powerful groups in society, and the implications this would have for
research:

The ethical, political, epistemological, and methodological practices and
implications of such studies would vary accordingly and could not be prescribed in
advance from those derived from radically different power relations and material
conditions.

While doctoral students may be temporarily in a position of relative powerlessness, they clearly do
not comprise a subordinate social category.
This research project has a strong exploratory component, as little has been written about the experiences of PhD students from their own perspective in academic literature. Much can be learned by letting students explain their experiences in their own words in an attempt to gain access to doctoral student experience as it is understood by them. Nevertheless, I recognize that as a doctoral student myself, I bring my own experiences and understandings with me to the research, as well as the body of social science research from which this project emerges. The methods of naturalistic inquiry form the basis of this research, but I draw from other research traditions to accommodate my own experiences and theoretical perspectives. My research combined a commitment to respect the understandings and interpretations PhD students had of their own experiences, while at the same time looking beyond the constructs students had created to inform my own understanding of those experiences. I recognize the perceptive criticisms of assumptions behind naturalistic inquiry made by critical theorists, but disagree that all research should unite the researcher and the research subjects in a common political and moral enterprise. Throughout my research I was never convinced PhD students were a marginalized social group, nor that we shared fundamental interests in common. Nevertheless, the study of PhD students is important for improving our understanding of doctoral education and how it functions in a broader academic and social context. PhD student experiences provide insight into how doctoral education might be reformed to make it more humane for the individual students involved, and to promote critical and reflective commitments of PhD students.
Procedure

Initial Steps

In conducting this research I employed an embedded case study model informed by the theory and methods of ethnography. The over-all unit was a research university located in Western Canada with a wide range of PhD programs, permitting the study of doctoral student experiences across a variety of discipline cultures. I assumed discipline culture had an important effect on the nature of doctoral student experiences. My own understanding of doctoral studies prior to this research project was limited very much to the realities of doctoral student life in my own department. Contact with PhD students in other departments, particularly across the arts/science divide, was extremely limited before I began my study. I decided to focus my research on the experiences of PhD students in four departments, thereby establishing four sub-units for the study. These departments were chosen according to criteria established by Becher (1989) for understanding academic discipline culture. Becher identifies four main categories of knowledge domains that underpin academic discipline culture: hard/pure, hard/applied, soft/pure, soft/applied. I assumed at the beginning of my study that by choosing a representative department from each of these four discipline cultures I would be able to study a wide range of doctoral student experiences, while containing the research project within manageable limits for a PhD dissertation project. I chose the following departments, which each had at least 20 students enroled in the PhD program at the time of my study and appeared to comprise the elements of one of each of Becher's discipline cultures:

<table>
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<th>Hard/Pure</th>
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<th>Soft/Pure</th>
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Prior to conducting research I submitted a synopsis of the projects and methods to be employed to the university's Ethics Committee in accordance with the university regulations for research with human subjects. As all of the informants were to be adults, informed consent of each of the students involved was to be obtained from them personally, as well as from the Heads of the departments being studied. I undertook to explain the nature and purpose of the research to students of the departments as a group, and to each of the informants personally, and to provide the opportunity for any student to withdraw from the study at any time and for any reason. I also undertook to maintain the informants' anonymity, which was of particular importance due to the nature of the sensitive power relations between PhD students and their faculty supervisors.

In order to gain access to the university, the departments, and the students, I began by obtaining the permission of the Dean of Graduate Studies to carry out the research, and to make contact with the Heads of Department of the four departments chosen for the study. Three of these Department Heads consented to the study personally, and the fourth Department Head delegated this responsibility to the Graduate Coordinator. Easiest access was granted by the Physics Department, with the Head requesting no further explanation than that outlined in my letter of introduction. In both the Chemical Engineering and History Departments, the Heads asked that I meet with them to discuss my project in more detail. The Education Department was clearly the most tentative in agreeing that I proceed to speak with students. After obtaining initial access I was introduced to key PhD student informants in each of the departments, all of whom were student representatives. I arranged with these student representatives to meet with PhD students at their next scheduled graduate student meeting to explain my research project, if such
meetings existed, or called a meeting of graduate students specifically to present my research in departments where regularly-scheduled meetings did not occur. Graduate students in each department were notified in advance that my research would be a topic of discussion, and students were invited to ask questions or express reservations about the research. In all of the departments students were willing to cooperate in the research provided I quoted them directly only from formal interviews where they had provided written consent to be interviewed. With these assurances, no students in attendance at the meetings objected to my research in any of the four departments.

At the outset of the research project, I intended to formally interview five students from each department, for a total of twenty interviews. I decided to confine my study to doctoral students pursuing a PhD degree, and not to those studying in more applied doctoral programs such as the EdD program. I was interested in the experiences of students who were being educated for admission into the academic professions, and the PhD is the most widely accepted degree for entrance into the academy. My assumption was that PhD students occupy the very sensitive border zones surrounding the academic professions, and their experiences provide an opportunity for insight into the professionalization process of academics. I also confined my study to students who were then currently enrolled in the PhD program at the university. I realized students who had dropped out of doctoral studies and students who had recently completed their PhD would be able to provide valuable information, and in some ways be more free to openly discuss their experiences as doctoral students. Nevertheless, I decided that as an initial study of this kind, it would be appropriate to begin with the experiences of PhD students themselves.
Conduct of the Research

I employed judgment sampling techniques, where I first established a key student contact in each of the departments who was likely to have contact with a wide variety of students. This contact was a student representative who normally had more than two years experience as a PhD student and was familiar with the structures, requirements, and student activities in their particular departments. Selection of the informants from each department then "snowballed" through a network of contacts I developed through the key contact. These contacts were normally the first students interviewed in each department, and continued to be valuable sources of information throughout the study. Because of the very isolated nature of doctoral studies for some students, graduate secretaries in each of the departments were very helpful for locating students who were not part of the everyday life of their departments. Recent privacy guidelines at the university made access to such students difficult, but the increased use of electronic communications by doctoral students allowed initial contact with many isolated students without departments disclosing private information such as telephone numbers and addresses. I considered this access particularly important for reaching a broad range of student experiences, as there is considerable pressure from a variety of sources when conducting ethnographic research to confine the scope of the research to those informants at the centre of social activities. My interest from the outset of this research was to learn about the experiences of a broad selection of PhD students, as opposed to conducting a study of a culture that just happened to be composed of doctoral students. I did not want to disqualify a student from participation in my study because the student had very little interaction with other PhD students. An important assumption of this study was that doctoral
student culture, if it existed in a department, was probably relatively weak compared with student cultures at other levels of university education.

My first consideration for selection of informants was students' interest and willingness to be candid about their experiences as doctoral students. The initial meetings with graduate students to discuss my research were extremely useful in locating initial informants, all of whom were in attendance at those first meetings. I began my research with the explicit goal of interviewing from each department at least one male, one female, one Canadian, and one international student. Over the course of the interview process, I decided to interview at least two male and two female students from each department, even if the numbers of one group was very small. I used the initial interviews with key informants to develop other criteria for selection of subsequent informants on the basis of the unique characteristics of each department. I was particularly interested in important structural divisions that might exist in the departments, whether formal or informal. If key informants suggested such divisions might significantly affect the experiences of students, I ensured that at least one student from each of the department sections was interviewed. I also chose informants from early, intermediate, and advanced stages of the PhD to develop a sense of how student experience changed over the course of the degree. By starting my interviews with key informants who were often at the centre of their departmental activities, I found it was difficult to gain access to students who were not well-connected in the departments, and therefore perhaps more at risk in their degree programs. As I increasingly became aware of how isolating the PhD experience was for some students, I made conscious efforts to include such students in my study. One student, for example, had been out of the province for more than two years, a situation which was not unusual in that particular department.
I was able to locate and interview that student who had virtually no contact with other students in
the department, and this student provided an understanding of doctoral student experience not
available to other students at the centre of the department community.

In two departments, Physics and Education, I increased the number of interview
informants from five to six, because conditions emerged in each department that suggested an
additional informant would provide valuable information without expanding the scope of the
research beyond that appropriate for dissertation study. In Physics, students frequently spoke of
an exceptional Sub-Unit within the department where the few students in that area had very
different experiences from other Physics students, so I made contact with an additional student in
that Sub-Unit who was willing to participate in my study. In Education, the deep structural
divisions within the department required that I also increase the number of interviews there so my
study would not unduly focus on the experiences of students from the more dominant Sub-Unit in
that department. In order to accommodate the busy schedules of PhD students, to ensure that I
select students from as broad a representation of experiences as possible, and to gain access to
students without breaching their privacy, I proceeded with selection of informants slowly and
deliberately after the initial interview with key informants. At times the process seemed
agonizingly slow, as it might take weeks or months to make contact a student who met my
developing criteria, and was willing to participate in an interview. The entire interview process
took place over a twelve month period, from March 1995 to March 1996, with a four-month
summer break during which I was employed away from the university.

Interviews were typically held in an office made available to me at the university, outside
the four departments of the study. Students were given the opportunity to choose a location
where they would be most comfortable, and I conducted some interviews in students' homes and in their own offices. Most students preferred to discuss their experiences away from their own departments, and many expressed an interest in seeing how other PhD students went about their research, so my office was usually the preferred location. Due to students' busy schedules I decided to conduct one interview with each student, and met informally with some of the informants subsequent to the interviews when one of us had reason to discuss our interviews further. Interviews ranged from one to five hours, with the typical interview lasting about two to three hours. Tape recordings were made of each interview, but some students requested portions of the interview remain unrecorded, or segments be erased after reflection on the discussion. I employed ethnographic interview techniques (Spradley, 1979), with predetermined topics for each interview, but an interest in following the leads of informants. As each interview deepened my understanding of student experiences, I modified the focus of future interviews. For example, in my first interview with the key informant in the Physics Department, we discussed the absence of Philosophy of Science as an interest of students in their doctoral programs. This was not a topic I had considered before the interview, but arose by chance in our conversation. I subsequently pursued this topic with other science students, and was surprised to learn how little discussion of Philosophy or History of Science occurred at the PhD level. This was in sharp contrast to the arts departments, where students recognized the need to examine fundamental premises of their research traditions. As I analyzed the data from interviews during the course of my research this difference became increasingly important, but had only become an important topic for discussion in the interviews after I had spoken with one of the key informants. Despite important assumptions I brought with me about doctoral studies to my research, I had a deep commitment
to learning what students in other departments described as critical aspects of their studies. I considered my study to be primarily discovery-oriented, as little had been written about doctoral student experiences across departments, and I knew my own experiences were limited to my department community.

Interviews began with a general discussion of my research and how it had evolved to that point. I noticed different interests of various informants, depending on their discipline background. Physics and Chemical Engineering students asked questions about what I had "discovered" about doctoral studies in general. History students shared this interest in discovery, but were specifically interested in what I had discovered about their own department. Education students, on the other hand, did not ask me what I had discovered, but were more interested in "locating" my research in the broad field of competing research paradigms in Education. Informants' initial questions provided insight into the ways academic disciplines shaped students' notions of the purpose of research. The taped part of the interview began with specific questions about the academic and personal backgrounds of students, information which was important for me, but was also unproblematic for the students, facilitating dialogue. Subsequent questions were generally organized around five themes: evolution of the students' research interests, departmental structures and requirements, student relations with faculty, student interaction with other students, and financial and work-related issues. Although I directed the discussion to cover these broad areas during the course of the interviews, I was very interested in specific themes that emerged from students' own experiences, and incorporated these themes in future interviews. An example of such a theme was the sense of isolation science students spoke of, an isolation I expected from arts students but was surprised to hear discussed by the Physics and Chemical
Engineering students. This challenged an important assumption I brought with me to the research from Becher's (1989) description of interaction within discipline cultures, and became incorporated into the explicit focus of subsequent interviews with science students. Interviews ended with an opportunity for the informant to talk about any issue not discussed during the course of the interview which that student believed was an important aspect of doctoral studies. As the research progressed, I began asking informants if there was a topic or issue I might like to bring up with future informants, and this was a valuable strategy for getting at sensitive issues in the departments and selecting future informants.

Observation of PhD student activities within each department of this study complemented the student interviews. Attendance at graduate student meetings to introduce my research project provided an opportunity to begin to observe student activities in which PhD students were involved. Unlike undergraduate education, graduate studies tends to be a very isolating process for students, and there are very few locations where the important activities of doctoral students can be observed. Student interaction tends to occur in small groups or very intermittently in larger groups. At the beginning of my research I believed student interviews would be the most valuable source of information about doctoral student experience, but was not sure if my own experience could be generalized across departments. Therefore, I was particularly interested in the initial interviews to elicit information about formal or informal student activities PhD students considered important during their studies. I was surprised to discover the students I interviewed were generally more convinced than I had been in my own department that student activities were not a significant aspect of the lives of most doctoral students. For this research I was most interested in activities in which PhD students played a central role, but students informed me that
unless faculty were involved in departmental activities, they occupied a peripheral space in the lives of doctoral students. I attended organized student activities in all departments and found very few PhD students were in attendance, particularly after their first months in the programs. The activities which students considered central to their experiences involved close interaction with supervisors, either in labs or faculty offices. Nevertheless, I attended a variety of functions, such as student colloquia, department orientation meetings, seminars and courses, student meetings, dissertation defenses, and informal social gatherings on the university campus. I also monitored graduate student and departmental E-Mail discussion lists, and observed the settings in which PhD students conducted their research. While student interviews remained the most important source of data for this research, observation of the physical location of student research, as well as student activities, helped to validate data gathered during the interviews or suggest new approaches to subsequent interviews.

University documents, such as calendars and departmental graduate student handbooks provided essential background information for the university, departments, and PhD students. Unfortunately, basic university statistics for particular departments on attrition rates, ages of students, and length of time to complete degrees were either not compiled by the university or not made available to me. Recent university guidelines on student privacy and cutbacks in funding for administration were cited by various university offices as reasons for not allowing access to raw data where information had not been published. I had some success obtaining estimates of this type of information for current students from graduate secretaries in each of the departments studied, for which I was grateful considering their own concerns about issues of privacy and resources available to them. Some departments have just begun to compile their own statistics on
dropouts and length of time for completion of degrees, but it will be many years before enough data is collected to permit meaningful conclusions to be drawn from this information. Even the university's basic PhD student enrolment statistics were unreliable for the Education Department, as the recent restructuring of Education Departments at the university appeared to have university staff confused about the status of students in that department. I was forced to rely on the graduate secretary in that department as the most reliable source for current enrolments. Calls in academic literature (e.g., Cude, 1987; Walford, 1992) for more complete statistics on graduate studies and graduate students are supported by my efforts at this university to gather the most basic statistical data at a department level.

During the course of my research I kept a field diary to provide a framework for organizing the research process and for recording the sequence of data-collection and data-analysis steps taken during the course of my research. Observations of the research settings and student activities were recorded in this diary as were my thoughts following student interviews. I used a separate diary to record my reflections on the research process, and was able to reflect back on this information during the course of the study to relate my own experiences as a PhD student to those of my informants.

Analysis of Data

Data analysis began as I established first contact with Heads of the departments under study, and was a continuous process to the final writing of this thesis. I brought some basic assumptions about the experiences of PhD students with me into the research from my own experience as a doctoral student, and from the academic literature. These assumptions shaped my
original decisions about methods for studying PhD student experience and the initial themes around which interview discussions were framed. Analysis of data from the outset of the research confirmed some of these assumptions, and suggested areas for modification of others. For example, my own experiences suggested PhD students typically began their doctoral studies with well-defined research topics they had developed outside the academy and the process of re-defining these topics to conform to the interests and standards of academic disciplines was a major problem for PhD students. This assumption was based on my own experience, the experiences of other students within my own department, and academic literature, such as Common's (1994) study of professionals returning to graduate study. As my research unfolded I realized the extent to which this assumption had been based on the peculiar circumstances of my own PhD program in a professional department (Education) which drew from foundational disciplines (History, Philosophy, and Sociology of Education) for academic authority. Students in my department were typically professionals who returned to graduate studies after establishing careers where they had developed commitments to problems they wished to pursue in the academy. Transformation of their research interests from the priorities and conceptual frameworks of their professional work outside the academy to the imperatives of academic disciplines was not always an easy process. At the outset of my research I expected this problem to be an important focus of my study. It soon became apparent that in three departments (Physics, Chemical Engineering, and History) students typically defined their original research interests from within their academic disciplines, and that my original assumption needed to be modified. The related issues of student ownership of research and student autonomy emerged during the course of my interviews, enabling me to locate the specific concerns of students in my
own department, and the Education Department of my study, with broader issues relevant to the experiences of all PhD students.

Transcription of the taped portions of interviews provided an opportunity for categories of analysis to congeal. By re-immersing myself in the interviews, without the need to divide my attention between the discussion I was having with the informant and the need to guide the direction of the interview, I discovered fresh interpretations of the student's experiences that had passed unnoticed during the course of the original interview. The transcription process was extremely valuable for shaping the themes that eventually emerged in this thesis. Following transcription of the interviews, the themes of expertise, standards, ownership, autonomy, isolation, and contradictions took shape as I re-worked the interview data and field notes, and reflected on my own experiences as a PhD student and the experiences of my colleagues.

In the following chapters I have used two-letter codes in place of informants' names to protect their anonymity. These codes bear no relation to the actual names or initials of the informants. All direct quotations are followed by a code, as are my own statements that are substantially the same as those made by informants. A series of codes indicates a similar statement was made by more than one informant. The agreement of more than one informant is one indication of increased confidence in the truth of the statement, but should not be regarded as the only test of validity. Many statements which are identified by only one code are supported by other data obtained from documents, observation, and related statements made by other informants.

Reflexivity was an important aspect of this study, as my own doctoral degree experiences shaped my theoretical approaches, beliefs and assumptions about how to approach other students'
experiences, and the experiences of students in my study in turn both confirmed and challenged my own understandings and conceptualizations. In my department PhD students analyzed and re-analyzed the goals and practices of their own department almost to the point of obsession. I was surprised to discover during the course of my study that this intensity of analysis and reflection on their degree programs and departmental cultures was not widespread among all PhD students, and the search for reasons to explain this difference began to inform both my research project and my analysis of my own unfolding experiences as a doctoral student. As students in my study increasingly spoke of the dangers of confronting the contradictions of doctoral studies for fear of becoming "paralysed" I noticed my own colleagues were beginning to speak in similar language. Close reflection and analysis of their own experiences began to give way to an increasing need to complete their degrees regardless of the implications for commitments and values my colleagues had originally brought with them to doctoral studies. The research project was informed by my experiences as a PhD student, but more importantly for me, the research project has shaped the way I understand my own experiences as a doctoral student and educator: my primary motivation for carrying out the research project from the beginning.
Canadian society has increasingly trusted and relied on professional expertise in this century, following an earlier and more pronounced professionalization in the United States. The professionalization of society entails a separation of "expert" knowledge from the less trustworthy knowledge of ordinary people (Bledstein, 1976; Silva and Slaughter, 1984). Professionals claim expertise in an arcane body of specialized knowledge, an expertise that usually involves lengthy training culminating in the mastery of superior skills that can be applied in the solution of practical problems for the benefit of society. The tremendous expansion of knowledge at American universities from the latter half of the nineteenth century led to increased specialization of academic work and the need for advanced training in emerging fields of science, including the social sciences: "A specialized division of expert labour implies that each occupational niche creates its own knowledge boundaries, defining currently correct ideas and their practical application." (Silva and Slaughter, 1984, p. 3) Coinciding with the proliferation of knowledge organized into increasingly specialized fields was the growth of graduate education and the PhD degree:

The rise of the graduate school was predicated on academic specialization, and modern professors are experts. Through its power to grant higher degrees, the university confirms our monopolies of specialized knowledge. Theoretically, all professors are certified as experts. The PhD, our highest degree, attests to its holder's original work on a specialized question that is part of the problematic of a larger field. (Silva and Slaughter, 1984, p. 9)

The PhD has become almost universally recognized in the United States and Canada as the necessary qualification for an academic career. Nevertheless, the emergence of the PhD in the
United States at the end of the nineteenth century was not without its critics. Professor James Taylor of Vasser College expressed fear in 1894 the PhD would encourage undo specialization, and President Lowell of Harvard university claimed a degree could not replace results as a test of original thought (Walters, 1965, p. 17).

Lowell's criticism of the PhD lies at the heart of my discussion of standards and the experiences of PhD students at this university. Problematic for the academic profession, as opposed to more applied professions such as medicine and law, is the claim that producers of original knowledge can be given prior certification that legitimizes entry into the academic profession. Greenwood (1966, p. 13) observes:

Every profession strives to persuade the community to sanction its authority within certain spheres by conferring upon the profession a series of powers and privileges....Among its powers is the profession's control over its training centres.

The professional model inspires confidence when it incorporates an agreed-upon body of knowledge and expertise in a particular field, allowing the professional to apply this expertise to practical problems in society. It is not self-evident there can be an agreed-upon expert method of producing original knowledge. For the student, the PhD marks a significant shift from a consumer of research to a producer of research, with the student being expected to generate original knowledge (Hawley, 1993). What standard can exist for judging original knowledge?

The existence, and importance, of the PhD as a certificate of expertise in the production of knowledge implies PhD holders share determinable attributes, and universities judge PhD candidates according to legitimate standards: "Normally, we in higher education assume that our knowledge monopolies are legitimate; that we receive our resources from an approving community in tacit exchange for the work we do." (Silva and Slaughter, 1984, p. 3) Whereas the
PhD was originally granted to scholars at their intellectual peak, the PhD of this century "signifies the holder possesses academically acceptable abilities to commence independent scholarly investigations." (Noble, 1994, p. 10) The question of standards for certifying a student's ability to generate knowledge is central to any PhD program, and is where I begin my discussion of the experiences of PhD students at this university.

The Faculty of Graduate Studies at this university requires PhD students to fulfill certain standard requirements across university departments in order to graduate. These requirements are set out in the university Calendar, and include the following: a Residency Period, Comprehensive Examinations, acceptance of a Thesis Proposal, and a Thesis Defense. The Residency Period normally consists of two sessions of full-time attendance at the university, each at least eight months long. During this time students are usually required by their departments or supervisory committees to successfully complete a certain number of courses, although the Faculty of Graduate Studies does not itself make coursework a requirement for the PhD. The Comprehensive Examination is the first formal examination required by the Faculty of Graduate Studies and is normally held at the end of the student's coursework, but the form of this examination is determined by each department. Although the Calendar does not refer to acceptance of the Thesis Proposal as an examination, it specifies that students are not admitted to candidacy until "their research supervisor has certified that their thesis proposal has been approved." PhD students are normally expected to be Admitted to Candidacy after the two year residency period, and upon successful completion of Comprehensive Examinations and an acceptable Thesis Proposal. The Final Oral Examination of the Thesis has detailed rules concerning its procedures set out in both the Calendar and a specific university publication on
graduate theses. All doctoral theses have to be examined externally by an "appropriate specialist" from outside the university. The application of the requirements of the Faculty of Graduate Studies in the four departments I studied varied considerably, as did the understanding of those requirements by PhD students in the various departments. I will briefly outline the backgrounds of each of the four departments of this study to provide context for their examination practices that enforce standards in the doctoral program.

Department Backgrounds

The Physics Department is one of the most established departments in the university, and has been at the forefront of the growth of graduate studies. The need to involve university research in the war effort during World War II led to an increased awareness on the part of the Canadian federal government of the importance of graduate studies at Canadian universities, which was brought to public attention by Brebner (1945). The Physics Department at this university was well-positioned to take advantage of the emerging importance of university research and graduate education in Canada after the Second World War. A new building, which opened in 1947, made the department one of the best equipped at the university (Logan, 1958). Logan (p. 195) explains why the post-war years were particularly significant for the Physics Department:

Because Physics and Chemistry had to do more intimately with supplying modern needs of modern defense and with the work of government supply agencies, these two university departments received more generous financial support and expanded more dramatically than others. Many of their research projects were continuous from the war years, some were concerned with work which had to be abandoned during the war, but the great bulk of them were undertaken at the request of defence and scientific agencies of the Federal government and with the aid of subsidies.
A Faculty of Graduate Studies was created in the academic year 1947-48, reflecting the increasing attention paid to graduate studies at the university. Until that time only masters degrees had been awarded at the university, but in 1950 the first two PhDs were awarded, one of which was in Physics (Logan, 1958).

In the 1950s, the Physics Department gained an international reputation, particularly in Theoretical Physics, and by 1957 had awarded 34 PhDs (Logan, 1958). The late 1950s and early 1960s was a period of rapid growth for doctoral studies in the department, with a total of 63 doctoral students enrolled by 1964 (Calendar). Doctoral students comprised two thirds of the graduate students in the Physics Department, a ratio which was much higher than in many other disciplines at the university and has been maintained through to the present. By 1970 doctoral enrolments had reached a peak of 81, although Chemistry and Zoology had both surpassed Physics in the number of doctoral students enrolled in those departments. Between 1970 and 1975 doctoral enrolments in Physics declined significantly to 37, but steadily increased since that time to equal the 1970 peak of 81 in 1996. While entrance into the PhD is normally preceded by the completion of a masters degree, there was an alternative route into the PhD, a choice that was not at all uncommon. Masters students could transfer directly into the PhD program after one year of a masters degree if they had successfully completed the bulk of their masters-level coursework with first-class grades, and showed "clear evidence of research ability" (Handbook, 1 p. 4); as one doctoral student explained, this option has become increasingly common in recent years with Theory students (Tb).

1Each of the four departments produces materials to acquaint graduate students with departmental policies and practices. I refer to these materials generically as the "Handbook".
The PhD program in the Physics Department has no formal structural division, although students are generally regarded as pursuing either theoretical or experimental work, a division often mentioned by students when identifying their research area. Nevertheless, no formal divisions exist and doctoral students, both theoretical and experimental, can be found in the same courses: "There are usually theorists and experimentalists in all the classes, even higher theory ones; you'll find experimentalists taking them." (Tb) Research activities can differ markedly, with experimentalists generally working in teams and putting in more lab hours, perhaps having to do shift-work to supervise experiments. Theory students, on the other hand, are more likely to work individually or in small groups, and, according to one student, often just have to "sit in the office 9-5." (Tb)

The department is also divided informally according to field of research in the department; for example, Medical Physics, Condensed Matter, or Subatomic Physics. A student explained: "I think in general Physics gets fairly departmentalized and people go off in their own little area" (Tg), but those divisions are not formal, and there are no variations in the requirements for completion of the PhD degree. PhD students in Physics spoke of a strong belief all physicists were involved in the same general pursuit, with one student claiming that "no-one who's really interested in Physics will want to suppress a certain research project or will want to exalt a certain research project." (Br) This attitude is promoted by the discipline culture:

When I started as a graduate student I had the idea "well, Theoretical Physics is more important than Experimental Physics", and I sort of looked down on Experimental Physicists as being a lower grade of people. But since then I've realized that what they do is extremely important too. And what they do is quite difficult to do as well. So Theoretical Physicists and Experimental Physicists each acknowledge each other as being essential to the progress of Physics. And every single field of Physics will also recognize that any other research projects going on are also of great importance. (Br)
The belief that all physicists are pursuing a common goal, combined with the stability of the Physics Department over the years at the university, is reflected in the lack of formal divisions within the department. By its relative unity, and long and stable history, this Physics Department embodies the important structural characteristics of a "Hard" discipline described by Clark (1987) and Becher (1989).

Recent university re-organization of departments were affecting the structure of the Physics Department at the end of the period of my study, as the department was about to amalgamate with part of another science department at the university. There may now be a more formal division than those that previously existed, with differing requirements for doctoral students who began their programs in the two separate departments, but my study did not include any students from that new field. The Physics students I interviewed generally agreed that, aside from physical changes in office space, this merger was likely to have little effect on their own studies.

Chemical Engineering courses have also been offered at this university since its inception (Logan, 1958). In the early years, those courses were offered through the Department of Chemistry, a department which, along with Physics, gained in importance as a result of defense-related research during and after the Second World War. The growth of science research and graduate studies at this university after the Second World War led to re-organization of departments and graduate studies in the decade following the war. Chemical Engineering was removed from the Chemistry Department in 1954 with the creation of a separate Chemical Engineering Department (Annual Review). Doctoral studies in Chemical Engineering lagged behind the PhD program in Chemistry, and ten years after the creation of the department just
three students were enrolled in the PhD program in Chemical Engineering, with enrolment increasing steadily, but not dramatically, to 18 by the mid-1980s (Calendar). In the decade preceding my study, PhD enrolment in the department more than doubled to 41 by 1996. (Department Figures)

By 1996 there were slightly more doctoral students in Chemical Engineering than masters students. Although permitted, it is less common for students in Chemical Engineering to enter the doctoral program before completing a masters degree than in Physics. Students I interviewed had all completed a masters degree before entering the PhD program, and unlike Physics students, it is not unusual for Chemical Engineering students to have periods in the workforce between degrees. The PhD program in Chemical Engineering Department does not have the prominence of the doctoral program in the Physics Department. One student's impression of the status of PhD students in the department put them "almost at the bottom of the rung" when compared to masters and fourth year Undergraduate students (Ck), and a masters degree was thought to make students even more employable than a PhD (Ck). While this may not have been a widely-held view, the PhD program did not seem to dominate the Chemical Engineering Department, highlighting the applied bias of Engineering studies.

Students did not identify competing camps of faculty or ideological differences in the Chemical Engineering Department (Ck), and departmental structures and requirements were well-understood by students and faculty (Nr). A detailed Handbook for graduate students was produced by the department, contributing to a shared understanding of formal policies which were uniform across the department (Handbook). Some distinctions are made between faculty and students whose research consists primarily of computer modelling, which is largely theoretical
work, and those are "doing the dirty lab work." (Ck) While this distinction is not critical, one student suggested applied researchers probably had a higher status than those doing modelling (Ck). Nevertheless, this student went on to state, "Generally, the feeling that just sort of pervades the department is just one of very loose structure." (Ck) Divisions in the department are based on fields of interest, with limited interaction between research groups (Ff). Although faculty work in separate fields, there is the sense they are part of a larger Chemical Engineering project, or they are "working on parallel things." (Ff)

The Chemical Engineering Department is characterized as being loosely structured, but conducting allied research activities. The lack of structural or theoretical divisions suggests Chemical Engineering operates out of a secure paradigm with widespread consensus of what counts as legitimate research. Conflict, if any, might arise from disputes between the academic community and industry which is directly served by this applied field. Becher (1989) identifies a sense of inferiority felt by academic Engineers arising from the blurred boundaries between the academic community and industry, an inferiority that might be reflected in this department with its relatively recent history in comparison with the more established "Pure" discipline of Physics. PhD students in this department were clear that the relative status of Engineering research at the university is currently on the rise as a result of the increased importance society places on applied research. One student suggested recent cutbacks in funding were forcing the department to hire faculty who could draw research money from industry, further privileging more applied research (Ff).

History is also an established subject of study at this university, and students taking a Pass Degree in the university's early years were required to include a course in History in their first
Although History has been an established department for undergraduate studies throughout this century, it was not until the late 1960s that graduate studies in History expanded substantially. When PhD degrees were first awarded by the university in the 1950s, the bulk of doctoral students were in the sciences, and by 1964 there were only seven students enrol in the masters program in History, and there were no PhD students (Calendar). The first two PhDs enrolled in the department in 1965, and by 1970 the number of doctoral students had increased more than ten-fold to 26.

Doctoral enrolments declined to 10 by 1980 (Calendar), but then began to increase again with the number of doctoral students in History reaching 24 in the Winter of 1996 (Departmental Information), just short of the peak in the early 1970s. At the time of my study the History Department had graduate enrolments comparable with other major arts departments at the university, but much smaller than established science departments. Doctoral students in the department explained that graduate studies had not been the department's priority until very recently, with the honours undergraduate program having the highest status. Students believed that faculty considered American universities to be the most logical choice of good graduate students in History, particularly doctoral students (Tm). That attitude was evolving at the time of this study, as the department attempted to raise the profile of the graduate programs (Cq).

By 1996 there were 24 doctoral students enrolled in the department and 26 masters students. Although it is possible to advance directly from a masters degree to a PhD without completing the M.A. if the student's "independent research" is "of high quality" and the student is recommended by faculty (Handbook, p. 7) the department specifically points out in its Handbook that this route is not common in practice (p. 5). My discussions with doctoral students in the
department confirmed this, and all of the students I interviewed had obtained a masters degree in History before beginning PhD studies. Students in this History Department were expected to complete their masters degrees in 12-18 months (Handbook), so the turnover of masters students was much greater than that of doctoral students. Still, masters students outnumbered doctoral students in the History Department, unlike Physics and Chemical Engineering.

The History Department has offices in a prominent position in a complex of buildings housing a number of arts departments, reflecting its position at the university as an established arts discipline. While the department contains identifiable fields within the discipline, it lacked any formal structural divisions. Those fields are both geographical and topical, and important throughout the PhD student's program. Doctoral students I interviewed mentioned the fields as the major divisions within the department (Km), and students often had little contact with faculty outside their fields (Tm). Informal methodological divisions exist within the History Department which are not clearly perceived by all students. In general, faculty are divided by students into two groups, those who hold a "realist" conception of the study of History (Cq) and those who stress the importance of theory in any understanding of the past (Ca, Km). Students also mention a distinction between faculty who publish frequently and those who stress teaching (Cq), but none of these divisions are in any way formalized in the department (Tm). The History Department is described by doctoral students as being rather traditional in its approach to History, but changing in recent years:

I think the department has a reputation as being rather traditional methodologically and ideologically, but that's changing and the composition of the department is changing. You're having more people who are much more radical in their sense of what they're doing. (Cq)
The department had been "trying to become more current and more engaged in contemporary thinking about history", and not mired in practices which are "naive methodologically." (Cq) According to one student, the department was "very Eurocentric", but now broadening the research scope, particularly in the area of Asian History (Ko). This is a result of the recent hiring of new faculty whose interests are in Asian History and well-known in their field (Ko). While attempts have been made to legitimize feminist approaches to history in the department, feminist history is not a well-defined grouping of students or faculty (Ca). The department is also attempting to eliminate past attitudes which regarded graduate work in the department as somewhat second-rate:

I think that one thing the department's been trying to change is that whole attitude, because they've been trying to really upgrade the PhD program and make it more of a competitive program. (Cq)

Debates are ongoing concerning departmental standards which some students and faculty believe are being threatened by pressure to increase course grades so History students can compete for external awards (Ca).

In general, the department has a unified structure, with informal divisions principally defined by geographical fields. Methodological and ideological commitments of faculty are generally described as traditional, reflecting the age and background of the faculty, many of whom were hired during the expansion of the late 1960s and early 1970s. The long history and relative unity of departmental structures suggest a secure paradigm (Kuhn, 1970), although there are indications consensus around realist conceptions of history have been undermined in recent years. Some students are unaware of strong divisions within faculty, while other students, who are themselves in opposition to conventional approaches to history, are much more acutely aware of
internal divisions (Ca). These divisions have considerable impact on the understanding and application of standards of good historical research in the History Department. Clark (1987) predicts such disagreement leads to less predictability and more anxiety than in fields characterized by stronger consensus, a condition that would impact directly on the experiences of doctoral students.

The Education Department of this study is one department of five in the Faculty of Education at the university. Education faculties typically include a wide variety of sub-fields, reflecting the individual subjects taught in schools; foundational subjects such as history, philosophy, and sociology of education; methods of instruction; curriculum; counselling and educational psychology; educational administration; adult education; and higher education. At the university of this study these sub-fields have been organized into five separate departments. I have not named the particular department to protect the anonymity of students.

A Department of Education was first created at the university in the 1920s (Logan, 1958), but teacher training remained largely outside the university until after the Second World War. The Bachelor of Education Degree was created in 1942 and the Department of Education was renamed a School a decade later (Logan), training most secondary school teachers in the province until it was converted into a full-fledged Faculty at the university in 1956 (Tompkins, 1969). This was seen as recognition by the government and university that teaching "deserved the recognition of professional status." (President's Review, 1979, p. 13)

In the early 1960s, the Faculty of Education was given the right to offer the EdD degree "without prejudice" to the possibility in the future of offering a PhD program (Tompkins, 1969, p. 67). The Education Faculty at this university, though, suffered from a general lack of prestige:
In almost every quarter of the campus there is an unhealthy and cynical suspicion about the performance of the Faculty of Education, and neither its staff nor its students is held in high regard. (President's Review, 1979, p. 15)

The way to improve the Faculty's reputation was to address its standards:

The buttress of the faculty's reputation is, in a word, standards—in the selection and evaluation of students, in the recruitment, reappointment, and promotion of faculty, in the insistence on and recognition of quality research, and in the development and continuous reassessment of academic and professional programmes which serve the educational needs of students in the province. (President's Review, p. 16)

By the end of the 1970s, the Faculty contained more than 20 small divisions, sometimes referred to at the university as "departments", none of which offered a PhD degree (President's Review, 1979, p. 20). In 1975, 77 EdD students were registered in the Faculty, but students and faculty in Education were pressuring the university to grant the PhD, as the EdD was considered to be of lesser status (President's Review). Morale in the Faculty was at a low ebb, and the President's Review of the Faculty called for a re-organization of the small, loosely organized "departments" which had caused "insecurity", "a feeling of anonymity", and "problems of identification" for faculty in Education. The President's Review called for formal departmentalization of the Faculty in order to bond faculty "in a common enterprise". (p. 25)

They believed organizing faculty in formal departments would raise their status at the university:

...they [departments] inhabit a discipline base which has its own integrity within the collective framework of a larger intellectual pursuit. Academic and personnel decisions as well as budgetary requests are more easily arrived at in such units, and they can more convincingly be presented to higher authorities precisely because the units have a legitimate status, formally recognized and endorsed by both the Faculty and the University. (p. 25)

The authors of the President's Review did not think graduate programs in the Faculty enjoyed support across the university, explaining why applications for the PhD had been turned down on
numerous occasions, and the Dean of Graduate Studies had expressed little confidence in the Faculty's "capacity to offer the degree." (p. 51) The President's Review recommended a gradual transition from the EdD degree to the PhD in selected departments, and possibly interdisciplinary degrees offered through an interdisciplinary Research Centre (pp. 54-56), but it had serious reservations about standards and recommended any application for the PhD degree be subjected to external review to "test the programs against standards maintained by other scholars in other universities". (p. 55)

In the early 1980s the Faculty of Education offered courses within 8 newly-organized departments. The recommendation of the President's Review had been put into effect, and in the following year the first PhD student was enrolled in the Faculty, though not in an area that would become part of the particular Education Department of this study. The number of PhD students enrolled in the Faculty of Education increased to 30 in 1990, but it wasn't until the academic year 1992-93 that the first PhD student was enrolled in an Interdisciplinary Centre, through which all of the PhD students in the Education Department of this study would obtain their degrees. The departmental structure was once again reorganized in the Faculty of Education, immediately prior to the commencement of this study, further consolidating the Education Departments to the current number of five, plus the Interdisciplinary Centre. The PhD degree is regarded by many students as having higher status than the EdD degree, and the vast majority of doctoral students in this department are now pursuing a PhD. In the winter of 1996, 49 students were pursuing a PhD in the department.

This Education Department was in existence for only two years by the end of my study, and was largely comprised of a merger of two of the eight departments in the Faculty that were
created in 1981. A small number of students previously studied in some of the other departments in the Faculty. In the 15 years preceding my study, there was considerable change in the departmental organization of the Faculty, and this had an unsettling effect on the experiences of PhD students. Students still identified very strongly with one of the 23 "departments" that existed in 1980 (Ks), and there were still nine different "areas of special interest" (Handbook, p. 2) in which PhD students were separately placed in the department (Departmental Information). The reorganizations in 1981 and in 1994 offered the structure around which the PhD degree was given legitimacy by the university, but these reorganizations did not alter many students' first loyalty, or sense of identity. When I asked students questions about "their departments", I often received responses referring to one of the nine areas of special interest rather than the new department, or even the departments that had previously existed for 13 years. This confusion is important for understanding student's attitudes toward departmental standards. Clark (1980, p. 6) identifies disciplines as the "primary culture for academic workers", but it is not clear from PhD students in this Education Department what discipline their department represents. Adams (1976, p. 8) claims "the fundamental allegiances of the faculty member will be to the smallest unit to which he belongs", and the identification of PhD students in Education with their area of special interest illustrates how they have already adopted the priorities of their faculty mentors.

The vast majority of current students in this department are masters students, outnumbering doctoral students by a ratio of more than 2:1 (Calendar), reflecting the professional nature of studies in Education. All PhD students in this department receive their degrees through the Interdisciplinary Centre which was created in 1976, arising out of the need to encourage dialogue between the various small "departments" at that time, according to its first director. It
increased the legitimacy of Education as a unified field of academic inquiry that could sustain a PhD program at the university. When the PhD was finally allowed in Education, it was first awarded to just two departments, and then to students in other departments through the Interdisciplinary Centre (Calendar).

For PhD students in this Education Department, the structure of their program is very confusing, with three different levels of identification. While identifying primarily with their area of special interest, they also belong to the new department, which is making attempts to bridge the nine areas within the department. On a third level, the Interdisciplinary Centre actually offers their PhD program, and delivers the only compulsory course for all PhD students in this department. Many students expressed complete bewilderment about these structures. One student, for example, submitted an application for the PhD without being quite sure to which department it was going, "I guess I didn't really understand how the departments were set up", and when the acceptance letter arrived the student was surprised at the name of the department sending the reply, thinking, "Oh, that's exactly where I didn't want to go." (Sy) After almost a full year in the department this student did not have a very good idea of what other areas of special interest were part of the new department. Another student was uncertain about the relationship between the department and the Interdisciplinary Centre:

I've never really understood [the Interdisciplinary Centre] anyway; I don't think most people do. It's very confusing. Apparently I'm getting my doctorate in [the Interdisciplinary Centre]. Isn't that nice. Now, where exactly are they located? (Ni)

A student living and doing research out of the city had very little familiarity with the various areas of special interest within the department, and had absolutely no understanding of the relationship between the department and the Interdisciplinary Centre (Dg).
The reasoning behind the reorganization of this department into a "wacky department that doesn't make any sense" was suspect, according to one student:

It seems to me that we're brought together, I guess it's for purely administrative purposes, to cut down on the costs. But from the student perspective, it doesn't seem to make a whole lot of sense, I think mainly because there hasn't been any effort to draw the different departments together in a way that makes sense. (Sy)

This sentiment was reflected strongly by another student in the same area of special interest (Ks). Attempts to offer courses across the unit boundaries met with limited success in the first two years of the department's reorganization, and was an absolute failure in one case. A student believed it was easier to co-ordinate contact with faculty and students outside the department than across some of the unit boundaries within the department (Sy). With the shift from emphasis on the EdD in the department to the PhD, some students were quite unclear about the distinction between the two degrees and what it might mean (Sy). The lack of clarity about departmental structure during the initial period of upheaval seemed to contribute to a general sense of uncertainty for some students, partly because faculty were not always able to focus their attention on students' needs in the confusion surrounding the recent departmental restructuring (Sy).

This Education Department can be described as operating at a pre-paradigm stage, where there is not yet a core of "solved problems and techniques." (Kuhn, 1970, p. 43) The boundaries of the field are extremely unclear, and identification for students is primarily with their areas of special interest, which, though relatively stable, are not considered prestigious enough by the university to support PhD programs. The boundaries around the department and Interdisciplinary Centre, on the other hand, seem to encompass fields with conflicting problems and standards. A Commitment to Excellence (p. 28) argues interdisciplinary centres may be "inimical to effective graduate studies" in Canada:
Education at this level requires the development of certain skills: training in a well-defined and well-established method, language, and set of concepts; the acquisition of acceptable standards of validation and assessment; the development of an ability to criticize, synthesize, and conceptualize; and the learning of well-honed research skills in depth. Experience indicates that the attainment of these goals requires systematic immersion within a discipline.

 Those aspects of the PhD program devoted to enforcement of standards are bound to be problematic when there is relatively little consensus about what counts as a legitimate problem or technique in the field.

 **Departmental Standards**

 **Physics**

 The Physics Department appears to deviate substantially from the requirements for a PhD stipulated by the Faculty of Graduate Studies. The department enforces important PhD program requirements not specifically outlined in the university Calendar, while modifying some of the Faculty requirements to suit the nature of doctoral studies within that particular discipline. The university Calendar specifically recognizes that some departments might require students to meet certain course requirements, and the Physics Department did, in fact, require that PhD students complete a total of twelve courses. This requirement is outlined in the department's Handbook students are given at the beginning of their program, and is a requirement about which there seems to be no confusion for students or faculty. There are no required courses, and the choice is left to individual supervisors and/or committees in consultation with students.

 The issue of Comprehensive Examinations, on the other hand, is a source of much greater variance in understanding. The Department Handbook indicates the absence of a written Comprehensive Examination, but that a departmental oral examination at the time of submission
of the thesis "serves this purpose." This appears to be at variance with the Calendar which provides that the Comprehensive Examination normally takes place at the end of coursework and that it is required for Admission to Candidacy, which typically occurs at the end of the residency period. An oral examination just weeks prior to the final thesis defense seems to be a considerable modification of this requirement.

When I asked one student whether the department had Comprehensive Examinations, the student replied: "No. The university requires them, but the Physics Department gets around them in that you do two defenses of your thesis." (Tg) For one PhD student, coursework was the only requirement outside the thesis defense: "Formally, I think you need to take 12 credits, 12 units of coursework, and then do a thesis." (Tg) Other students had a different understanding of the Comprehensive Examinations requirement for Physics students: "We have yearly PhD committees in which you can be quizzed orally on comprehensive topics, I guess you'd say." (Ku) One student answered with a simple "No" when I asked about the existence of Comprehensive Examinations. (Ne) Another explanation was as follows: "There's no Comprehensive. A lot of other departments have Comprehensives, but we don't. We have more courses that you have to take instead of having the Comprehensives." (Ju) Considerable confusion exists in the department over just what took the place of the Comprehensive Examinations, if anything. It is remarkable that this was not a concern or even an important issue for most students. Nevertheless, I was given an interesting explanation for why the Comprehensive Examination might not exist in the Physics Department:

The university does have a requirement that you have departmental comprehensive exams. The Physics Department doesn't want to do that; they don't want to pay the students to study for six months or a year. (Tg)
In other words, studying for a Comprehensive Examination was fine as long as it was the student who was footing the bill.

Even though the department appears to do without a Comprehensive Examination, there are Annual Meetings with the student's committee that serves the purpose of supervising the student's progress: "You also are required to have an Annual PhD Committee Meeting where you present to your PhD committee what you have been working on and where it's going." (Tg) This meeting is not a mere formality, and the progress of students is carefully monitored: "Yes. Oh definitely! If they're not happy with your progress generally what they do is they schedule the next one six months later instead of a year and they ask you to come back with some progress." (Tg) Or, "I guess at least they have the power to make you at least take courses, specific courses, even if you have enough credits already." (Ne) This student doubted the committees would actually remove students from the program: "Oh, no, I think that's really rare as long as you're trying." (Ne) This was confirmed by another student who claimed, "Basically, no-one's ever had a problem really with their Committee Meeting; no-one's ever gotten kicked out as a result of a Committee Meeting." (Br) Another student agreed: "Not only do I not think they weed very many, I think I'd be surprised if they weed one in a hundred out that way." (Tg) The purpose seems to be more to develop the student's work to meet departmental standards: "This is just to ensure that your supervisor isn't sheltering you. Your work actually has to get exposed to three other people who also have to approve of what you're doing." (Br) Nevertheless, a student with experience in the department was aware of a case where the Annual Committee Meeting was actually used in making the decision to remove a student from the department (Tb). The
meetings can be quite stressful for the student, and the degree of formality depends very much on the make-up of the committee (Tg).

The Physics Department has a policy of requiring a Departmental Defense just prior to the University Defense, and it is intended to cover a broader area of knowledge than the final defense. This is the replacement for the Comprehensive Examination, according to the Department Handbook. One student thought the existence of a departmental defense was a poor substitute for Comprehensive Examinations which would normally take place earlier in a student's program, because questions could be asked from coursework the student might not have taken since undergraduate days, perhaps ten years previously. The student added, "Besides which, if you're going to weed people out you should be doing it at the beginning, not at the end." (Tg)

This was not a significant concern for students because students believed the departmental defense did not actually weed out many students (Tg), perhaps due to their timing: "Nobody that I know has actually been failed, or whatever, at that point; like, usually it's too late." (Tb)

Physics students seem to prepare for their final Thesis Defense only at the very last minute, and do not seem interested in attending other defenses or discussing defenses before they actually prepare for their own: "Well, I've been to one although it was in Forestry... it's going to be horrible" (Ju) It was a frightening prospect to have to go through the ordeal, but not considered likely a student would fail: "Usually by that point any real problems are uncovered in the departmental exam and should have been cleared up by the time the university one rolls around, so the university one does tend to be pretty smooth." (Tb) Students are more likely to attend a university defense than a departmental defense, but, in general, students do not seem to
place a great deal of importance on specific preparation, indicating a confidence that knowledge and quality of research are important standards of student success in the Physics Department.

A very strong belief exists among doctoral students in Physics that their discipline has uniform and relatively unproblematic standards. Those standards are well-understood by physicists, and eliminate the uncertainties and subjective judgements of some other fields. This belief provides a strong bond for people in the Physics community, and is reinforced by a relatively stable discipline with established practices. Physics, and Experimental Physics in particular, is considered to involve objective standards for good research:

As far as research goes, if you think experimental research, you're doing experiments to find some results, so it's not that subjective. Whereas in arts, if you're doing some research on whatever, it's what you think. There's the subjectiveness that comes into that. (Ju)

Other students repeated this same general theme:

In general, because it's a mathematical field, a lot of the methodology is very well-defined. I know in Particle Physics it's very well-defined what they're using....Just by the nature of the science, if you're using some mathematical technique, you make a prediction. If the experimentalist goes out and measures that number, then people will begin to believe your method works. So there is a kind of acid test. (Tg)

And:

Physics is, I guess, one of the more basic fields of research, where you're really inquiring into what are the fundamental underlying structures and behaviours of the natural world. And that all goes on independent of physics; the world will still operate independent of us, but we want to just see how it happens. (Br)

Physics students believe their discipline is based on objective standards that are not obscured by subjectivity or politics.

Confidence in the existence of standards of good research in Physics allows the Annual Committee Meetings to be used as a means of eliminating students from the department in
extreme cases. (Tg) Committee members might have different areas of expertise, but they are unlikely to have fundamental disagreements over acceptable physics knowledge or research. (Tg) This allows for the smooth operation of a committee of four or more members. One student, responding to a question about how important it was for students to "learn the ropes", a concept that would be well-understood in some other departments, replied, "What do you mean, 'learning the ropes'?'" The question had no meaning without an explanation, and the student was quite sure that "learning the ropes" was not a concern in Physics. (Tb) Another student was confident departmental politics played virtually no part in the life of a Physics student: "There aren't any sort of underlying essential politics that you have to get to know."

A notable exception to this acceptance of objective standards in the Physics Department is a Theoretical Sub-Field many students regard as an exceptional case, and somewhat puzzling. Students spoke of it being more like the "subjective" arts fields than a typical science field: "I would think it's very different because it is very subjective....there's all these underlying assumptions that you have to make ...and if you don't make these assumptions then there's no way you can ever figure anything out." (Ju) This was particularly problematic in the Sub-Field because it had "no experimental comparison." (Ku) The importance of experimental evidence for agreement in Physics became apparent as I spoke with Physics students, and was highlighted by the difficulties experienced by students in this Theoretical Sub-Field:

I still think the biggest thing, the thing that would make the difference, is if there was more experimental evidence. If there was something that we could compare to and see, "Oh, this is what we're trying to construct. Can we make a theory that mimics this actual experimental behaviour?" Most other fields of Physics, there is an opportunity. (Ku)
Without experimental evidence to validate theoretical claims, some students in this field find progress agonizingly slow. One student explained that Physics research involved "intuitive leaps" (Ku) that were only later justified by experimental tests, and where no experimental comparison was possible there was little agreement on the validity of competing theories. Rigorous mathematical proofs were sought for new theory, but remained inconclusive. The need to justify claims with more rigorous proofs than would have been necessary if experiments could have validated the new theory delayed progress:

I like to get the whole picture and then fill in the details, so it's kind of a style clash there I guess. And I think it has to do with the fact that it's theory, and there's theory without any experimentalist support. If it had experimentalist support I could have justification for making leaps in logic because I'd say, "Well, it looks like this and this is what it's supposed to look like." There's no model to follow; we're just building it. I guess maybe I didn't know that about the field when I chose it. (Ku)

Agreement with the supervisor, and the supervisor's approach, was crucial to the success of the student in the Theoretical Sub-Field. This need for allegiance is a condition unfamiliar to other Physics students who generally believe the quality of their work will be recognized by any physicist. In the Theoretical Sub-Field the experiences of students more closely resemble the experiences of students in the arts/professions, where assumptions underlying any research are much more apparent, and commitment to basic assumptions made by the student's supervisor and committee are crucial for success. This is not a situation with which Physics students are very comfortable, having a firm commitment to objective standards in their field. One student described the frustrations of this Sub-Field:

It always seems to be that one person is trying to out-shout the other person because none of the theories can be actually proven. They're just like, "Oh, this is what I think it is and I've got all these assumptions which I think are good but they
may not be." You know, someone else may say, "Oh well, you know, that assumption is totally garbage," and they just try and yell at each other. (Ju)

The importance of using the "proper" language and terminology in this area is foreign to Physics students: "It's just so weird, this area, because there's all this terminology for simple things." (Ju) Learning the terminology of the Sub-Field creates a bond between the student and the supervisor that seems a prerequisite to serious attention by the supervisor and success (Ju), indicating a commitment to the same basic assumptions in a contested field as the supervisor. I found parallels with experiences of arts/professional\(^2\) students I was interviewing striking.

The boundaries dividing academics in the Theoretical Sub-Field from non-academic theorists are carefully guarded. Maintenance of those boundaries has a significant affect on the experiences of students, as they find themselves on the front lines of the struggle to keep the amateurs separate from the academic professionals in the Sub-Field. The concern that anyone can make claims in the field requires academic theorists to differentiate themselves from the non-academics:

This is the field that, I don't know if there are many other fields in Physics that this can be said, but this is a field where you get dozens and dozens of letters coming from laymen....It's because of the field that the field requires the rigour, because there are a lot of people who try to do it intuitively who fail, to be honest. They end up making basic assumptions, and they build this basic theory on their basic assumptions, and end up being wrong. (Ku)

The professional physicists do not want to be confused with the outsiders: "Well, as I said, there is much greater opportunity for quackery in this field. That's probably a concern of [the supervisor]." Even within the academic Sub-Field there is little agreement:

\(^2\)I refer to arts and professional departments such as Education as arts/professions.
Not that many people have managed to make [the object of research] in the lab, and because of that you can say anything and get published. At least not in any journal, but certain journals are a little less discriminative about what they publish, and people might get mistaken for experts in the field because they're prolific rather than accurate. So there are a wide variety of opinions. (Ku)

Students align themselves with an accepted theory to avoid being confused with the "quacks".

With the notable exception of students in this Sub-Field, Physics students generally feel assured of successful completion of a doctoral degree if they are persistent. Students I interviewed had difficulty recalling any dropouts, except for a few students who left the program to take jobs. Students were more likely to change fields than drop out completely: "It just seems to be that they don't drift out of Physics, they just drift away from their topic and they find themselves somewhere else." (Ku) Even a student in the Theoretical Sub-field, who felt at considerable risk of not completing a doctoral degree in that area, did not intend to abandon the PhD, program altogether: "I said I might continue with this [an alternative career] and quit the PhD as it is now, but I kind of want to resume it again later, maybe in a different field." (Ku) Although actual time of completion of the degree seems to be longer than students initially believed (Br), there is little doubt or anxiety in Physics about eventual completion of the PhD.

PhD students in Physics operate within well-established practices to enforce standards of good scholarship and research. The mechanisms for enforcing those standards do not strictly conform to the requirements set out by the Faculty of Graduate Studies at the university, but this does not trouble students. Kuhn (1970, p. 47) suggests that a scientific field with a secure paradigm has little need for a body of rules when the "problem-solutions" are not seriously questioned. Members of the field take for granted the established practices of their discipline, and this seems to be the case in this Physics Department. PhD students in Physics generally have a
strong belief in a universalistic standard for science that allows for objective assessment of a
student's performance. The Physics Department employs Annual Committee Meetings and a
Departmental Defense at the end of a student's program to examine their progress, and students
take those examinations seriously, they were not mere "hoops". Faculty are brought onto student
Committees from across the department, and from other science departments, for the purpose of
examining the progress of students. Even when committees contain more than four members,
students have confidence there will be general agreement about what comprises quality Physics
research, reflecting the consensus predicted by Kuhn (1970) and measured by Lodahl and Gordon
(1972) in Physics, a scientific field with a secure paradigm. For students, this means nothing
stands in their way to graduate with a PhD in Physics as long as they apply themselves diligently
and sustain sufficient interest in their research projects.

Even though Physics is considered a "Pure" discipline (Clark, 1987; Becher, 1989), it is
interesting that Physics students place great importance on experimental "support" or
"justification" for theoretical claims, regardless of the rigour of the mathematical formulation of
the theory. The "acid test" of any theory, for these students, is evidence that the theory actually
works in practice. The possibility of experimental evidence to support theoretical claims
underpins the clarity and consensus around standards for scientific research. In the Theoretical
Sub-Field, where such evidence is not possible, theoretical claims are hotly contested regardless
of the mathematical rigour involved. The lack of experimental support for theory undermines the
student's confidence in the possibility of objective standards for research in this area, making the
Sub-Field more subjective, like the arts/professional disciplines, and students find this quite
foreign and troubling. As I will discuss in Chapter VII, particular conditions of doctoral studies
for students in Physics discourage them from examining in any depth possible reasons for this inconsistency in their discipline. The result is that students in the Theoretical Sub-Field have difficulty recognizing what actually counts for success as a doctoral student in the absence of objective standards in the Sub-Field, and sometimes feel paralysed.

Chemical Engineering

The Chemical Engineering Department's extensive Handbook outlines the formal requirements of the doctoral program, and students find the Handbook particularly useful: "Even now I am reading it because, I don't know, there might be something different; each year I browse through." (Ff) An international student believes the decision to produce the Handbook was partly due to the large number of international students in the department who were not likely to have contacts beyond their supervisors when they first arrived in the department, "so they took longer to learn simple things." (Bk)

The department does not require PhD students to take courses during their studies, except for registration in a series of seminars and the formality of registering in a PhD thesis course. The Handbook stipulates that individual committees might require the student to take other courses deemed essential by the committee. This was generally confirmed by students who claimed doctoral students in Chemical Engineering were not required to take any courses, and many students, in fact, took few:

I guess most PhD students don't end up taking a significant number of courses. In our department if you come through a mainstream Canadian university recognized program, as we did, then we don't have to take any courses at all....I chose not to take courses. (Ck)

Another student explained:
One of the things that I was told when I was applying was that you don't have to take any courses if you don't want to. The reality is a little bit different because if your prof wants you to take a course...there's not really much you can say about not taking it; you have to have some pretty darn good reasons. (Nr)

Sometimes additional courses are required after the proposal defense if the committee detects a weakness (Bc). The "compulsory" seminars are held once a week where students give presentations of their research, and they are required to obtain a pass in this course based on their presentation. Graduate students must attend the seminars at least until they have presented their own, but this requirement is not strictly enforced: "As you noticed the room was not packed. Most people don't go. In fact, if everyone were to show up, I don't think the room would hold them." (Ck) Another student described the seminars as compulsory "up to a point." (Nr)

To fulfill the Comprehensive Examination requirement of the Faculty of Graduate Studies, the department sets out the requirement in its Handbook for doctoral students to present and defend a Thesis Proposal within 12-15 months of commencing the program, depending on the number of courses being taken by the student. Students confirm they usually started writing up a Proposal within the first six months of their program (Bc, Ck), but the requirement that it be defended within 12-15 months is not strictly enforced: "They are not very strict about when it does occur....in the end my committee members were not available so the date just kept getting pushed back farther." (Ck) The Thesis Proposal is intended "to demonstrate to an examining committee that the Candidate has the basic knowledge and potential ability to pursue research in his/her chosen field." (Handbook, p. 8) After successful defense of a research proposal the doctoral student is formally Admitted to Candidacy.

Considerable confusion prevails among PhD students about the actual existence of a Comprehensive Examination in their department. A student knowledgeable in departmental
affairs explained: "In theory they can question you about absolutely anything [at the Proposal Defense], being officially called a Comprehensive Exam, but there's not enough time." (Ck) While all students were aware of the need to defend a Thesis Proposal, some did not realise this requirement was actually intended to fulfil the Comprehensive Examination requirement of the university. Following are some responses to my questions about the existence of Comprehensive Examinations in the department: "They don't [have Comprehensive Examinations]; they just have the Proposal Defense" (Bc); "No we don't have [Comprehensive Examinations]: we have just the Research Proposal Defense, and there they might ask you more general questions, but we don't have more formal Comprehensive Exams" (Ff); "No, fortunately not!" (Bk) This particular student believed it was impossible to have a truly "comprehensive" exam in Chemical Engineering, but that it would be a good idea to require that students take a set of core courses in its place (Bk).

The Proposal Defense was regarded as a real test by most students:

I think they know this is the last chance to send a bad guy home, because afterwards it would be very hard because there is nothing objective....[After the Defense] the supervisor has to take the responsibility and say, "No, I don't like your performance," and that's very hard for a supervisor to do. (Bk)

This student likened the Proposal Defense to the Oral Defense of the Thesis. Another student agreed:

They're definitely judging what you're doing, because in the end when you come to defend your entire work, if anyone questions the validity of your research it's already gotten that rubber stamp of approval from your proposal. (Ck)

This student also described it as "just an oral grilling of sorts." (Ck) The student explained further:
It is a hoop in the end. You do realise in the back of your mind it is just one of those things that you have to jump through; you have to play the game; you will survive. Nevertheless it is a very nervewracking experience. They sort of, it's made out to be a terror of an experience. (Ck)

Students gave each other this advice before the defense:

"It's just an afternoon of hell, but after that you know you're going to get through it." And you say, "Yeah, I do know I'm going to get through it." But it's just not something that you look forward to. (Ck)

This student had no knowledge of a PhD student who was actually prevented from completing a degree because of an unsuccessful proposal defense: "What would happen if you didn't make it through is that you would do it again." (Ck) The department has an interest in making sure students are successful: "I imagine it would look bad, from the point of view of the students, for them to be losing their students" (Ck) Another student could only recall a rumour of a previously unsuccessful student at some time in the past (Bc).

Between the Proposal Defense and the Thesis Defense, students are guided in their research primarily by their supervisor: "Apart from your supervisor, you have very little professional interaction with the other supervisors." (Ck) Students understand this as a major reason why the formal defenses of the Proposal and Thesis are so important in Chemical Engineering, as the judgement of the individual supervisor can be dismissed as subjective. For a Chemical Engineering student this kind of individual enforcement of standards runs contrary to the universal standards they believe exists in their discipline, and individual supervision is in need of the check imposed by the defenses.

The Thesis Defense consists of two parts in the Department of Chemical Engineering, according to the Department Handbook. The first part, a Departmental Defense which utilizes a committee of at least four examiners, one of which is normally from another science department at
the university, ensures the student meets the standards of the Chemical Engineering Department and science in general. Only after those standards have been rigorously applied does the doctoral student go on to the second stage of the Thesis Defense which includes the participation of an external examiner. One student who had seen many defenses considered the Departmental Defense to be the tougher of the two, with the final defense a mere "formality" because students already had the whole department behind their work (Bk). Despite the importance of the Thesis Defenses, some students had never been to watch a Defense, believing they would be judged fairly according to objective scientific standards when it was their turn to defend (Bc).

PhD students do not consider standards of good research in Chemical Engineering to be particularly problematic (Bk, Nr): "In the fields I can think of, it's one of the easier fields to judge. Many projects either succeed or do not." (Ck) They generally believe that if they do good work they will be successful in their studies (Ck), perceiving a consensus among faculty around the definition of good research (Ck), and disagreement only occurs when faculty in various sub-fields of Chemical Engineering simply lack the technical expertise to judge each other's work (Ck). Standards of good research are more negotiable on the boundary between the academy and industry:

There's a definite difference between industry's view of what should be done at the university and the academic's view of what should be done at the university, and that's a good thing, actually, because we get funding from both. We get funding from a number of places and it's very important for that industrial perspective to be there, because otherwise I firmly believe that academics have a tendency to drift off into the nether world of not-necessarily-applicable research. Engineering, if nothing else, should be applicable in the end. (Ck)

Industry-sponsored research is by definition more applied, but also places less emphasis on scientific rigour: "The industry would want, just in general, more quick and dirty answers." (Ck)
Students generally approve of industry standards, and agree that input from industry has a beneficial effect on research in Chemical Engineering by keeping university research in line with social needs (Bc, Nr). PhD students say they are not caught up in disputes between industry and the academy over the quality of research required of students, because industry is tolerant of the extra demands put on student research by the university: "They understand that [the demands of university supervisors]: as long as we're progressing they don't mind." (Nr) Success in graduate school is unproblematic: "I think it's a case of once you're accepted, actually, it takes a bit of effort actually not to succeed." (Nr) The only people who drop out are those who lose interest or get jobs, according to this student. Students often generalize about doctoral studies across the university from their own experiences without having much contact with students in other departments, particularly across the arts/science divide, and the problem of unclear standards in other departments is largely unknown to doctoral students in Chemical Engineering.

Students claim science and engineering are universal, and even where debates existed around new theories, those debates were contained within "certain limits". One student had no concerns regarding judgement of student research: "It will be judged by objective standards." (Ff) The question of standards and their application is even less problematic in the Chemical Engineering Department than in the Physics Department. This reflects the importance students place on experimental evidence to support theory, and in Engineering experimental evidence is a primary concern of the field. Chemical Engineering students engaged in "modelling", a more theoretical endeavour than most Engineering work, are held in somewhat lower esteem in the department. Although Becher (1989) suggests an feeling of inferiority among academic Engineers, the students in this department do not support this view. They generally privilege the
standards of industry as opposed to those of the academy, and consider any conflict a difference of degree as opposed to an incommensurable conflict of standards. Chemical Engineering students assume consensus in their field over objective standards of good research, and have little reason to question the existence of those standards. As with the Physics Department, the Chemical Engineering Department's mechanisms for examining the progress of students are not a particular concern of students, even though, in the students' eyes, they do not conform to university requirements. A hard-working PhD student has little reason to doubt eventual success in Chemical Engineering.

History

Standards of scholarship and research in the History Department are one of the most troubling aspects of a PhD student's program, as the actual understanding and application of those standards is unclear and often inconsistent. The History Department closely follows the requirements for a PhD set out by the Faculty of Graduate Studies in the university Calendar. When students enter the doctoral program they are required to consult with their supervisor or temporary advisor plus the department's Graduate Advisor to set out a suitable program of courses. Final approval for course selection rests with the Graduate Advisor, so the department maintains close control over the selection of courses, unlike the other three departments I studied that left selection of courses up to students and their individual supervisors.

PhD students take a minimum of one research seminar and two major readings courses (Cq). They are also required to pass a second language requirement in order to graduate (Handbook, Tm), but this is not identified by any students as a source of particular concern.
According to the Handbook, History graduate students are required to take courses in both Comparative History and Historiography at some point in their graduate programs, either as masters or doctoral students (Handbook, Tm). This requirement has arisen out of the increasing awareness of the extent to which theory informed all historical research, altering the department's traditional conception of historical research as atheoretical and objectively understood (Km).

Doctoral students, themselves, pushed to have more explicit evaluation of coursework by faculty in the first semester of a student's program (Cq). Prior to that, many students received good comments from faculty, and then received unsatisfactory grades at the end of the course (Ko). As course results are important measures of a student's progress in the History Department, students took this problem very seriously. To the students' surprise, faculty resisted more formal and explicit evaluation of students' progress in a traditional area of enforcement of standards, suggesting to students faculty were often uncomfortable with their ability to apply fair standards. Despite a trend toward more detailed and helpful evaluation practices, a concern about inconsistent evaluation remains in a department where resources are scarce and grades from courses are crucial for securing the limited funding available.

Comprehensive Examinations are the most important hurdle for PhD students in History aside from the Thesis Defense. The Handbook sets out the format of the examinations, and students describe actual experiences writing Comprehensive Examinations as conforming very closely to their proscribed format (Cq). This might not seem remarkable, but of the four departments in this study History is the only department that strictly follows the university's own requirements for Comprehensive Examinations. PhD students write three three-hour exams in one week, followed by an oral examination in the following week (Handbook), choosing their fields
for examination in consultation with their supervisor and the department's Graduate Advisor. The Handbook sets out a list of fields, from which students can deviate with good reasons (Ko, Ca), but, in the end, are required to follow the "suggestions" of the Graduate Advisor, and students know "suggestions" are usually requirements (Ko). Comprehensive Examinations are held twice a year (Handbook, Tm), and although students do not sit exams together, each sitting is held within a short block of time (Handbook).

For one student, preparation for the Comprehensive Examination involved a very easy relationship between the student and supervisors:

It ended up being a very informal process of discussion between me and my supervisor, and me and each of the other minor field supervisors. In each case we came up with a reading list that we both mutually agreed upon, and in the case of my minor field, we essentially spent the year before, I would come in once a week and we would talk about what I should be doing, and I would make sure that I would be reading that, and it was almost like a mini-readings course where...I just went through all this stuff. (Cq)

Some students had very different experiences, being given a prepared list of readings and told to go off and prepare for an exam (Cq), but, as this student said, "Mine was more of an evolving process in all three areas." (Cq) This student received assurances of success from faculty prior to the exams (Cq), and only the student's own sense of insecurity, an insecurity shared by most students interviewed, kept the student unsure of the end-result. This insecurity seems to arise from the belief anything can happen at a Comprehensive Examination. The standards are not clear, and seem idiosyncratic: "The requirements for the Comp Exams, even, are just all over the place; it just depends who you get." (Km) Alignment with a supportive supervisor is a crucial element of success, and appeal to a broad standard of scholarship in the judging of examination results is not possible for students (Km). One student believed insecurity results in students
conforming to a "template" created by faculty and valuing "safety" over "experimentation" (Km).

When students are not sure standards exist by which original ideas might be judged, they can increase their confidence of success simply by agreeing with their supervisors. Even though students believe few students fail their Comprehensive Examinations, and do not see them functioning for that purpose (Cq), the occasional exception does occur (Km). The result for PhD students is tremendous insecurity in the face of almost certain success.

Students sometimes describe the process of preparing for Comprehensive Examinations as a useful exercise, but they are much less charitable about the function of the Comprehensives as examinations: "They're horrible things; they're useless really." (Tm) This student claimed it was impossible to demonstrate anything like a comprehensive knowledge of a subject in three hours. Nevertheless, they were of huge importance in the student's life:

There's a lot of discussion because the comps loom so obviously...the actual event is not so bad, but you have to build it up as something - a rite of passage - otherwise you won't survive. There's a lot of stress involved, and they're made out to be that way. (Tm)

Another student supports this view of the purpose of the exams:

To make sure you read the books [laughter]!...I also see it very much as a male rite of passage: if you can get through that, you're OK. If you can't get through that then it's a good thing you're out of here because you obviously don't have the stuff. It's very much a "we had to do it, you have to do it" point of view. (Ca)

The real test is of the students' personal qualities, favouring toughness and individual perseverance, rather than being a test of the student's grasp of an agreed-upon body of knowledge. Students claim faculty have no common understanding of what the Comprehensive Examinations are meant to achieve: "I guess the main beef about Comps is that no-one agrees about what their purpose is." (Tm)
A common belief among students is that the decision about who passes the exams is made before the exams are actually held: "I think everyone's decided, before the event ever happens, whether you've passed or failed." (Tm) And, "I think it's always decided before you do your Comps." (Ca) Some faculty let their students know the questions in a general way in advance, and others were much more guarded with their questions (Tm). When one student was unsuccessful in the Comprehensive Examinations, there was a lot of discussion among other students about the reasons for the failure:

There was a lot of discussion about where this [the failure] came from, whether the student just didn't perform up to standard, or whether there was something else going on. There seems to be the conclusion that there must have been something else; that the student must have been blacklisted or something. (Tm)

Apparently, this student had never been warned there was a problem with the student's work (Tm). The purpose of the comprehensive requirement and the method of preparing for the examinations are not clearly articulated, and a student explained why this might be the case:

They'd have to decide then what the purpose of these might be, right? I think it would conflict with personal styles of how they interact with their students; whether they're a hands-off kind of person or whether they'd like to be very close and guiding. (Tm)

Students do not believe the Comprehensive Examinations need to be such a hurdle:

I think the idea of mastering a large body of material and being able to say something sensible about it, being able to draw out some themes, is very useful. I think the logistics of how it is done could be changed radically. (Ca)

The Thesis Proposal requirement is quite new in the department, only being implemented in practice for three years (Tm), and for many students it is still quite an informal procedure (Cq). Some students are quite satisfied with the way the new requirement was being put into practice (Cq), although there is some uncertainty about what makes a good Thesis Proposal:
One thing I have to make clear is I don't know if the department really has a guideline or structure for writing a research proposal, or writing comprehensive exams. I've heard there are various versions of what is a good research proposal and what is not...so I guess students don't have a clear idea about how to write a research proposal. (Ko)

One of the biggest issues around the Thesis Proposal for students is the language used to describe the Proposal meeting with the student's committee. Some faculty refer to the meeting as a Proposal "Defense", and students are very concerned the use of this language to describe the meeting might cause it to become another large hurdle like the Comprehensive Examinations (Tm). Some students are content with the formal Proposal requirement itself because it forces both students and faculty to keep the student's progress in mind; however, the temptation to turn the meeting into one more overblown ritual rather than a truly developmental tool in the thesis writing process concerns some students: "It is a concern because we could see it becoming something like the Comps, very stressful, being very formal, being a Defense", (Tm) The concept of defense does not make much sense to one student in History who believes the nature of historical research does not lend itself to any sort of defense of a Thesis Proposal at that stage in a student's program. This student believes a researcher in History begins with a set of questions and a vague idea of what approach or theory the researcher needs to draw on, but has to actually delve into the materials before deciding what approach actually works (Tm). Another student makes an interesting distinction between a defense model for the Thesis Proposal and a more developmental model:

I'm always pushing grad students to make sure that we don't see it that way [as a defense], because I think then the potential for the interaction that can be beneficial in this process is lost because you're stuck with defending it, and how they judge you is based on how successfully you defend it....It seems to me that casting it in that adversarial term just negates anything that you can benefit from it, and then the concern is that it would become another gatekeeping potential, and yet another
hurdle. Rather than something that assists you it becomes something that impedes your progress. (Ca)

It is still too early for students to judge whether they will be able to rely on the acceptance of the Thesis Proposal should problems occur later in their programs, as this has not yet been tested in the History Department (Ca, Tm).

Informal divisions in the department make establishing standards of research problematic, particularly between the "naive" historians coming out of a "19th century conception of history" (Cq) and those who critique the possibility of meta-narratives in history, and it takes PhD students some time to understand the importance of these two approaches to History (Ca). Faculty, on the other hand, are quite aware of the different approaches and often disagree about the value of each other's work (Ca, Km). Unfortunately, they rarely debate these issues directly in public so students can see the extent of disagreement between faculty (Km). Students are exposed to individual faculty's theoretical stances in isolation, mostly in coursework, where students are immersed in one theoretical position or another (Ca). Students, by choosing the right supervisor can escape serious challenge to their own research commitments, but getting caught up in a dispute between faculty can be "terrifying" and a serious blow to the chances of success for a doctoral student (Km). At important junctures in the student's program, the ultimate defense is a supportive supervisor with power (Km).

The question of standards is very difficult for students, even those who believe they are quite successful: "I haven't had a sense that one prof thinks I'm not doing enough and one thinks I'm doing plenty, but it's something I worry about, so I just try to do everything." (Cq) A student who has had some difficulties with the formal requirements of the department was at a complete loss to even begin to describe what kind of standards might exist in the department (Km).
Students spoke of a kind of literary standard (Cq) (although even that was disputed by one student who believed the process of the PhD degree contributed to a lessening of literary standards) (Km), or a vague sense of thoroughness (Ca), or rigour: "If somebody is really just doing journalism, or are they really doing History?" (Cq). One student summed up standards in the department in one word: "Idiosyncratic" (Ca). The student went on to explain: "I don't think there are standards for this [historical research]. I think History is too slippery to establish a standard." (Ca) Another student was quite unaware of any standards in the department for historical scholarship: "I don't see that; I don't see any requirement or any standard that's set by the department." (Ko) The lack of a commonly understood standards of good research in History explains why some supervisors are unwilling to stand up for their students: "They're not sure of their judgement; therefore, they don't promote anyone; therefore, they can never have made a mistake." (Ca) Ultimately, the standard of good work seems to be whether the "finished product" contributes to the contemporary debates in history (Ca), a standard that had little to do with prior judgements of methods or conduct of research, which one student believes is "very spotty" in History. (Ca)

A student who was secure about meeting faculty's expectations, expressed some exasperation that many other students didn't understand what was really expected of them as doctoral students:

I always feel that the students who don't really know [what the standards are] aren't really paying attention, because you're made to know quite soon that really what you should be doing is, your papers should be journal-quality papers. If you read journal quality articles, that's what your papers should look like, so you do have a standard you're given. (Cq)
This student was confident "journal-quality" was an unproblematic standard, in full view of the students from the beginning of their graduate programs:

I think I've been a little anomalous because I've been more aggressive, and I've just taken seriously this standard which I felt was put out right at the beginning, and that's been how I've worked. I haven't felt like there hasn't been a clear idea of the kind of stuff that I should be doing. (Cq)

By meeting the expectations of faculty, this student felt accepted in the departmental community:

I think the fact that I've published stuff throughout my time I've been in the department doesn't hurt. I mean people look at you differently once you start, because then you're one of them. So you get taken more seriously because you're just, I wouldn't call it a game as much as you're making yourself conform to the general standards. (Cq)

In my view, this student identified a critical departmental standard that was not formally articulated in the PhD program. Students who follow the explicit curriculum of the doctoral program and ignore the other informal requirements are not meeting the expectations of faculty:

"The value really is to be able to do independent research and to get it published, and so that's how you attain status, that's how you are accepted in." (Cq) This student thinks most students are unaware of the seriousness of these standards, and this student was rewarded for uncovering them independently.

When students make an appropriate alignment with a faculty member who shares their theoretical commitments, then progress for the doctoral student can be quite smooth:

"Everything I've ever done [s/he's] liked, and I can't quite figure it out." (Cq) When comments were given to this student, there was no problem for the student to interpret their meaning: "I will get responses that give me an idea of the kinds of things that this person thinks are good things to do or important things to do." (Cq) Proper alignment with the right supervisor also means the student is able to pick up on the cues of the faculty, which are especially important in an
environment where students feel judged constantly, but according to standards that are not recognized by most students. (Cq) As one student put it, "History is incredibly subjective: what one person sees as wonderful research, someone else writes a book report that just flays the person alive." (Ca) This student explained a defensive strategy in the absence of clear standards of good work:

I think [publishing] is good protection. I think going to conferences is very good protection....It sounds so manipulative, doesn't it? I'm doing what I can to make sure I have a reputation that goes beyond [the university]. (Ca)

If that fails, the student has considered other strategies: "What will protect me? The fact that I will push as hard as I can." (Ca) Insecurity promoted a certain combativeness in this student:

If they're going to shoot me down, they're going to have to really make some holes, because I will not knuckle under and say, "OK, that's your judgement. I accept it." That's the only thing I can do. (Ca)

Many students in the History Department anticipate the Thesis Defense with a sense of dread. Like students in other departments, some make a point of watching a number of other students' defenses (Ca), and others admit they have not seen enough to prepare for their own (Tm). One student who had struggled with oral presentations in the past was too frightened to watch even one (Km). Another student who had finished writing and was waiting to defend made a fairly typical comment: I've been to a couple; I should probably go to some more." (Cq) Studying other defenses is important preparation in History because students do not feel confident the quality of their work will be enough to guarantee success. They must be able to conduct themselves appropriately and meet a standard of performance for which science students do concern themselves.
Very few students drop out of the History program at the doctoral level, according to departmental information, but data on exact numbers or rates of attrition have not been kept at a departmental level. Students consider drop-outs a pervasive problem (Km), and identify the first year of coursework and the latter years of thesis research as the times when students are most likely to leave a PhD program in History (Cq). A lack of funding was one reason students mention as a reason for students to drop out, or "just fade away" as some students put it (Tm, Km), although one student claimed the problem was further exacerbated when supervisors also did not give students non-financial support in their research (Km).

Students spoke of a real concern on the part of the faculty concerning the policies and standards of the PhD program: "They've been trying to really upgrade the PhD program and make it more of a competitive program." (Cq) The recent addition of the Thesis Proposal requirement and reaction against attempts to bring grades in history courses into line with other disciplines in the arts is perceived by students as examples of attempts at reinforcing departmental standards (Cq, Ca). One student indicated the department had a very lax admissions policy, and they were then in the process of tightening their admissions requirements:

I see our department as a department that is trying to really lift itself up by its bootstraps, and it's in the process of really trying to turn out excellent degrees, and it's probably in the transition from a regional university that's more accepting, and I think they're going to start tightening up their requirements. (Cq)

This had some connection to recent budget problems for the university:

The sense is growing that there are already so many PhDs being produced that it's not really doing people much good to turn out middle level PhDs, but to maybe accept fewer people in, but make sure that those few people are better supported and turn out a better product. (Cq)
Students generally agree student evaluation and maintenance of standards is a critical issue, and evaluation of students takes place on many levels, including departmental rankings for fellowships and other funding (Cq). But the formal mechanisms for maintaining standards, such as the Comprehensive Examinations, the Thesis Proposal meeting, and the Thesis Defense do not seem to actually function directly to screen students. One explanation offered by students is that faculty cannot agree on anything, and have difficulty making any common standard explicit (Km). Students mostly self-select themselves by giving in to the "threat" of those mechanisms because they do not believe they can "make the grade." (Tm) This message is transmitted in all sorts of informal ways to students, but reasons for the message being directed at particular students is often not clear to them. Students with the most tenacity are likely to succeed, as Adams (1976, p. 77) suggests: "But all in all the test of endurance creates self-selection: those continue who can run the requisite distance and whose hearts are attuned to the pace." PhD students in History experience considerable stress when they have no explicit standard for success, but believe they were constantly being judged (Cq).

The extent of distress among History students concerning the application of standards of good research is much greater than that of students in Physics and Chemical Engineering. This surprised me, as History had a long and stable tradition at the university, suggesting more consensus regarding standards of competent historical scholarship. Clark (1987) and Becher (1989) suggest History is a typical "Soft" discipline, characterized by disputes over theory and method. At this university, doctoral studies in History began in the 1960s, at a time when "realist" conceptions of history were dominant among faculty. Belief in universal or objective standards of historical scholarship fit comfortably with the notion of a PhD degree certifying the
future competence of a professional academic. As the increasing realization of the importance of theory in History undermines confidence in the existence of these standards, consensus as to what valuable historical research entails has broken down. Kuhn (1970) identifies a post-paradigm stage, when a field which previously achieved the consensus of its members becomes vulnerable to dissension from within. This History Department provides some evidence of the post-paradigm stage, making the question of standards an increasingly urgent concern. The introduction of more explicit and visible standards to measure competency in a field is symptomatic of an insecure paradigm, perhaps explaining the recent concern of students and faculty in History over entrance requirements, course grading, and thesis proposals. The actual application of standards is extremely problematic at the same time they are increasingly stressed by everyone involved. This contradiction is central to the experiences of doctoral students, and I will argue in Chapter VII the PhD student's ultimate success in History might depend on the student's ability to obscure that contradiction.

Education

The examination practices of this Education Department conform very closely with the requirements set out in the university Calendar, reflecting a need in Education to appear to apply rigorous standards to the PhD to gain acceptance by the university as a legitimate program. Explicit and formalized rules suggest consensus in a field, but Kuhn (1970, p. 48) argues just the opposite: "When scientists disagree about whether the fundamental problems of their field have been solved, the search for rules gains a function that it does not ordinarily possess." The Department Handbook outlines a brief, but explicit, framework for the formal requirements of the
program. Students are required to complete a program of coursework, the core of which includes at least one research seminar offered by the student's area of special interest, and one common course offered by the Interdisciplinary Centre. Although this department is the only one of the four departments I studied that imposes a common required course, students entering the PhD program in the same year do not actually all take the same course at the same time. Students typically take a total of 6-8 one-semester courses over a period of two years (Handbook). Because of the recent merger of departments, many PhD students I spoke with had not been subject to these precise requirements, although they described course requirements and practices that were quite similar.

Attempts to bring students into common courses from across areas of special interest in this department were sometimes unsuccessful. One student spoke of a core seminar in the first year of the new department that attempted to bridge two areas as being such a difficult mix that it was disbanded part way through the course:

Actually, part way through this term we were split up because it was so desperate....What it turned out to be was just a total waste of time for everybody, so we just split up after Christmas. (Sy)

After the split students and the faculty member in charge of the course commented on how well the new arrangement seemed to work:

I think the students, long before that, should have said they felt their time was being wasted because now that we're unto ourselves even the professor has remarked, "Oh, I wish it could have been like this before, because now that we're by ourselves we're actually having discussion that are worth our time. (Sy)

This student was very skeptical of the possibility of core courses in the department being able to bridge the areas of special interest very successfully: "I think unless it's really carefully thought
out, it's a really bad idea. It could prove to be a horrific waste of time." (Sy) The possibility of creating a course with a common theoretical base for the department might prove to be difficult. For many students this is a confusing requirement, as the relationship between the department and the Interdisciplinary Centre is not always well-understood by students (Sy): "I could never really figure out what I was doing there...It was confusing, and all I know is that it was required and it was my time to do it." (Ni) The purpose of the course is to bring students together in one forum to be introduced to the wide variety of approaches that can be brought to bear on the study of Education (Course Outline). The course provides students an opportunity to situate their own project within a number of competing paradigms, and to begin to promote and defend their own particular choices of research projects. It is an early opportunity for students to "rehearse" (Course Outline) the promotion and defense of their research they will be called upon to perfect over the course of their doctoral studies. Rather than being taught how to master a commonly agreed-upon research standard or method in their area, students are being trained to defend their choice of project and its method in a contested field. Students begin to recognize that any choice they make is open to attack from other researchers in their own field, and their success lies in articulating reasoned defenses of their commitments even if they are unsuccessful in convincing their opponents (Ks). Researchers with diametrically opposed research commitments learn to co-exist in the same field, and the common core-course seemed to serve the purpose of immersing the student into that environment, as well as developing in the student a commitment to engaging in those debates.
PhD students also take a number of optional courses chosen in conjunction with their supervisors, although the limited choice of courses in particular areas of special interest makes some of those courses virtually compulsory in practice:

The major problem, to my mind, is that there aren't sufficient courses for us to take within our department, nor are there sufficient ones that can be recommended to us from outside our department. (Sy)

These courses neither serve the function of eliminating students from the program who do not meet certain standards (Sy), nor do they prepare students very well to learn common standards of research in the department, as students find standards for research articulated in courses sometimes actually contradict those of their supervisors (Dg). Coursework is considered beneficial when it specifically focuses on the area of interest of the student (Ni), and reading courses designed to meet the needs of the particular student's research projects are often those the students find most helpful:

I think it would have been much more helpful for me to do more reading classes with one or two more people. I mean, personally it [the formal coursework] was great. I found these classes really interesting and I'm glad I took them, but I mean if my goal was to get a PhD, these classes didn't help me. (Dg)

One student stressed the importance of courses in shaping that student's fundamental commitments about research. Choice of the right courses provides a forum for students to "get to know how to stick to their research ideas and fight for them." (Kj) Coursework is considered most valuable by students when it helps develop individual research projects and the students' ability to defend those projects, but it does very little to develop or enforce department-wide standards of good research.

Comprehensive Examinations in this department differ somewhat from those in the History Department. The Education Department has abandoned the "testing" format of
comprehensive examinations where students answer questions designed to verify their expertise. The Education Comprehensives consist of three papers written by the student, typically over a period of 2-3 months, in consultation with an examination committee. Rather than simply testing the student's ability to recall and demonstrate a comprehensive understanding of broad fields, these examinations also serve the purpose of developing the student's ability to write to a standard acceptable in their particular field (Handbook). Supervisors in the department are very diverse and flexible as to the formalities of the process, with students actually writing the papers in disparate circumstances. Reading lists and questions develop as a part of a mutual discussion between student and committee members (Kj), and students speak of the benefits of using the Comprehensive Examinations as chapters in their theses, or as eventual publications (Ni). One student who wrote a Thesis Proposal before doing the Comprehensive Examination believed this allowed a more focused approach to the development of Comprehensive Examination answers that would feed directly into the student's research (Kj). The Thesis Proposal requirement is well-established in the Education Department, and, although the Proposal is intended to be written after Comprehensive Examinations have been completed, some students I spoke with had reversed the order of the requirements because of their particular circumstances (Ks). The practice of the Comprehensive Examinations and Thesis Proposals in this department function to bolster the student's ability to do research and defend their projects within in an area of special interest, but do little to enforce a broader department-wide standard of good research. Some students refer to the Comprehensive Examinations and Thesis Proposal as "hoops", meaning they have the appearance of gatekeeping mechanisms but not much substance.
Although many students have little difficulty developing an acceptable Thesis Proposal, and speak of the process in developmental terms, the issue of standards in this department is very problematic for other students. They often refer to "good research" or "excellent students" and are reluctant to give up notions of agreed upon standards of research, but an awareness of the criteria on which these judgments are based in the department is not always evident. I identified two main demands placed on the students. One of those demands involves the students' willingness to align themselves with particular supervisors' methods and approaches to research, and demonstrating the commitment to forcefully defend those commitments in an appropriate forum. Although this seems to be crucial to the success of students, they are reluctant to admit this is indeed an important test, as it conflicts with their commitment to uphold a belief in a standard of research shared by all in the field. Only after some discussion are students willing to admit that evidence supporting a particular theoretical approach is more favourably judged than evidence from a contrary approach.

An interesting case was a PhD student whose committee changed part way through the writing of the Thesis Proposal because of the withdrawal of the supervisor. The remaining committee members had previously supported the developing Proposal based on a quantitative design. In fact, the university's Ethical Review had been approved and the initial supervisor advised the student to "get going" on the research even before the Proposal had been accepted. After the withdrawal of the initial supervisor, who was the proponent of quantitative research, the remaining committee members were suddenly not particularly enthusiastic about the research design. But the student was never directly informed of the problems the remaining committee members had with Proposal drafts submitted by the student, and was simply told there were
"some problems" (Dg). The student submitted drafts over a period of more than a year, receiving general encouragement and no major criticism. Finally, after a "frustrating" process that seemed to go nowhere, the student and new supervisor finally agreed to change the design essentially from quantitative to qualitative. The student was never explicitly told the research the student had already started would not be accepted by the committee, as this would have required an explicit rejection of research standards which were quite acceptable for other faculty in the same department, and, in fact, had been accepted by the rest of the committee while the more established faculty member had been supervisor. The preferred process was for the student to "voluntarily" realign the research to the new dynamic on the committee. Most students never underwent this kind of blatant manipulation, so they were not forced to confront the extent to which standards of good research might conflict within their own department. They did not have to examine the source of the standards on which their own research was judged acceptable. Even this student had very conflicting views of the process that had occurred. Nevertheless, this student was aware of the importance of choosing committee members carefully (Dg), and believed students choosing committee members "incorrectly" was the biggest problem for some PhD students:

I think it's committee members who've been chosen incorrectly that has been the biggest problem. Some people have had very well-thought-out ideas that they're having, that people who are available to them don't understand or won't accept. (Dg)

A student suggested that the fewer committee members the better, as more than three just increased the chance of disagreement among them (Kj).

Another case illustrates how students are able to hold on to contradictory notions about standards of good research. This student first claimed the supervisor was encouraging research
with "substantiated support." (Ks) The supervisor was dismissive of work that seemed to be "off the cuff", and the student, at this point, believed that simply providing evidence for a claim was one criterion for good research and that any substantiated claims would be accepted. The student also recognized that in addition to providing evidence, the evidence must be located within a theoretical framework, and theories must be "logically argued" and not just "beliefs". I inquired whether a student could come from a theoretical approach that the supervisor disagreed with, articulate that theory "logically", provide evidence in support of the theory, and succeed in doing PhD research from that approach. The student admitted this would have been impossible, and the judgement of what was "good evidence" and a "logical theory" depended on the supervisor's agreement with the research approach from which the evidence and theory came:

I guess I'm very careful about whose work I base my own ideas on, and that's another thing, if I'm able to find people that [s/he] has respect for to back up my argument, no matter what it is, then [s/he'll] go along with it. That's true, yeah, so definitely for us the standard is based on who you're citing, who you've been reading, how much credibility those people have in the field already according to them [the individual supervisors]. (Ks)

Students often spoke of the importance of adopting the research commitments of their special areas of interest, and of their supervisors. Developing a research project out of courses offered by the eventual supervisor is an especially fruitful way to begin any PhD program, or, even better, arriving at the university with a clear interest and a faculty member who supports that interest. One student complained that the specific foci of graduate-level courses undermined that student's ability to make informed judgements about the relative merits of competing theoretical stances (Sy). Faculty teach courses with their own theoretical stance clearly privileged, but students do not have the confidence or the "expertise" (Dg) to seriously critique these stances. The path of least resistance for students is to align themselves with a faculty member who shares
their commitments, if possible, or to gradually allow themselves to shift their positions to conform with the faculty member if there is none who shares their initial commitments (Dg). Evidence of shared commitments includes the adoption of a common language to discuss problems in the field (Ks). One student mentioned that using the "right words" seemed to be the most important issue with respect to Comprehensive Examination answers that were not acceptable. Once the student altered the choice of language, the faculty member was satisfied: "[The supervisor] was very careful about word usage. [S/he] disagreed with some of the words that I used and the way I used some of the words, that was the major problem." (Dg) Although the student disagreed with the supervisor, the student eventually re-wrote the answer to conform with the wishes of the supervisor. This is particularly interesting because the student had a firm commitment to autonomy. Another successful student spoke of coming to learn just how important it was to identify the assumptions that underlay any research, and how arguments are always based on a particular set of assumptions, an issue that was not explicitly discussed in the PhD program, according to this student (Hg). Alignment with the right people and the right theories and the right evidence in a very contested arena is an important test of good research for students, but those students seemed reluctant to admit this was the test, preferring to believe they were meeting a more objective standard.

The second demand placed on students is a kind of rhetorical ability, both written and oral. The students do not necessarily expect to convince an opponent with conflicting commitments, but need to make a good presentation of the rational arguments in support of their own commitments (Ks). Even though various researchers in the field might have diametrically opposed views on the value of each other's research, the ability to defend one's project is an
important test recognized by all. The rhetorical standard involves both an ability to argue for the commitments of the chosen research project and design, and the commitment to do so publicly in a department where various approaches compete for respect and adherents. A difficulty for PhD students in this department is that, although everyone might recognize the advantage of being a skilled advocate of a strong position, it is not so clear the advocacy itself might be the central standard by which faculty across the department judge students. The actual substance of the argument, which is open to legitimate attack from a variety of perspectives within the same department, indicates a more personal allegiance with supervisor and committee. Although the skill of argumentation is a major concern in this department, one student did not think there was much preparation for students to succeed in this area: "I don't think you are prepared very well. There's no deliberate, I haven't come across deliberate teaching of how to present an argument." (Hg) This student believed it was a problem that PhD students were forever being told to clarify or improve an argument, but were never given actual instruction on how to do this. It was as if the real rules of the game were being kept hidden (Hg). Another student agreed, "Everybody says how important writing is, yet it's never addressed directly." (Ks)

Learning the hidden rules of the game is an important theme of students in this department, underscoring the lack of explicit standards from which the students might derive a measure of security: "I think you've got to find out what the requirements are and use them to your advantage." (Sy) For the students who do uncover the hidden rules, success comes much easier (Sy, Hg). Some students mentioned they learnt the rules from their masters degree (Kj), and believed that students who had not done a thesis masters would be at a real disadvantage in the PhD program (Sy): "I talk to students around here who have done a masters degree by
coursework and they're nowhere near as street-wise as I am." (Hg). The fact that some students had experience teaching at universities prior to their PhD program was also of benefit (Dg): "I may be a bit lucky here in the fact that having worked in a university...I know a bit how the system works, the academic system, so I think you've got to work it, you know." (Hg) Students who do not make good use of the system find the "endurance test" of the PhD all the more gruelling.

Students learn they had little to gain from seriously questioning their own positions once they were aligned with their supervisors and committees. To do so would be to question the "expert" supervisor, and to expose the student to easy attack in the public forums in which students are encouraged to engage, beginning with the Interdisciplinary Centre's compulsory core course. Students in this department have the dual task of showing sufficient identification with a particular research tradition at a sub-departmental level, while meeting standards of rhetoric at an extra-departmental level. Neither demand originates from any identifiable departmental standard of good research. Nevertheless, students I spoke with were reluctant to give up convictions that standards of research existed, and that they were becoming increasingly successful at meeting those standards (Ks).

In an environment where standards are not well-understood, the Thesis Defense becomes an important concern. Students in this department prepare more for their eventual Defense than in the other three departments. Considering the importance of rhetorical skills in this department, the performance of the student is put to a real test at the time of the Defense. In the sciences, where there seems to be much more agreement about what made good research, the research findings might be allowed to speak for themselves, even if the rhetorical skills of the student are
not well-developed. Where standards of good research are not well-accepted, and value is put on strong presentation and defense of the research project, quality of writing and a strong oral defense is the ultimate test of the student's ability. It surprised me to learn that students in this department not only went to see many defenses, but some actually found them very enjoyable:

Yeah, I love them [Defenses]....I can tell you that since I've been here I have been to 1,2,3,4,5 defenses and I've learned something from every one of them....I think you learn every time you go to these things. You see the style of questions asked and so on. (Hg)

After seeing Defenses, some students then discussed the merits of the student's performance: "I think there's been a lot of debate about Defenses among students, whether it was a good Defense, bad Defense." (Hg) Another student mentioned an incident where a fellow PhD student gave a Defense that was judged by other students to be inadequate, so the student who gave the Defense was asked to come speak to a class about the reasons for the poor performance (Kj). This would have been unimaginable in the Chemical Engineering Department, for example, where students did not even ask questions of other students at the compulsory seminar as their way of showing support and solidarity. There, presentation of research is an aggravation, as opposed to an important end in itself. In Education, students are being socialized into a "combative environment" (Ks).

Kuhn (1970, p. 48) describes the pre-paradigm period of a field as "marked by frequent and deep debates over legitimate methods, problems, and standards of solution, though these serve rather to define schools than to produce agreement." This is the environment PhD students in the Education Department are being socialized, and the contradictions these students face concerning standards of research and scholarship are deep, and sources of potential danger.
Standard Contradictions

PhD students are standing at the gates to an academic profession, and, as Clark (1980, p. 4) states, "The recruits to different academic specialties enter different paradigms, the sharing of beliefs within a field about theory, methodology, techniques, and problems." The various academic professions, through the departmental structures at the universities, enforce standards to ensure adequate expertise for their new members. The PhD is the most widely accepted educational process through which such recruits are certified as experts, so enforcement of standards of research ability is central to that degree. The legitimacy of the degree to accredit expertise in the production of original knowledge assumes such standards exist and are generally shared by members of the particular professions.

The experiences of PhD students in four departments at this university suggest there are very different conditions regarding the credentialing aspect of the PhD, and the experiences of PhD students are fundamentally affected by those conditions. In the sciences, students generally share a belief in objective standards of research that are well-understood in their departments by students and faculty, and which can be used to certify expertise in their disciplines. Those standards are bolstered by "experimental comparison", which is possible in most areas of Physics and Chemical Engineering. Structures and practices which apply those standards are respected by students, and students concentrate on developing their research expertise. The one area of Physics where there is no possibility for experimental comparison is considered to be an anomaly that puzzles students both within and outside the Sub-Field. With no way to develop consensus around competing theoretical perspectives, PhD students in this Sub-Field are judged on the basis of their choice of language and personal allegiances, as well as their mathematical rigour. Rather
than attempting to reconcile the conflicting experiences of PhD students in that contested area, Physics students dismiss this area as an anomaly in an otherwise unproblematic, objective discipline.

Arts/professional students, on the other hand, tend to reject the possibility of objective standards in their own theoretical approaches to History and Education. They recognize that all knowledge is situated within particular theoretical frameworks or perspectives, and that consensus in their fields is unlikely. The experimental comparisons that convince science students they are engaged in a common enterprise of knowledge accumulation and production are not possible in the study of the social world. Arts/professional students engage in the contestation that arises from incommensurable theoretical approaches applied to the same aspects of the social world, and try to develop the commitments and abilities that promote their own particular positions in those contests. For the most part, arts/professional students do not confront the contradictions that arise from their theoretical rejection of objective standards, while at the same time participating in a professional credentialing process that is predicated on the existence of just such standards.

Cude (1987, p. 49) explains:

> The PhD degree, initially proving itself as an apprenticeship to scientific research, simply expanded into the humanities and social sciences as these disciplines strove to emulate the more rigorous methodologies of scientific inquiry.

The History and Education students generally reject the epistemological assumptions behind those methodologies which enhance the authority of the PhD, but are careful not to undermine the status and power they hope to eventually attain from the degree. Nelkin (1975, p. 54) recognizes the interest experts have in containing apparent disagreement:

> Conflict among experts reduces their political impact. The influence of experts is based on public trust in the infallibility of expertise...
scientists...demystifies their special expertise and calls attention to non-technical and political assumptions that influence technical advice.

Just as the faculty in the History Department are careful not to make their disagreements explicit through open confrontation, PhD students in the arts/professions learn to protect their own emerging expert status by not seriously confronting the contradictions it entails.

Both science and arts/professional students have particular interests in obscuring conflicting or contradictory elements of their PhD programs: the need to avoid paralysis and complete their degrees, and the desire to avoid detracting from the prestige of the professions from which they hope to eventually gain expert status and power.
Academic freedom is a dominant ideology of the academic profession. Silva and Slaughter (1984, p. 303), although they doubt the accuracy of this claim, recognize that "members of the academic community tend to see academic freedom as a well-established and liberating tangible right, the privilege of professors that distinguishes them from other cultural workers."

Metzger makes a distinction between "academic freedom" and "scientific freedom", arguing academic freedom refers to the autonomy of academics working at a university, arising out of their employment at that university: the freedom to inquire, teach, and express their beliefs with minimal restraint from the institution or society. Scientific freedom involves the freedom to advance knowledge from within a particular discipline, regardless of the location of that research, and includes professional work performed outside of a university. Both academic and scientific freedom are central tenets in the belief systems of professional academics, and manifest themselves in the assertion of the right to individual autonomy by those professionals.

Clark (1980, p. 6) refers to the personal autonomy of academics as central to the culture of the academic profession. He claims "the culture of the profession contains not only stirring ideological defenses of professional autonomy but also of a professional right to power." (p. 7)

The notion of personal autonomy valued by academics is reinforced by an historic belief in the importance of autonomy among professionals in general, as Bledstein (1976, pp. 87-88) illustrates in his discussion of late 19th century American professionals: "The Mid-Victorian as professional person strove to achieve a level of autonomous individualism, a position of unchallenged authority
heretofore unknown in American life." He further emphasizes the critical importance of professional autonomy: "But most importantly, the professional person absolutely protected his professional autonomy, not in the name of an irrational egotism but in the name of a special grasp of the universe and a special place in it." (Bledstein, p. 92) The claim to expertise in a particular field of knowledge bolstered the legitimacy of the autonomy expected by the professional, an expectation that is central to the academic profession today.

PhD students are prepared for acceptance into both the culture of their discipline and the culture of the academic profession, and, as a result, are deeply implicated in practices and ideologies that promote and protect the notion of the autonomous academic. Their location at the borders of both of these cultures places them in the sometimes awkward position of having to assert their autonomy at the same time they are required to submit themselves to continuous testing and evaluation. The ideologies and practices around expertise and autonomy are intertwined and mutually supportive, making it crucial the student pass a dual test for admission into the professional ranks. Not only must the PhD student display a high level of expertise in an academic field, but the student must also show sufficient commitment to autonomy to be judged worthy of professional respect. The challenge for students is to assert that autonomy while conforming to the standards of expertise enforced by their departments discussed in the previous chapter. In the four departments of this study, the nature of each discipline tends to define the form and intensity of that challenge, and where standards for judging expertise are not well-understood or developed, commitment to autonomy as a researcher becomes a more important issue for the PhD student. The notion of autonomy for PhD students in the various departments is intimately connected to the their own backgrounds, as well as their relationships with
supervisors, and, usually to a lesser extent, with other members of the supervisory committee. I will discuss issues around autonomy for PhD students in the context of their ability to choose supervisors, the relationships they have with their supervisors, and their sense of ownership of their research projects.

Student Background

PhD students in the Physics Department typically do not have a break of one year or more in their formal education, and this is true of all the students I interviewed. Some had summer or co-op research experience related to Physics before beginning doctoral studies, but students generally agree it would be difficult for a Physics student to take more than a year's break from studies. One student described the study of Physics as follows:

> It's sort of a continuous process where you have to start off, actually, in grade three when you start learning how to do Arithmetic, and you accumulate your knowledge in Math and Science and Physics, and if you were to leave that for a few years you'd probably lose the ability. (Br)

The fear the field of Physics will progress and leave the student behind certainly exists: "If I were to take, say, two years off, I'd have to spend about a year catching up to find out what happened". (Br) As a result, the average age of Physics students is lower than that of students in other departments studied, and estimated to be about 26 years of age in the Winter Term of 1996 (Department Information).

The Physics Department requires students to have a background in Physics or Engineering Physics for admission into the masters or PhD program (Handbook), resulting in a common academic background for most students. They generally aspire to an academic career when they begin their studies, although many students' goals undergo important shifts during the
course of their studies. A theoretical student is more likely to pursue doctoral studies with an academic career in mind, whereas experimentalists are less likely to be interested in the academy. The theoretical students I spoke with all began their programs with an academic career as at least a vague goal, but poor job prospects in Theoretical Physics are forcing some to shift their sights toward industry. On the other hand, some experimentalists have no interest in an academic career at first. One international student, for example, considered an academic career to be particularly unappealing at the beginning of the program: "Who the hell would want to be an academic and get paid so low and work so hard?" (Ne) This particular student experienced a change of mind by the second year of the program that ran counter to the doubts many theoretical students experienced: "But now I guess I wouldn't mind being an academic" (Ne).

The prestige of this Physics Department attracts students from across the country and abroad, and they typically choose to enter this particular department, at either the masters or doctoral level, quite deliberately and for specific purposes. Sometimes research fields are so specific that this university is one of only a few available choices, and when I asked if one student was committed to a particular field of research before beginning studies in the department, the response was, "Oh definitely! There were only about three places in Canada that I could do it, and I did want to stay in Canada, actually." (Ku) Furthermore, students who are interested in experimental work need to know the equipment necessary for their research either exists in the department or can be constructed easily. Doctoral students' research interests may have their roots as far back as the student's undergraduate work, and experimentation with various fields often takes place prior to graduate study. The specific PhD research project, though, is not left up to the student to freely choose. Procedures for admission to the department require that
applicants for the PhD program indicate their field of interest, but when I asked a student if it was important to have a specific research project in mind when applying, the student claimed, "No, it wasn't important at all." (Tb) Students begin their PhD programs with definite interests in a particular field of Physics, but without a clearly defined research project in mind.

Students describe the community of physicists as inter-related, with national and international collaboration across universities. One student developed an interest in an experimental field at a university in another region of the country that had a strong tie with a faculty member at this university through an undergraduate project. Another was influenced by a personal relationship between a professor in the student's previous university and faculty in this department. Because many students had particular reasons for choosing to do graduate work in the department, and might have had connection with the department prior to their arrival, the transition to graduate work and to the university seemed to be relatively smooth in the Physics Department.

Students entering the PhD program in Chemical Engineering have often had a significant break in their studies, and many have established careers in Chemical Engineering. Two of the students I interviewed worked at universities in their home countries before deciding to pursue doctoral studies (Bc, Ff), both countries having university systems where faculty could begin their careers after a bachelor or masters degree. These students' reasons for pursuing the PhD are to advance their academic careers in their home countries. Other students have taken short periods of a year or two off from their studies to work in industry before deciding to upgrade their qualifications as researchers (Nr, Ck). This is fairly typical of Chemical Engineering PhD students, unlike Physics, where the norm is for students to have a continuous education from High
School through the PhD. More than half the PhD students in Chemical Engineering are international students, and reasons for pursuing the degree are quite diverse, but students' previous academic backgrounds are typically in Chemical Engineering. It is possible to move from the pure sciences into engineering at the doctoral level, and this does occur, but students I interviewed all had engineering backgrounds. Nevertheless, fields of interest of these students often alter considerably between the masters and PhD programs. This is explained by intervening years of employment between degrees (Ck) or a change of universities (Bc), but also by the lack of choice students have in defining their own research topics.

Pursuing an academic career is an important motivation for some students, at least in the beginning, but this was the goal of only a minority of Chemical Engineering students (Nr), "Most people want to get out of there [the university] and make something" (Ck). The opportunity to take advantage of available funding is often an important consideration for students (Ck), (Bc), but, even in an applied field such as Chemical Engineering, personal development strongly motivates some students. One student was interested simply in becoming a good researcher, "I would say that my only goal was to do good graduate work somewhere," (Ff) but another had more definite personal goals:

I came here not to get the degree; this was part of my program. I came here to change myself, so my PhD program is a personal development, and I arrived here enjoying that process. I am still in that process and I am enjoying it a lot. (Bk)

This international student felt stifled after many years working in industry, and felt in need of fulfilment:

I lacked personal abilities. I would say that I lacked the intelligence that I needed, the creativeness that I needed, the willingness to be with myself hours and hours digging inside, and so that was my challenge. It was like therapy, and it has been, and I knew about it. I came towards it; I built it. (Bk)
Other students have more career related reasons for pursuing a PhD. A student who had been working on a contract basis in industry after obtaining a masters degree took advantage of the opportunity to do applied work at the PhD level:

I wanted to go with a project that was industrially sponsored, simply because I didn't want it to be one of those theses that just sit there and grow dust on the shelves, which happens a lot in Engineering, I believe. (Nr)

Another student had a definite purpose for pursuing a PhD, "I had a very specific goal since the age of three: I was going to go into space; I was going to be an astronaut. Until now I have kept that on line." (Ck) I was somewhat surprised by the wide range of motivations I encountered in this department, and attribute it to the experience and age of Chemical Engineering students, combined with the high percentage of international students.

In History, the vast majority of PhD students have obtained bachelor and masters degrees in History, although some students have backgrounds in related fields such as Law and Political Science (Cq). The Department Handbook stipulates, "the candidate must hold a master's degree (or equivalent) in history," but an exception is made in limited circumstances for "mature returning students and applicants with strong academic backgrounds in other academic disciplines" (7). All of the students I interviewed had done their previous studies in History.

History students typically spend at least a few years in the workforce before beginning their doctoral studies (Cq), so the average estimated age of 30 years for a PhD student in History (Department Information) is slightly higher than that of a Physics student, but not nearly as high as an Education student. Virtually all History students have at least a vague plan to work in the academic world when they enter the PhD program: "I think I came back with the idea that I wanted to continue in academics and perhaps toward teaching." (Cq) Students I interviewed
thought there would be few doctoral students in History who did not want to become academics (Cq). Some have a strong commitment to teaching, but are not interested in teaching below the university or college level (Tm), and others who have worked as college History instructors were forced by changing requirements for employment at colleges to pursue doctoral studies simply to continue in their teaching careers (Km):

This [college teaching] is what I had always wanted to do....I was advised by numerous people, both at the college level and the university level, that if this is what I wanted to pursue then I had better go off and get that PhD because the colleges were all becoming universities and they would require everybody to be PhDs. (Ca)

An academic career was not the only reason for students to pursue doctoral studies:

I always felt it was important just to get an education and to continue it in whatever field, so even if I don't end up teaching in History I will have shown that I can do a PhD in the arts, and this will set me up for other kinds of work, obviously. (Cq)

Some students also talked about their interest in their planned research, quite apart from career goals, as a strong motivating factor in their decision to do a PhD (Cq) While doing a masters degree, one student realized, "I really liked being a student; I thought I would like to continue....this topic just jumped out - do it, do it, do something like this." (Tm) An international student who spent two years as a research assistant at a government agency between undergraduate studies and graduate studies was strongly motivated by a particular research interest arising out of that employment (Ko). For students with families the decision to begin the PhD is a particularly serious decision: "I think it's not something that's undertaken lightly when you have people that are dependant on you....I could not have undertaken this as a flight of fancy, of course not." (Ca) History students, like Physics students, identify strongly with their academic
discipline, and even though they typically have breaks in their studies, their research interests have roots in their past work in History.

PhD students in the Education Department are substantially older than those in the other three departments with an average age of 39 in 1996 (Department Information). They have had a wide variety of experiences and backgrounds, and all the students I interviewed had taken time off from formal education for periods of at least three years. Nevertheless, all the students I interviewed had been teachers in their past careers, and some had worked at universities in the same general areas as their doctoral studies. For them, the PhD was an opportunity to "climb the academic ladder." (Kj) A student who already had an academic position realised the importance of obtaining the PhD for future promotion in the academic world: "There's no promotion without a PhD at the university, so I knew the earlier the better." (Kj) Because many students have come from careers in their own areas of special interest, they identify strongly with their professional fields, often in teaching. The Education students never actually spoke of an academic discipline that corresponded to their own particular Education Department, speaking instead of teaching subjects that had a close connection with their areas of special interest. Their research concerns often develop from previous professional work, and they bring commitments about research in those areas to this university with them. For many of these students, family and career responsibilities make giving up a secure job for the uncertainties of doctoral studies a decision made with careful planning and deliberation. Egan (1989) expects graduate students, such as these older Education students with professional backgrounds, to think of themselves as independent and autonomous, and, although the circumstances of their lives and careers were
varied, they each had a strong individual sense of why they were pursuing a PhD (Hg, Dg, Ni, Kj).

Supervisors and Student Autonomy

Physics

The Faculty of Graduate Studies at this university requires that all PhD students be supervised in their academic work by a Committee of at least three faculty members, and students are expected to consult with their committee upon registration in their doctoral program (Calendar). The Physics Department imposes a further requirement of an additional committee member, making a total of four (Handbook). Choosing an appropriate supervisor is regarded by many PhD students to be the single most important decision they make in their doctoral studies. Adding additional committee members can take many months, or even years.

In the Physics Department it is not unusual for students to choose this university because they want to work with one particular faculty member and will not pursue their studies there if that faculty member is not available to act as their supervisor (Ju). Choice of supervisors can take place informally well before a student arrives at the university: "I arrived here in September and I actually chose him the previous January". (Br) Not all students are so particular in their choice of supervisors, but may still make efforts to make their choice before they arrive at the university:

We received a Physics calendar in the mail in the Spring before we arrived here. This would have been before we were officially accepted, as part of the package. I picked my supervisor by looking through that book because I thought it was necessary for us to contact somebody before we got there. (Tb)

Students who do not have a supervisor when they arrive in the department, spend the first few weeks canvassing various faculty members: "I came in September and just went around to
different people who were working in the areas that I was interested in and talked to them about projects and whether or not they were taking on students." (Tg)

The process of selecting supervisors can be problematic because students often want to work with the faculty member with the highest profile or most prestige in a particular field, but this choice is generally not seen by Physics students as crucial for success as a doctoral student. The wrong supervisor can make life unpleasant, but is unlikely to mean the student will be unsuccessful in completing a degree. Students first consider the area of research and the reputation of the faculty member, with the personality-match between supervisor and student being a secondary consideration. Because students often choose their supervisors before arriving at the university it is difficult for them to make decisions based on any criteria other than area of interest: "That's usually all we know about. That's all I knew about when I came....The relationship you have is left up to chance, I would say" (Tb). When students do try to find out more about the personality of faculty they have mixed results. Some students find this information shared freely by other students:

I went around and talked to other graduate students who had been there a while who were working in sort of the same area I was. They gave me a fairly candid idea of who's good to work for, and who's not. (Tg)

One student, though, found advice about the personality of a particular supervisor was very difficult to obtain: "It's amazing how tight-lipped people are about supervisors before you take them on" (Ku).

Physics students believe the supervisor's decision about whether or not to take on a student depend mostly on the funding the student has already obtained (Tb): "The first question they always asked me was, 'Do you have a scholarship?'" (Tg) And, "If a student comes to you
with a scholarship and says, 'I'd like to work for you,' then usually the professor will go, 'Yes, you can work with me,' because this is like a free person." (Ju) Supervisors in the Physics Department have an obligation to fund students without their own funding, and, because this money would come out of the supervisors' own research grants, they much prefer to take on students who already have funding guaranteed. At most, those students would need topping up of only a couple of thousand dollars per year (Ne). If a student does not have funding, the search for a supervisor can be much more difficult, with little choice of research fields for that student. Theoretical research is generally less well-funded than experimental research, as one student explains: "Most of us in Theory have scholarships because the Theory people [faculty] don't have as much money." (Tb)

The question of how much choice a Physics student actually has in choosing a supervisor depends not only on funding, but on the particular research area in which the student is interested. The Physics Department is relatively large, but also described by students as compartmentalized. Research is very specialized, so the available faculty to choose from for supervisors depends very much on the field, explaining why some students do not have the luxury to make the personality of their supervisor a major concern: "In my field, if I wanted to do [a particular project] then I had one choice....But if I had a more general interest, like Medical Physics, then there are about four professors that I could go and choose from." (Ju)

If Physics students find they have made a poor choice of supervisors, it is usually possible for them to change supervisors without much difficulty. Often PhD students have done their masters degree at this university, so the shift is easily made when students move from the masters program to the PhD. By explaining the change of supervisors in terms of a shift of focus in
research, bad feelings can be avoided between the student and the ex-supervisor: "Quite often what happens is if people do a masters degree and then a PhD they'll work for one of these people in their masters and then go work with someone else for their PhD." (Me) Students I talked with in Physics did not know of any cases in the department where a poor choice of supervisors resulted in insurmountable problems for PhD students.

The supervisor plays a central role in most aspects of a student's program. From the time the student arrives in the department, it is the supervisor who is most likely to provide advice and guidance. Because the department has a long and relatively stable history, its practices and expectations are generally agreed upon by faculty and students. The role of the supervisor includes educating the doctoral student about those expectations and practices, which are uniform across the department. For example, supervisors provide details to students about the Annual Committee Meetings with students (Tb), which is not a university requirement and does not exist in all departments. Nevertheless, this information may not be volunteered to students until they ask for it (Tb), and it is possible for students to ignore departmental requirements as long as the supervisor is not alerted (Br, Ne). Eventually, supervisors and students are reminded of deadlines and requirements by the Graduate Chair who keeps track of the progress of doctoral students (Tg, Ne). The opportunity for disaster as a result of an individual supervisor's neglect seems to be constrained by the culture of the department, which has fairly well-shared and well-understood expectations of doctoral students, consistent with Becher's (1989) description of a Hard/Pure discipline.

Supervisors are intimately involved in the student's choice of research topics: "Usually a student is just too unfamiliar with the literature and the current research that he wouldn't know of
a project that he wanted to do without the supervisor suggesting it". (Br) Often the supervisor gives the student a limited choice of projects, and the student chooses one. Supervisors reserve considerable control over students' choice of research projects, and, in return, students expect to be given a project that is reasonable, based on the supervisor's experience. Once a topic is chosen, students rely on the supervisor for the day-to-day advice a technical field such as Physics requires:

The projects involve so many technical points and you need contact with the literature and so on that the graduate student's totally inexperienced on, and relatively incapable of doing. The supervisor has to point you to the resources and has to help you with the difficulties of your calculation and things like that. It's basically unheard of that a student would say, "Well, OK, so I've got a supervisor. But who cares? I'll just do my own research." (Br)

Relations between doctoral students and supervisors are generally described as being amiable and constructive (Ju), and contact is frequent and quite informal. One student describes the typical meeting as occurring at least once a week and lasting for about one or two hours (Br). In addition, students have frequent informal contact (Br): "Monday, Wednesday, and Friday [s/he] usually pops into the lab at some point, and so I can talk to [him/her] if I want to. If I don't want to talk to [him/her], I don't have to." (Ju) The introduction of E-Mail has modified contact between some students and their supervisors, allowing even more frequent and informal contact, especially for mundane or minor technical questions (Br). Social contact between doctoral students and supervisors outside the university occurs, but usually in organized settings: "He usually invites a group of people about twice a year, usually in May and December for a brunch." (Br) Or, "When there's a visiting collaborator visiting from other parts of the world, he sometimes has dinner at his place or something." (Ne)
close or personal friendships with their supervisors, and relationships seem friendly but primarily professional.

Not all student-supervisor relations are as positive as those just described, and some students mentioned the problem of supervisors who used students for their own benefit: "I think few, but some, professors look at students as cheap labour to build whatever device it is..." (Tg) This may affect the progress of students if the supervisor demands "one more thing, and one more thing, and one more thing...It stretches out the length of the program." (Tg) But none of the students I spoke with had experienced this problem first-hand, and it seemed to be more of a student myth than a reality. One student commented, "I have heard the theory," then laughed, but could recall no specific cases of this problem. (Ne) A more common complaint was simply that some supervisors expected students to put in too many hours in the lab: "I think they expect a lot of hours and a lot of work and the student doesn't really want to put in that much time. They want to have a life, too, so that's kind of a problem" (Ju) While this was a genuine irritant, students generally consider it simply part of the life of a poorly-paid student researcher.

An exception to the generally positive picture of student-supervisor relations exists in the Theoretical Sub-Field. In this Sub-Field, the supervisor is a more important person in determining the success of doctoral students than is generally the case in the Physics Department. Students both in and out of the Sub-Field remarked on the distinct nature of student experiences there. Choice of supervisors is not really possible because of the size of the field, and any choice that exists is really between universities, not within the department. Students spoke of the possibility of a clash of styles between the student and the supervisor, a problem which did not seem to be of
critical importance in other areas. Without "an experimental comparison" for theoretical issues in this field, commitment to the supervisor's approach became paramount:

"It's just, it's suddenly the situation gets very uncomfortable because I have to do the thing precisely this way. Basically, I'm not allowed to look at the big picture, almost. And I'm not allowed to use an approach other than the one that [the supervisor] specifies." (Ku)

Although commitment to the supervisor's particular approach to research in the sub-field was crucial, the student's actual research project was more distinct from the supervisor's research than was typically the case in Physics, and the student enjoyed more apparent autonomy. This student actually had no clear idea of what research the supervisor was actually carrying on, and compared this to previous undergraduate work in a more experimental area:

"As an undergrad I had a lot of interaction, and it's nice to be able to bounce ideas off people or even just say them aloud...I felt like I was part of a team and my supervisor was part of that team. (Ku)"

This student's PhD research was separate from the research of the supervisor, and from the other students in the sub-field, making it difficult to come to terms with a very different kind of experience from that of most other students in the department. The effects were paralysing for the student: "My progress is just a kind of self-defeating cycle. Because I haven't been making a lot of progress, I get discouraged and disinterested, which means I don't make a lot of progress." (Ku) The student felt the supervisor had lost interest in their relationship, and the incompatibility of the student and the supervisor was important enough to seriously threaten the student's success. This student had more autonomy and ownership of the research project than the typical Physics student, but was more at risk. The much more isolated research style was uncommon in Physics, and illustrated by contrast the support generally provided to PhD students by more collaborative research with their supervisors and other students.
PhD students in Physics typically arrive at the department without a clear idea of their research topic. They may have already chosen a supervisor, but they are not required to submit details of a particular project. This is significant, because it is an indication of the relative unimportance of the "ownership" of research for Physics students. Once students have chosen a supervisor they are almost certain to work on a project closely connected to the research of that professor. An experimental student at a research facility explained that "typical research is relatively larger scale...up to ten people work on one particular experiment....There isn't much freedom or much to choose." The nature of the research facility and the access available to students also restricts the choice of projects for doctoral students working there (Ne).

Theoretical students may have more choice of topics, but it is usually a choice guided very much by the supervisor. Students believe the technical complexity of Physics research requires that students accept projects defined by faculty:

...students are aware and comfortable with the idea that their research projects will be defined partly by their supervisors and they will be doing something that is considered to be an open question. (Br)

Physics students do not take an important role in choosing their committee members, leaving the choice mostly up to the supervisor: "I didn't actually choose them. I chose my supervisor and he chose the other three with some consultation." (Tg) Theoretical students are expected by the department to have an experimentalist on their committees and vice versa, further constraining the freedom of students to choose.

Physics students conduct their research under the close supervision of their supervisors, and expect the supervisor to be actively engaged in the progress of their research projects. In addition, students expect supervisors to provide assistance and encouragement in career-related
activities such as publishing papers (Tb) and submitting research proposals (Ne), and the supervisor's participation in the funding of student research increases in importance as the student uses up external sources of funding in the latter part of their studies (Br). Supervisors are also considered one of the only resources in the department for career advice during doctoral studies, and assistance in finding a job after graduation. This kind of advice is increasing in importance because of shifts in funding for research in Physics, but the department has been slow to adjust:

While nobody has a crystal ball, I think if anyone, the Physics community should know what's going to be going on in the Physics community in a few years. Really, that kind of advice within the department is almost non-existent except from supervisor to student. (Tg)

But, unlike PhD students in the arts/professional departments I studied, Physics students depend primarily on their supervisors for assistance in fulfilling the formal requirements of the PhD program.

From the beginning of their programs, PhD students think of their research as part of a larger research endeavour, and identification with the research community remains throughout the degree process. Becher (1989, p. 13) describes scientists in Hard/Pure disciplines as visualizing themselves "standing on the shoulders of their predecessors," with students having to accept strong limitations on their ability to negotiate the dissertation topic. Nevertheless, students maintain a belief that credentials of researchers are relatively unimportant: "In the Physics community I guess graduate students are treated in the same way. Students are researchers; profs are researchers. The same deal." (Br) This illustrates the extent to which students accept the practice of suspension of individual autonomy in Physics when it come to definition of valuable research. Students are little different from fully-qualified researchers in Hard/Pure disciplines, who also sacrifice this kind of autonomy for the benefits of the prestige attached to highly-
respected scientific research (Becher). Politics and personal alignment with particular individuals does not seem to play an important role in the success of the doctoral student, and the most important research problem identified by Physics students was the possibility of equipment failure: "Well, if you're in Particle Physics, if whatever accelerator you're using dies, then you're probably in big trouble." (Ju)

PhD students in Physics are guaranteed funding to do their work, feel part of the research community, and expect to adjust their own research interests to meet the research community's needs. They believe the Physics Department, being concerned with value-free research, provides an unproblematic environment for scientific freedom to flourish. Reliance on faculty for financial and technical support, assistance which is virtually guaranteed, seems to justify the close involvement of the supervisor in explicitly defining possible research topics. Of course, students are expected to carry out research independently, but that research is largely determined by the needs of the discipline. Physics students seem relatively unconcerned about issues around research autonomy and ownership of research projects, as their eventual status as professionals will depend more on meeting well-understood standards of expertise rather than the assertion of their autonomy as researchers.

Chemical Engineering

The Chemical Engineering Department does not officially require students to have more than the three committee members stipulated by the university Calendar (Handbook), but students I interviewed all had more than three committee members. According to the Department Handbook, one of those committee members "would normally be a faculty member from a
different department" (p. 7), which was confirmed by all students interviewed. PhD students in Chemical Engineering often choose a supervisor well before being accepted for study in the department. Because many students are from overseas, it is a very important decision for them: "Actually, I came to [this university] by first picking up my supervisor." (Ff) One international student met the supervisor years before beginning the PhD program during a visit to Canada sponsored by the student's previous employer: "I spent two weeks with [him/her] here at [the university] and during that time the possibility of this PhD arose, so I had time to check the cost of living, the housing conditions, and stuff like that." (Bk) The choice of university might even be determined by the availability of a suitable supervisor:

I think I would have gone somewhere else because first of all I heard about [the university] by working with papers by this professor, so I didn't know about [the university] otherwise. And, yeah, I think I would have gone somewhere else, maybe even to the U.S. (Ff)

If students do not have particular supervisors in mind before applying then the department will circulate the student's application:

...the way this university department works is you apply and then your application is circulated within the department, and then the various profs who are interested will call you up and talk to you. (Nr)

Many students and supervisors, then, had direct contact and came to an understanding before the students' applications were even accepted: "When the student arrives, he or she knows who is his or her supervisor; it's not something that's going to happen later on, as in other departments." (Bk)

PhD applicants in Chemical Engineering are not required to have a clear definition of their research topic, and one student cared very little about the actual topic: "I was pretty flexible as to what I was going to do. (Nr) Students choose supervisors on the basis of the work they will
allow them to do, but the requirements of industry also help shape their choice of work:

"Definitely it was because my supervisor was interested in that, but even more so it was because it
was something that industry wanted to see." (Nr) Students have to determine the areas of
research of each potential supervisor:

When I first came here and I talked to the various professors, what I was asking
them was "What do you do? What kind of work do you do? What kind of projects
do you have going on right now? And what are you looking at doing in the future? (Ck)

They believe supervisors then examine the suitability of potential students for the supervisors' own
research projects: "They think that 'Well, student "x" is going to come along and I'm going to
encourage them to do this particular project.'" (Ck) Because students think of themselves as
employees of the supervisor (Ck) there is little dissatisfaction with the lack of choice of particular
research topics. Many students found questions along this line quite puzzling. One student quite
readily accepted a change in topic when informed by the supervisor that funding for the initial
topic was drying up (Ff). Furthermore, pursuing research at the PhD level unconnected with their
previous masters research was not unusual, as many students had breaks of a year or more
between degrees (Bc, Nr).

The field of research of the supervisor is the primary criterion for students to choose a
particular supervisor (Bc). Nevertheless, the personality of the supervisor, or the compatibility of
student and supervisor is also considered important by students in Chemical Engineering: "This
was one of the factors why I decided to stay after my masters, and not to change" (Ff), and
furthermore, "I think it's very important because how you feel about your whole situation and
your whole relationship with your supervisor influences very much your attitude toward your
work." (Ff) The importance of a good relationship increases as the student's program advances:
"I think, in fact, at some times, especially toward the end of your degree, it becomes more important who they are than what they are." (Nr) An International student explained, "It's important, I think, to work with a supervisor if you can get along with him or her," (Bc), but admitted to having no idea about their own compatibility before the initial selection. Students who apply from within Canada may have the chance to shop around for a supervisor, but even then choices can be limited:

I talked to a number of supervisors or profs in our department and just questioned them about their research and looked around. In the end it came around to a lot of supervisors already having their plates quite full with students already and just really not willing to take on anyone else. (Ck)

This student was concerned about compatibility, "You do tend to, as with I guess any human activity, you try to make sure the person's a person you can get along with," but found the relationship was actually quite poor due to the supervisor's inexperience and lack of interest in the student's research project. (Ck) But this relationship did not seem to be critical for success in Chemical Engineering, as this same student explained:

Oh, it would never prevent you from completing. In fact I have had difficulties with my supervisor. I don't want to turn this into a complaining session or anything, but just basically - how do I put this? - I can't put this nicely: we've had problems. The work goes on. (Ck)

When I asked if the supervisor was standing in the way of the student's progress, I received this answer: "Oh, no, no! In fact, if anything [s/he] would be eager to get rid of me, but not before I publish." (Ck) Another student made the following comment: "I would say you complete your degree [with an unsatisfactory supervisor], but in a sort of depressing fashion." (Ff)

Many students have more than one supervisor, particularly if they are working in an industrial-related field, and one of the supervisors is from industry. (Nr) Changing supervisors
once they have been chosen by students is not an easy decision, unlike departments where a provisional supervisor has been appointed by the department: "I would say it is not a very pleasant thing to do." (Ff) More than one student spoke of being "hired" by their supervisor, and this indicates a recognition of the serious and permanent nature of the relationship. This makes the initial choice of supervisor particularly important for students in Chemical Engineering.

The supervisor plays a very important initial role in the career of a doctoral student in Chemical Engineering, particularly because of the large number of international students:

I talked to my supervisor and we got along very well because [s/he] knew me a long time and there was this two pages written about what was a research proposal, and that would be my first big challenge. He gave me that right at the first week....I had some questions about adapting here; he was very pleased to answer. (Bk)

Students are not required to take any courses in doctoral studies in this department, but supervisors can recommend students do so in order to fill any gaps in the student's previous education. Preparation for the proposal defense is very much an individual effort by students, but done in close contact with the supervisor (Ff):

Certainly your supervisor should have a clear idea of what you're proposing, because the whole notion of a supervisor is this is the person who will be there to guide you and assist you if you have any problems. In fact you're actually doing this person's work, as well. (Ck)

The timing of the Proposal Defense is often left up to the supervisor: "I don't think any student would jump up and down and say 'I'd really like to be grilled now'. It's the supervisor who says, 'It's time to get your proposal in. You've got to do this now.'" (Ck) After the proposal defense, the student and the supervisor continue to have close contact while the student conducts research:

It [The progress of the student's research] is totally concentrated at the hands of the supervisor. After the research proposal you have a green light until the public defense that will happen three years afterward, so if during that time your
supervisor's happy with you, that's OK. There is nothing, no challenge, except
your discussions with your supervisor. (Bk)

The decision about when the student is ready to wrap up data collection and begin writing the
thesis is a decision made in close collaboration with the supervisor (Nr): "I think it's something
just between you and you supervisor....As far as I know it would always be a mutual thing that
both people are ready, are willing to tie things up and move on." (Ck)

Students particularly appreciate supervisors who are able to make time for students:

I would say that our supervisor is extremely available. [S/he] is the type of
[person] who is more interested in research than any administrative work....You
can call [him/her] at home and tell [him/her] what went wrong or if you have a
good result or something, so [s/he] is available. (Ff)

This student and supervisor met more than once a week informally, and met with the research
group at least once a month (Ff). Another student liked the idea of regular meetings with other
students in the supervisor's research group, but found that they were not productive if the
atmosphere was too formal: "It's not a big discussion...it's not comfortable." (Bc) Other students,
though, were quite happy with their relationship, and content with the availability of supervisors:
"If I really needed to see [him/her] I could pick up the phone and call [him/her]. As it is we have
scheduled meetings weekly, and I think most people in the department do." (Nr) While some
supervisors were very controlling of students others give the student more freedom, "I prefer to
work with some freedom, and I have that here." (Bk) This student knew of cases, though, where
students wanted the close control of a supervisor: "I knew a student who left because,...[the]
supervisor was not 'on his back' every morning." (Bk) If, for any reason, the student lost funding
for research it was the responsibility of the supervisor to make up the lost funding up to the
$15,000 guaranteed by the department. (Ck) This gave the supervisor an important stake in the student's progress:

I imagine that a supervisor who felt that their student wasn't doing enough...would think that their student isn't living up to their $15,000 bargain or deal: "They're not doing enough to earn what I'm paying them." (Ck)

Chemical Engineering students do not typically work as part of a lab team. Those who work for a particular supervisor consider themselves part of a research group, but there is no such thing as "The Lab" of a supervisor (Bk). Research labs do exist in the department, of course, but PhD students tend to use a number of labs depending on their particular equipment needs at the time (Bk, Bc). Research groups of a particular professor may consist of masters students, doctoral students, and post-doctorates, but interaction is mostly social:

I meet them here and there on coffee breaks, but we don't meet to discuss our work formally. When we meet, it's "How is your research going?" "Oh, it's fine." You know, this and that, but it's nothing substantial. (Bk)

Another student agreed: "I don't know many students who are sharing equipment or sharing research topics. I think it's mostly individual with some group effort." (Nr)

Professors usually work out of their own offices, but some faculty members reserve areas of labs for their research. Even in those cases, interaction on a professional level between PhD students and faculty is rare: "The prof's not actually in the lab working with you." (Nr) Even the members of a research group work quite independently:

I assumed, say before I started my PhD, that as a PhD student I would be actively involved in a larger group of researchers; I would certainly be aware of what everyone else in the group was doing. We would interact professionally, have these meetings, not too often, but say once a month, get together and thrash out ideas where you could say "I'm having a problem with this" or "What do you think of this?" and get professional ideas back. That doesn't happen at all, at least in my group. (Ck)
This was also disappointing for another student: "There was practically no scientific interaction between me and them [the rest of the group], and this is something that I missed (Bk)." When I inquired about the possible reason for lack of collaboration, the student replied:

There is nothing that prevents that, but also there is nothing that compels you to do it, or favours this. It's up to us, and being up to us, as I said, I was there doing what I had to do and then I came home and stayed at home. (Bk)

There is little departmental supervision of the actual research project beyond that of the supervisor, because the supervisor is the only person considered close enough to the research to monitor the student's progress (Nr). The individual nature of Chemical Engineering research sometimes leads to duplication of efforts: "Occasionally you find that one person is doing research on this and the other person is doing research on the same thing, and you think 'Why is there no collaboration?'" (Ck) This seemed particularly true of an Applied Centre connected to the department where there were people from a variety of departments working with little coordination:

We've got Civil Engineering, Chemical Engineering, and say Forestry people doing very similar research. Extremely similar! Really, how can I stress how similar it is? There could be collaboration there. (Ck)

Although students work mostly as individual researchers, they still feel they are doing "parallel" work with others on number of different levels of research efforts in Chemical Engineering: the supervisor's group, the department, and even industry (Ff).

Social contact between students and supervisors is quite common in the Chemical Engineering Department. Annual gatherings at the home of the supervisor are not unusual, and students appreciate attempts by supervisors to have social contact with their students, even if this is not always particularly successful, "Because [s/he] is not very talkative, or whatever, when
there was no topic to talk about we just kept quiet in [his/her] house." (Bc) More sociable supervisors develop a closer bond with students:

...after these group meetings [s/he] used to take us out [his/her] whole research group for lunch in some restaurant. We would go out for lunch and then we would spend some time together...everything is on [him/her], so it's nice. (Ff)

Other students find their contact with supervisors is confined mainly to their regularly-scheduled meetings. (Ck, Nr) One international student would have preferred more social contact:

"Whenever we meet, that's fine, that's great. But we didn't meet as often as I would like; I miss that." (Bk)

The Department Handbook stipulates that the student's committee "should be struck by the supervisor(s) within 6 months of the Candidate's arrival". (7) Normally students have no role in the selection of their other committee members: "I didn't have any say about it." (Bk) Another student agreed: "I don't think any student would have a role to play in that process." (Ck) Other students have limited input, and one expressed appreciation of the supervisor's help: "We discussed [the committee]. Yeah, I liked the way [s/he] suggested which professors from which departments should be helpful to my research work." (Bc) Committee members do not need to be from the university (Ck), and committees can often be quite large, particularly if there are industrial collaborators involved in the project:

I have two supervisors, a person who's working with the project, and then I have a couple of people from industry as well who are working with us. We chose a lot of the committee members from there, and I guess the other committee members are essentially chosen from within the department and outside the department on the basis of availability, really, in a lot of cases. (Nr)

Another student had six committee members on the research proposal committee, but expected the number to be fewer at the final dissertation defense. (Bk) Many students had trouble
remembering who their committee members actually were, regarding the committee, other than the supervisor, as mainly an examining body (Ff). In general, the supervisors closely monitor the progress of doctoral students in Chemical Engineering, but other committee members who might number six or more, play a much more limited role as examiners at the proposal and dissertation defenses.

Students identify problems associated with research as their biggest concerns in the PhD, but the problems associated with student research seem to be largely mundane, "I can't think of any particularly large challenges; basically the way I see it is it's just a bunch of work I've set out for myself" (Ck), with problems most often having to do with equipment, "If you need something and order it, and you have to wait a month, you've wasted a month." (Nr) Although they recognize the possibility of students getting caught up in disputes between industry standards for research and academic standards, students I spoke with had never heard of this ever seriously affecting the progress of student research. (Ck) Even a situation where a student was required to keep certain information about industry-related research secret at an academic conference was not considered by other students to be an important problem (Bk). The struggle for control and definition of academic work between the university and industry discussed by Rhoades and Slaughter (1991) is not a problem for PhD students in Chemical Engineering, who expressed no concern about direct interference by industry in the ability of professional academics to freely disseminate their research findings.

Writing papers and attending conferences is important for Chemical Engineering students in the course of conducting research, but not as crucial as in pure sciences like Physics (Ff), and connections outside the university tend to be with researchers in industry rather than other
academic researchers (Ff). Outside contacts provide help in technical matters as opposed to more personal networking needs that exist in the arts/professional departments (Bc), and some successful students have no connections whatsoever outside the Chemical Engineering Department (Bk). Although Chemical Engineering students seem less connected to a broad academic field than Physics students, they are closely tied to supervisor's research interests and those of industry.

Clark (1987) suggests the more an academic discipline moves toward applied work, the more it is willing to adopt the values and standards of non-academic institutions. This involves an undermining of the notion of the autonomy of the researcher, as industry imposes its needs on the discipline. Becher (1989, p. 15) stresses the "purposive and functional" criteria Hard/Applied disciplines adopt for judging research activities, leaving little scope for the kind of curiosity-driven research typically associated with Pure disciplines. PhD students in the Chemical Engineering Department, depending on both their supervisors and industry for financial and technical support, willingly accommodate themselves to the needs of their sponsors. Even more than Physics students, PhD students in Chemical Engineering consider themselves to be "hired" to work directly for their supervisors, and have little concern about their autonomy as researchers or ownership of their research projects.

History

Unlike the Physics and Chemical Engineering Departments, the History Department makes specific provision in its Handbook for a "provisional advisor" at the beginning of the PhD student's program: "The provisional advisor is responsible for providing general assistance and
advice on the student's programme and for overseeing the student's progress." (Handbook, p. 17)

This is not always the person with whom the student would continue to use as permanent thesis supervisor:

You're appointed a provisional supervisor based on your application, and perhaps my application was a bit unusual in that I was not continuing my masters research....I was assigned a provisional supervisor who was actually more appropriate for my M.A. work rather than what I wanted to do as a PhD student. (Tm)

The provisional nature of the initial advisor in the History Department is different from the Physics and Chemical Engineering Departments where a student enters into a much more permanent relationship with a supervisor from the time of initial registration in those departments. In History, there is a recognition of the importance of the relationship between student and advisor that goes well beyond the supervisor's expertise in the student's chosen area of study, and that the final choice must be made with serious deliberation.

Some students arrive in the department without a clear idea of the kind of research project they want to pursue (Ko, Tm) and if they wish to change advisors or supervisors after they become more familiar with the department, they are able to do so after conferring with the Graduate Advisor. But the danger exists of wading into departmental politics of which the student might be unaware at the beginning of a PhD program (Tm, Km). Often the relationship between student and permanent supervisor begins during coursework where the student and a faculty member discover they share research interests, and courses serve the function of promoting appropriate relationships:

In the course of that seminar, part of its purpose is to maybe lead you into your thesis work, so in the course of that year, working with this prof whom I was taking a course with, I discovered what topic I wanted to work with and found I liked working with this person. (Tm)
Choice of courses, though, is usually by field, and the range of faculty students come into close contact with early in their programs is largely a matter of chance.

Students are not admitted to the PhD program unless there is a faculty member working in the same field in which the student expresses an interest (Handbook, Tm), but this is not the only concern of students in making their choice:

I've often told people that are coming in that even if the field fits perfectly, if you can't really get along with your supervisor you should try someone else even if they don't know as much directly, because to me the working relationship is more important than the expertise. (Cq)

Students spoke of the need to ensure the supervising styles of particular faculty meet the needs of the student (Tm):

I would probably counsel any new student that they need to get to know their supervisor, and in a sense they have to do things; they have to be there for that person until they really can develop a rapport, and that's got to be the most important relationship. (Cq)

Faculty are not described as being very flexible in their relationships with students, and do not respond well to the particular needs of individuals. Instead, they have their own styles and it is up to the student to conform to that style: "There are people in the department who are wonderful nurturers; there just are a large number, I would say there's an equal number, who don't know how to spell the word." (Ca) Some students prefer a nurturing supervisor who plays a direct role in the progress of the student:

It's not just getting along with, it's the type of person they are; whether they do for you or not. You need a supervisor who not only supervises your work and is critical of it, but you need someone who is going to mentor you, you need someone who is going to promote you. (Ca)
Other students prefer to be left very much on their own:

Some supervisors are a lot more nurturing and they take more responsibility. My feeling about this is that there's the other side to that: that you get someone who's too intrusive. I've always preferred to have somebody who's there if I need them but is not going to be necessarily controlling what I'm doing. (Cq)

Although it is important to make a comfortable match between the student and faculty member, recognizing the supervisor's style is not easy in the early months of a doctoral program.

Students also spoke of the need to align themselves, or share fundamental research commitments, with the faculty member in order to be a successful student: "You know, you learn, if you're successful, you learn very quickly that you're on this side or that side." (Ca) The importance of aligning oneself to a particular faculty member or group of faculty is also not always evident to students: "I don't think they understand it when they first start. Sometimes by the time they figure it out it's too late." (Ca) Aligning oneself in the department means a number of other decisions aside from choice of supervisor:

Choice of supervisor's important. Who you fraternize with is important....Attendance at seminars, that sort of thing; you just don't go to seminars by people that are not on your...side....So, I think your choice of supervisor, your choice of project, your choice of approach, whether you are going to be empirical, whether you're going to be theoretically-based. I think all these things are important and students do get caught in the cross-fire, they really do. (Ca)

The problem for doctoral students is that faculty tend to keep their disputes hidden from students, so it takes time to recognize the various camps in the department. (Ca, Km) The distinction between "realists" and those faculty who recognize the importance of theory as "an informing aspect" of history is one which students need to take into account when choosing supervisors because the student is expected to share the theoretical perspective of the supervisor (Ca). One student mentioned how it was only by chance a serious conflict was avoided when that student
was "straddling the faction line", with the factions being "very weird...really hard to define." (Tm) Students believe a fellow student failed Comprehensive Examinations by getting caught up in factional conflict: "We...have come to the decision that [s/he] must have offended one of the faction lines, and [his/her] supporter was not strong enough to defend [him/her]." (Tm)

Once a student commits to a supervisor, they expect the supervisor to support them throughout the PhD program, and even beyond. (Cq) The supervisor needs to be strong enough to defend the interests of the student in front of other faculty: "You need someone who is going to sit on those committee meetings and go, 'No, no, I think student needs that money more'" (Tm) But, again, students are not aware of the importance of this early in their programs (Km): "I don't think it's something that you consciously do. It's not something you really think about, but it's what you need, actually." (Tm) Some History students believe those students who have had difficulty completing their degrees have not had the full support of their supervisors: "Everyone seems to believe it was because no-one went to bat for them. If you had someone who was willing to stand up for you then you would do fine." (Tm) Another student explained a different aspect of this kind of commitment:

Graduate student life is very isolating, and I think for most people it's a tough row to hoe. If you don't have somebody there that you like, and that likes you, and that's going to be saying "good job, keep going, you're doing great," at least I wouldn't have continued....to me it's just crucial to have a supporter, and just a colleague that you can feel good about being with. (Cq)

Despite the importance of the supervisor, the amount of support given to students by supervisors in the department is considered to be very uneven:

I have friends who have been with a supervisor and the supervisor's had them help with research, and help write articles for journals, and put them on as co-editors, which looks good on a CV. Others just totally ignore the student, never see them, never speak to them, and just make life hell. (Km)
History students believe it is the responsibility of the supervisor to be honest about the student's progress, but, unfortunately for students, supervisors often seem uncomfortable making explicit negative comments until it is too late: "I know in some cases, sure, some people are really frustrated that their supervisors will never say, will never make a real critical comment about anything." (Cq) Students are often expected to "get the message" without being told directly, and one student described a very good relationship with a supervisor this way: "...my experience is direct...[s/he] would give me comments directly, so I don't have any problems." (Ko) Some supervisors expect students to attend conferences and publish, but, again, sometimes they do not make expectations explicit, and it is up to the student to realize the importance of those unspoken expectations:

My supervisor just didn't explicitly tell me, "Oh, you should follow me to go to the conferences" or "I should introduce you to certain people"...but I can tell that they do have some certain expectations on me." (Ko)

Supervisors play an important role in gaining funding for students, and need to be willing to promote the student in the departmental ranking of students for external awards. They are also needed to advance the students' future career prospects by introducing them to a wide network of contacts (Tm), and to promote the student whenever possible (Ca). One student got this advice from an important faculty member: "You know, even after you get your degree and leave from here....you're going to have your supervisor's signature at least, or letters of reference for many years to come. (Tm) This student felt particularly pleased to be "really well-connected" and to have a supervisor who had "taken an interest and who knows that [s/he] will matter in the long run, rather than just in a short period of time." (Tm) This student concluded, "A lot of it, it does depend on your personal relationship with them, whether they like meeting you on a regular basis
or not." (Tm) The student, though, was not sure if supervisors are always aware of the important long-term role they played in the student's career:

Sadly, I don't think that's something that a lot of profs realize, and it may be that they're really blind in what the doctoral student's needs are, that doctoral students, in a way, aren't just students, they're apprentices. (Tm)

The Department Handbook distinguishes between two different committees: a Field Examination Committee and a Thesis Committee (pp. 9-10). The Field Examination Committee examines the student in the Comprehensive Examination requirement, and consists of four members. After completing all coursework and the Comprehensive Examination, the student and the Graduate Advisor establish a Thesis Committee which consisted of at least three members, including the student's thesis supervisor (Handbook, Tm). Doctoral students in History feel the onus is on them to gather the people to serve on the committee and to set a date for the meeting to discuss the Research Proposal (Tm). The choice of committee members is mostly the students', but they "consult" or "negotiate" with their supervisors during this process (Ca, Cq, Ko), but the actual choice of members is made difficult when the student is not aware of the nature of the divisions that run through the department:

It's terrifying because you have no idea what the departmental divisions are, and you've got a supervisor, and then you have to pick the rest of your committee, and this even operates during your Comprehensive Exams. You're picking fields that seem to go together, but what you don't know is how the professors go together, and frequently that can be a dreadful job. (Km)

Real choice of supervisors and committee members is a major issue for students in the History Department (Cq): "In our department there's really very little choice." (Ca) The actual compatibility between student and supervisor is often just a matter of chance, "you never know if you're going to get along with the person." (Tm) If a student is doing research in a small History
field, there may be no actual choice at all (Tm) even if there is a serious conflict in personal styles between students and supervisors (Ca). One student suggested this was not peculiar to the History Department: "I would think most departments, though, there probably never enough people to really make a real choice." (Cq) What makes the History Department different from the Physics and Chemical Engineering Departments, is the greater importance in History of choosing just the right supervisor.

Students' sense of ownership of their research is extremely important in the History Department, and when I asked one student the source of the student's research interest, the answer was quick and clear: "It comes from myself." (Ca) Some students take a year or more deciding what their research topic will be, and one student resented pressure during that time to define a topic quickly: "I didn't like being told 'Why don't you do this.' Well, my understanding was that I'd decide what I wanted to do for my dissertation." (Tm) The stress placed on student ownership can partly be explained by the culture of the academic discipline, and one student supported Becher's (1989) notion of "Rural" research styles in Soft/Pure disciplines: "Individual ownership, as opposed to having your supervisor have a piece of your research, I think that's definitely a hallmark of historical work." (Ca) Unlike in the science departments, students do not believe they are working as part of a team or on a supervisor's larger project. A sense of ownership of research is crucial for the student to sustain interest in doctoral studies over the extended period a PhD requires for completion: "I need to do something that is my own. If I don't do that I can't get up every day and do it." (Ca) Nevertheless, it can be a heavy responsibility, especially for a student new to the doctoral program:
You know, there's a lot of pressure of finding a good dissertation project: something that you're interested in, something that you like, something that you feel you can say something and really contribute. (Tm)

Individual ownership of research extends beyond the initial choice of research topic into most stages of the doctoral student's program. Students choose their own supervisors, arrange their own Comprehensive Examination fields, take the initiative in choosing committee members, and even arrange for the timing of the Research Proposal meeting. The preferred model of student interaction with the supervisor and other committee members in the History Department is for the student to take the initiative in approaching the supervisor, rather than having regularly-scheduled meetings:

I've been the one who's always initiated whatever, and that's the way my supervisor likes it. If I come with a need or proposal that [s/he] can comment on, and we can discuss, it's really up to me to make sure it happens (Cq).

This was much to the student's liking:

I prefer it that way. I mean one could complain that I always have to set everything up, but whenever I do ask for help it's always forthcoming. If I don't, I'm just left alone, and I really prefer that. (Cq)

This student believes an autonomous relationship is probably the standard model of supervision of student research in the department, and helps explain why some other students found supervisors less nurturing than those students might have liked. All of these practices sustain students' belief that they are the "owners" of their research, and in control of their research project.

When one student believed the research interest was being modified to suit the discipline, that student resisted: "I push against that." (Ca) But research direction is often modified in very subtle ways of which students are often not aware. Coursework, for example, is where many students get to know faculty and choose their permanent supervisors. In a particular field, few
courses are offered (Ca) and students do not have much choice of the faculty who will ultimately influence their commitments to research and historiographical approaches. In courses, faculty promote their own commitments:

I suppose they make it clear which side they're on in the selection of the readings for the courses, by the way they treat students who try to take an alternative approach, the kinds of critiques they give papers, and that kind of thing. (Ca)

Students are not always aware of the process shaping their own commitments:

It tends to be very much by accumulation of these kinds of cues, and as I said, we're trained...I think it's seen as personal growth, but not examined in the fact that if you were to have accidently taken another set of courses with another person, you would have come to a different conclusion, which doesn't show it as personal growth, but shows it as part of the system. (Ca)

Another student described the process as "involuntary" and "subconscious" (Km). For this student, the actual freedom of the student to freely conduct research is constrained by the need to look closely for what is expected, and to provide just that. Kuhn (1970, pp. 193-194) describes the way academics are immersed into their paradigm:

One of the fundamental techniques by which the members of a group, whether an entire culture or a specialists' sub-community within it, learn to see the same things when confronted with the same stimuli is by being shown examples of situations that their predecessors in the group have already learned to see as like each other and different from other sorts of situations.

Faculty do not typically direct students explicitly, and another common method of shaping student research is for the student to fly "trial balloons", and if there is not sufficient enthusiasm from the supervisor then the student is best advised not to include those ideas in future work (Km).

Carrying out research is almost entirely an individual effort in History, and it is unusual for a student to be able to collaborate very closely with another student or faculty member:

I think people would share resources if you happen to be lucky enough to find someone that is working in your area. I mean that's a luxury, that's something that
you're really excited about and you want to share your experience, but it doesn't happen very often. (Ca)

Even supervisors can not always be of much assistance in the actual topic of student research:

If you're working in a faculty member's area and you're doing something that he or she is interested in, then I think the dynamics would totally change. But everyone I know is working with someone who only has a peripheral knowledge of what they're looking at. (Ca)

Funding is also rarely tied to the supervisor's project: "In History it's just not that way. If the prof gets an award, they're just going to use it....You can't really hitch your wagon to somebody else's star." (Cq) One of the drawbacks of the stress on individual work and student ownership of research is that students can get lost in the research process without adequate supervision (Ko).

Departmental secretaries and students both estimate the average length of completion for PhD degrees in the department is seven years, meaning the typical student needs to apply for at least one extension of the time allowed by the university for completion of a PhD.

Students find it is not enough to simply carry out the PhD research project, but there are a number of other demands placed on them if they are to be considered successful students: "I think the fact that I've published stuff throughout my time I've been in the department doesn't hurt. I mean people look at you differently once you start because then you're one of them." (Cq) Publishing is also helpful for funding the student's program: "It feeds back to you. Your chances of getting funding are better if you have publications." (Tm) This is not always understood initially by students themselves, and they depend on their supervisors for help:

It's not only promoting you, but pushing you to do things that you might not have undertaken otherwise....If you're going to push yourself professionally, you need to have those opportunities: you need to have the opportunity to teach, you need to have an opportunity to do some reviews, you need to be encouraged to go to conferences. (Ca)
Students also speak of the need to get teaching experience on their CVs (Tm), which adds one more responsibility to the doctoral student's agenda. Furthermore, it is important for them to extend their contacts beyond the department, not in the way science students make contacts for technical advice, but for political and defensive purposes. (Ca)

All of these activities can be as important as the actual dissertation research, and require the students to make the right alignments with faculty, as well as to pick up on subtle cues about what is valued in the discipline culture. Unlike PhD students in Physics and Chemical Engineering, History students have strong commitments to the importance of their autonomy as researchers. As Becher (1989) points out, History is a relatively convergent discipline in the arts, and, as such, one would expect clear and established expectations of students in History. To some extent this is true, and students accept a certain degree of explicit control over their research arising out of the demands of shared disciplinary standards and practices. To a large extent, though, historical standards are seriously questioned by students and some faculty in this department, as discussed in the previous chapter. This trend toward divergence, more characteristic of other social sciences and humanities according to Clark (1987), accommodates greater variety of competing theoretical perspectives, and greater commitment to the autonomy of the researcher.

Students in History resent explicit interference in their choice of research topics and perspectives, placing high value on ownership of their research, confirming the individual, or rural, style of research in History identified by Becher (1989). Not only do students value autonomy, but the ability to independently carry out a research project is required and rewarded by faculty. But this requirement is at the heart of an important contradiction for students. While
they are expected to maintain the appearance of independent researchers, they are constrained in important ways by the structures and practices of their PhD program. The segmentation of the department into a variety of fields means that within each field there may be very little actual choice of faculty. Choice is critically important for History students, because, unlike Physics and Chemical Engineering students, the theoretical perspectives and personalities of potential supervisors can be even more important considerations than expertise in a particular field. But the theoretical and political divisions within the department are kept quite hidden from students, particularly at the beginning of their programs, when crucial decisions were being made. Throughout the PhD program, uncovering divisions in the department, and striving to meet implicit expectations of individual faculty, are important student endeavours. The obscured or hidden nature of the divisions and demands of the PhD program allow students to maintain a strong commitment to their own individual autonomy, while in practice being forced to conform to the informal requirements of their department and individual supervisors. For students to admit the actual limits on their autonomy would be to undermine their esteem and the value of their research.

Education

On acceptance into the PhD program in Education, a student is assigned a provisional supervisor who is considered by the Admissions Committee to best match the academic needs of the student. Prospective students are also invited to approach faculty members about taking on the role of supervisor, and if the faculty member is willing to supervise the student, that agreement is communicated to the department. The Department Handbook states that faculty who are
assigned as provisional supervisors "typically" continue as the student's program and thesis supervisor. The actual experiences of PhD students in the department confirms this is the case (Kj, Dg, Sy, Hg).

Choosing the right supervisor in this Education Department is considered crucial by the students I interviewed. Although matching faculty to students' interests is important (Kj), of even more importance is the personal relationship between the student and supervisor: "That you maintain a good relationship, even on a personal level, with your advisor and the people involved in your research is very important." (Sy) One student described the process of selecting a supervisor before applying to any university as "like going shopping". Because of the importance of this decision, the student travelled to a number of universities, and met faculty at conferences before making the decision to attend this university and work with a particular supervisor: "I was only going to work with my professor here; if [s/he] wasn't going to take me, I wasn't coming." (Hg) For students who do not make a choice of permanent supervisor on arrival in the department, contact with faculty is made during coursework, but the notion of "choice", as with students in the History Department, is very problematic for students in this department. Because of the many structural divisions in this Education Department, the actual choice of faculty is extremely limited (Kj), explaining perhaps why it is "typical" for students to remain with their provisional supervisors. One student, for example, came to the university to pursue a PhD with almost no knowledge of the faculty working there (Dg). In this student's case there were four faculty in that particular area of special interest, and when selection of additional committee members was taken into account there was little actual choice left: "I think that the department's quite limited....I think there were only four people in [the area] and that really limited your
choices." (Dg) This was confirmed by another student in a different area of special interest with even more limited choice of potential supervisors (Ks).

One student with colleagues who are unable to communicate well with their supervisors believes it is important for students to "change them early when you have the signs." (Kj) Even if those faculty are good teachers or experts in the field, there has to be a trusting relationship between the student and supervisor for the student to succeed in the doctoral program. One student spoke of the need to be free to take risks with a supervisor as crucial, while another student had a supervisor who was actually blocking the progress of the student (Ni). This student decided to pursue an entirely different area of interest in order to change supervisors in terms acceptable to the department. Another student whose relationship with the supervisor was very unsatisfactory, did not perceive any choice of supervisors at all in that particular area of interest, and knew it would be necessary to try to make the best of a situation that could actually threaten the success of the student (Sy).

In making a decision about the choice of a permanent supervisor, it is very important to align oneself with the particular research approach of that professor: "I think I would do a lot better if I chose one of the same topics that my supervisor's doing." (Sy) Adopting the faculty member's approach sometimes occurs beyond the conscious control of the student:

I get the feeling that I'm being more or less indoctrinated to a certain way of thinking, and that I should accept that, at least as part of my research, that I should follow sort of the same path. (Sy)

Because of a commitment to pursue their own interests, students often do not want to admit the importance of aligning oneself with the right supervisor, but this student offered the following advice for new students:
I think that if you want to get through, the easiest way is to get an advisor and follow their path of research in your own. That's the easiest way, but if you don't want to do that then you're kind of in trouble. You still have to modify what you want to do suit what their interests are, I think. (Sy)

Students who make the right choice, or by chance align themselves with a suitable supervisor speak of a tremendous freedom to pursue their own research interests. Students who make the wrong choice, or are forced through lack of choice to accept an unsuitable supervisor, often experience subtle but strong pressure to change their research approach.

The individual nature of the student's research project in this department requires that supervisors come to understand the individual needs and styles of their doctoral students. Some students flourish with a minimum of direction, and others require regular and explicit guidance. Unfortunately, as in History, the style of the supervisor/student relationship seems to depend on the preferred style of the supervisor rather than that of the student. One student who felt the need for guidance expressed dissatisfaction with the role the supervisor had been playing in the student's program:

I'm a person who needs direction in order to pursue my research and I don't feel like I've been given a whole lot....I think there's a big problem of lack of meetings with the advisor, and lack of communication with the student's own work. I do a lot of reading outside of what I'm required to do and I'm always trying to formulate my own ideas. I do a lot of research on my own and I feel like I'm doing it in sort of a vacuum. A 15-minute meeting once a month doesn't sort of cut it to get to the bottom of what I'm trying to do on my own, or if I'm going in the right direction, even. (Sy)

This experience can be contrasted with that of other students who have complete satisfaction with the student/supervisor relationship. One student described the relationship between the supervisor and graduate students in the department as like an "extended family." (Hg) Another stressed the close contact and informality of the relationship:
[S/he] keeps in touch: we are always on E-mail....There's always space...I think that's how we were able to move fast, because you know the doors are open if you are stuck....For me, it's very, very important to feel that I have a space; any time that I have a question, "Come..." That relationship is important for me. (Kj)

This student also stressed the benefits of consistency in a relationship between supervisor and student, both in terms of availability to the student and in terms of advice about research. When I asked if other students had this kind of good relationship with supervisors, I received the following response:

Not at all, not at all. It varies, I think. There's a lot of personalities, maybe. It's different, it's different. Sometimes I don't even talk about that because I look like I'm bragging. (Kj)

Students describe supervisors as being "immensely" (Hg) busy: "My sense is they're run off their feet. They'll help you when you specifically ask for help," (Hg) and some students attribute poor supervision by some faculty to the almost impossible schedules supervisors have to keep. But recent restructuring of the department, and the physical dislocation that accompanied it, is blamed by one student for the lack of attention that student receives from the supervisor:

I think it's a general attitude across the university, especially that professors are pushed to do their own research, and I think this is augmented by the fact that the department is in such disarray....they all must oversee changes, so they're being in more and more meetings, and more and more confusion going on. (Sy)

This student went on to say:

I find that the professors have very little time between the classes and their own work and everything else. And the point that I find completely disgusting is when you finally do get an appointment, that you come and you can either be in the room right away and only be allotted 5 minutes, or you can be expected to politely wait for an hour and a half, and then still go in there and only get 5 minutes. (Sy)

The solution to the problem, according to this student, would be a formalized policy in the department for regular meetings between students and supervisors: "There should be guidelines
in place. I think PhD students should have a meeting every two weeks at least...right from day one....That system's not in place." (Sy)

Choosing committee members is left very much up to the student, but final approval rests with the supervisor. The department's Graduate Chair plays little role in this process, unlike the Graduate Advisor in the History Department. One student who was unfamiliar with the faculty in the department, and in related departments, left the decisions mostly up to the supervisor who "assembled" a committee for the student (Kj). Another student stressed to the supervisor that the committee members had to be able to get along with each other: "I said...'Look I want this committee that there's three people who can work together, who don't necessarily have similar ideas, but have similar ideas on doctoral students.'" (Dg) This student felt the best advice that could be given to incoming students would be, "Pick your committee well." (Dg) A beginning doctoral student reflected on recent committee experiences from the masters degree and explained the difficulties faced in dealing with a committee:

My masters came down to more of an ability to co-ordinate the members of my committee in a way that was compatible with what I was trying to do....You have to find a way to communicate with them that doesn't offend them at all times, I think. It's very difficult. (Sy)

Experience from the masters degree taught this student to be very careful in the eventual selection of a committee for the PhD degree. Unfortunately for PhD students in this Education Department, the segmentation into various areas of special interest severely limits the actual choice of supervisors.

For many students in this Education Department, ownership of their research is not only taken for granted, but the assertion of this ownership is considered to be the very basis for success as a PhD student (Hg). Some students arrive with a research project already developed in their
careers outside this university (Hg, Ni). Those students strongly believe in the importance of being allowed the freedom to pursue their interests, and resist any attempts to substantially change their projects. This can be best achieved by aligning themselves with a faculty member who will support them in pursuit of that project, making the appropriate choice of supervisors tremendously important. It is a critical problem if choice within a particular area of interest is not wide enough to accommodate the student's commitments, causing students to "flounder" (Hg) when they are unable to match themselves with an appropriate topic and/or supervisor. In the science departments students need primarily to be concerned about finding an area of interest that suits them, giving minor consideration to the personalities of supervisors. In this Education Department basic assumptions behind the research regarding method and underlying values has to be taken into account. In a segmented department where the students are invited to enter the program without making a firm commitment to a supervisor upon acceptance of admission (Handbook), some PhD students find themselves in a serious quandary.

Students without clear research interests when they first arrive in the department express the importance of being given the space to choose a research topic that is their own (Kj, Ks, Sy). These students are encouraged to take their time and let the coursework help shape their choice of projects. One student was grateful to have been given an "open-ended route" to develop a research topic and have pride in giving shape to a successful project:

> It's [up to] me now to swim through this mud that I have created for myself, because you have been given the opportunity to do what ever you want. Then you get yourself into this muddy stuff, and then you have to really wade through it because it's your own making. I like that. (Kj)

Nevertheless, the freedom students appreciated so much seems to have some important limits of which students are not always conscious. One student suggested that letting the research topic...
emerge from the issues discussed in courses was the best way to facilitate a smooth transition into research and writing (Sy), but some students discovered their courses privileged certain themes and approaches: "I think we are more or less being indoctrinated with these themes that run through all the time. You know, it seems to be the same thing all year." (Sy) Another student was even stronger in this regard:

In the classroom I didn't get the feeling that there was free and open discourse. To a certain extent there was, but to a certain extent if you happened to disagree with the instructor then you were told, "This is wrong and this is why you are wrong." And I think it sometimes that was very personal as opposed to, you know, they weren't welcoming dissent, they wanted you to tow the line, to see a certain thing. (Dg)

Resistance by students is sometimes attempted, but not entirely successfully:

I resist having the same common threads coming through all the time, and at first I thought the students were so weak that they couldn't understand what was going on, but now I think some of them have really good ideas that are being shot down a lot of the time, I think. (Sy)

This student does not think courses have a broadening influence, but are intended to advance the professor's own approach to the subject, and the easiest path to successful research is to follow faculty interests and approaches as they emerge from the coursework. Both students and faculty can maintain a belief in complete freedom of research for students, but students are actually considerably constrained in the real choices available to them.

One student often spoke of the need to "work the system". The supervisors and other faculty are described as too busy to have a lot of interaction with students, so students have to discover what will work for them. Once students learn the system success comes easier: "If you work the system you'll get more help." (Hg) Those who do not learn the system are left to "flounder", a term students often use in this department to describe students who seem to make
little progress. An example given by one student of what was meant by the term "using the system", was to connect every course assignment with the student's eventual research project, underscoring the influence courses can have in the shaping of successful students' research.

Some students want explicit direction from their supervisors to define and carry out a research project (Sy, Dg), but such direction is given reluctantly. Instead, supervisors prefer more subtle suggestions or a process of immersion that does not require them to directly discredit the work of some of their colleagues in the same field. The student described in Chapter IV who completely altered a research design after the departure of the original supervisor explained the way the initial design had been chosen:

Because my advisor did a lot of empirical [quantitative] research, I leaned more to that direction....The way I first wrote up my proposal was to please my [supervisor], more a quantitative research project....The initial impetus was to do it quantitatively as a result of reading some articles. (Dg)

When circumstances led to the student's supervisor having to withdraw from the committee, the student found the rest of the committee had not shared the original supervisor's commitment to quantitative research. The student was never told directly a different approach was necessary, nor was the student engaged in an open debate about the relative merits of the different research approaches:

I was never told "No, don't do this quantitative." It was always intimated through conversations that "I don't think this is where you're going to get your best information. You're going to get your best information from your interviews."

The new supervisor simply immersed the student into a new body of qualitative literature: "I think I was under a bit of pressure to change it. The more I did some reading the more I felt that, yeah, it was probably better to go with the qualitative approach." (Dg) Looking back on the process, this student admitted it probably would have been impossible to have continued to
conduct the original research project even if the student had wanted to continue with that research design: "It wouldn't have been in my interest to do that. I think it would have caused dissension in the committee."

Another student who entered the doctoral program with a theoretical approach at odds with that of the supervisor, in a situation where there was virtually no choice of supervisors, found the process of adjusting to a new perspective difficult:

It's painful, very painful. Being in such a small department [area of special interest], you ended up taking your major courses with the supervisor, so this would be driven home in every course you took....At first you're really frustrated because somebody's taking away really deeply-held beliefs that you once had, and beliefs that are shared by people you grew up with. (Ks)

The challenge for students is to make those new research approaches their own while maintaining a belief in their own autonomy. This student also describes a process of immersion: "I was just overwhelmed, overwhelmed I would say, for about the first six months just learning the language." (Ks) With a new language, the student can not help but approach the issues which originally brought the student to the department in a completely different way. This might be considered a simple developmental process, initiating the student into a language and approach to research shared in the academic community, but this student recognized that the original approach was accepted as a legitimate research paradigm in other universities in the same area of special interest. The new approach was not necessarily superior, academically, according to a recognized standard in the field, but was simply that of the particular faculty at this university. Immersion into that particular research approach by this particular student was not at all an informed choice of the student.
Supervisors play a critical role in shaping the students' research, but students manage to maintain a contradictory belief in their ownership of the research project. One student made the following claim: "I think they're trying to say, 'This is your research project. You do what, you plan it, you do it.' And I don't think they want to impose their direction on other people." (Dg) After some discussion, the student finally admitted: "This isn't going to be earth-shattering, world-changing research that you're doing. If somebody says, "Change this because that way you'll get your doctorate", well I'll change it." (Dg) This contradiction seemed difficult for the student to confront head-on, and it remained obscured because the student did end up agreeing with the supervisor: "I think to a certain extent there's a lot of me thinking along their lines." (Dg) The question of how freely the student underwent the conversion, remained largely unasked. Simply to ask the question is to undermine an important source of legitimacy for the student's research project, as the autonomy of the researcher in the arts/professions is a fundamental principle. One Education student stated very clearly, "I love freedom!" (Ni)

Even more than in History, which has traditionally been a more stable and convergent discipline, PhD students in this department are reluctant to confront the actual limits to their autonomy. Egan's (1989) expectation that older students with a professional background will highly value independence and autonomy is indeed confirmed in Education. A sense of autonomy is crucial for students to engage in the combative environment of a contested field, and limitations imposed by the subtle but forceful process that aligns students with a particular theoretical perspective need to be kept veiled. As in History, the structures and the practices of the PhD program in Education created and reinforced the contradictions between beliefs and practices of doctoral students.
Limited Autonomy

A clear division became apparent between the experiences of doctoral students in the sciences and the arts/professions with respect to autonomy as student researchers. Students in Physics and Chemical Engineering willingly conform to the explicit restraints placed on their research projects by supervisors, the department, and industry. They expect to forfeit autonomy, as they are dependent on support for funding, equipment, and technical advice. In Chemical Engineering students go so far as to speak of being "hired" by their supervisors. This notion of employment is not for a specific job, but rather defines the entire relationship with their supervisor. Students, of course, have the ability to choose from a range of research topics offered by their supervisors, but that choice is clearly limited by resources available. Students' belief in universal scientific methods and objective standards of good research, as discussed in the previous chapter, make the question of theoretical approach a non-issue. Except for the interesting exception of the Physics students in the Theoretical Sub-Field, science students cannot conceive of competing theoretical approaches to research within their fields, and feel complete freedom in the consensus of convergent disciplines. For students in the sciences, authority and power result from operating in an objective discipline that is value-free. Because all knowledge arising from the universal scientific disciplines is valuable, according to science students, to contribute to their fields without political pressure is to maintain sufficient autonomy. The authority of students' scientific research and the esteem of the student researcher is based more on the disciplinary standards students meet than their autonomous choice and development of a research project.

Arts/professional students, on the other hand, place a much greater value on their freedom as researchers. This sense of autonomy seems to go to the very root of their self-respect as
researchers, and, perhaps more importantly, the respect and support of faculty in their departments. In divergent disciplines, where the standards of good research are contested and unclear, autonomy is a much more important source of authority. For students in History and Education, their sense of autonomy conflicts with strong evidence of important restrictions on their freedom to choose and develop their own research projects. This impingement on their freedom arises from the segmented nature of their departments and the resulting limitations on their actual choice of supervisors and research projects, restrictions that are less than those imposed on science students, but more troubling because they conflict with deeply-held convictions. Even more important are the subtle mechanisms for aligning students with the research commitments and practices of their supervising committees which obscure students' subordinate position in the power relations between them and faculty. Arts/professional students must accommodate the contradiction between beliefs and practices, and not let resolution of this important conflict stand in their way of successful completion of their degree. In addition, explicit recognition of the limits on their own autonomy might undermine the respect they have for their own research endeavours, and the respect given to students by faculty. It is important for arts/professional students to maintain and assert the appearance of their individual autonomy in the relative absence of the authority science students achieve by meeting apparently universal standards of scientific research. Von Blum (1986, p. 56) describes graduate school as a socialization process that encourages a high level of conformity from students "approaching a state of intellectual prostitution". He claims, "Thousands of past and present graduate students, in pursuit of advanced degrees required for certification to academic legitimacy, have found it expedient to conform to the academic ideology of their professor-superiors." This criticism
strikes at the heart of the professional esteem of academics in the arts/professions, and PhD students can afford only fleeting recognition of its validity.
CHAPTER VI ISOLATION

Student interaction is essential for the development of a student culture or subculture. Kuh and Whitt (1988), in their discussion of undergraduate student culture, claim students can exert considerable influence over the operation of an educational institution. Student culture entails a collective response to circumstances and experiences shared by students for meaningful participation within the more dominant educational culture. The strength of the student culture depends on the extent to which students interact with each other, the degree of separation between students and non-students, and the existence of processes for socializing new students into the student culture. Interaction of students is of most significance when students share common interests, but students' perception of their interests may undergo change as they progress through their educational programs. Horowitz (1987) argues a student culture or subculture does not exist if students do not interact in a way that allows them to create their own unique understandings of their experiences and circumstances, and they simply adopt the values and norms of the dominant culture in which they are located.

Students do not passively accept the cultural symbols and practices of their educational institutions, but instead interact with those symbols and practices in ways that provide meaning for the student, but also alter the institution's culture. The extent to which students alter that culture depends on the nature of the student subculture that develops. Students may identify primarily with the dominant educational culture, accepting and strengthening the symbols and practices of the institution, or they may develop responses to the more dominant culture that do
not conform to its values and norms. Willis (1977) describes the classic example in educational literature of a student counter culture that resisted the authority structure and formal curriculum of the school, also rejecting those students who conformed to the expectations of the institution. Willis's "lads" created their own sub-culture at the school that enabled working-class boys to develop a shared understanding of their experiences and circumstances. This sub-culture had roots in shared gender and class interests that fostered an oppositional response to the dominant culture of the school.

PhD students at this university are located within departments whose discipline cultures exert tremendous influence over the ways students interact and understand their experiences. Becher (1989) differentiates between two broad patterns of interaction in academic communities which he describes as "urban" and "rural", roughly corresponding to his Hard/Soft distinctions for academic disciplines. Urban communities generally exhibit patterns of interaction that are frequent, intense, and competitive, with researchers typically focusing on narrow fields of study around a relatively few, but significant, topics. Becher (1989, p. 82) describes urban academics as "occupationally gregarious", engaging in serious-minded "shop-talk", as opposed to the "gossip" and "rumour" of the rural academic. Academics in Physics and Chemical Engineering fall within the Becher's category of an urban community. Rural communities, on the other hand, exist in soft disciplines, such as History and Education, where interaction is typically uncompetitive and less frequent. Clearly demarcated boundaries around distinct research fields reduce the intensity of "shop-talk", or informal professional discussion, in rural communities because of the segmentation of members' research interests.
The PhD students of this study are in the process of socialization into the discipline cultures that manifest themselves in the students' particular departments at this university. Student interaction, and the formation of a student culture or subculture in these departments, is influenced by the patterns of interaction into which they are being socialized, but also by the extent students perceive a need to create their own cultural symbols and practices in response to the dominant discipline cultures. A strong student culture provides the critical lens and conceptual tools for analyzing the values, beliefs and practices of the institutional cultures in which students are being socialized, but students who share the cultural norms of their disciplines have little reason to closely scrutinize this process. PhD students typically enter their doctoral programs with a history of academic success, and expectations of continued individual success leading to eventual acceptance as members of their chosen disciplines. In this chapter, I will discuss the nature of student interaction in the four departments of this study, and the extent PhD students identify with each other in the formation of cultural symbols and practices distinct from those of the dominant cultures.

**Students**

The composition of students in the Physics Department reflects the conventional image of a doctoral program in the sciences. The discipline of Physics is described by students as predominantly male, and this is very much the case in the Physics Department at this university. The vast majority of faculty are men, as are most doctoral students, with female students comprising only 14 percent (11 of 79) of the PhD students in the department in the winter of 1996. Women studying in the department are conscious they are functioning in a decidedly male
environment, even though as individuals they do not describe this situation as particularly problematic. International students comprise 24 percent (19 of 79) of the doctoral student population in the department in 1996, a relatively low proportion compared with the Chemical Engineering Department, but still a significant group in the department. Physics students are the youngest, on average, of the PhD students in the four departments with an average age estimated by the department to be 26 years in 1996. Because of the relatively young age of these doctoral students they are typically single without direct family responsibilities or dependants. As predicted by Becher (1989), students in Physics followed well-established and relatively uniform educational paths leading up to doctoral studies, and it is not uncommon for them to have begun their Masters degrees in the same department.

Doctoral students in Physics generally study in one main Physics building containing classrooms, laboratories, departmental offices, student offices, and other support services. It is an older building in the centre of the university campus, and the location where students have most interaction with one another. The Physics Department has strong ties to a major research facility in the city, where some students also conduct their research. This research facility houses students, faculty and researchers from other departments and universities, and students whose research is primarily located at this facility are somewhat isolated from the broader student interaction within the main department building. The Physics Department also has connections with a number of research facilities world-wide, and, although very few doctoral students conduct their research out of the city, many spend some time off-campus at various research facilities, especially after they have completed their coursework.
The Chemical Engineering Department can be distinguished from other departments of this study by the large proportion of international students in the PhD program. In January, 1996, slightly more than half of the PhD students (22 of 41) were studying on a student authorization, but even this number can be misleading because many of the Canadian students at that time had begun their graduate programs at the university as international students (Department Figures). This high proportion of international students affects social interaction of students, and has led the Chemical Engineering Department to make its policies and practices more explicit than in other departments. Women comprise only 17 percent of doctoral students (7 of 41), but even though they make up only a small segment of PhD students their numbers are greater than students themselves estimate (Ck). The average age of students in 1996 was 34 years, eight years higher than that of students in Physics, but five years less than the average age of Education students. The students I interviewed in this department spoke of important connections outside the university, such as family and cultural organizations.

Chemical Engineering has no formal divisions, but most students are located in three different locations on the university campus. The bulk of students study and conduct research in the aging main building, which is to be replaced by a larger, better-equipped main Chemical Engineering building (Bc, Ck). A significant group of students work in an Applied Centre devoted to collaborative work between the university and industry, which occupies a much newer building with better research facilities than the current main building (Ff, Bc). A few Chemical Engineering doctoral students are also located in a Research Laboratory that draws students from a number science disciplines. Although students often indicate a lack of knowledge about conditions in buildings other than their own, they all regularly visit the main building where their
mailboxes are located and have occasion to interact there with students from across the
department. The majority of doctoral students in the department are international students, but
there does not seem to be the same sense of belonging to a wide international community of
researchers in Chemical Engineering that exists in Physics. Collaboration with researchers outside
the university is more likely to be with industrial groups than with a larger academic community in
the discipline.

Doctoral students in History at this university are a small group, totalling only 24 in the
Winter of 1996. The small size of the group is significant for understanding social interaction of
students, as this is the only department I studied in which I could expect each PhD student to have
at least a passing acquaintance with most other doctoral students in their department. Women are
under-represented in the PhD program, comprising only 38 percent (9 of 24) of the total number
of students (Department Information), perhaps reflecting the "conventional" nature of the
department and its only gradual shift toward contemporary issues in historical research that give
more prominence to the participation and perspectives of women in History. International
students make up only 17 percent (4 of 24) of the total, the lowest percentage of the four
departments studied, again reflecting a cautious deviation from the conventional focus of the
department.

A noticeable distinction exists in the History Department between masters students and
PhD students (Ko, Tm). Although PhD students do not believe they create exclusive social
networks, it is evident to most students which graduate program a student is pursuing. Some
students attribute this awareness to the very brief period of approximately 12-18 months in which
masters students are expected to finish a degree, whereas doctoral students spend an average of
seven years completing their programs (Department Information, Cq, Km). More is expected of
doctoral students in coursework than was expected of masters students (Ko) even though they are
studying together in the same courses, and one PhD student who did a masters degree in the
department described the masters degree as an extension of the undergraduate degree, whereas
the PhD is a distinctly different kind of project (Tm).

Although the History department occupies a prominent location among arts departments
at the university, the actual physical facilities available to PhD students in the department are
minimal. Office or desk space for graduate students is at a premium in the department, and
students who do get space are scattered across the university. Only PhD students who are
employed as Teaching Assistants receive offices, and other students compete for carrels in the
library or in a large open room shared with another department (Ko). Unless the student is a
Teaching Assistant, there is no secure place for the student to keep books or computer equipment
(Km), so student interaction through sharing of office space is minimal compared with other
departments. The department provides a lounge for all graduate students, staff and faculty, but
few students made use of it, so doctoral students in History tend not to be in the department
except for courses and specific events (Ko).

PhD students in the Education Department are substantially older than those in the other
three departments I studied at this university, the average age being 39 years in the Winter of
1996. A younger student in this department who is approximately the average age of students in
History (30 years of age) mentioned feeling very young and inexperienced in this department (Sy).
Women comprised the majority of PhD students in 1996, with male students making up only 35
percent (17 of 49) of all doctoral students. Some areas of special interest had even higher
percentages of women, reaching as high as 100 percent in one smaller area. This creates a
different dynamic for the relationship between women students and faculty than in History, for
example, where faculty and students are predominantly male, but there are also differences within
this department, depending on the gender of faculty in the various areas of special interest.
International students totalled 30 percent (15 of 49) of the PhD student enrolment in the winter of
1996, and for international students, the decision to undertake a PhD has serious ramifications for
their careers and lives, as it does for other Education students who are typically giving up or
suspending established careers.

Office and classroom space for students was undergoing radical restructuring at the time
of this study: "...the department is in such disarray" (Sy). Some students mentioned the
considerable disruption this had on their social interaction, academic research, and even
employment: "The [Education] building has been torn limb from limb, and it's just wreaking
havoc on everything that's going on over there." (Sy) And:

For a year now, the [area of special interest] grad students have been across
campus...so you're not even near the faculty, much less the other students....So
those things have not exactly endeared the new department to the [area of special
interest] students. (Ni)

Even ability of PhD students to meet the responsibilities of their employment was being
compromised (Ks): "People who were teaching, they didn't have an office, they didn't have a
place to see students, they didn't have a place to mark - it was crazy - much less a place to work." (Ni)

Overall, the physical, academic, and social structures of the department were in transition in
its first two years of existence, and this significantly affected the experiences of PhD students. In
the context of a relatively new and growing PhD program in the Faculty of Education, physical
dislocation contributes to the insecurity of students. But this sense of physical separation had a
history predating the current renovations and reorganization of department buildings. In one of the previous departments that was part of the recent merger, for example, two areas of special interest that had remained almost completely separate for the 13 years of that old department's existence. When I asked a student who began the PhD program in that department about students' experiences in the other area of interest, I received this reply: "I have no idea. They were on a different floor,...they had a different secretary, they had different faculty, we rarely mixed." (Ni) This student did not think interaction between PhD students in different areas of interest would increase under the new departmental structures. An atmosphere of change or, more negatively, disruption has been an important element of the experiences of students in this department over the past 15 years.

**Student Interaction**

**Physics**

Student interaction in the Physics Department is generally described as frequent and informal. The nature of the student's research project has an important effect on the contact students have with one another, as does the stage of the student's progress in the PhD program. For experimentalists, the research group is often the focus of their social interaction in the department, and this group is typically composed of a mix of doctoral students, masters students, post-doctorates, faculty, and other researchers. Doctoral students, and even graduate students in general, do not form a cohesive or even distinct group unto themselves (Ju), and very little distinction is made between masters and doctoral students in the department. (Tg) Student interaction is important for Physics PhD students, but not necessary for learning departmental
politics or other informal knowledge which is not considered critical for student success in the objective world of Physics research. The established nature of departmental practices, combined with the belief politics has little place in Physics, diminishes the need for students to create structures to pass on student understandings about departmental politics: "...the politics doesn't creep in really. Well, I don't think it really rates." (Br)

Initially, students are most concerned about success in coursework, and find other students can be of benefit for that purpose, but the importance of student interaction for academic success decreases as the student progresses through the doctoral program. When asked if colleagues were important, one student replied:

While I was taking courses, yeah, because you bounce ideas off each other and you collaborate somewhat, but since I have been doing just research they have been a lot less important. (Tg)

Most contact occurs between graduate students at the beginning of the masters program, and as the student progresses through the masters degree and into the PhD the sense of unity among graduate students tends to weaken. First year masters students are assigned to carrels in one particular area of the department, and it is there that they get to know each other: "It's sort of called the zoo, for the first year graduate students. (Br) One student remembered this time fondly: "I think it was the really nice thing about my experience when I first came here. They put the first year graduate students in the same office space." (Ne) In addition, all masters students are required to take a course in Quantum Mechanics, which brings them together at the beginning of graduate work for a common purpose: "So everyone's talking and trying to figure out these Quantum Mechanics problems because they're impossible to do, so you talk and that sort of starts
kind of a group." (Ju) Another student explained, "...you take the similar courses and you work together, doing assignments and stuff, so first year was really the most fun." (Ne)

Students who have not done their masters degree at this university have a more difficult time connecting with other students:

Now, if you come in as a PhD I don't know how much interaction you would have with people....you might get to know people in your own little office, but there isn't a lot of interaction back and forth. (Ju)

This early bond between students weakened as time passed:

And then we finished our coursework and everybody took off into their own little lab or into their little field, so the interaction of physicists has decreased quite a bit. And now I am sure there are people I never see. (Tg)

The increasing isolation of students from one another seems to be particularly true of Theory students, who do not often have the experience of working in a lab with other students: "...then everybody got paired off with their supervisors, disappeared into their labs and gradually... I hardly see some of them any more." (Ku) This is confirmed by another student who complained, "I lost all those friends I made when I first arrived..." (Tb). But bonds created between students in the first year of a masters degree might not completely disappear: "I know the students that were in my year for my masters. I don't necessarily hang around with them any more, but I do recognize them and know them." (Ju) The nature of student research plays an important role in determining student interaction, and, unless students work in the same lab there tends to be little interaction, especially between cohorts (Ju). For those few students who conduct their research at laboratories outside of the city there is virtually no contact (Tb). Nevertheless, Physics students typically do their academic work on campus, and often within the same department
building, so contact with fellow students is possible, if not always a priority due to the demands of research.

PhD students in Physics have only one organized social activity, the annual orientation meeting for new students. It occurs either at the end of September or beginning of October and is intended to be "just kind of an ice-breaker" (Tg). It also provides an opportunity for students to elect representatives and discuss any pressing issues in the department. The meetings combine a somewhat formal agenda to deal with issues presented by student representatives, followed by refreshments and informal socializing. Although the meetings are fairly well-attended, according to students, I observed just less than 20 percent of the total graduate student population in attendance at the meeting in the Fall of 1995, and Physics students do not seem to place a lot of importance on organized social activities (Ju). Some students mentioned the existence in a previous year of student-run seminars that provided an opportunity for graduate students to present research to other graduate students, but these only lasted for a short time because of lack of interest among students (Ju). This phenomenon seems quite typical of graduate student attempts to organize academic-centred activities in all four departments. If faculty are not involved, student-run seminars or colloquia generally have a short life-span, and flourish only when particular students have a strong interest in presenting their own work. Considerable pressure has to be brought to bear on other students to participate, and the interest of students inevitably wanes, as was the case in the Physics Department.

Physics graduate students elect representatives whose primary function is to attend department faculty meetings and report back to students. Those student representatives do not vote at meetings and if they want to raise issues they do so through the Head of Department or a
sympathetic faculty member. A student representative thought students actually had little
influence at those meetings, and were discouraged from asking questions (Tb). At the 1995
annual orientation meeting the students agreed to lobby the department for the right to vote at
departmental meetings, as they believed their participation did not match that afforded to students
in other departments at the university. Recently, students have been involved in the interviewing
process for new faculty, and it was there they think they are gaining a say in at least one aspect of
department affairs:

...as the department's trying to hire people, they're allowing graduate students to
interview the people coming in to be hired, and we get to have a little input on
whether or not we think they'd be a good graduate supervisor or a good teacher.
(Ju)

A more personal benefit was identified by one student who also saw this participation as
important because it gives students an opportunity to see first-hand what will be required of them
in the future when they apply for their own academic positions (Br). This attitude was shared by
students in other departments, and reflects the importance of individual and career-related
motivation for participation in student activities. Graduate students in Physics also participate in a
variety of sports on campus, but no activity seems to bring students together as a cohesive group:
"There's not one thing that we all do, but there's lot's of students doing individual things." (Tb)
This seems to typify the kind of social activity that exists in the Physics Department, consisting
mainly of small informal groups of students and lab colleagues.

Student offices are typically shared by 2-6 students and are the places where much of the
social interaction occurs, particularly for Theory students. (Tg) For some students, even that is
not assured: "I have my own office now. It's actually an office meant for two post-docs, but I'm
the only one in it right now." (Br) Outside of interaction in courses, laboratories, and offices,
there are few venues for regular student interaction. As in other departments, students often mention the belief other graduate students might go to the pub regularly for drinks together, but this is typically an activity the student believes common of other students: "I maybe went twice when I was a masters student but I kind of stopped doing that." (Ju) Or, "In fact I have never even been to the Graduate Student House. I find when I'm on campus, I'm just focused on doing my work." (Br) There seems to be the belief that a much stronger social community exists outside of each particular student's experience. As I interviewed students across departments, I often heard of groups of "regulars" who met for drinks on a weekly basis, but the particular student being interviewed was never actually part of that group. These meetings seem more myth than reality, as the memory of departmental gatherings of graduate students often long outlive their actual existence, and this seems to be true of the Physics Department.

Students discuss non-Physics topics when they do get together. In the first year of a masters program students may be interested in discussing Physics-related topics with fellow students, but by the time students are in doctoral studies they are more likely to want to talk about much more mundane topics such as the latest hockey game (Tb) or their up-coming vacations (Br). When I asked one student what kinds of topics Physics students might typically discuss, I was told: "I don't know, because I don't generally hang around the grad students that much." This was an interesting response because that student had been described as having a very good social life in the department by other students. Social contact for this student centred around the research lab, and often did not involve other PhD students: "Being in my lab, I'm kind of isolated from everyone else." (Ju) This was confirmed by another student working at a research facility:
I don't even meet new people from Physics. I always work at [the research facility] in the same office, the same group, so when your daily life is so limited and confined it's very hard to get in contact with other people. (Ne)

A married student suggested single students without a partner or family might be much more likely to socialize with colleagues, but this student did not think such interaction would be a particular advantage or disadvantage for those students in their academic programs (Ju).

The department makes use of electronic discussion lists as a way of keeping students informed about upcoming events and other topics of general interest within the department. In addition, E-mail is becoming an important method of social communication between students in the Physics Department: "I use it [E-Mail] as a main method of communication with other people," (Br) and "E-Mail: I check it two or three times a day....it's really changed the way I communicate with a lot of people." (Tg) The use of the computer as a communication device increased significantly in importance during the graduate careers of current students:

When I first came here it wasn't as readily available. there weren't very many computers, actually. We've been getting more since, and now there's a computer on my desk. I'll do things by E-Mail that I didn't do by E-Mail before. (Br)

Another student expressed the importance of E-mail this way: "In general it's really important. I can't really do without it at all." (Ne) But none of the students I interviewed thought electronic communications had significantly altered the nature of student interaction in the department.

Kuh and Whitt (1988) suggest student sub-cultures often form around oppositional stances taken by excluded or disadvantaged students in college or university settings. The Physics Department is a very male environment with only 14 percent female students, and one might expect these students to interact to discuss and confront the conditions in Physics that work to exclude women in the field. Yet female PhD students do not perceive a particularly strong
disincentive for women to continue in Physics once they reach university studies, so the students I interviewed are not active in any groups on campus that deals with women's issues. They are aware such groups exist on campus, particularly with regard to women in science, but do not personally think they need the kind of support or activism these groups might offer. There seems to be a stronger interest in connecting with young women or girls of high school age in order to encourage their interest in the sciences, or to act as role models for those girls, but the demands on a doctoral student's time prevent such action:

I do think it's a good idea, and it's something that if I have more time I will do. I am very interested in getting in touch with the high school student - well, any level of under-educated women. (Tb)

Resentment was expressed by one female student about the way issues dealing with women's experiences as students at the university are discussed by women themselves; for example, concern over the physical safety of women on campus was an annoyance for this student, as she resented what she perceived to be the portrayal of women on campus as victims: "I think they talk too much about the victimization of women and I think they miss the point of it all....I don't think women need to be afraid." (Tb) The women I interviewed care very much about the advancement of women in science, but do not perceive the need to work in conjunction with other women to bring about change. Their approach is individualistic, and they are confident of their own chances of success in the Physics community.

International students do not think they share common concerns that might bring them together as a cohesive group within the Physics Department. Students come from a variety of regions and countries in the world, and tend to identify with other students with common nationality across the university rather than with other international students in the department.
The perception of Physics as an objective discipline and international community worked against the formation of an identifiable group of international students in the department who shared common interests. I will discuss the lack of interest in oppositional association or politics for women and international students in more detail in Chapter VII.

Students generally describe the climate of the department as uncompetitive, with PhD students unconcerned about how they rate in comparison with other students. When I asked about the possibility of students competing for things like future jobs in the department I received a shocked reply: "Oh no!" (Br) In the context of a discussion of the importance of publications, a student confirmed the climate in the department was not competitive, "We don't say 'Oh well, you know, I've got so many publications," and stuff, so I guess it's not really that competitive, really." (Ju) An important reason for the lack of competition seems to be the guarantee of funding all students are given by the department. Students are guaranteed a minimum of $15,000 per year, and any money earned from Teaching Assistantships is normally considered to be additional funding to be kept by the student (Ju, Ne, Br). This prevents the kind of competition for jobs and research grants that occurs in some other departments, and prevents discrimination against particular groups of students in the awarding of Teaching Assistantships: "There's a well-defined sequence and it's pretty well based on need." (Tg) Guaranteed funding eliminates an important source of competition, and even resentment, I discovered in the two arts/professional departments of this study.

Nevertheless, the specialization of fields and the demands of research tends to isolate students from each other as they get increasingly immersed in their research projects. Doing research can be all-consuming for doctoral students, threatening to take over their entire lives:
"It's too bad because there's some kind of mechanism in doing research that really sucks you in. ...so you tend to focus on one thing so much that you tend to neglect everything else." (Ne)

Doctoral student interaction in Physics is often part of a more diverse group of graduate students, faculty, post-docs and other researchers. Even though contact is often frequent, as Becher would predict, students still complain of the isolation of research, particularly in Theoretical Physics. They speak of the importance of establishing an identity outside of Physics: "I generally find that...when I'm doing Physics I like to do Physics; when I'm not doing Physics I don't want to hear about Physics." (Tg) Physics students are involved in a surprising variety of outside interests, and one student chose to live in a residential college that stresses interdisciplinary activities among its residents. Another student got involved in student politics: "I find it kind of grounds me. Otherwise you get too wrapped up in something that is kind of impersonal and doesn't have a lot of relation to the world outside you." (Tg) The outside activity provides a much-needed balance to the isolated and segmented nature of Physics research. This seemed to contradict the stereotype that even Physics students have of themselves as people who spend their whole lives wrapped up in their experiments. On the other hand, some are most comfortable in the company of other scientists:

I think it's partly me, but it's partly the way we are...these sort of nerdy Math/Physics type people. It's hard to talk to about anything to someone who's not in Physics....Whenever we're at a party it's always Physics people in one group and then everybody else somewhere else. (Tb)

Nevertheless, my over-all conception of Physics students includes a much richer life outside of their studies than many Physics students imagine. This is often driven by the need to escape the segmentation and isolation of doctoral research, a characterization of student experience quite at odds with the pattern of academic interaction described by Becher (1989) as being frequent,
intense, and competitive in an urban community. The need for PhD students to prove their individual worth as physicists seem to create a student experience that does not reflect the typical urban academic experience. Physics students also perceive little need to develop an oppositional stance toward the department or discipline. Physics doctoral students share the commitments of their department, and, in general, believe they are being treated fairly. Their interaction is usually quite superficial, apart from close friends, and departmental issues are not often the topic of student conversations. PhD students in Physics have little reason to form a cohesive social group, and look beyond their department colleagues for fulfillment if they are dissatisfied with the isolation imposed by their PhD program.

Chemical Engineering

Students describe the environment of the Chemical Engineering Department as friendly (Bc) and uncompetitive (Nr, Bc), but rather segmented (Ck). There is little distinction made by students between masters and doctoral students, with no distinct social grouping of PhD students (Nr, Ck, Nr). Most students conduct their research on campus, although brief periods of out-of-town research may be conducted at industrial sites. PhD students talk about their interaction in this department in generally positive terms, but do not think it is particularly important for student success (Nr).

In other departments courses are the location for PhD students to make their first important contacts with each other, but there are no required courses for doctoral students in Chemical Engineering other than the seminar series, so not all students have the opportunity to meet other PhD students in class. Some students do not take any courses: "People like us would
not meet anyone through courses," (Ck) and generally make their contacts in the offices they are assigned when they first arrive:

...you start from the people you work with, the people in my research group, you tend to meet them first, of course. Then, once you establish relations...it sort of widens out after that pretty quickly. (Nr)

Organized social activities are rare in the department. One important event is the annual Christmas party for all graduate students, post-doctorates, and faculty in the department. One student wished there were more such activities so students, staff and their families could have more social contact (Bk), but another student had never attended the Christmas party or any organized social activity in the department (Bc). Graduate students elect representatives in Chemical Engineering, and helping to organize this party is one of the main jobs of that student:

"It turns out that just sort of being the person who said 'I'll do the Christmas party' I became the GSS president for Chem. Eng." (Ck) A meeting of graduate students and faculty in September provides a forum where information is shared and new students can inquire about their programs and the department (Ck). This meeting was described as somewhat useful for new students to meet each other and faculty, but attendance is never as good as organizers would hope (Nr). One international student admitted this meeting is not of much help for students in the first days, but rather "just a formality." (Bk) This attitude is not uncommon across departments, as students often find orientation meetings with new students and faculty quite bewildering in their first weeks as PhD students.

The weekly seminars that comprise one of the compulsory elements of the doctoral student's program includes a social gathering 15-20 minutes before the seminar begins where students and faculty can have coffee in an informal environment (Ck, Ff). This is important for
some students, but not all: "It's in the grad student lounge, and socializing definitely goes on there, but most people don't partake." (Ck) The seminar itself is not used for student business, and in fact this is actively discouraged (Nr). During the student presentations, PhD students rarely ask questions of the speaker out of consideration for their fellow students, according to one student (Ck), and attendance is generally poor among PhD students. After the seminars a group of students and some faculty have occasionally gone to the pub for drinks, but that is relatively rare (Nr). In fact, this did not occur on the occasions I attended the seminars.

Informally, students interact with other students in the same office or in the labs where they work (Ck). Students in the main building, which is considered to be old and crowded, have more of an opportunity to meet fellow students than those in the better-equipped Applied Centre (Ff). Although the conditions might not be conducive to student research in the main building, students generally agree the crowded offices and labs provide opportunities for new students to develop a social network (Ck): "It's not a good idea to have it very crowded, I mean in one big room, to study. But to get to know people, that's OK." (Bc) This actually puts students coming from other universities for their PhD at a disadvantage socially, because they are likely to be assigned a better, or smaller, office than a new masters student (Ff). The Applied Centre has students from a number of disciplines, and this seems to limit student interaction rather than to broaden it:

You don't actually tend to interact with people in another discipline as much, even though they are in your building, because apart from the fact that you walk in the same door your research and everything just has nothing to do with the other group. (Ck)

I was surprised at the extent to which disciplinary segmentation seemed to restrict the social interaction of students in all four departments. One student who lived at an interdisciplinary
college at the university had mixed feelings about its effectiveness in bringing students together across disciplines. This student thought it was successful in bringing the residents together, but the college itself tended to isolate residents from the rest of the university (Nr).

Students look to each other for some support in the weeks leading up to departmental examinations, such as the Proposal and Thesis Defenses (Bc): "Immediately before anyone's Proposal, people who have gone through it before will give them words of encouragement" (Ck) Some students practise their presentations in front of fellow-students (Nr), but otherwise do not help each other prepare for their thesis defenses (Bk). Chemical Engineering students do not consider student interaction to be of significant importance in the conduct of research or in the negotiation of departmental politics (Bc). The need to learn about negotiating with Stores for equipment was all one student could think of as an example of students needing to "learn the ropes" from other students (Ck), clearly an indication students do not think there is an important body of information to pass from one cohort of students to another. The notion of departmental politics is quite foreign for Chemical Engineering students, and students discuss topics unrelated to their research when they are together, unless they happened to be working on the same project (Ff): "If all you're going to be talking about is research, then you're not friends really with this person..." (Nr) But this was regretted by one student: "There was practically no scientific interaction between me and them [other students], and this is something that I missed." (Bk) Topics of conversation between students might include departmental gossip or casual conversation about sports (Ck), but do not usually include discussion on a professional level. Regular trips to the university pub by doctoral students seem to be more myth than reality in the
Chemical Engineering Department (Bk, Nr), as I did not actually speak with a student who took part in such activities.

One couple who are both doctoral students in the department have very little to do with other students socially:

I don't want to say we are anti-social or anything, but we don't have too many close friends here. Our activities, apart from school, are in the mountains...So we tend not to participate in a lot of the social activities. (Ck)

These students found it extremely important to maintain a strong life outside the department (Ck).

One international student does not ever socialize, even informally, with other Chemical Engineering students, and depends on fellow-nationals outside the university for social contact. (Bc) Canadian students, on the other hand, find their friends are confined mostly to Engineering or other science departments (Nr), and one PhD student expressed regret this was the case (Ff).

E-mail, as in Physics, is considered an important tool for social contact both within and outside the university, but students do not think it has considerably changed the nature of student interaction in Chemical Engineering (Nr, Bk).

International students comprise the majority of students in the department, and represent a wide variety of backgrounds and experiences. One student, whose spouse studies in another country, finds separation difficult (Bc). Another international student, whose family was able to come to Canada, has had a very different experience and enjoys the support provided by the presence of the family (Bk). For this student, family life is an important focal point for life outside the department. International students often have connections with their fellow nationals at the university that provide them with a social group outside the Chemical Engineering Department:

"I'm an international student so most of my friends are from my country. I have another group of
friends: different." (Bc) Another international student who has friends from the same country
doing doctoral studies in other departments at this university considers them to be extremely
useful in getting to know the ropes of the university (Bk). Within the department international
students do not form a cohesive group with common concerns or interests.

Writing is identified as the biggest difficulty in adjusting to doctoral studies in Canada by
one international student: "Ohhhh...(laughter)... writing is a big problem!" (Bc). Fellow students
are of no help "because they are all busy," and the department has no program to help second-
language students with their writing. (Bc) While language does not present a barrier for social
interaction in the department for this student, neither does the challenge to cope with academic
writing in a second language provide an opportunity for students to come together to share
common concerns. Cultural differences, though, are a real barrier for social interaction:

I have a lot of problems about culture. Trying to be an acquaintance to some
Canadian students, I don't know what to talk about besides the research work. I
just communicate with them only related to the research or academics, but for
social life you cannot share, I don't know, I cannot share anything. (Bc)

This student perceives a general disinterest on the part of Canadians toward international
students: "Canadians don't care about international students, and the international students mostly
have more problems, have many problems....They miss home, I told you, language, food,
environment, and no friends." (Bc) The stress on individuality in the Canadian academic world
concerns this student, who was employed at a university before coming to Canada:

I found that when I studied, mostly international or other students will help each
other in my culture. It's not like copying, but we share our knowledge, and discuss
and help each other. But I found Canadians are individual; even to ask him or her,
I am afraid I should not ask because I found that they do not want anyone to
disturb or ask them. (Bc)
Other international students have very different experiences, and attribute this to their particular cultural backgrounds. One such student, from a European background, has had no significant language problems, but did find cultural differences took some time getting used to. An example is the informality of the student/faculty relationships in Canada, which are much more formal in the student's country (Ff). Another student found language a problem in the first few weeks, but this quickly resolved itself, and this student thinks writing is not actually a major concern because there is generally ample time for students to prepare written work (Bk). The very diverse circumstances and needs of international students, combined with their belief in the universality of Chemical Engineering research, seem to work against the establishment of a network of international students in the department.

Women comprise a small minority in the department, and particular problems for women in Engineering are well-known to female PhD students. Women have not always felt accepted in the Engineering world, but they believe Engineers' attitudes are changing, and have little doubt they, as individuals, will be successful in the field (Ck). As in Physics, the barriers for women participating in Chemical Engineering are believed to begin before graduate school (Ck), and the department itself is regarded as being fair, so women have not collaborated to discuss particular problems in Chemical Engineering for women: "There isn't a bond there or anything; I don't say 'Oh, there's another person like me'". (Ck) One female student claims there are no problems specific to women at all in the department: "There is no difference between men and women: it's about research work." (Bc) As in Physics, the problems for women in Chemical Engineering are perceived by female PhD students to exist largely outside their particular department, and they
have little interest in forming social networks with other female academics. Oppositional politics
seem to have no place in this department.

Despite the relatively unproblematic experiences described by students in Chemical
Engineering, isolation is a common theme running through students' descriptions of their lives
(Ff). It is an isolation imposed by the demands of research: "Usually when doing research you
are isolated: you do your own research and you solve your own problems, and if you cannot
solve it, it's a lot of frustration." (Be) This student believes everyone feels isolated in the
department as a result of the research process, and other students cannot help; only the supervisor
can help in that regard. Another student thinks the beginning and end periods of the PhD
program are the most isolating (Nr). The demands of the PhD program also affect life outside the
department:

You are so busy sometimes if you are researching and focused on something that
maybe you don't have enough time to go out and seek other social groups, and
also maybe others who are outside the whole university life, maybe they wouldn't
understand your concerns. I think it limits your social life, or it directs your social
life towards certain things. (Ff)

Because of the demands of research, establishing a separate life outside the university becomes all
the more important to some students: "I think that there has to be far more than anyone's work.
No matter how much you love your work, there's got to be more than that." (Ck)

There is little reason to develop social networks of students within the department to
offset the isolation imposed by the demands of doing student research, as PhD students perceive
such social interaction as unnecessary for academic success (Ck, Bc). One international student
agreed doctoral research was a somewhat isolating process, but this was, in fact, an important
reason for this student's decision to pursue a PhD: "It has to be done like that: you must have
time for yourself, to go deep into yourself, and that could take hours." (Bk) This student embarked on a project of self-discovery by pursuing a PhD, and the kind of isolation associated with research was necessary to achieve that goal. Doctoral studies in Chemical Engineering can be characterized as a very individualistic endeavour. Student relations are informal and uncompetitive, but somewhat peripheral to the central objective of academic success as a PhD student. Like in the Physics Department, doctoral studies in Chemical Engineering seems to impose an isolation on students uncharacteristic of an urban academic community. The pressure on students to develop individual research projects in isolation from the activities of other students over-rides the benefits of student interaction, and Becher's (1989) description of "occupationally gregarious" urban academics has little relevance for the very individualistic research activities of students, except for student/supervisor interaction which is the paramount professional relationship for students.

History

Social interaction among some doctoral students in History plays an important role in their academic success, at least during the first few years of the PhD program. Students do not have a common course at the beginning of their doctoral program, and therefore are unlikely to meet the other doctoral students in their particular cohort through coursework (Ko). Nevertheless, coursework in particular fields is required of all PhD students, where they come into contact with students who share their particular interests. The recent requirement for new students to take a Historiography course and a Comparative History course at some point in their graduate work promises increased interaction across fields in the future (Tm). Formal student contact in the
History Department is important for some doctoral students, and the graduate students organize yearly functions. Early in the Fall semester students and some faculty meet in the graduate pub for a welcoming get-together. This meeting is very well-attended by new students, and even by some of the more established students. Other functions are somewhat sporadic, and have recently included scholarship colloquia and graduate student colloquia for student research (Tm). The graduate student colloquia is held when there is student interest in presenting work to other students, but a lot of arm twisting is required to hold just a couple of meetings per semester (Km). As in other departments, when faculty are not directly involved in academic-related events, these events are intermittent and short-lived. Most social interaction is informal, between smaller groups of friends within the department (Tm, Cq). During the summer semester students and faculty have the opportunity to participate in sports such as softball, and one student who has been in the department a number of years thought this the best way for students to get to know other graduate students around the university (Cq).

Doctoral students in the department are confident they have been able to influence departmental activities through elected student representation. Two graduate student representatives have votes at departmental meetings, and have been involved in a number of issues raised by students in the past five or six years (Tm). The recent institution of detailed evaluation practices by faculty in the student's first semester of a PhD is an example that students point to with pride (Ko, Tm), as is the resistance students have maintained to the Thesis Proposal meeting being spoken of as a "defense" (Tm). In addition, students mention their pressure to have the provisional nature of the Provisional Advisor specifically referred to in the department's Handbook (Tm). Students are not as pleased with their ability to ensure all students be treated
fairly and with respect by faculty, and this is of particular concern to female students in the department (Tm). Efforts to allow students to avoid interaction with faculty who are considered antagonistic toward particular groups of students have been successfully resisted by the department, as this would reflect on the reputations of individual faculty, and student influence is not allowed to penetrate to the heart of the individual faculty autonomy that is highly valued in History.

Graduate students are invited to take part in the interviewing process of prospective faculty, and many doctoral students find it useful to do so (Tm). It surprised one student that graduate students actually do have an influence in steering the faculty away from certain recruits, and this student thinks faculty have generally been open to working with graduate students for this purpose (Cq). At the time of this study, students were actively engaged in the search for a new Head of Department. It is not just to have input on the actual selection that students participated in the selection process, but it is also seen by doctoral students as good professional training: "There's a good reason why doctoral students like to participate in this: because they're going to have to go through it." (Tm) As in Physics, the opportunity to advance one's career prospects is a compelling motivator for doctoral student involvement in departmental affairs.

Informal contact between graduate students is how they begin to learn about the various factions within the faculty (Tm), information that can be crucial for a doctoral student's success, but information that is often obtained too late to help them make the important decision about choice of supervisors (Ca). Students are not certain just how they actually "learn the ropes" of the department, and one student simply described the process as "osmosis" and laughed (Ca). But this confirms the need to interact with other students in the early years to acquire an
understanding of the informal and hidden requirements of the department. Departmental politics and other departmental gossip are dominant topics of discussion among students in History, so much so that the students have occasionally made the department a banned subject of conversation at social gatherings (Tm). Nevertheless, students speak of the importance of the support students give each other in the preparation for Comprehensive Examinations (Ca, Tm): "It was most probably the informal kind of support, and at that time it was very important that you do a lot of talking about the process and what to expect." (Cq) One student mentioned, though, that because of the very different expectations of the various faculty in the department, students all have different opinions on what should be done to prepare for the comprehensive exams (Km). Because students often have their own unique fields, they cannot always count on the technical support of other students, but the moral support they provide during a time of tremendous insecurity and stress is critical. The lack of standards in this department, discussed in Chapter IV, creates a special need for reinforcement from others who have been successful in the process: "It's [the Comprehensive Exam] a big concern, and certainly in preparation for the Comps the first thing you do is go and talk to other people, other students who have just recently sat Comps." (Tm) Students sometimes lend their preparation notes to other students (Ca), but this practice is not universal (Tm). Some students take the testing function of the Comprehensive Examinations seriously, and are reluctant to share their work with other students (Tm).

Beyond the coursework and Comprehensive Examination stage of the PhD student's life, social interaction is not a strong element of most students' experiences. As in other departments, there is a belief among History students that a group of graduate students in History meet regularly in the graduate pub on campus, but the reality seems to be that this is a memory from
days gone by (Km), and students actually meet as a departmental group in the pub infrequently (Tm, Cq). A graduate student electronic discussion list allows students to keep in touch with other students in the department, as well as students who are doing research out of town or out of the country (Ko, Tm). It is also used, to some extent, by students to discuss concerns such as the Comprehensive Exams (Ko), but seems to be used more for announcing social events and student colloquia, simply taking the place of a departmental bulletin board. Close social contact with supervisors is not common (Ko), and faculty and students do not have extensive social contact in the History Department.

Historians, in general, are described by students as being "very individualistic" (Cq) and competitive: "[The History profession] is far too competitive....There's always this air of camaraderie, but it strikes me very often as very hollow." (Km). One student spoke of competitiveness among faculty for students, and there was some discussion of supervisors being accused of "stealing" students of other supervisors (Tm). With a perennial shortage of funding for students in the department, students are encouraged to compete for external funding (Ko). Students cannot work "under the umbrella" of a faculty member in History, but have to pursue their funding individually from the beginning of their doctoral programs (Cq). One student, through participation in the search process for new faculty, learned the department put a premium on archival skills, and seemed little interested in the prospective faculty member's ability to relate effectively with others (Cq). This doctoral student learned an important lesson about the attributes that were most valued in History, a profession that requires its members to work individually, often in isolation from others.
Students in History reflect the individualistic tendencies of their profession:

I think we're all so individual, we're all so isolated, that you've learned to deal with that or you don't do History. You've learned do deal with the fact that it's an individual project and you're out there on a limb unless you're working with someone whose area it is. (Ca)

The individual nature of historical research confirms the rural attributes of this academic community identified by Becher (1989), but the competitive atmosphere is unexpected. Competition seems to have roots in the particular concerns of students trying to gain the support and recognition from faculty in a department where there is a perennial shortage of money available for students. History students believe their department is relatively uncompetitive, but provide contradictory evidence of a deep-seated competitiveness they simply take for granted exists among all doctoral students. As mentioned previously, students are not always willing to share study notes or even discuss their questions with other students during preparation for Comprehensive Examinations (Tm), and students realize their success as students ultimately depended on their ability to "aggressively" pursue their individual goals (Cq, Ca). They point out the importance of practices that sustain a competitive environment: "There are winners and losers, you know. There are winners and then there are people that just never can distinguish themselves that way [competing for scholarships]." (Cq) The department rewards the "winners" with unsolicited attention: "Not that I've announced it [winning a scholarship], but we have a departmental newsletter, in which all these things are always posted, so it's kind of the way of announcing these things." (Cq) This is confirmed by another student: "Everybody knows [who wins scholarships]....People will be congratulated when you win things. Yeah, it will be in the departmental newsletter and there's also scuttlebutt." (Ca) This student was amazed to hear this kind of identification of "winning" students does not occur in the science departments I studied.
It seemed such a natural part of doctoral studies to make public a student's award of money that this student had not considered that in another environment this might be considered a private matter and not appropriate for public display. Students are constantly being observed by faculty and have "this sense of always being judged." (Cq) One student described the competition for writing book reviews:

    The competition is intense and the other people are being promoted, so your chances of even hearing of a book review that you could do before it's given to someone else comes through the network. (Ca)

Students need to be strong, not just as intellectuals:

    I think they still feel that the rigours of this are useful, and as an intellectual if you can't handle it, and even if psychologically you can't handle it, then you don't belong here. (Ca)

Doctoral students also judge each other, and one student thought this inevitable in doctoral studies: "I think in our department you want to know who got top in the class, and if it's not you, you want to know why, definitely." (Ca) Again, the student was surprised to hear of a different atmosphere in some of the science departments. This acceptance of a competitive environment by students undermines the possibility of students sharing common interests through to the end of their PhD programs and contributes to the sense of isolation that often begins to develop by the time PhD students have completed their Comprehensive Examinations.

    Students in History describe the successful completion of Comprehensive Examinations as a clear gateway from one stage in their program to another: "Well, the big one [step] was passing, was after your comps....That was a definite one everyone acknowledges." (Cq) Although doctoral students themselves do not think they make many distinctions between students (Ko),
they speak of an almost unsettlingly abrupt change in the way faculty treat students who have passed into this second stage (Tm):

The biggest sign [of change] is that it's made clear to you that you go from addressing them as superiors to addressing them generally by their first name. And I had people explicitly tell me..."Don't call me so and so, just call me by my first name." It's funny how it just sort of happened after my comps. (Cq)

This was confirmed by another student in even stronger terms:

After the comps there's just such a radical change you wouldn't believe it. Suddenly you become, instead of a student, you become accepted as potentially one of them; the change is astounding. I would never have believed it, just how much acceptance there is from that week of hell. Then it's as if you've been stamped "Approved. Good Housekeeping" seal on the middle of your forehead....It's absolutely astounding. (Ca)

Students have made an important step toward acceptance into the profession, leaving behind the shared interests of students.

As students step closer to the academic profession they are increasingly isolated. This isolation has its roots in the preparation for the Comprehensive Examinations, where students generally spend enormous amounts of time and effort to master three fields of literature: "It's a very isolating thing the Comps...most people are studying for their comps alone." (Tm) After the Comprehensive Examinations comes increased acceptance by faculty, but a corresponding isolation from other students:

The fact that History is by nature a very solitary endeavour, it's not like you're going into a lab and you're seeing people every day, you're off and you're doing your own thing and it's very focused. A lot of people have found it very lonely after comps. (Tm)

Once in the research stage, students do not perceive the need for contact with other students, and strive to please their supervisors by doing good work (Cq):
I think you get more and more isolated the more you get into writing because you don't come in as often. It's too easy to waste time. You stay home, you write. I think that is productive in the sense that you probably get more written, but I think it's very isolating. It gets more and more isolating as you go on.

One student did not see any benefit in students banding together:

I'm not of the school of thought that sees graduate students as one bloc and faculty as another. At this level, especially PhD, you're much more, once you pass your comps anyway, you're much more a colleague and it doesn't make much sense any more to have these kinds of blocs. (Cq)

The following description seems to sum up the beliefs of many students:

I find it to be a very monastic exercise. It's just, before you are really a part of anything, you are told that you need to go out and occupy your little cell and do this fairly rigorous amount of work, which takes years and years to do, and then come back with it and be told whether it's good enough. It's an isolating thing, it's very daunting for some people....There's just this lack of guarantee, there's this isolation. And sort of this sense of always being judged, of not really having your basis to critique others. You're just still out there trying to make your way. (Cq)

Although students think more contact with each other would be a benefit, it is difficult to escape the isolation, as it is a direct result of the individual nature of students' research: "The problem is that everyone's area is so different. What can we link to?" (Ca) This was confirmed by another student:

You're doing your own projects, and really they can be quite different, and so the time and energy that it takes to get to know what somebody else is doing is sort of time and energy taken away from your own work. (Cq)

Even doing research in the same field as other students can still involve divergent approaches that limit interaction with other students: "I can talk to other...people [in the field]; I have nothing to say to them, or they to say to me, except 'Oh, that's interesting'. So, yeah, I think definitely isolating." (Ca) And this isolating effect is thought to be just the preparation the profession required:
I think that the nature of the game, again, is such that there is no impelling reason to band together if you're getting enough support from your supervisor, etc. If you feel like your work is being accepted...the value really is to be able to do independent research and to get it published. So that's how you attain status, that's how you're accepted in. (Cq)

Students try to set up informal groups of students, but with limited success:

I think we've tried to overcome it [the isolation] but I think that our reaching out is always at a time when we're needy, and we don't interact with other people who are needy. Then they become needy; they try to reach out and we're doing our thing. I think you become increasingly more selfish and more hoarding of your time and energy as you go along, and you're less likely to give to others. (Ca)

One student mentioned how important it was to have a spouse during the course of the PhD program: "I think everyone's different, but I need a lot of support and I think it would have been very hard if I would have been just living on my own." (Cq) This student has a whole community of friends outside the department to "keep everything in balance". (Cq) But even this student has few friends across the science/arts divide (Cq). For students who do not have families in the city, their research becomes their life and they are extremely focused on academic activities. One student claimed, "My world is my work, and the History Department is my universe." (Tm) It is interesting that international students, like those in other departments, often have a more developed social network outside of the department through their contacts with other international students across the university (Ko). International graduate students within the History Department comprise such a small and segmented category of students they do not comprise a distinct group with common interests.

Some female graduate students in the department do want to collaborate, and reject the "this is just male, aggressive, survive if you can" attitude an individualistic approach to doctoral research seems to entail (Ca). This history department has a distinctively male environment,
according to one student, and typical of "established" history departments across the country (Tm). Some women identified common interests of female students in the department and, unlike women in the science departments, analyzed and discussed their concerns from a woman's perspective (Tm). They mentioned, for example, the difficulty in arranging a series of seminars around Gender and History, although in the end the series was successful and well-received even by many of the male faculty who had originally put rather trivial obstacles in the way of its organization (Tm). Female students in History speak of being less secure than their male colleagues, often beginning with their interaction in courses where the atmosphere can be particularly intimidating for women (Tm). One student talked in terms of "growing intellectually" during the first few courses, and becoming more comfortable with the atmosphere in classes, noticing, however, that another woman in her class dropped out that semester. She thinks women are particularly intimidated at first, and heard from another student that her own tone of voice changed in the classroom, perhaps reflecting a male standard: "I had one student say 'I've noticed when you speak in class discussions you lower your voice and you talk slowly. That's really effective, you know.'" (Tm) Other women resist the need to conform to a male standard, and reject it being interpreted as "growth". They collaborate to develop alternative interpretations in the hope of encouraging changes in the department that would allow women to participate freely in departmental activities without having to adopt a male standard they consider unduly competitive and aggressive. But they fear their efforts are not part of a sustained oppositional sub-culture that will outlive their own presence as students in the department (Ca).

PhD students in this department typically approach their studies and research with an individualism that reflects the nature of the discipline of History. A competitiveness Becher
(1989) does not describe as typical of a rural academic community also seems to pervade the relations of History students, a competitiveness Egan (1989) suggests leads to isolation for some graduate students, which was confirmed by the students with whom I spoke. This competitiveness is nurtured by departmental practices that require students to impress faculty in their competition for scarce resources, not just in their research but in all departmental activities. Early in the PhD program, students have an interest in collaborating and sharing their work to a limited extent in order to understand and succeed in the early program requirements, such as coursework and Comprehensive Examinations. At the same time, students compete for recognition from faculty and financial support, and increasingly identify with the interests of their supervisors and committees as they develop their individual research projects. Students very clearly recognize an abrupt shift in their status as students after they successfully complete their Comprehensive Examinations. This shift involves an increasing emphasis on the importance of identification with faculty, and reduced reliance on fellow students for success. An exception to this pattern is the group of female graduate students in the department who oppose what they interpret as the dominant male ethos of the discipline, an opposition they fear will not be sustained after their own graduation. Student counter-culture, although present in the History Department, apparently does not have the strength to sustain itself through generations of doctoral students.

Education

Student interaction in the Education Department is important for students to get to know their way around the structures, requirements, and politics of the department, but is, at the same time, limited by a number of constraints on PhD student interaction. The department has made
attempts to encourage student interaction, attempts which are interpreted in very different ways by the various students with whom I spoke. Some students, particularly those from the more dominant section of the department, have a positive impression of the efforts at integration made in the first two years of the new department:

The department has tried really hard to integrate and to work together, but you see the small territories still remain. It's not easy to come and, you can't dissolve the territories, no. But the management has tried to integrate and share the responsibility, I think, equally. (Kj)

These students identify first with the new department, and only then with their more specialized areas of interest (Kj, Hg). Students from other areas of special interest tend to value close connection with other students in their own particular areas of special interest, and find attempts by the department to bridge the gaps between these areas either misguided or ineffectual (Ks). They believe the disruption caused by physical reorganization much more adversely affects some areas than others (Ni): "I think because we've made so many sacrifices that you kind of resent, you almost have this resentful attitude toward people there [the dominant section]." (Ks) Physical dislocation clearly works to divide students in the department, and attempts to ameliorate the effects of this dislocation have mixed results. In addition to this internal separation, some students pursue research off-campus and have virtually no contact with other students at all (Dg).

Education students identify coursework as the location where first important interaction occurs in their doctoral programs (Dg, Kj). The existence of the compulsory course in the Interdisciplinary Centre provides an opportunity for some students to make contact with students from other Education departments. This is a unique opportunity among the four departments I studied, but students have mixed feelings about that opportunity. For some students it provided an opportunity to make connections across departmental boundaries (Ni), but for others the
course was just one more confusing collection of students who seemed to share very little in common. Students do not attend these courses at any specified time in their program, so the existence of a cohort of students working their way together through the program was not evident.

Students usually make the closest contact with other students in their special area of interest, as they share something in common academically. (Sy, Kj, Ni). This identification has its roots in the old departments, where internal divisions were well-established. A student mentioned that in one of the old departments, students from special areas of interest had offices on separate floors, their own secretaries, and different courses, with students rarely mixing. This student went through years in that department without getting to know any of the students in the other area of interest (Ni). Nevertheless, within that student's area of special interest, there were very close ties between students and faculty, and the contact was facilitated by close physical proximity and shared interest in both academic and personal issues (Ni). Taking courses in a particular area of special interest provides a venue for rehearsing the promotion and defense of research ideas and gives students an incentive to interaction at an early stage in their PhD programs. Students also spoke of how small groups of friends would emerge from coursework (Kj). Although the notion of a cohort of students across the department does not exist (Sy), groups of friends develop from early contact in courses (Kj, Sy, Ni, Dg, Ks). Some of these small groups of students create study groups that met regularly to give each other support (Kj, Ks). The success of these networks is based on shared academic interests, and where students do not have that connection they have little reason to interact. One student, for example, found that mixing students in core courses across areas of interest discouraged student interaction rather than promoted it, and this student
found more valuable contact occurred when the core course eventually split according to areas of interest part way through the student's first year (Sy).

A number of formalized activities exist in this department for students to meet across the special areas of interest. But the success of those attempts is compromised by the physical dislocation that is occurring in the department at the same time as the departmental restructuring. The initial departmental orientation meeting for new students was dismissed by some students as just a confusing formality (Ks):

I walked in by myself; there were all these professors who I'd never seen before, all these students who I'd never seen before, and we were all plunked in there and sort of introduced to the professors that had turned up....We're sort of going, "So what?" because we didn't really know why that was being done...I think everyone had to introduce themselves, everyone who was present, but it didn't really help all that much. I don't know what that meeting was really about; I don't think it really helped me that much. (Sy)

A particularly successful program in this department, especially for international students, is a "buddy system" for new students who are paired with experienced students when they first arrive at the university (Hg, Kj). In fact, the relationship begins before the student even arrives, with contact by letter with students overseas (Kj). Nevertheless, some PhD students have never heard of the program, and its success seemed to be confined to a particular section of the department.

Students hold meetings every two weeks where student representatives speak with graduate students about concerns in the department, but very few doctoral students actually attend those meetings (Kj, Ks). Some students mentioned the competing demands on doctoral students' time, as well as the perception that students actually have very little in common across the departmental divisions (Sy, Ks). A small group of students regularly attend, but the vast majority of doctoral students have other commitments or are not interested. Some students in
non-dominant areas of special interest resented some of the attempts at bridge building as too focused on the more dominant old department (Sy). In the very beginning, two student representatives were appointed from the more dominant section to represent all students, and this disturbed some PhD students in the less dominant areas:

From the very beginning I didn't like the fact that the student representatives all seemed to me to be from [the more dominant section] and...there didn't seem to be any of them from [the less dominant section]. (Sy)

Even one student who went to meetings of students regularly found they were far less frequent and less intimate than the kinds of social events that had occurred in that student's area of interest in an old department:

I don't think there's just any opportunities for socializing. I know they are having the lunches that students are arranging....I go to a lot of them, so that's one thing, but our old department we used to be constantly having pot-lucks or lunches, or if we had a meeting they would be at lunch and they'd have the food catered, whatever. You really got to know people. You got to know them so that you knew their children, you knew their children's names and you'd probably been in their homes. (Ni)

Social events were a joint effort between students and faculty in the old department. In the new department, students are encouraged to set up their own networks, but most doctoral students do not seem to find it in their interest to attend purely student functions. They mentioned how uncomfortable it can be to meet with a group of students with whom they share little in common (Ni, Sy), and one student found that without the involvement of faculty in student meetings, the topics of conversation are too personal and divorced from academic work to compete with other demands on the student's time (Ks). This suggests a student need to develop connections with a community that includes faculty, as opposed to identifying too strongly with a student bloc.
Student interaction seems much more important on a less formal and organized level, and with smaller groups of students (Hg). Because the ability to defend a research position or commitment is an important standard by which students are judged in this department, some students find it very valuable to use other graduate students as sounding boards to try out their ideas and see how others might respond (Hg, Kj). Other students are similarly recruited by some PhD students to make comments on writing, the other major standard enforced by the department (Hg, Kj). In a department where faculty are very busy, some students find their student colleagues to be "great assets" (Kj, Hg). One student made contact with students further advanced in the program, and was able to learn necessary information about the department and its informal requirements to successfully "use the system." (Hg) This student admitted, though, to having little contact or knowledge of the less successful students who were struggling with their programs. Another student who made valuable use of fellow students, thought that networks of real friends in the department were often quite narrow (Kj).

Some students are not particularly concerned about student interaction, even on an informal level. One student claimed to have no contact at all with students outside of the particular special area of interest, and had no interest in student social activities (Sy). This student had a very demanding schedule outside the university in order to fund doctoral studies, and was forced by circumstances to have limited involvement at the university. It surprised me that this student did not consider that situation to be unique in the department: "Everyone seems to be so busy with other things, it's [getting together with other students] not something they want to take time out for, it seems to me." (Sy) Students with family commitments find they are particularly limited in their ability to interact socially with other students, even if they have the desire (Dg, Ni).
A student who appreciated the mixing of faculty and students in the old department, regretted attempts to create an "enclave" of students in the department separate from the faculty (Ni). This student is not certain there would be increased student interaction, but is sure there would be less of a collegial environment among faculty and students. Contact with faculty is much more important than student interaction across the department for PhD students in Education.

Commitments outside of the university divide the loyalties of some students, weakening their ties to a wide group of other students:

I think the day's long gone when everyone just does their PhD and that's it....Everyone has their fingers in many pies outside the PhD program as far as I can tell. I don't think people have a lot of time. (Sy)

This student thinks having a life outside the university is not only essential, but preferable to being totally devoted to the PhD program:

I often feel quite good that I work outside, because with the term ending now, if I didn't have something going outside to go to, I would feel very lost....I really like having a life outside, and I think the other students do too. I don't think they want to totally dedicate themselves to their studies. (Sy)

An international student with a family explained the need to finish the degree as quickly as possible, even if that meant sacrificing contact with a wide group of students:

There are students I've met in other courses, not a wide circle of friends at all. I mean I don't pursue a social life here....I'm here to learn as much as I can and get out, you know. (Hg)

A student who lived out of town was particularly isolated: "I guess not being on campus, I don't have an affinity towards the academic community, because I'm pretty alienated from it....I've lost contact." (Dg) Nevertheless, this student does not think lack of contact with other students will be a problem at the writing stage of the degree program.
Isolation is a common theme in this department, an isolation imposed not only by the demands of juggling studies, work, and family, but also by the need to establish the student's own worth in the professional field (Ks). Students can gain in limited ways by establishing close networks with other students, but realise this is not ultimately what leads to success as a professional. PhD students need to show initiative and the ability to promote the value of their research to pass what is essentially an individual test, and to be seen as too student-oriented by faculty is a risk. One student spoke of a situation where a fellow student needed support against a faculty member who was thought to be treating the student unfairly, but that support was withheld for the following reason: "Well, I want to finish this doctoral degree, and if I end up on the bad side of my advisor, where does that leave me?". (Ks). This illustrates the dilemma facing students when they consider opposition to faculty practices, a dilemma best resolved by concentrating on individual success.

Students in this department are typically pursuing individual research projects which will contribute to their previously established professional careers. Their work has strong connections to personal commitments in society, and one student spoke of being "consumed" by the work (Ks). Whereas students in the sciences sometimes mention the importance of a separation of their academic work from their personal lives, the academic and personal commitments for students in the Education Department are often intimately connected (Ks). Research interests connect with employment, and research commitments are expected to arise from the personal and political commitments of the student. Separating studies from personal life does not seem possible, or desirable. The result is a personal life often consumed by the demands of research and employment (Ks), with little time left for wider social networks at the university. Combined with
the structural divisions and physical dislocations of the department, the individual pursuit of
academic and career success discourages PhD students from collaborating across the department
to advance their collective interests. Small groups of students form to temporarily resist
departmental values and practices, but, unlike Willis's "lads", individual success within the
dominant institutional culture is a realistic goal for these doctoral students and weakens student
interaction.

A Fragile Student Culture

During the course of this study, I was surprised at the extent to which students mentioned
isolation as a pervasive element of their doctoral studies. The University of British Columbia
conducted a survey of it's graduate students in 1994, in which only 16 percent of male doctoral
students and 27 percent of women reported feeling alone or isolated "often" or "almost always" in
the year prior to the survey (Final Report, 1995). Students in my study virtually all spoke of the
isolating effects of doctoral studies, and identified the focus of the PhD program on testing
individual worth as the main contributor to this sense of isolation. While it may have been true at
the University of British Columbia that most graduate students did not usually feel alone or
isolated during their studies, the doctoral students I spoke with clearly indicated the importance of
the isolating effect of the PhD degree in shaping their experiences as students.

In the sciences, students have frequent, but rather inconsequential interaction with
students across their departments, and their belief that the testing function of the degree is
objective and fair eliminates any need for development of understandings and practices in
opposition to dominant discipline culture. Even women, who are clearly under-represented in
these departments and recognize the "maleness" of their environments, find little occasion to interact with each other. Their almost complete assurance of individual success within their disciplines discourages any challenge to accepted norms and practices. Assured funding reduces competition between students, but strong student networks are not developed because student success depends on very individual research projects which have a strong isolating effect on PhD students.

In the arts/professions, PhD students have more problematic experiences during their programs and form narrow and temporary alliances with other students to deal with particular circumstances, such as the preparation for Comprehensive Examinations. This kind of interaction is most important in the first few years of the PhD programs. Some women in History maintain close and sustained contact in opposition to departmental practices they find competitive and aggressive, but their own individual success as PhD students depends on the very attributes they oppose. Those students are aware of the danger of being too visible as a student support group in a discipline where individual competence is highly prized. An active student network exists in History to deal with issues that arise early in a student's program, but once students are Accepted into Candidacy, they are expected to get down to the real business of the degree, which is to prove their individual worth. Gerholm (1985, p. 13) cites similar evidence in a Sociology department where students understood "they were expected to differentiate themselves as much as possible from each other so as to become highly individual and original researchers." In Education, the segmented and insecure environment of a department in flux constrains efforts to develop broad student alliances, and individual career aspirations divert the attention of students from the needs of their fellow students toward the expectations of faculty. Student interaction
without a strong professional component is considered a waste of time by many students in this department.

PhD students in all four departments of this study have little to gain from rejecting values and practices of disciplines they have reasonable expectations of joining in the near future. They realize their position of relative powerlessness with respect to faculty and the university is temporary, as is students' shared interest in working to change those values and practices. PhD students hope to enter their academic professions before they can ever realistically hope to change them, so students focus on the more realistic task of achieving individual professional success and the power that entails. Horowitz (1987) discourages the use of the concept of "culture" or "sub-culture" to describe such categories of students, and interaction across departments, especially across the science/arts divide, is even more limited, indicating at best a relatively weak and fragile doctoral student culture. PhD students develop few of their own cultural resources to closely examine the fundamental elements of their doctoral education, contributing to an uncritical acceptance of the values, beliefs and practices of their chosen disciplines.
PhD students confront a variety of contradictory ideologies, beliefs and practices during the course of their doctoral programs that invite serious questioning of the preeminence and authority of the PhD degree. The success of doctoral students depends on their ability to carefully manage their awareness and understanding of these contradictions so attempts at resolution do not consume the attention and energy required to accomplish program requirements. The PhD degree acts as a gateway into an academic profession that values both critical thought and rational resolution of contradiction, yet its own structures and practices discourage reflective examination by students of the processes through which they are being initiated into the academic world.

Expertise is a central concept in professional ideology, and the academic profession holds out its members as expert producers of knowledge in their respective fields. In return, professional academics are rewarded by the lay public with status, prestige and material reward. The PhD degree confers on the student expert status through the successful completion of a series of examinations prescribed by the university, but administered largely by the various departments to uphold the standards of the disciplines they represent. In the science departments of this study there are important deviations in the practice of these examinations from the requirements of the university as set out in its Calendar, particularly with respect to Comprehensive Examinations. Nevertheless, students think their departments are able to effectively apply commonly-understand standards of professional expertise to their work, and an examination of the basis for those
standards is not an issue for science students. By stressing technical expertise in isolated fields within their respective departments, the structures and practices of the PhD programs in both Physics and Chemical Engineering neither encourage nor provide an opportunity for students to critically engage in current debates around the values and assumptions that underpin all scientific research.

Avoiding Contradictions

Harding (1986, p. 34) criticizes the "excessively empiricist philosophy" generally held by natural scientists that denies the importance of "critical reflection on social influences on their conceptual systems". She identifies a contradiction between the "origins myth" of science and its practice of avoiding critical self-examination:

The origins myth for our scientific culture tells us that we came into existence in part through the kind of critical thought about the social relations between medieval inquiry and society that is subsequently forbidden in our scientific culture. This is a magical - perhaps even mystical - conception of ideal knowledge-seeking. It excludes itself from the categories and activities it prescribes for everything else. It recommends that we understand everything but science through causal analyses and critical scrutiny of inherited beliefs. (Harding, p. 36)

Positivist assumptions about the value-free nature of scientific research have been seriously questioned by Philosophers and Historians of Science. Early in this century Duhem (1959) stressed the extent to which all scientific propositions were underdetermined by empirical evidence. Kuhn (1970) describes the important values, assumptions, and theory choices that underpin any scientific research project in terms of its scientific paradigm. PhD students in the science departments of this study do not perceive such debates to be helpful for successful completion of a long and arduous degree program, and take for granted what Kuhn refers to as
"normal science". Kuhn (p. 10) describes normal science as "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice." Normal science consists primarily of puzzle solving, following models accepted by the particular scientific community at a particular time. The conception of scientific research as a continuous, cumulative process leading progressively toward a more complete and universally accepted understanding of the natural world is rejected by Kuhn. Instead, the history of scientific research reveals revolutionary shifts which Kuhn describes as paradigmatic shifts, which render much of the scientific discoveries of previous paradigms meaningless. The assumptions and values behind current scientific research can only be understood in the context of the history through which a particular paradigm emerges, and no scientific research is purely objective or value-free.

Foucault (1980) discusses the intimate connection between claims of truth and the operation of power in society. He rejects the notion of an objective truth divorced from considerations of power: "We are subjected to the production of truth through power and we cannot exercise power except through the production of truth." (Foucault, p. 93) PhD students in the sciences at this university generally hold the belief that scientific research is objective, universal, and value-free. Based on this belief and the practices that arise from it in the PhD program students are able to progress through their degree programs with relative ease, and their naive acceptance of universal standards of research and unquestioning assumptions that any scientific research is good for society complements the goals and practices of their PhD programs. The students I interviewed manage the contradiction between the technical and uncritical nature of their own education and current debates which call into question purely positivist conceptions
of scientific research by simply avoiding those debates. Physics students express an almost total lack of interest in the Philosophy or History of Science, regarding this kind of critical examination of their field a concern of the Humanities and not quite relevant to their own studies and research, and beyond their expertise: "I could say it might be an interest, but I don't believe I am experienced enough to comment on these kinds of things." (Ku) One student, for example, indicated the majority of PhD students in Physics would not have heard of the work of Kuhn. (Tb) Any discussion of underlying assumptions of scientific research is dismissed as "political" or "subjective" by many students, something which has no place in Physics. This attitude is reinforced by the specialization that Physics students see as characterizing their discipline, and science in general:

But in terms of how their research fits into the greater society as a whole, [they analyze it] very little in science as opposed to the arts. The arts tend to look at the big picture, whereas science is so specific in one little area. (Tg)

The effort required of the doctoral student to master the technical skills in a particular branch of Physics does not leave much time for speculation about the premises underlying knowledge claims. They believe they are unqualified to investigate the historical and social contexts of their research, and the department does not provide courses in the Philosophy or History of Science for graduate students (Calendar). One student offered the following explanation for the lack of such courses:

It's such a closed world and it seems to me sort of like a game. There are just a certain set of rules they have to play, so I guess people are mainly interested in playing well in those rules. (Ne)
This "game" is the normal science discussed by Kuhn (1970), and PhD students in Physics do not think that even at their advanced stage of the study of Physics it is their place to consider the implications of that "game" or that they are qualified to do so.

Students in Chemical Engineering also have very little opportunity to formally pursue studies in the Philosophy or History of Science. One student simply laughed at the suggestion, explaining later there just wasn't the time to think about such things (Bc). When I asked a question about the value of research in Chemical Engineering, the student replied matter of factly: "No research is bad for society" (Bc). Another student who did not take any courses at all during doctoral studies expressed a desire to take courses outside the department because, as this student explained, "Engineers tend to be lacking in knowledge outside the Engineering world" (Ck). And within the Engineering world, this student claimed to be "thoroughly indoctrinated" into an unquestioning acceptance of the value of Chemical Engineering work in general: "Definitely you do not become reflective of the field: the field is something that is given." (Ck) Another student explained students might be concerned about the value of their specific research project as it related to the general research being conducted within the department, but gave little thought to the general value for society of research in the field (Nr).

Harding (1986, p. 34) questions this kind of uncritical self-examination of scientists, particularly in their training:

There is thought to be no need to train physicists, chemists, or biologists as critical theorists; consequently little in their training or in the ethos of scientific endeavour encourages the development or appreciation of the critical interpretive theory and skills that have proved so fruitful in the social sciences.

Despite the influence of Kuhn (1970) on discussions in the Philosophy and History of Science, "traditional science and philosophical and popular enthusiasm for the traditional vision of science
remain pugnaciously hostile to such critical accounts. (Harding 1986, p. 35) Society always needs technicians who have mastered a certain level of expertise based on the accepted scientific models of normal science. To the extent we share commitments about the value of particular research projects in achieving social goals, and the effectiveness of normal science to advance those projects, technical expertise is a valuable asset. Kuhn (p. 47) explains:

Though many scientists talk easily and well about the particular individual hypotheses that underlie a concrete piece of current research, they are little better than laymen at characterizing the established bases of their fields, its legitimate problems and methods. If they have learned such abstractions at all they show it mainly through their ability to do successful research.

But it is also essential to examine, and continuously re-examine, assumptions and values that underlie those research projects. All scientific research arises out of specific historical and social contexts, and furthers the interests of particular social groups under particular historical conditions. Foucault (1980, p. 131) supports this conception of scientific research with his claims about the search for truth: "Truth is a thing of this world: it is produced only by virtue of multiple forms of constraint. And it induces regular effects of power." The PhD, being the highest level of formal education for scientists in our society, should be the location of the most intensive discussion and debate of the assumptions on which current scientific research is based, and on its value for society or particular social groups. Instead, the PhD programs I studied discourage this kind of debate.

Examination practices of the PhD programs in Physics and Chemical Engineering reinforce the notion of the objective nature of scientific research. Not only are students led to believe that agreement about the value of particular research projects can be judged objectively by faculty across their departments, but their committees routinely include a relatively large number of
faculty, including professors from other related departments, indicating a universal scientific standard for judging the quality of research. Within this apparently objective environment, students conduct research projects in isolation from each other and within segmented fields of interest, providing little opportunity to discuss their research projects across a broad spectrum of scientific research. The conditions that make progress in their degree programs relatively unproblematic and virtually guarantee individual success for students function to restrict the vision of PhD students in the sciences, limiting discussion of the moral and political implications of students' research.

An opportunity for more critical examination of scientific research and the social value of particular research projects appears to exist in the Theoretical Sub-Field in Physics. Interest in the Philosophy of Science seems to be the greatest there, according to one student: "These are kind of Philosophy of Science things, and they tend to come from people in the field I'm in." (Ku) The existence of disputes over legitimacy of competing theories in the Sub-Field is apparently related to an acceptance in the field of the importance of questioning basic assumptions of physics and science. But rather than enhancing the educational experience of the student in this Sub-Field, the critical debates of scientists in this area create an insecure and problematic environment for students. Where there is no possibility of experimental evidence to give legitimacy to claims made by the student through "intuitive leaps", this student was required to conduct research with added "rigour" and show loyalty to the theoretical approach of the particular supervisor.

Other Physics students regard this Sub-Field as an anomaly in an otherwise objective and universal scientific world, and can do little more than offer sympathy to a fellow student who has become embroiled in a messy situation. Because students do not question the objective nature of
scientific research, they have no reason to look to this Sub-Field for perhaps the most interesting and informing debates in Physics. They do not relate the controversy over competing theories at the heart of current Physics research to their own individual projects, as the structure and practices of their PhD program encourage specialization and segmentation of research projects, and the isolation of students from each other. The student in the Sub-Field has little to share with other Physics students, and is not aware of the extent to which PhD students in the arts/professions share the kinds of conflicts and insecurities of that area of physics research. More professional contact with other PhD students in the sciences, and in the arts/professions, may have helped this student locate the disputes in the Sub-Field in a much broader discussion of the foundations of knowledge and scientific inquiry. The imperatives of professional training interfere with the possibility of critical intellectual inquiry for PhD students in the sciences.

Harding (1986) supports Kuhn's emphasis on the importance of an historical understanding of the social implications of scientific research, and argues for feminism as an appropriate analytic category for the study of science. She rejects the notion that scientific research is defined by a particular method that makes research value-free (Harding, 1989), and suggests commitments underlying social science research should be looked to as models for the natural sciences:

I will argue that a critical and self-reflective social science should be the model for all science, and that if there are any special requirements for adequate explanations in physics, they are just that - special. (Harding, 1986, p. 44)

Harding goes on to refute arguments that physics should be regarded as a special case in science, and argues a feminist critique of all scientific inquiry is essential. Nevertheless she is aware of the obstacles that stand in the way of such a critique:
I have been arguing that scientific, philosophic, and popular understandings of natural science are particularly hostile to a feminist critique....A series of related dogmas of empiricism ground and provide justification for this hostility, securing an apparent immunity for the scientific enterprise from the kinds of critical and causal scrutiny that science recommends for all the other regularities of nature and social life. (Harding, 1986, p. 56)

The hostility identified by Harding to feminist critiques of science is evident in the experiences of female students in Physics and Chemical Engineering. Women in Physics speak of conditions that worked to exclude women from the discipline, but hold apparently conflicting assessments that Physics is objective and universal. Female students suggest girls decide to give up Physics and Math at an early age but make little analysis of the reasons for that phenomenon: "I really don't understand why it happens, but it happens way before they can even suspect that this is what's going on: I think that they're covertly discouraged in high school by their high school Math teachers." (Tb) This student could recall times in her own schooling when she was discouraged in Mathematics:

I found this even for myself, that the Math teachers ignored me even though I had the highest marks in the class. They didn't call on me, they didn't talk to me after school, they didn't joke around with me, nothing. (Tb)

Nevertheless, she has no explanation for her own survival and success in a field she described as very male. She identified instances in her undergraduate and graduate education when she experienced unwelcome comments and attentions from men. These instances were described as "isolated", but this student was also aware of a more pervasive problem: "The only thing that bothers me is that I'm constantly sub-conscious of being the only woman in the room...I'm just self-conscious, constantly." At the same time this student described the atmosphere for women in the department as "fine" and claimed, "Once you are in the system, it's like with Engineering, once
you're inside it, you don't feel any sexism at all." (Tb) This view was certainly shared by the men I spoke with:

> People from outside of Physics will look in and say there aren't many women in Physics; therefore, you must be discriminating against women somehow or other....I think it is really a...perception because any woman who actually is in Physics, when you're doing Physics you don't even really notice they're a woman. (Br)

Women in Chemical Engineering reflect the attitudes of Physics students, and are also conscious of their unique position as women in a male dominated environment:

> It always strikes me as a surprise. I usually realise it about ten minutes into the situation. I think, 'I'm the only woman here, it's just me'. I look around and I think 'Woah, and it comes as a surprise, and most of the surprise is that I didn't realise it at first. I think "Woah!" (Ck)

They too are sometimes troubled by the apparent exclusion of women, but do not believe their own chances of success are diminished on account of their gender.

> Although graduate studies in Physics is not regarded by the women I interviewed as being particularly problematic for women, they are aware women tend to be attracted to particular sub-fields in Physics research: "We all start off in Physics, but then some of them end up in Bio-Physics, and the Bio-physics lab is full of women. I think almost all the graduate students working there are women." (Tb) When I asked this student why that might be the case, she answered: "I don't know. They say it's the path of least resistance, but it hasn't happened to me. I don't know why it happened to them." (Tb) A female doctoral student in a sub-field with a relatively high percentage of women expressed her thoughts about being in that field: "I did feel lucky that I do have a large amount of women that I can work with. I've never felt that I'm a woman and so I've been treated differently from people [sic]. I haven't felt that." (Ju) She was also puzzled by women's under-representation in Physics:
I mean it's always a big thing, "Why don't women go into Physics?" Is it somehow that Physics, the mentality of physics - the way it's taught - it just isn't geared toward women? Yeah, I don't know why there aren't a lot of women. (Ju)

Women in science believe they stand a very good chance of finding employment when they graduate. There appears to be little fear of discriminatory hiring practices working against them, and one student in Physics believed her chances of finding employment were enhanced as a woman (Tb). A Chemical Engineering student realised she could experience discrimination in the future searching for employment, but believed such discrimination was isolated and on the decline: "The people in charge of hiring are still mainly male, and they are of that generation where there were very few, if any, female Engineers in the world. It just needs time." (Ck) She was confident the academic world would not have such discriminatory practices.

The women I interviewed do care about the advancement of women in science, but have not been politicized to the extent they perceive the need to work in conjunction with other women to bring about change. A female Chemical Engineering student had heard that a "Women in Engineering" group existed on campus but had no desire to join: "I personally have always had a problem with that kind of thing, just simply because I don't think that further segregation is a good idea." (Ck) Feminist approaches to science are considered to be an unnecessary divisive influence in a field believed to be universal. Students disregard the actual segmentation and isolation they described as an aspect of their social relations with other doctoral students, and argue against feminist collaboration. One Physics student saw a link between the work of women's groups and current hiring practices in Physics: "The progress that's been made in the sciences has come about, I guess, because of government policies to force them to hire more women, and that, I guess, has come about from women's groups." (Tb) But this evidence of the
success that can be achieved through collaborative effort does not lead to the kind of analysis envisioned by Harding. This student rejected biological explanations of women's exclusion from Physics: "Outside people who don't know anything about it might suggest that there are male brains and female brains, and male brains are better at doing Math or crap like that." But fundamental feminist critiques of the objective and universal nature of scientific research, such as those posed by Harding (1986; 1989), are not even within the realm of possibilities considered by the female PhD students women in the sciences I interviewed. Their approach is individualistic, reinforced by confidence of success in their scientific communities, and unchallenged by feminist debates common to PhD students in the arts/professions.

The strongest evidence of any interest in the Philosophy or History of Science came from a few isolated international students in Physics and Chemical Engineering. One Physics student audited a Philosophy of Science course in the Philosophy Department (Ne), and a Chemical Engineering student had considered such courses:

I was thinking of taking a course in, maybe just for audit, in the History of Science or the Philosophy of Science....Sometimes I feel that we are too much concerned with the particular tree and we don't see the forest. (Ff)

This student discussed the problem with another international student at the university and they agreed they needed more exposure to other ideas than they normally received in their doctoral studies. The fact that courses providing critical discussion of the underlying assumptions and values of scientific inquiry are located in arts/professional departments discourages science students from participation, and many students expressed scepticism about "outsiders" looking in at the world of science. This attitude represents an uncritical approach to science rejected by Harding (1986, p. 39):
The project that science's sacredness makes taboo is the examination of science in just the ways any other institution or set of social practices can be examined....To what other community of "natives" would we give the final word about the causes, consequences, and social meanings of their own beliefs.

An international student from South America who is disturbed by the lack of opportunity to discuss fundamental issues about science attributes this partly to Canadian culture. This student believes Canadians are too reserved to easily open themselves up to discussion that touch them personally. While there may have been some validity to this argument within the Chemical Engineering Department, this student is apparently not aware of the extent to which these debates flourish in arts/professional departments, and it is regrettable the student is isolated from such discussion within the formal structures of the department's PhD program. The Physics student who actually audited a Philosophy of Science course found the segmentation and isolation of research a barrier to making connections with a broader social context: "I guess doing research keeps you away from social issues....which is really one of the unfortunate things about graduate student life." (Ne)

Like women in science, international students generally believe they face no particular barriers to success as doctoral students, and are judged solely on the basis of their work. The possibility of racism or cultural conflict seems remote to most students, and a Chemical Engineering student stressed that the "universal" nature of Engineering made racism in the department unlikely (Ff). A Physics student did not think racism was any more of a problem in the department than in Canadian society in general: "If there is racism in the department, it is not more than it is outside the campus; it's probably much less." (Ne) But this student had become aware of subtle conflicts over time:
I guess in the first year dealing with peers was fine, but sometimes working in a group I guess there are some cultural differences....I guess sometimes working with students in the group I feel sort of a lack of respect....I'm not sure if it's racism or it's maybe just lack of respect. (Ne)

The cultural conflicts involve such issues as differing work habits in the laboratory, style of presenting arguments in class, and the amount of deference to be shown to those in authority. Although the student does think the conflicts actually have an affect on studies, they are not a matter for great concern. Problems for this student are most acute when interacting orally in a group situation, a not uncommon experience for a student working in a laboratory. When I asked about the truth of the perception of Physics as an international community with unproblematic standards, the student replied: "Oh no. In that sense [working with colleagues] it's really dependant on culture." (Ne) This was the same student who had audited a Philosophy of Science course, and the analysis begun by this Physics student could have been reinforced and encouraged by a PhD program more supportive of critical examination of the cultural components of scientific research. A rejection of value-free conceptions of science in PhD programs could help students make the connections between politics and science that are implicit in works such as Rodney's (1981) How Europe Underdeveloped Africa and explicit in Goonatilake's (1984) Aborted Discovery: Science and Creativity in the Third World. But the entrenched universalist assumptions of scientific research at the PhD level discourage such analysis, even by women and other minority students. Harding (1986, p. 56) asserts:

If we were to abandon these dogmas of empiricism, we could adopt the alternative view that science is a fully social activity - as social and as culturally specific as are religious, educational, economic, and family activities.

The structures and practices of PhD programs in the sciences are based on a conception of professional expertise that derives its authority from positivist claims of a universal science.
Internal forces pressure students to conform to an unreflective, technical approach to research to the detriment of critical intellectual inquiry at the highest level of science education, even when they confront evidence that undermines the notion of the universality of scientific research.

Political and economic forces external to the university have an important influence on the experiences of academics and university students. David Cameron (1991) examines the effect changing public policy has had on the governing and management of universities since the Second World War, illustrating the important connections between universities and the needs of Canadian society. Axelrod (1982) discusses the role Ontario universities have been expected to play as instruments of economic development in the post-war period, and Buchbinder (1993) criticises increasing connections between universities and the private sector. Ideology supporting the conventional conceptions of universities as "ivory towers" and professors as autonomous truth-seekers tends to blur the extent to which dominant economic and political forces impinge on university activities. Silva and Slaughter (1984) describe how professional activities of social science academics have functioned to serve dominant interests in society, and Buchbinder warns that increased reliance on the private sector by universities will benefit narrow corporate interests as opposed to a more broadly-defined public interest. Science students in this study make little distinction between the private interests that increasingly fund their research and a broad public interest. Their experiences, values and beliefs are influenced by the apparent support society gives to their research activities, and students have little incentive to question their belief that all scientific research is beneficial for society as a whole.

Science students receive guaranteed funding for their PhD studies of at least $15,000 per year, and this monetary support has a considerable impact on the way science students conceive
of the relationship between their student research and the needs of society. PhD students in Chemical Engineering always have funding arranged before they begin their studies, much of it coming from granting agencies external to the university. This external funding is often closely tied to industry: "In order to get one of these grants, you apply to them [a provincial science council] with an industrial collaborator, and the two of you go to the Science Council..." (Ck) In recent years the need to be funded externally, as opposed to being funded from a supervisor's own research grants, has increased due to funding cut-backs at the university (Bk). Students speak of being "hired" by supervisors when they are taken on as students (Ff, Bc), which indicates a relationship different from the student/faculty relationship one might think as normal in an educational environment. Funding one's own research is not even considered an option by Chemical Engineering students (Bc), resulting in an unquestioning acceptance of sponsored research.

Doctoral students in Chemical Engineering believe they are all working on socially beneficial projects (Ff, Ck). As a result, they consider the $15,000 guaranteed annual support to be a meagre reward for their work: "I'm sure I speak for everyone when I say that $15000 is not, we're not being paid for the work we do." (Ck) And, "I think it's deserved, because you work really hard, and actually when you work you get paid, right?" (Bc) Even though PhD students usually work on their own individual research projects, that research ultimately belongs to the supervisor: "Your own research is your supervisor's research, so that's why they're paying you." (Ck) Physics students reflect the attitudes of Chemical Engineering students, and, although they realize their funding is much more secure than that of students in many other departments, they too think of themselves as poorly-paid researchers:
I guess it's not fair that arts students don't get paid as much as science students, so if you compare it to other disciplines I guess we should think we are lucky. But you tend to compare other guys in industry who have similar background and experience, and those people are getting much more money. (Ne)

Physics students regard themselves as members of the scientific research community, even as students, and set their standards according to the work they do alongside other fully-paid researchers.

As direct government funding of university research declines, science students realise the increasing importance of private or industry-related support:

As you know, the money is cut now, so students are not being supported any more. If they have funds from other sources, that's fine, but most professors in our department don't have funds any more: it's very scarce. (Bk)

This student believes the Chemical Engineering Department needs to be more aggressive to take advantage of potential industrial funding:

They were used to getting easy money from the government, and now they have to sell their research and I don't think they are ready to do it, or willing to do it. It is a transitional time right now, but I see more contact with industry, and industry putting some money into research. (Bk)

The nature of research in Chemical Engineering and the professional relations among people in the field are influenced very much by the ties between the university and industry:

My professor, for instance, is funded. The reason [s/he] is here is that [his/her] funding comes from a particular chair that was set up by the government, and collaboration between government and industry. And all that money was pooled, and they agreed that this pooled money would be used by three professors at the university....so they had to do research in the areas that industry and government had decided were important. (Ck)

These ties are not seriously questioned by students, as their own funding is often tied to industrial involvement in research and they have little interest in undermining their own source of financial support (Bc). Applied work in Chemical Engineering has more status in the field than theoretical
work, which is a good thing according to many students: "Definitely there's room for theory, and it's very important, but it has to be going somewhere." (Ck) Another student supports the involvement of industry: "I think that there is a niche for industry supporting the university research." (Bk) Even the secrecy required of some industry-sponsored research is not considered a problem by this student, or by the faculty in the department (Bk).

Industrial funding of research forces the university researcher to adapt to the needs of industry: "If an industry has supplied a certain amount, or a vast amount, of money to one particular project, their goal for doing that is their hope that you will do things their way." (Ck) In general this is seen as a balancing act "because you need to put a bit of the scientific approach into the industry's desires...and you also need to have it go the other way." (Ck) Another student described the industry/academic tension as "a very gentle tug-of-war." (Nr) This tension is insignificant, according to one student, because academics really have "no choice" but to accept the influence of industry. For some students the trend toward industry sponsorship of research does not alter their conception of scientific research as socially useful, and for other students it is an indication their research is even more valuable for society. One student considers the status of Chemical Engineering research to be on the rise with the recent trend to more practical work at universities:

Somehow I think everyone feels that the age of some big theoretical research is somewhat over, at least for now....There is no way here that someone looks down on Engineering research, but generally, in the past, this was the feeling. (Ff)

Increasing reliance on the private sector is also thought to be a positive trend by many students in Physics. They spoke of how traditional government funding tends to stress defence-related research (Tg) as opposed to the current emphasis on medically-oriented research: "I guess
you feel less guilty doing Medical Physics than Particle Physics because it's more really working for society." (Ne) Private funding is currently influencing choice of research fields for graduate students in Physics: "Yeah, more people are certainly interested in Medical Physics, for example, I guess at least partly because of better job prospects." (Ne) And, "You talk to any Physics student and you say, 'Medical Physics,' and they say, 'Oh you're in the right field. You'll get a job.'" (Ju) Other industrial-related research is becoming more popular as well:

Around the 1980s there was a lot of funding going towards the star-wars project, a lot of work on lasers...In the past few years the ones that do have industrial uses have been the ones that...students are starting to think about. (Tg)

This trend convinces some students who began their PhDs in Physics with an academic career as a goal to look seriously at industry as an alternative. (Ju) Whereas government motivation in funding scientific research is regarded with suspicion by some students, particularly now that the Cold War has ended, direct private funding is thought to reflect broadly-defined public needs, and science students express no awareness of the critiques of industry's direct involvement in education and research. They realise research priorities change over time, but they have not had occasion in their doctoral education to examine and discuss these shifts in a social or historical context.

Doctoral students in both Physics and Chemical Engineering consider themselves to be conducting socially useful research, and, in fact, research commissioned by society. Personal ownership of their research is not an issue as they are clearly working as part of a larger research endeavour, and PhD students in the sciences expect to be paid by society for their labour. They are not merely educating themselves, but are already employed by society; funding is not a reward for educational success, but a paycheck in a career already begun. Axelrod (1982) criticises the
career-consciousness of students in the "utilitarian multiversity", but for doctoral students in the sciences it reflects an established fact. Career prospects for science students after graduation are by no means guaranteed, particularly in Theoretical Physics, but the easy transition from the university environment to private industry allows most students to regard the future with at least mild optimism. Students estimate fewer than half of Chemical Engineering doctoral students are interested in becoming academics (Ck): "Just a few people I know would like to stay in university". (Ff) For others: "They're not necessarily aiming for it [an academic job], but if that's the way it goes, that's the way it goes." (Ck) Chemical Engineering students tend to be very career-oriented in their doctoral studies, and that career is likely to be in industry:

I realized how much I really like machinery and industrial plants. Any time I'm in a plant I feel very comfortable. It's a great place to be and I look around me and I think "Wow, things are being manufactured," or whatever's happening there. (Ck)

Because some students came to the department from university jobs, they are certain of returning to these positions when they complete their programs (Be, Bk). One student with university teaching experience intends to switch to industry upon graduation:

Initially I liked very much the university environment and everything, but I went to a few conferences and saw people with PhDs working with different companies, and I found out that actually very exciting research is going on there. Although there's lots of secrecy and everything, from a research point of view, it is maybe more attractive than university research. (Ff)

Opportunities for employment in their field exist for Chemical Engineering students, and this student summed up the job prospects for Chemical Engineering graduates: "Still, I have maybe that naive impression that as long as you do good work then maybe you can find a job..." (Ff)

Job prospects for Physics students are less positive, and this has created some bitterness on the part of Theoretical students who feel they were induced into a field in decline: "I do think
that at least our department probably could have done a somewhat better job in predicting what areas of Physics [were in decline] and informing students about that." (Tg) This is an important topic of conversation among doctoral students: "We worry about it a lot." (Tb) Government cutbacks have just recently put pressure on the department to reduce student numbers, according to this student:

I think the department is probably going to cut back the number of students they take on. I have noted that in the last year or two they are trying to get rid of students in the department. They're putting more pressure on them to finish up and graduate. (Tg)

The PhD in Physics no longer provides immediate entrance into the academic profession for all students: "Usually the route from getting your PhD in Physics to an academic position has an intermediate range of about five years where you basically do your post-doctoral." (Br) The declining opportunities for academic employment in Physics prompt some students to consider careers totally unrelated to Physics: "Physics is kind of interesting; right now it seems kind of interesting, but it's not the only thing I'm interested in" (Ne). Physics students who had entered their PhD programs with aspirations for an academic career realise they have far greater chances for a successful career in applied research or industry, and some students look to Computer Science as a field in which they had some training and lucrative career opportunities (Ku). Like Chemical Engineering students, Physics students rely increasingly on private industry for their future careers, and have little motivation to question the source of their strongest career prospects.

Science students generally do not share the concerns expressed by academics such as Axelrod (1982) and Buchbinder (1993) of the dangers of increasing reliance on industry-supported research at universities, and many students feel industrial involvement in science is
generally beneficial to their own careers and to society. Nelkin (1979, p. 106) observes:

"Scientific expertise" is a critical political resource and control over knowledge, its production, and its codification is intrinsically linked to power and influence. The political role of science, apparent since World War II, has shaped the development of scientific fields and the structures through which knowledge is employed for political purposes.

PhD students in the sciences give little thought to the connections between science research and political power in society, and regarded as unproblematic the changing power relations in current Canadian society that underlie shifting patterns of scientific research funding. Discussion of such issues is not common, as students have little professional interaction with one another and confine their social and professional interaction to relatively apolitical topics. They consider changes in political forces behind scientific funding to be inevitable and outside their domain: "Essentially that's a government thing. As the government keeps losing money they're not going to be giving it out as freely. That's just economics." (Nr) Isolation from students in the arts/professions who do question the reasons behind withdrawal of government funding for universities keeps science students unaware of those debates, and the structures and practices of their degree programs do not encourage PhD students to make these connections.

PhD students in the sciences concentrate on the development of their technical expertise in scientific fields they consider distinct and isolated from the social and political environment in which that research is conducted. As long as their personal career goals are not seriously threatened, and students continue to receive adequate financial support from society for their PhD studies, science students have little interest in closely examining the sources of that support or its political and social significance. Contradictions between students' conceptions of scientific research as a value-free and universally valuable activity and the critical scrutiny of such
conceptions by philosophers and historians of science are simply ignored by students in PhD programs in science, as is the direct influence funding bodies have on their autonomy as researchers. The imperatives of the degree and their personal career goals discourage PhD students from engaging in critical inquiry of their own fields.

**Immersed in Contradictions**

Unlike students in the sciences, PhD students in the arts/professions are immersed in an environment of contestation and conflict. Whereas science students describe their experiences as relatively benign and unproblematic, students in History and Education identify serious problems in coping with the contradictions surrounding them. Concerns about the absence of consensus around standards of good research in their fields runs through discussions of their student experiences. Clark (1995, p. 248) poses the following concern for universities:

> If the main commodity of higher education - knowledge - becomes more diffuse, opaque, incoherent, and centrifugal and basic educational tasks more complicated and contradictory, then the struggle of various interest groups within universities and between them and external groups is bound to widen and intensify.

Foster (1991) delineates three main divisions within social science research at the postgraduate level, and argues research emanating from a positivist paradigm has dominated postgraduate education. He argues a competing paradigm, constructivism, has emerged in recent years as a challenge to positivism, promoting research that recognizes the extent to which any conceptualization of the social world is embedded with values. Foster proposes a third paradigm for social research in postgraduate education that stresses the moral component of all education and research. Within this critical paradigm students would conduct research that promotes goals
such as equality and freedom, and the success of a student's research program is judged according to its ability to promote those moral commitments.

The assumptions underpinning research programs carried out within each of these paradigms are clearly distinct, and success in achieving research goals is measured according to very different standards. With incommensurable goals for carrying out social research, the positivist and constructivist are incapable of agreeing on a common standard for good research. The critical researcher has even different goals, measuring the success of a research project according to its ability to promote desired social change. The debate, discussion and conflict engendered by this competition may be healthy for the development of inquiry in the social realm, but it has serious implications for the possibility of standard judgment of research quality across academic disciplines or university departments. It undermines the notion of expertise at the heart of professional status and authority. Kuhn (1970, p. 200) argues: "There is no neutral algorithm for theory choice, no systematic decision procedure which, properly applied, must lead each individual in the group to the same decision." Without consensus there can be no expertise.

Students in History and Education discuss research carried out within their departments in terms that indicate the existence of all three of Foster's three broad paradigms in each department, and these divisions are the source of considerable confusion about the existence of standards within each department. All university departments operate their doctoral programs with structures and examination practices that imply a reasonable consensus about what entails good research within each discipline. These standards are the foundations of the expertise on which academic professions rely for their authority in society, and from which PhD students hope to eventually gain status. But as Common (1994, p. 23) points out, the research university
"embraces as its predominate epistemology of practice technical rationality derived from positivist philosophy". The examination practices of doctoral programs are compatible with consensus around a positivist conception of the universal truth-seeking goals of empirical inquiry, and are in direct conflict with Kuhn's (1970) conceptualization of scientific inquiry located in historically located paradigms. The notion of expertise in the production of knowledge, which doctoral programs are designed to certify, depends on a reasonable consensus as to the underlying assumptions and goals of all research within a particular academic profession, and with the society that supports that profession. Without consensus, there can be no clear standards of good research within a discipline or university department. Arts/professional departments have no such consensus, and doctoral students operate in an educational environment where their own theoretical commitments about the legitimacy of knowledge claims and research fundamentally conflict with the practice of their PhD programs to apply such standards. This conflict is at the heart of contradictions that shape the experiences of doctoral students in the arts/professions.

PhD students in contested fields must not examine closely the depth of the divisions between research paradigms, for fear this examination might undermine the authority of their developing expertise within their disciplines. This in turn discourages close scrutiny of the process by which their alignment with a particular paradigm occurs, allowing students to maintain a strong belief in their personal autonomy and freedom to conduct research of their own choosing. The constant scrutiny and classification of students conducted by faculty can be interpreted as a process of professional development rather than a subtle mechanism for ensuring proper alignment in a contested environment. Students who undergo fundamental shifts in their research commitments during the course of their degree programs are reluctant to confront the extent to
which their new research orientation conflicts with the goals and purposes of their prior commitments. They increasingly rely on their alignment with like-minded faculty and become isolated from oppositional student politics that might expose the contradictions in which they are enmeshed. Giroux and Simon (1989, p. 251) discuss the sense of hopelessness and despair that might overwhelm students when teachers engage in pedagogical activities that undermine existing social practices and expose social contradictions. They ask:

However, will not raising contradictions in students' lives simply threaten them...? Will not pointing to social contradictions lead to cynicism and despair? Furthermore,...will not ideological critique produce a destabilization of identity and a paralysis of action? If we start questioning the givens of everyday life, won't this simply be overwhelming?

These questions are relevant when considering the strategies adopted by PhD students to avoid confronting the contradictions in their own lives.

In both History and Education students provide evidence of the strong disincentives for confronting the serious contradictions in which they were immersed. Students who are properly aligned or have met the expectations of faculty in the department tend not to notice the contradictions that surround them. They often know their own seemingly benign experiences are not typical of other students, but they have little interest in analyzing or reconciling the conflicting experiences. Such analysis might force them to confront the contradictory standards by which they are judged successful. One student in the History Department who did not perceive much competitiveness among students in the department admitted this perception could simply be due to the student's own "golden" status in the department, and then obscured the incongruity with embarrassed laughter. Another student who experienced few significant problems during the PhD program emphasized that students do not need to band together in a "bloc" to confront faculty
To confront the reasons for conflicting experiences of students across the department would be counterproductive for successful students:

I've been very calculating in my work, and I've just, to be honest, I've always, whatever I've done, it's been for my own advancement...I've really tried to do the professional things, and I just haven't taken the time to do the more social things. I wish I could have done a little more, but on the other hand I think I did what I needed to do. (Cq)

This student knew the experiences of students were not all positive:

I've always just felt like it's a decent place and there's always been a good sense in the department of inclusion, but I know I'm not the typical student who is going to be excluded so there's the other side of it. (Cq)

Increasing isolation of students from one another in History discourages attempts to sort out the contradictions and dilemmas they confront in their doctoral programs, not the least of which is the contradiction between students' belief in the importance of maintaining standards in the department and their conflicting belief that there are no agreed-upon standards in the discipline. The dilemma for students is the need to participate in professional practices that derive their authority from a belief in agreed-upon standards while attacking that belief in their own academic work. Fisher (1993) points out the importance people place on the creation and maintenance of social and knowledge boundaries, and PhD students must protect the boundary around the academic professions even if that boundary maintenance conflicts with their own theoretical commitments. Adams (1976, p. 65) employs a cultural metaphor to explain the priorities of academics when he claims "guardianship of the sacred turf is regarded in every tribe as a sacred duty", this commitment is internalized by PhD students during the course of their degree programs. Von Blum (1986, p. 56) observes that activities of PhD students which are at first "tactically advantageous" soon become "emotionally and politically necessary", a process that
"inexorably alters consciousness". Von Blum's analysis appropriately describes the process by which PhD students come to accommodate contradictions between their theoretical commitments and their professional practice.

History students discuss a wide range of contradictory experiences. They generally find the trauma of preparing for and worrying about Comprehensive Examinations to be rarely justified, yet the practice continues without substantial reform in the department (Cq, Ca, Tm). One student mentioned the dilemma of trying to justify not crossing picket lines for a Teaching Assistant's job at the same time the student was attending classes off campus: "The prof offered to have it [the graduate class] off campus, and it was a huge dilemma for me to try to decide whether...I would go to class and then deny my students their class." (Tm) But the student did just that, becoming further accustomed to an environment that tolerated contradictions. Another student mentioned the contradiction between the academic ideal of the pursuit of knowledge and the reality of an obsession with chasing grant money:

We're supposed to be above things like that [marking success with the amount of grant money awarded]. This is the intellectual life, this is where the ethics of society are watchdogged, and everything else. Yet it is more cut-throat and more materialistic in that way than most places I've ever seen. (Km)

Another student who began the PhD with the clear goal of continuing teaching at the college level because "I love teaching and colleges value teaching" changed career aspirations over the course of the PhD: "I think the university is the cream of the crop as far as having less teaching load, more time for research... If I had my druthers that's where I would go." (Ca) This inconsistency remained unexamined by the student and indicates how a successful student can adopt values of the university that conflict with the student's reasons for pursuing a PhD without being aware of the process. The need to deal with contradictions and dilemmas coincides with students' sense of
increasing isolation and insecurity. Attempting to confront those conflicts alone can be paralysing, so students choose to obscure the conflicts:

You're buying into a system where you hope to be able to shine, to excel, to find a place, and the contradictions are soul-destroying. I think that that's why when people get together to talk about their PhD experience it's almost universally negative. I have never once heard anyone say that the PhD experience was a good experience. People have said "Oh, it's better than getting divorced" or things like that, but it does destroy your soul, and you spend so much time trying to keep the two elements separate, alive. What happens if they were to mix? We would then be paralysed, we would then lose. You feel like you're being hollowed out from the inside and there's just less and less of you there as you do more and more of what the system requires. (Ca)

The key to a successful PhD is often said to be "passion" for one's research, and without passion a student cannot finish a PhD. Passion helps obscure the contradictions of doctoral study, according to this student:

I think that passion is what drives you, and I think that is what happens in the PhD program. Your passion tends to be undermined while your commitment to the system rises, but at the end of it you must get through before your passion dies. It's like there's a time limit on this, or a psychic limit beyond which you cannot maintain your passion, where you cannot maintain those contradictions. (Ca)

Isolation is a student's worst enemy in these circumstances, but isolation in the doctoral program is possibly the most extreme it will be in the person's career:

I think that even when you become faculty, if you do that, you still have a support network. You do your work in isolation, but intellectually you can discuss things with your colleagues, and psychologically and personally you have a support network...I think you're probably more isolated at that point than you will ever be in your career. (Ca)

A History student who had serious difficulties during the course of the PhD program was well aware of the contradictions that seemed to define student experience, but admitted that after a few years in a PhD program students lose interest in ever reforming the practices of the department and just want to finish their degrees (Km). Cude (1987, p. 52) discusses the pressures
that encourage doctoral students to defer controversial ideas in favour of conformity and the
development of a safe project that ensures successful graduation:

As the routine drags on literally for years, it increasingly functions in favour of
conformity and mediocrity, actually engendering in the candidate a mistrust of the
very innovation it is intended to instil.

Serious discussion of issues, such as the contradictions around standards of good historical
research, are not easily entered into with faculty for fear of being seen as a "flake" and never taken
seriously again (Km). Students often express their concerns privately to each other, but are
unwilling to engage in open challenges to departmental practices. As students become
increasingly isolated from one another and the rewards of professional status draw closer, even
those private discussions lose importance.

Living with contradictions is also a way of life for doctoral students in Education.
Students from competing theoretical approaches share a common interest in obscuring the
contradictions inherent in that situation, making them reluctant to reconcile their practices with
their beliefs. Education students who have chosen supervisors and committees very carefully feel
they had complete freedom to pursue their research interests, and value that freedom very much:

Because I love freedom, I felt with freedom then it [research] is meaningful. It will
end up very good for you because you have the freedom to do and to search and
to understand what you feel you need to understand, to research in whatever
manner. (Kj)

These students truly believe in their freedom because they have no reason to test it; their values
and commitments conform to those of their supervisors and committees. They realize other
students were having a more difficult time with their programs, but have little interest in delving
too deeply into the reasons for those difficulties. Even students who have not been able to align
themselves as effectively as the luckier students speak in contradictory terms about their freedom:
"I guess I was not entirely persuaded by [his/her] point of view, but I've been able to accept it."

(Ks) This student was willing to accept the supervisor’s point of view because evidence had been presented by the supervisor to support that approach to research, but it did not entirely convince the student. Nevertheless, the student was willing to give up commitments that had been deeply held before beginning the program, while at the same time remaining convinced students are free to pursue their own research. Von Blum (1986, p. 56) decries the need for graduate students to willingly conform to the academic ideology of their supervisors, and is correct when he claims "the junior initiates [doctoral students] quickly become eager proselytes of the prevailing orthodoxy." Even the student who underwent the coercive process described in Chapter V claimed, "I don't think they want to impose their direction on other people," immediately after describing that process during our interview (Dg). Egan (1989, p. 204) discusses the threat that recognition of their lack of autonomy would pose for some students, particularly older professional students such as these Education students:

> Persons who define themselves as capitulating to the organization by following its rules, sacrificing themselves in the hope of gaining its approval, or denying themselves by accepting its view of the person they should be will have difficulty in maintaining a self-concept of strength and individuality; lowered self-esteem may occur.

Successful PhD students are well-aware of the need to present themselves as strong and independent, and protect their self-esteem by denying their lack of autonomy.

Students believe faculty are experts in their fields even if various faculty members are diametrically opposed to each other regarding the nature of good research. This belief in faculty expertise is the reason given for deferring to faculty expectations without serious question by some students (Dg, Hg). The notion of "expert" in a field where there is substantial disagreement...
over what rates as good work is a troublesome notion, but doctoral students who intend to accept the "expert" badge upon graduation do not seriously examine its underpinnings. For example, Education students do not question the participation in PhD examination practices of postmodern theorists who reject the very possibility of achieving agreement about the meaning of the concepts and values, and as Tierney (1993, p. 5) claims, "eschew the search for clarity or persuasion through rational logic because absolutes no longer exist." The paralysis that might result from questioning the very legitimacy of their sought-after status would be counter-productive for students seeking the authority of professional status. As one student explained, "this is a career-building place," and doctoral studies is simply a gateway into an academic profession:

I see the whole process as a means to an and....I'm learning what it means to juggle teaching and research and being on committee with everything, and make it still work. I'm learning what it's like to publish and have stuff come out and have people criticize it, or go to conventions and have to speak to people who are going to be critical. I'm learning what it means to be part of the field. (Ni)

Ultimately, students are concerned with furthering their careers in a very tight job market. Some students are disillusioned by what they had learnt about the academic world, as illustrated by one student's comments:

I'm just a little disenchanted....The politics, it's awful. The life doesn't seem that exciting. You spend a lot of time in your office, a couple of classes a week, there doesn't seem to be a great lively camaraderie between staff. They obviously live for any opportunities to go to conferences, etc. It just doesn't seem that stimulating. (Ks)

Nevertheless, the time and money devoted to the PhD degree means most Education students remained committed to an academic career. To succeed in a period of cutbacks, students need to maintain close connections with their supervisors and other faculty, and students who are successful in this regard have little incentive to identify closely with student concerns (Hg).
PhD students in the arts/professional departments have far less evidence of society's support for their education and research than science students receive with their guaranteed funding and relatively secure job prospects. Students in History do not typically have external funding (Km), and most students rely on Teaching Assistant positions in order to finance their studies (Ko, Tm). Unlike in the science departments, Teaching Assistantships are not just a top-up of basic support, and the concept of "support" seems inappropriate in a context where students are clearly being paid a salary for work performed. Insecure finances make the scramble for money a common feature of a doctoral student's life in History. Teaching Assistant positions are necessary for many students to finance their degrees, but they were also important for career preparation. Nevertheless, being a Teaching Assistant is a mixed blessing for History students, as the job normally requires that a student spend more time finishing the degree than would be the case if the student were not devoting so much time to employment.

Students often need to do sessional teaching to get the experience for academic employment in a very tight job market (Tm). Unfortunately, the pay for sessional work at many universities is even lower than that for Teaching Assistants, and can be counter-productive for progressing with the formal requirements of the PhD program:

I've gotten a sessional job in the summer...so that will delay me because I've never taught the course before and it's really intense....That'll cut out, apparently, 2 1/2 - 3 months from core dissertation research. (Tm)

Another student agreed:

I'm teaching here. I'm teaching at [another university]. I'm not going to write anything this term. I'm going to get a little bit of money ahead, hopefully get two months clear to write in the summer, but it becomes much more of a juggling act the longer you go without financing. (Ca)
Students also engage in non-teaching employment off campus (Ca), a practice science students find quite surprising, as they understand this to be not permitted for doctoral students.

Cutbacks in funding of universities does not seem to directly impact on doctoral student experience in History, as they believed History has always been underfunded, and involvement of industry in historical research seems a remote possibility to many students (Km, Ko). One area where cutbacks do have an effect on students is the availability of sessional work, which might be reduced as full-time faculty are increasingly expected to teach larger sections of students.

Cutbacks in funding also influence doctoral students' thoughts about future job prospects, which are primarily in the academic field (Cq): "This [teaching] is my goal. It recedes into the sunset with budget cuts." (Ca) Most students are quite pessimistic about the chances of obtaining a job in History at a college or university, but have not given up hope:

I think I can get, eventually, if I keep working, land some kind of job that's amenable to what I want. A lot of people have told me that, and that's one reason I've continued is that I've been encouraged to think that I could. (Cq)

In science, apparent support from society reinforces students' belief in the value of conventional science. Lack of apparent support from society for research and teaching in History feeds on an already-present insecurity among doctoral students. This insecurity leads students to participate in conventional practices which may run counter to their theoretical commitments. While some students in Education are able to fund the majority of their studies with scholarships or grants, the majority of students in this department fund their own research, either through professional work within the department as university teachers (Ni, Dg), supervisors of student teachers (Kj, Dg), or through work outside the university (Sy, Ni, Dg). Students also rely on a number of other resources to fund their studies, such as student loans, spouses, personal savings and other forms
of credit (Dg). After completing the residency period, it is necessary for some students to return to full-time employment in order to support themselves and their families (Dg, Hg). One student believes the days of a "student life" envisioned by many people of graduate student life are "long gone", and few people comprehend the juggling act many students are forced to perform to complete degrees in a department where students depend on a variety of jobs (Sy). Some students perceive the field of Education to be in a period of decline, evidence of which is the recent amalgamation of Education departments students think was driven by shrinking budgets rather than any academic or educational rationale (Ks). Although students have heard of alternative sources of funding for Educational research, they are not very optimistic about either its actual existence or the direction it would push educational research even if it did exist (Ks). This underscores the sense among students in this department that their work is less appreciated by society than that carried out in the sciences, and reinforces the importance of their own individual commitment to their research and degree program.

Individual career interests combine with isolation and insecurity to obscure the contradictions inherent in PhD studies in both History and Education. In insecure environments they concentrate on individual career goals to justify the considerable commitment and individual sacrifice of the PhD, and have little interest in applying the theoretical critiques they employ in their own research to the practice of their degree programs. Feminist pedagogy offers insightful criticisms of PhD degree programs (for example, Brookes, 1992), and I expected students with feminist commitments in History and Education to offer strong critiques of their doctoral student experiences. Although some female students I interviewed in Education expressed strong support for feminist perspectives in their research, and on the conduct of graduate education in general,
there was little evidence women in the department aligned themselves with each other
academically or socially around feminist politics. Despite the large number of female students and
faculty in the department, feminist ideas face resistance:

I think there is a definite feeling that the older men are the gatekeepers and the
great majority of the doctoral students are women, so there is this
funny...defensive atmosphere. The women are bringing a lot of new ideas, the men
are defending their own, trying to be open to you at the same time so they don't
look like they're still back in the nineteenth century, but ultimately I think we face a
lot of resistance. I think there is a lot of resistance there. (Ks)

A female student from a special area of interest where the faculty are all men feels a combination
of youth and being a woman causes faculty to take her less seriously than other students, but was
hesitant to complain because of the "politics" involved, and the incredible risk of alienating a
faculty member in a small area of special interest in the department (Sy). Problems for
marginalized groups in the academy seem to be both exacerbated and made difficult to detect
when individual faculty are able to freely exercise discretion in an environment of very personal
power relations between faculty and students (Sy):

It's not as identifiable as that [discrimination or harassment]. It's more the
consciousness that I am being inculcated into a research field that has been I guess
to a certain point dominated by men....I'm sure it's similar for a guy too, this feeling
of bowing and scraping when you come into your advisor's office, and I don't
know if it feels more amplified as a result of being a woman or not. I don't know
how men feel when they approach them, but definitely I did feel a little bit too
compliant, and maybe it's because of this looming male figure type of thing. (Ks)

International students in the department confirm the importance of individual power relations in
obscuring marginalizing practices. Even for the student involved, it is very difficult to identify the
reasons for not being supported or promoted by faculty because granting or withholding support
from students is an individual decision of faculty, and not open to public scrutiny.
Some female graduate students in History do analyze and discuss their concerns from a feminist perspective (Tm), but it surprised me that few women in the department identify themselves or their work as feminist (Ko, Tm). A lack of critical mass in the department makes feminists aware of their vulnerability, and they are reluctant to openly use the language of feminist debate (Ca). They fear their research will be devalued, and they will be accused of bias because of their political commitments. Cases of harassment and gender bias are discussed by some women in the department, but the individual power of faculty, both as supervisors and as course instructors, facilitates and masks the existence of harassment and bias. Students who feel under threat have little appeal to outside authority, as faculty can protect themselves in the absence of clear standards by claiming the student was being judged on academic performance. The experience of some women in the History Department sparked a concern among many doctoral students about the more general issue of "what control grad students have over the quality of their education." (Tm) As Cude (1987) illustrates, there is little a student can do to counter a claim the student was treated fairly from a faculty member who has ultimate power over the student's progress. At least one woman decided against pursuing doctoral studies in the department for fear of having to work with a particular faculty member, a decision forced on the student because of the lack of actual choice of courses and supervisors (Tm, Ko).

Even with an active group of feminist doctoral students to provide support, PhD students realize the limits of their influence on their educational environment. In both Education and History students are aware of their vulnerability, and choose paths to individual success within existing structures and practices. Carnoy (1989, p. 21) discusses the conflict students at schools encounter when the school's vision is not their own. He explains:
Their conflict is resistance. They see the school as a barrier to the cultural development of their subordinate group because it prevents them, as a member of a particular group, from realizing their learning possibilities in terms that they can control.

Doctoral students reject strategies of resistance because they are extremely close to acceptance by the academic professions which they seek to enter. Clark (1987, p. 188) argues "new PhD's are among the staunchest true-believers in the value of their own disciplines and perspectives..." The risk inherent in alienating the gatekeepers to those professions prevents critical scrutiny of the practices that gatekeeping entails.

Reproduction

In both the sciences and the arts/professions, PhD programs function to prevent close examination of the contradictions on which the authority of the academic professions is based. In the sciences students share conceptions of knowledge derived from a positivist paradigm, and are discouraged in their PhD programs from engaging in debates within their own fields that question positivist assumptions. By concentrating on the development of technical expertise, they surrender the critical scrutiny of their disciplines one might expect at the highest level of education in their professional training. In his discussion of "disciplinary power", Foucault (1980, pp. 104-108) argues the "normalisation" of procedures for producing knowledge disguises the mechanisms of disciplinary power. PhD students are entrenched in what Foucault (p. 107) calls a "society of normalisation", encouraged in their pursuit of technical expertise by the financial support provided by the university and society. The apparent consensus around the legitimate goals of scientific research permits acceptance by students of their role as employees conducting research defined as valuable by the experts in the field. Expertise is an unquestioned concept as long as the positivist
paradigm of normal science is left unexamined, and it is the consensus around normal science that underlies professional authority and status. Harding (1986, p. 56) proposes an alternative to this kind of uncritical approach to science:

We would then find valuable critical interpretive approaches to all the activities that count as scientific, as well as to those that make scientific activity possible: selecting problematics; formulating and evaluating hypotheses; designing and performing experiments; interpreting results; motivating, educating, and recruiting young people for the scientific work force; organizing that work force and the support services - in families and psychiatrists' offices, as well as in laboratories - that make it possible for some people to be scientists; selecting, funding, and developing the technologies necessary to carry out scientific inquiry and those that make inquiry possible; assigning different social meanings and values to scientific reason, and to moral, political, and emotional reason.

PhD students in science, at the gateway to their academic professions, have little interest in serious questioning of the underpinnings of normal science that would result in an undermining of the current status of professional scientists and their own source of authority and power. The PhD in the sciences functions quite explicitly to reproduce the values, beliefs, and practices of normal science in the recruits to the scientific professions.

In the arts/professions, reproductive influences are at play, but they operate much less explicitly so as not to threaten the ideologies of autonomy, expertise, and critical inquiry. PhD students learn to bifurcate their reality, allowing critical theoretical commitments for the study of others that are not directed at the practices of the academic professions they expect to join. Arts/professional students generally reject positivist research paradigms, recognizing knowledge is never value-free and universally understood, but they are reluctant to examine the extent to which their own status as professionals derives from the possibility of judging expertise in an academic field. Historical consensus in the sciences around positivist conceptions of knowledge have translated into relatively unproblematic processes for judging expertise, and PhD programs
function smoothly in certifying professional status as long as that consensus is not seriously challenged. Arts/professional disciplines attempt to emulate the success of the sciences, but have never been able to achieve the consensus within the disciplines, and between the disciplines and society, that has been the foundation of the sciences' success. Competition between current research paradigms in the arts/professions undermines the possibility of reaching consensus and exposes the vulnerability of the notion of expertise upon which professional status depends for authority. PhD students are confronted with this fundamental contradiction throughout their doctoral programs, and must learn to live with it in order to complete their programs and continue to practice as professional academics.

Evidence of disputes over legitimate standards of expertise threatens the prestige of academic work in the arts/professions, but belief in the autonomy of the academic researcher, and the freedom to critically study social topics of their own choosing, compensates for the absence of agreed-upon standards and contributes to the authority of academic work in these disciplines. PhD students learn to maintain a belief in their autonomy, even in the face of strong contrary evidence, because to give up this belief would also undermine the authority they hope to gain upon acceptance into their academic profession. By keeping theoretical commitments separate from their actual practices, PhD students are able to achieve individual professional success, but they become socialized into a world that resists critical examination of its own practices. Apple (1988, p. 204) understands the need for teachers to make clear connections between theory and practice in their critical intellectual work:

It is not just contemplative, but should lead to, and stem from, political action in real institutions such as universities, schools, cultural and social movements, and so on...In fact, I would like to claim that, in not just a metaphorical way, unless it takes its democratic politics seriously such work can tend to reproduce on an
ideological level the separation of conception from execution that lies at the heart of the division of labour in our society.

PhD students need to critically reflect on their own education to understand how their own socialization into professionalized academic work reinforces and reproduces practices and conceptions of expert knowledge that are not only contradictory, but undemocratic. Clark (1995, p. 290) warns against the "technical barbarism" of the expert society:

The problem of the expert raised by the democratic-totalitarian struggle and the needs of underdeveloped countries is thus finally the large issue of educating men for cultural maturity and social responsibility in a technological age....As a society veers toward expertise, the cultural strains highlighted by the old distinctions between the cultivated man and the expert, the pure and the applied, are made severe.

Bledstein (1976) describes how professional academics contain controversial issues, reducing them to scientific or technical terms, and Altbach (1989) discusses their academic conservatism. Foucault (1980, p. 86) questions attempts to conceptualize theoretical approaches such as Marxism in scientific terms:

What types of knowledge do you want to disqualify in the very instant of your demand: "Is it a science"? Which speaking, discoursing subjects - which subjects of experience and knowledge - do you want to "diminish" when you say: "I who conduct this discourse am conducting a scientific discourse, and I am a scientist"?

PhD students are reluctant to confront such questions about the purpose of their own professional training and eventual certification as expert or scientist. Through insecurity, isolation, and promise of individual success PhD students are discouraged from reflecting on the part they themselves play in producing and reproducing professional ideology that separates and elevates expert and scientific knowledge.
Bourdieu (1988, p. 36) locates the professional academic in a social space opposed to industrial and business interests, but he claims that as "authorities" they are also opposed to more radical cultural workers:

But, as holders of an institutionalized form of cultural capital, which guarantees them a bureaucratic career and regular income, they are opposed to writers and artists: occupying a temporally dominant position in the field of cultural production, they are distinguished by this fact, to differing degrees according to the faculties, from the occupants of the less institutionalized and more heretical sectors of the field (and especially from the "independent" or "freelance" writers and artists, as opposed to those who belong to the university.)

PhD students need to reflect on the extent to which the authority of their sought-after professional status impinges on their autonomy and dulls their critical commitments. Lieberman (1970) suggests professionals typically avoid criticism of each other and their professions as this would result in a loss of autonomy, and access for the public to the source of their control, and Silva and Slaughter (1984, p. 303) illustrate the extent to which social science experts have unwittingly served the interests of power, "always separating their thoughts from deeds and keeping their ideas from reaching systematic limits." But students confront additional pressures, according to Lipkin (1994, p. 80):

...once a student invests the enormous amount of time and energy required to understand her own experience, experience that typically is embraced by one's family, friends, and social heroes, it is only the remarkable student who can also develop the tenor of mind to subject this experience to radical criticism.

PhD students in science avoid the need for reflection and scrutiny of their own professions through their relatively unproblematic experiences in fields that apparently enjoy a high degree of consensus. But this is achieved at the price of a missed opportunity to engage in critical analysis of the value and direction of conventional scientific research, surely an appropriate goal for students at the highest level of formal education. In the arts/professions, PhD students are able to
explore the underlying values and commitments of their research, but expend considerable energy carefully negotiating the contradictions arising from tension between activities reinforcing the notion of professional expertise and theoretical commitments to critical inquiry. At the borders of their academic professions, the experiences of PhD students in both the sciences and the arts/professions expose contradictions inherent in the professionalization of academic work.
CHAPTER VIII CONCLUSION

Summary of Findings

The results of this study support its initial assumption that an attempt to understand the experiences of PhD students should take into account the nature of the knowledge domain and discipline culture into which the student is being initiated. Lodahl and Gordon (1972, p. 71) argue:

There are differences between disciplines that go to the heart of teaching, research, and faculty-student relations. Any attempt to change the university must take into account the intimate relations between the structure of knowledge in different fields and the vastly different styles in which university departments operate.

This study documents significant differences between the experiences of doctoral students in the four departments, and those differences were related to the disciplines and knowledge domains operating within the particular departments. Physics and Chemical Engineering students typically shared fundamental theoretical approaches with other students and faculty within their departments. Divisions within their departments were based primarily on the subject of inquiry rather than on methods of inquiry. This permitted students to work on projects that were segmented from one another, and to have very little professional contact. Nevertheless, they maintained a belief they were engaged in complementary research. Students in Physics had a strong sense they belonged to an international community extending well beyond the borders of their particular department and university. They often had their first professional contact with their supervisors prior to their arrival in the department, working on projects that extended across university and national boundaries. During the course of their studies and research, Physics
students might have contact with researchers outside their universities for technical assistance, assuming all researchers in the same field could inform each other. Chemical Engineering students did not talk about belonging to a similar extended international community, but often had direct connections with industrial projects which illustrated the applied nature of the discipline, and expressed the strong belief that the standards of the academy and industry were not fundamentally different. Both Physics and Chemical Engineering students believed all research was a valuable and positive contribution to society, reflecting Becher's (1989) description of "Hard" disciplines with convergent knowledge domains.

Physics and Chemical Engineering students had very little reason to question their assumptions about the value of their research. They were financially supported by society for their student research projects, and guaranteed success in their programs if they applied themselves diligently. In general, the most serious problems they could encounter in their degree programs were connected with the availability and proper operation of equipment for their research projects rather than the personal or political relations between faculty and students in their departments. Their departments provided little opportunity for serious questioning of the value of their research, as they offered no graduate level courses in the History or Philosophy of Science. Students operated under the very broad assumption that positivist, experimental knowledge claims were unassailable. But Kuhn (1970) and Harding (1986) convincingly undermine this assumption. The one exception in the Physics Department where students in a Theoretical Sub-Field encountered significant disagreement over the value of various theoretical approaches was considered to be an exceptional case in a generally unproblematic theoretical field, and not a model which could inform all scientific research. Foucault (1980, pp. 105-107)
explains that "disciplinary power" is enhanced when the mechanisms of knowledge production remain unexamined.

Students in Physics and Chemical Engineering had frequent interaction during the course of their PhD programs, but this contact was not exclusively with other doctoral students and could include faculty, other researchers, masters students, and undergraduates. Interaction on a professional level occurred primarily between people working on the same projects, and did not typically extend beyond that small group. When PhD students met socially, their conversation centred primarily on matters unrelated to their research, and rarely extended to discussions of the underlying assumptions of their disciplines. Students who felt they needed to make connections with broader societal concerns usually involved themselves in activities separate from their research activities. The separation of professional work from social and political realities reinforced the conception of knowledge production as value free and disconnected from issues of power in society. Women and minority students believed their participation in the research communities of their disciplines was generally unproblematic, and they had little interest in the kinds of alternative approaches to science advocated by Harding (1986). Their patterns of interaction differed somewhat from those ascribed by Becher (1987) to members of "Hard" disciplines, which he described as urban and competitive. At this stage in their professional development, PhD students in the sciences appeared surprisingly uncompetitive and isolated in their professional activities.

PhD students in History and Education had markedly different understandings from those in the sciences about the nature of their disciplines and their student experiences. In these departments formal as well as informal divisions existed according to the subject matter being
studied, but even students doing research in the same subject area could be divided by competing theoretical approaches. The divisions within the arts/professional departments were extremely important, but not always apparent to students, particularly at the beginning of their programs when crucial decisions were being made about courses, supervisors, and research projects. Students were encouraged from the beginning of their programs to align themselves with a particular theoretical approach, but often felt underequipped at that point to make an informed choice. They committed themselves to a particular theoretical perspective, often through a process of immersion where students had little real choice, but they were required to maintain and assert a strong belief in their own autonomy as researchers. By leaving the process unexamined, PhD students remained unaware of the mechanisms of power at work in their alignment to particular research values and political commitments.

Students in History and Education needed to take responsibility for their research projects from the very beginning, and this responsibility continued until the end of their PhD programs. University and external support for their research was insufficient, requiring students to finance it primarily from their own resources and employment. They competed with each other for scarce resources within their departments, and this prepared them for the competition that would characterize their professional work even after graduation. The individual nature of the arts/professional students' experiences conformed to Becher's (1987) description of a rural community of isolated researchers in "Soft" disciplines, but the competitiveness of their PhD experiences was not anticipated. Personal and political conflicts were the most serious threats to an arts/professional student's success, and they had little confidence in appeals to well-understood standards for judging the value of their work. Problems resulting from the lack of apparent
standards, combined with the need to vigorously defend their own theoretical approaches to research, encouraged arts/professional students to examine the fundamental assumptions of their disciplines. One student in Education mentioned the PhD program seemed to resemble a program in Philosophy more than one devoted primarily to educational concerns. Arts/professional students made connections between their student research projects and their broader societal concerns which resulted in a need to reconcile their personal values with their academic commitments, but the power implications of that process were not well understood.

Contact between students in the arts/professions was very important early in their programs when they were engaged in coursework and preparing for Comprehensive Examinations. Once students were immersed in their own research projects, this contact became increasingly unimportant, particularly for those students who had employment and family commitments that demanded most of their attention. In History, students believed they were able to effect change to improve their programs to some extent, but were concerned student efforts were too often unsustained and fragmented. Women formed important informal networks to oppose what they considered a male dominated and unduly competitive environment, but in the end knew their individual success depended on their acceptance of the dominant values and practices of their discipline. Women in Education did not have a similar network, probably because of the deep structural divisions and physical dislocation in the department at the time of this study. These divisions caused students to have very little contact with each other beyond their own Areas of Special Interest, but students in Education often had strong ties to professional communities outside the academy.
Despite the important differences between the sciences and the arts/professional departments, PhD students of this study described some issues and understandings of their experiences that were common across departments. Isolation was the most significant common theme, with students identifying supervisors as their most important contacts. Student colleagues were often too technically deficient in the sciences to be of professional help, or theoretical adversaries and competitors for faculty attention in the arts/professions. The isolation of students from one another functioned to promote the professional socialization process of students by discouraging unified, sustained examination and opposition to contradictory educational practices in the PhD programs. This allowed students to remain largely uncritical of trends in higher education that directly impacted their education, such as the withdrawal of state support and increasing privatization of university education currently discussed in literature on higher education (Buchbinder, 1993; Becher and Kogan, 1993; Rhoades and Slaughter, 1991). The consensus around the science students' research paradigms sustained their belief in the value of private interests in research, and the financial insecurity of arts/professional students did not permit them to question the source of any scarce financial support they might receive. The result was that few PhD students I interviewed indicated any concern about the issues around increasing private and corporate involvement in university research and education prevalent in higher education literature. The commitments of arts/professional students' to critical analysis of competing paradigms within their disciplines did not extend to the foundations of general claims to professional expertise, as this would undermine their sought after status and power. While it was not a great surprise to me to discover science students did not share Harding's (1989) conceptualization of natural science research as inherently value laden, I did not anticipate the
uncritical approach to their own involvement in professional research maintained by arts/professional students. The isolation of students, both within departments and across the university, suggests a relatively weak and fragile student culture.

Further Study

Further research on PhD student programs and experiences across university departments is necessary to gain a richer understanding of the differences and similarities in doctoral studies. Students themselves are largely unaware of the experiences of students beyond their own disciplines, and literature on PhD students has often focused on the disciplines in which the writer is located. This study documents the wide gulf between science and arts/professional students' experiences, but the pure/applied distinction between departments was less important. Nevertheless, students in applied departments were somewhat older and often had established professional careers outside the academy, causing similar student experiences to manifest themselves somewhat differently. Further research might broaden the scope of doctoral student experiences to include a more diverse range of departments, as this study focused on only one representative department from each of Becher's (1989) four categories. On the other hand, it was apparent to me that my access to a deep understanding of individual student experience was restricted by the breadth of my study. I was particularly aware that my understanding of the experiences of women and minority students was affected by the limitations of a single-interview design. Despite my general satisfaction with the interviews I conducted, I was aware that more time and trust would be necessary to gain access to sensitive concerns around ethnicity and gender issues. In any research, trade offs must be made between breadth and depth of inquiry,
and I chose the design I considered most appropriate for an exploratory study. Future research with different approaches could complement the findings of this study.

During the course of this research I became aware how the method employed for gaining access to student informants influenced the findings of the study. Students within individual departments have a wide range of experiences, and interpret them differently depending on their location within the department. This was particularly true of the arts/professional departments, and most evident in Education. By gaining access to departments through Heads of Department, and then through student representatives as key informants, there were strong pressures to confine the choice of future informants to a small group of students at the centre of departmental activities. This pressure came from a variety of sources: key informants were best able to introduce me to other students within their close circle; privacy guidelines made contact with students who were not physically present in the department problematic; the concepts of student culture and ethnographic research focused attention on those students who had the most interaction with each other; students on the margins of departmental activities believed they had little to offer a study about student experiences; and some students were suspicious of any research that had the approval of faculty. Conscious efforts were made to include students as informants in this study who were removed from everyday departmental life as they often offered the most insightful comments about student experiences in their departments. Conducting an exploratory study, I attempted to be as inclusive as possible, but future research might deliberately target marginalized students, particularly those who have recently dropped out of doctoral studies.
Gaining access to statistics related to doctoral studies was also a significant problem during this research. This university publishes information on PhD enrolments broken down on the basis of sex, visa status, and age for various faculties in the university, but does not have this information available on a departmental level. I was informed by the office that compiled statistics at the university that as a student researcher I had the lowest priority of any of their "customers", and because of cutbacks to university funding they could offer no assistance to me whatsoever. This was particularly disturbing to me until I realized the statistics which they did make available after repeated requests were unreliable. Staff in individual departments were much more helpful for enrolment statistics, but could offer only estimates of attrition rates and length of time for completion of degrees. My experiences indicated a need for universities to compile much more complete data on graduate students, and to make this information available to all researchers.

Possible Reform

Suggestions for reform of doctoral studies come primarily from three perspectives: an institutional perspective concerned with student attrition and the efficient use of scarce university resources; a student perspective focusing on attempts to make the doctoral student career more meaningful and humane; and a critical perspective attempting to involve doctoral students in social struggles around equality. These perspectives may be complementary. For example, reducing the number of PhD dropouts would increase the efficiency of the university while indicating that the PhD program was also better meeting the needs of the students. But these perspectives can also involve conflicting understandings of the appropriate goals for doctoral
education. For example, meeting the needs of students who are primarily interested in advancing their own individual careers by reinforcing the boundaries that protect the authority of their disciplines may conflict with attempts to promote equality by bringing marginalized voices into the academy. Until the legitimate goals of the PhD are clarified universities are likely to adopt reforms that are confusing and lead to further contradictory practices.

If the goal of doctoral studies is considered to be primarily professional training based on consensual assumptions about knowledge and expertise, then reforms based on the model of doctoral studies found in the sciences might be appropriate. Students in the science departments of this study reported relatively unproblematic experiences during their doctoral studies, and expected to complete their degrees without serious challenges. This model of doctoral education appears much more efficient than that of the arts/professional departments, and also seems to meet the needs of students by preparing them for careers which are valued by society. Students shared with faculty a consensus about the standards for conducting and judging research, and considered the examination processes of their departments to be fair and meaningful. But this kind of efficiency came at the expense of a critical perspective on their disciplines that would be in apparent conflict with the dominant goal of technical proficiency. If the goal of doctoral studies is to merely train expert technicians then this model could be adopted by departments in the arts/professions. Their challenge would be to achieve some sort of consensus around legitimate knowledge claims and research goals, and train expert researchers. Until that consensus exists, it is damaging for both the university and PhD students to base doctoral programs in the arts/professions on assumptions about expertise that conflict with other goals currently valued in doctoral education in those disciplines.
After critically reflecting on the findings of my study, it is my position that developing a critical awareness in doctoral students of the assumptions that underlie their academic disciplines and providing the conceptual tools for judging the value of research in their fields are appropriate goals for all doctoral education. Lipkin (1994, p. 54) argues "the university should be a bastion of progressive or radical critique of the dominant culture, irrespective of the particular substantive content of that culture." Training technical expertise can be achieved in vocational programs and private industry, but society would be best served by encouraging its most highly educated citizens to take a critical stance, questioning and re-evaluating the priorities and assumptions of their fields of study. Current practices in the sciences reinforce assumptions about the universalistic nature of knowledge that discourage serious challenges to inequalities that are sustained when the values inherent in knowledge claims are not examined (Harding, 1989). Harding is right in calling for a conceptualization of the natural sciences based on a social sciences model that recognizes the important social and political context of all research, and I propose that doctoral education in the sciences should make the social and political context of scientific research a primary focus. PhD programs in the arts/professions would inform science programs to promote students' critical commitments.

Evidence from my study suggests current arts/professional programs are confused and contradictory because they have borrowed too much of the ideology and practices around expertise from the apparently successful science model of doctoral education. Adopting the goal of developing and judging technical expertise in fields where there is no consensus around appropriate standards for judging that expertise is a recipe for failure in itself, but I suggest achieving consensus is not a desirable goal for university academics. I agree with Lipkin (1994)
that universities should be a bastion of critique, and the role of doctoral education should be to
develop students' critical commitments rather than technical expertise. Foucault (1980, p. 132)
goes further in suggesting that intellectuals should struggle, not "on behalf" of truth, but about the
"status of truth and the economic and political role it plays." Both positions would require
academics and doctoral students to sacrifice some of the authority they currently achieve in the
academic professions through claims to professional expertise in the production of knowledge.
President Lowell of Harvard University was right in the late nineteenth century to argue a degree
program was not an appropriate test of future original thought, and knowledge must be judged on
its own merit. Arts/professional students in this study indicated that implicit requirements during
the degree program were at least as important as the explicit standards of success. The implicit
requirements usually involved appropriate theoretical commitments and the rhetorical skills to
promote students' ideas. Choice of appropriate theoretical commitments is a moral and political
decision that defies standards of expertise, and explicit education or training in rhetorical
standards is simply ignored in current doctoral education. PhD programs in the arts/professions
could be much improved and would serve as more attractive models for science programs if they
eliminated some of the fundamental contradictions that cause confusion and distress for current
students. This could be achieved by making implicit standards explicit, particularly by recognizing
the importance of rhetoric in all knowledge claims. Farrell (1993, p. 1) defines rhetoric as "the
collaborative art of addressing and guiding decision and judgment - usually public judgment about
matters that cannot be decided by force or expertise." PhD programs ignore explicit education in
rhetoric, and Farrell (p. 2) argues this is because of its current low status in the academy:

The very things that determine our participation in "public appearances" seem least
accessible to systematic reflection. It often proves easier for the academy,
therefore, to leave the incorrigible business of rhetoric to the interstices of the hoi polloi "where it belongs".

Rhetorical persuasion is often regarded as antithetical to scientific knowledge claims, having no place in a world of expert knowledge. If rhetoric were recognized as integral to any knowledge claim, then claims to expertise could be understood as merely an effective rhetorical device and the legitimate subject of criticism and debate. According to Guba and Lincoln (1994, p. 108), "no construction is or can be incontrovertibly right; advocates of any particular construction must rely on persuasiveness and utility rather than proof in arguing their position." Current practices that obscure the importance of rhetoric by keeping rhetorical standards implicit in doctoral programs should be abandoned in favour of explicit education in rhetorical theory and practices.

Improved doctoral education should stress educational goals over training in the production and promotion of knowledge claims. This would entail a shift in emphasis from university practices designed to certify expertise to practices that contribute to educational growth and the development of critical commitments. By resolving the contradictions between conflicting goals, doctoral programs in the arts/professions could offer an attractive alternative to the technical training of science programs. The student I interviewed in Education who believed philosophical concerns were at least as important as educational issues in that PhD program articulated a strength of the program rather than a criticism, and evidence of successful doctoral programs in all disciplines would be the integration of philosophy into the Doctor of Philosophy degree. Students would learn not just how to promote their own interests through effective rhetorical skills, but how to hold their own values and practices up to critical examination. Current practices unduly reward students who build strong defenses around their own ideas and discourage experimentation and risk-taking, undermining truly critical commitments of students.
The university should institutionalize interdisciplinary contact between students, encouraging
students to "try on" the challenges to their basic assumptions found in other disciplines, and to
recognize the validity of alternative knowledge and research traditions rather than merely
strengthening the force of their own claims. This type of reform in the training of professional
academics would weaken the boundaries built around legitimate knowledge claims and reduce
their authority and status, but it would also involve a move toward democratization of intellectual
conversation and the possibility of more critical educational commitments and practices
envisioned by Foster (1991), Harding (1986), and Lipkin (1994).

These proposed reforms are unlikely to be supported by either current academics or PhD
students, as they have individual career interests in maintaining strong claims to technical
expertise. Certifying the ability of students to produce expert knowledge is a core element of
doctoral programs despite the absence of consensus about standards in the arts/professional
departments, and even students with theoretical positions denying the possibility of knowledge
standards are unwilling to give up their personal claims to be conducting high quality research.
Students sacrifice considerable autonomy in a climate of insecurity and isolation to achieve expert
status in their fields, and are unlikely to advocate change that would undermine that status and the
power it entails. But it is not known how many potential doctoral students reject the PhD, or
how many PhD students drop out of their programs, because of its focus on professional training.
Some faculty express the opinion that it is inconceivable students would pursue a PhD for any
reason other than obtaining entrance into the academic profession, because the PhD program
offers very little else of value for students. Potential students should be warned that unless there
is reform in PhD programs, it may well be good advice to avoid the PhD if achieving professional certification is not their primary motivation.

Cude (1987, p. 108) suggests a second masters degree as an alternative for students who are not willing to face the sacrifices of time, money, and career a doctoral degree in the arts/professions requires:

Those determined to pursue graduate studies beyond the mastership in these fields, deterred by the manifest problems with the doctorate, might elect instead to take a second master's degree....The hazards of graduate study are much less pronounced with the mastership, so the chances of successful completion would be very high.

I have heard Cude's advice echoed by many PhD students who are dissatisfied with the tendency of PhD programs to stifle imagination and discourage truly original thought. Because masters programs do not generally function to certify graduates for entrance into the academic professions, students are allowed much more freedom to experiment with new ideas, cross disciplinary boundaries, and complete the degree in a time period that is not personally destructive. The History student who claimed, "I have never once heard anyone say that the PhD experience was a good experience," articulated the depth of the problems with the PhD degree: "You feel like you're being hollowed out from the inside and there's just less and less of you there as you do more and more of what the system requires." Nevertheless, many students will continue to pursue the PhD, some being required by inflation of credentials in careers totally unrelated to research. For those students who reject the professionalization of their educational pursuits, and the questionable notion of expertise in the production of knowledge it entails, opportunities exist to push for an alternative conception of doctoral studies.

Said (1994, p. 56) identifies professionalism as the greatest threat to the intellectual, with society "saying that the true intellectual ought to be only an expert professional in his or her field."
He argues there are four pressures related to professionalization that threaten intellectuals: specialization, expertise, power and authority, and centralization of power. Instead of ignoring the "impingements of modern professionalism," Said (p. 61) calls for an alternative set of values and prerogatives: "These I shall collect under the name of amateurism, literally, an activity that is fuelled by care and affection rather than by profit, and selfish, narrow specialization." PhD students could benefit by rejecting professional metaphors in the conceptualization and discussion of their educational activities. Welker (1991) argues the teacher as expert is a questionable metaphor, and, similarly, my position is that the metaphor of intellectual as professional should be abandoned. PhD students might promote a conception of their doctoral education as a process encouraging intellectual growth and critique as opposed to professional training, following Said's (pp. 61-62) characterization of the amateur intellectual:

The intellectual today ought to be an amateur, someone who considers that to be a thinking and concerned member of society one is entitled to raise moral issues at the heart of even the most technical and professionalized activity as it involves one's country, its power, its mode of interacting with its citizens as well as with other societies. In addition, the intellectual's spirit as an amateur can enter and transform the merely professional routine most of us go through into something much more lively and radical; instead of doing what one is supposed to do one can ask why one does it, who benefits from it, how can it [sic] reconnect with a personal project and original thoughts.

Fisher (1993, p. 249) recognizes that "academic culture has made intellectuals invisible as they got lost in the universities." Doctoral studies should promote students' direct participation in their society's moral and political challenges, as public discourse is weakened when critical voices "have retreated to professional enclaves." (Jacoby, 1987, p. 208) PhD students experience immense pressure to accept the demands and rewards of professional authority, but need to protect and foster their role as critics in a wider public culture.
REFERENCES


Brebner, J. B. (1945). *Scholarship for Canada: The function of graduate studies*. Ottawa: Canadian Social Science Research Council.


## Profile of Informants

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*Of the 7 international informants, 4 were members of visible minorities: 3 Asian and 1 African.*