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My dissertation is a response to the lacuna in the literature regarding the semiotic moments of the entrepreneurial university. The scholars on the entrepreneurial university describe a new knowledge regime that cinches the university to the global trade competition. These sources ignore the semiotic moments of the culture of competitiveness. In this dissertation I propose a third leg to the entrepreneurial turn which takes seriously these semiotic moments. I use university research magazines as primary texts, arguing that these magazines are representative of the technological and scientific advances that are crucial to the entrepreneurial university. I argue that the entrepreneurial university is legitimized as a lynchpin in the development of scientific research meant at once for human and capital regeneration.

My general findings are as follows:

1. How a fundamental singularity of research universities in the KBE is the representation of their research as directly answering to pressing human needs.

2. How answering to these needs results not from society but from the participation of university actors in entrepreneurial behavior.

3. How discourses of entrepreneurship derive legitimacy not explicitly through logics of explanation but through logics of appearance and through authorization vis-à-vis the university's relation to the market.

The entrepreneurial university is not only "realized" by state actors participating in institutionally specific structures adhering to the entrepreneurial turn, but by state actors aligning their particular research interests to the application of pressing human needs.

THE ENTREPRENEURIAL UNIVERSITY AND THE MEDIATION OF CRISIS:

A STUDY OF UNIVERSITY RESEARCH MAGAZINES

by

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Approved by

_____
Committee Chair

For my parents, Denny and Sue Jolliff.

This dissertation, written by Grant Douglas Jolliff, has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Why this urgency? I have just come back from China and India, and what I saw was a vivid demonstration of the sheer speed and scale of the changes going on in the world. . . . So, let's hold onto this fact. That the drivers of globalization are human beings, and the winners from globalization are human beings. Globalization is being led by all of us, by the choices we make. It is driven by the imagination and creativity of millions of people, through technological innovation and scientific process. (Barosso, 2005)

—Speech made to the European Ideas Network by European Commissioner President Juan Manuel Borosso, 2005

Susan Robertson (2008) studies this passage as an exhortation to respond to a crisis of competitiveness—the imperative, often made through comparison of one economic region to a more superior region, to succeed in a global economy through the production of knowledge-based goods and services. Robertson writes that neoliberal discourses of economic crisis explain "the emergence, since 2005, of a set of globally oriented 'education' policies and programmes shaped by a new set of ideas about the production of a European knowledge economy" (p. 90). She demonstrates how discourses animated Europe's transition from a "social market/fortress Europe" economic model to an "imagined European KBE [knowledge based economy]" (p. 5), resulting in the widespread adoption of neo-liberal policies. Higher education in Europe, Robinson argues, conformed to the economic pressures of the KBE as an economic imaginary. However much Robinson succeeds in her argument, questions remain in defining just what is Barosso's, and by

extension the European community's, notion of competitiveness. Most striking is the thrust of Barosso's argument; what it means to be human is to produce technologies and scientific discoveries in globally competitive environments. What does global competitiveness have to do with being human? What is it in the "imagination and creativity of millions of people" that drives "innovation and scientific process" (Barosso, 2005)? And, how does this relate to crisis? Just as Barosso calls on the European community to consider globalization's impact on the European higher education community, we are called to put these questions to those systems of higher education with which the European community sees as client-competitors—namely, those of the United States of America.

Purpose of the Dissertation

In this dissertation I explore the notion of the entrepreneurial university as a catalyst for a competitive higher education, producing the researchers, the educated workforce, and the technological and scientific innovations that are the crux of the knowledge-based economy.

In the pursuit of this task, I ask two broad questions. First, what role does the university play in the ever expanding notion of competitiveness and the concomitant burgeoning of technological and scientific innovation? Second, how is the university legitimized as a hub of technology and intellectual capital development and dissemination? These questions are impossible to completely answer in one dissertation; an entire academic career could be devoted to answering them. My work is one modest step toward answering this much broader, more theoretical issue. In this dissertation I will offer the

study of the university research magazine as a way to approach these issues. This leads to

the main research questions:

RQ1.   What is discursively unique about UNC Chapel Hill's *Endeavors*, NC State

Results, and *UNCG Research* when compared to the Corpus of

Contemporary American English (COCA)?

RQ2.   How, if at all, do these salient lexical items indicate discourses related to

entrepreneurialism?

RQ3.   How do the generic features of these texts function toward the legitimation

of the entrepreneurial university?

I demonstrate the following:

1. How a fundamental singularity of research universities in the KBE is the

representation of their research as directly answering to pressing human needs.

2. How answering to these needs results not from society but from the

participation of university actors in entrepreneurial behavior.

3. How discourses of entrepreneurship derive legitimacy not explicitly through

logics of explanation but through logics of appearance and through

authorization vis-à-vis the university's relation to the market.

I argue that the genre of the university research magazines functions towards the

legitimation of the entrepreneurial university presenting entrepreneurship and the growth

of technologies as opportunity for human connection and regeneration.

In my introductory chapter I expound upon the notion of the crisis of

competitiveness and technological and scientific innovation. First, I frame my discussion

of the entrepreneurial university using cultural political economy and the "technological sublime." Each of the conceptual models captures the entrepreneurial university's role in creating and disseminating scientific and technological developments as a mediation of crisis (Figure 1). Throughout the discussion of my theoretical framework I will refer the reader to Figure 1, which is a figural depiction of the theories and scholars I discuss in this section to build up to my own argument that the entrepreneurial university mediates crisis. The theories of cultural political economy and the "technological sublime" inform my analysis of the mediation of crises, the former informing how crises is mediated through state power and the latter informing how crises is mediated through representations of technological and scientific development. I consider the university using these theories, and propose that contemporary imaginaries present science entrepreneurship as an opportunity for the university to flourish. One of the main questions throughout this dissertation revolves around how the university legitimizes science entrepreneurship, and I introduce the university research magazine as representation of the technological and scientific developments characteristic of the entrepreneurial university, and thus a prime source for the analysis of legitimation strategies. The benefits of my chosen methodologies—critical discourse analysis and corpus linguistics—to studying the university research magazine as genre are also discussed. An explication of selected content of a university research magazine demonstrates the role the magazine plays in describing the science and technology developments made at the university, their economic boons, and their potentially life-enhancing and lifesaving applications. I argue

that the research magazine is a resource for reaching out to the public and normalizing

science entrepreneurship. Lastly, I describe the texts which I plan to use in my study.
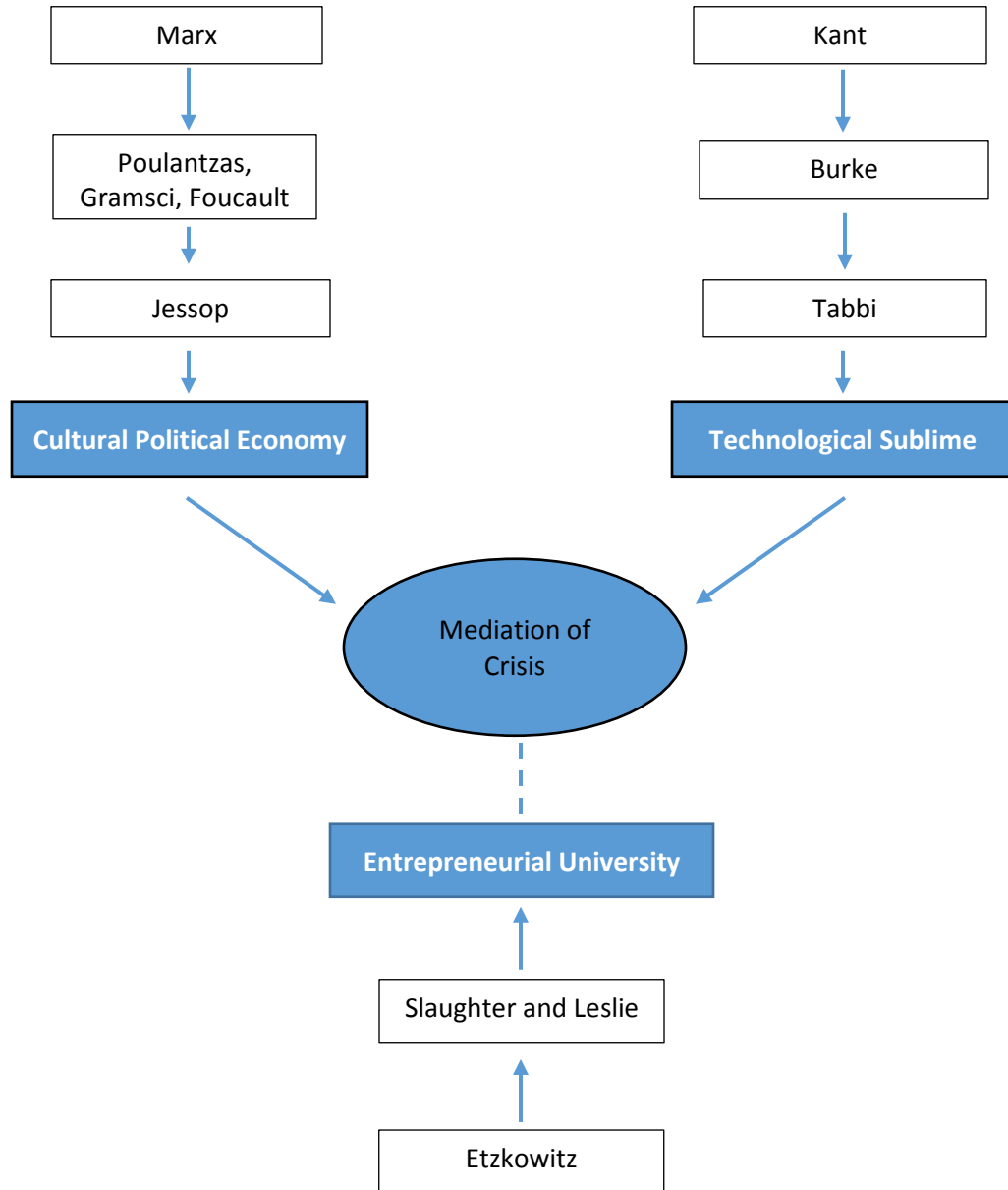
Figure 1. Theoretical Framework.

Theoretical Framework

Cultural Political Economy

A more fleshed out understanding of "crisis"—with special emphasis on Barosso's example of "technological innovation and scientific process"—helps connect the notion of humanity to that of competitiveness. David Tyfield (2012) states that our recent economic crises, environmental degradation, climate change, and energy constraints are inextricably connected with science, and that solutions to these crises are demanded of science. Tyfield studies how science policy and science practices emerge within the cultural, political, and economic milieu as an answer to societies pressing issues. I am also interested in exploring the conflation of crises and science using cultural political economy, particularly looking at how the technology and knowledge produced by the university is proposed as a way of mediating crisis. In Chapter II, I discuss in more detail Tyfield's application of cultural political economy to science policies and practices; I will now explain the significance of cultural political economy to my theoretical framework.

Bob Jessop's (2008) application of the "strategic-relational approach" to cultural political economy informs the first part of my framework. Jessop's "strategic-relational approach" holds that the state, as an institutional and organizational ensemble, does not exercise power as it is not a "real" subject. Rather, the state is a social relation. Different actors within different institutions constitutive of the state may enact, resist, or hybridize state policy in different ways. But, what does it mean to practice the "strategic-relational approach" within cultural political economy?   Jessop describes it best in his discussion of

discursive selectivity—variation, selection, and retention—performed by various social actors to maintain power or challenge it:

> CPE [cultural political economy] studies the role of semiotic practices only in the continual (re)making of social relations, but also in the contingent emergence (variation), privileging (selection), ongoing realization (retention), subsequent reinforcement through structural coupling (consolidation) of their extra-semiotic properties, or their weakening through contestation. (p. 240)

Institutions and organizations exercise state power by selecting discourses that privilege certain explanations of crises (read: breakdown in the (re)production of state power through events which threaten to expose a politically mediated form of capital accumulation) above others. These discourses, also referenced by Jessop as "imaginaries," help explain and construct economic events to the benefit of state power—i.e., the separation of market and state for the purposes of legitimizing the state. The strategic-relational approach to cultural political economy sees these "imaginaries" as semiotic constructions that reproduce and demarcate "economic and political categories" (p. 56) to secure the "conditions for capital accumulation" (p. 52). The application of cultural political economy allows scholars to map out how state power is (re)produced social through a selective process. Thus my debt to Jessop's strategic relational approach in formulating my research questions: the analysis of discourse allows us to trace the way state power is legitimated through discoursal selectivity.

As explained above, the "strategic-relational approach" is the study of how various actors within organizations and institutions (re)produce and maintain state power through a semiotically-oriented selective process. This selective process serves to legitimize state

power by securing the "conditions for capital accumulation," which in Marxist terms is done by the separation of the struggles of the subordinate class into boxes, i.e., political struggles connected to the logic of the state, economic struggles connected to the logic of the market (Center for Labour Studies, 2014). In this way the actors within institutions and organizations can exercise and (re)produce state power through privileging certain explanations of crises over others. Jessop's argument that the state is a social relation, and this relation can be analyzed semiotically, channels the work of Marx, Poulantzas, Gramsci, and Foucault. I have worked through Jessop's debt to Marx in the above explanations, but it is necessary that I explain the connection of the "strategic-relational approach" to Poulantzas, Gramsci and Foucault, all of whom are mentioned in Chapter II.

The following discussion of Poulantzas, Gramsci, and Foucault is meant to be a simple nod to these theorists in the hopes of clarifying the theoretical underpinnings of Jessop's "strategic-relational approach," and also the theoretical underpinnings of my theoretical framework (Figure 1). It also should be noted that these explanations are based off Jessop's own interpretation of them. Poulantzas was simply the first state theorist to claim that the state is a social relation. Poulantzas described state power as "a relationship of forces, or more precisely the material condensation of such a relationship among classes and among class factions, such as this is expressed in the state in a necessarily specific form" (Poulantzas, as cited in Jessop, 2008, p. 125). There are limits to form analysis of the state, since the form of the state is a material expression of the relationship among social classes. State power is contingent upon form only so far as it is contingent upon the social relations that make up the form.

Gramsci, on the other hand, emphasizes the form of the state in his analysis. For Gramsci, the state was made up of "political society + civil society" (Gramsci, as cited in Jessop, 2008, p. 24). State power in the West is bipartite: a "hegemony armoured by coercion" made possible by bringing the masses into conformity with modes of production through "force" on behalf of the coercive apparatus, and "hegemony" of a ruling class seeking active consent of dominated groups through intellectual, moral, and political leadership (Center for Labour Studies, 2014; Gramsci, as cited in Jessop, 2008, p. 24). In contrast to Poulantzas and Gramsci, Foucault rejected any formal definition of the state, instead arguing that the work of the state was performed by a multiplicity of institutions widely dispersed and extra-juridicial. Jessop states that Foucault was interested in "the art of government, a skilled discursive practice in which state capacities were used reflexively to monitor the population and, with all due prudence, to make it conform to specific state projects" (Jessop, 2008, p. 66). Through the scholars above Jessop developed the notion of state power realized through social forces selecting discourses to explain crises in a way that (re)produces the power of the dominant classes to influence capital accumulation, and align economic and political occurrences to their respective logics.

Technological Sublime

The strategic-relational approach to cultural political economy described above focuses specifically on the crises felt within state power. Jessop's interpretation, ala Marx, Poulantzas, Gramsci, and Foucault is exhaustive of the ways in which institutional and organizational state powers select "imaginaries" (discourses) for the sake of (re)producing and legitimizing power. To inform the semiotic analysis of these "imaginaries" cultural

political economy asks of us, I would like to bring in a second part to my theoretical framework—the "technological sublime." In my opinion the "technological sublime" compliments the critique of capital accumulation found in Jessop's strategic-relational approach because it allows the scholar to consider the subjectivity of those affected by these "imaginaries."

I use Julian Henneberg's (2011) critical interpretation of the "technological sublime" as a conflation of the Kantian and Burkean notion of sublime. The former "produced by a spontaneous overload of our imaginative faculties . . . caused by the excessive demands of something that is either immeasurable (the mathematical sublime) or whose force would overpower us physically (the dynamical sublime)"; the latter's version derives from "the irrational and instinctive feeling of terror and threat" (p. 54). Thus, Henneberg describes the technological sublime as having to do with terror and threat as well as the cognitive overload stemming from facing unreckonable phenomena.

Discussion of the sublime, however, stops not with these Enlightenment notions. Henneberg (2011) brings the discussion to postmodernity, an era marked by expansion of "information technologies, electronic communications, and new media, as well as advances in molecular biology, biotechnology, and related fields . . . important aspects of an increasingly globalized and technologically sophisticated postmodern age" (p. 55). The expansions of these technologies has led thinkers like Frederick Jameson to rethink "nature" as "Other," as it was in precapitalist times; technology is other, in tandem with its "underlying driving force, late capitalism" (p. 56), throwing in high relief the contradictions of capital that contribute to the cognitive overload of postmodern life (i.e.,

commodification of knowledge vs. knowledge as public good). However, Joseph Tabbi encourages a more constructive view of cognitive overload. Henneberg writes that Tabbi's "understanding the sublime as 'a complex pleasure derived from representational insufficiency' enables Tabbi to explain postmodernity's 'simultaneous attraction to and repulsion from technology'" (Tabbi, as cited in Henneberg, 2011, p. 56). Henneberg sees in Tabbi's rethinking of cognitive overload space for human connection and regeneration, offering literary production as one site of this experience of the technological sublime. In later chapters, I will be addressing the question: How does the technological sublime enhance our understanding of the ways that state power is legitimized and (re)produced through a selection of discourses?

The Entrepreneurial University

Cultural political economy and the technological sublime frame my discussion of the entrepreneurial university because of the latter's position as a hub for the technological and scientific developments of the knowledge-based economy. Jessop's "strategic-relational approach" allows me to examine discourses, and how they function towards the legitimation of the entrepreneurial university; the technological sublime allows me to consider the how discourses of academic entrepreneurship answer to pressing human needs. It is also important to note that in Figure 1 cultural political economy and the technological sublime are directly connected to the mediation of crisis. However, the dash between the mediation of crises and the entrepreneurial university indicates the purpose of this paper to introduce the connection between the entrepreneurial university and the mediation of crises.

I theorize the entrepreneurial university in Chapter I, but it is important to note here that three scholars known for their work on the entrepreneurial university see it as inextricably connected to the burgeoning in the demand for science and technology. Etzkowitz (2002) describes an "endless transition," in which basic research, applied research, and product development blend as more emphasis is placed on interdisciplinary research. The nature of the university-industry-government triple helix as a "spiral pattern of linkages" will "emerge at various stages of the process" (p. 139). Slaughter and Leslie (1997) claim that traditional dichotomies between types of knowledge no longer hold, like basic and applied, science and technology, discovery and innovation. The term they use to describe this new knowledge scheme is technoscience, a way of blending science and product with the intent to create new industries or restructure old. Geiger's (2004) "biocapitalism" describes the relationship between academic science and the biotechnology industry in which academic science, innovation, and the generation of capital work together. The entrepreneurial university is a lynchpin in the development of scientific research meant at once for human and capital regeneration. Throughout this dissertation I will continue to develop the connection between these technological and scientific innovations made through academic entrepreneurship in the sciences and the selection of discourses to legitimize the entrepreneurial university.

The scholars on the entrepreneurial university discussed above describe a new knowledge regime that cinches the university to the global trade competition. As I will explain in Chapter II, their conceptualizations of a new knowledge regime are essential to the study of the entrepreneurial university. However, these sources ignore the semiotic

moments of the culture of competitiveness. In this dissertation I propose a third leg to the entrepreneurial turn which takes seriously these semiotic moments. I will now introduce the university research magazine and the ways it legitimates the entrepreneurial university as a mediator of crisis.

The University Research Magazine

The university research magazine is understood by those who produce it and the universities that sponsor them as a format for empowering the public through knowledge of the research activities at their universities. Alana Mikkelsen's (1994) "University Research Magazines: Purposes and Characteristics of a Science-Writing Venue" describes the genre as particularly concerned with the public's knowledge of scientific innovation. She opens her discussion saying, "In this age of the Human Genome Project, thinning ozone, and humankind's now-routine forays into space, public understanding of science is an increasingly important element in aiding people to make informed decisions" (p. 15). The science-fiction-like progress of the 20th century nearly mandated close communication between those at the forefront of research and the public with whom they are communicating. To investigate how the university research magazine accomplishes this, I researched the magazines listed on the University Research Magazine Association's (2015) website—the main professional organization for those involved in research publication. The following are explications of the publications for the purposes of introducing the general themes of research magazines—a limning meant to foreshadow the detailed analysis of how the magazines legitimate the entrepreneurial university as a mediator of crisis.

The medium—the science- and technology-driven platform with marketing scheme—is the message, as demonstrated by close reading of an article from *UNLV Innovation: The Research Magazine of The University of Nevada, Las Vegas* titled "From Breakthrough to Business: Faculty Discoveries with Commercial Potential" (2013). The article's purpose is to introduce research at UNLV that is undergoing the technology transfer process—from the isolated lab, to the board room, and ostensibly into the hands of the public. The introduction makes UNLV's pro stance on commercialization clear:

> Commercialization of faculty discoveries is on the rise at UNLV, facilitated by a new emphasis on economic development associated with research, according to Thomas Piechota, interim vice president for the recently renamed Division of Research and Economic Development. (University of Nevada, Las Vegas, 2013, p. 15)

The article begins with what can be considered a full-fledged, unwavering support of commercialization of faculty discoveries by the university, as evidenced by a recent reorganization of the university structure to include a Division of Research and Economic Development. It is unclear, however, if exogenous or endogenous factors prompted this turn to research and economic development; within two sentences mention is made of highly successful, university-based technology transfer initiatives like Google and Gatorade, and a groundswell of technology transfer at UNLV.

The descriptions of the research and their applications might reflect what Barosso (2005) called "the imagination and creativity of millions of people, through technological innovation and scientific process" (para. 17). The first touts new techniques for genome surgery for HIV patients. The technique involves a blending of two processes; one the

technology "to specifically target and cut out a region of DNA," and the second to "harness

the protein" that "can actually travel across cellular membranes" (University of Nevada,

Las Vegas, 2013, p. 16). These "technologies" were combined into a "blood stream

injection," though bringing these technologies to market requires much more work.

Moreover, the research generated a completely different application from the original

intent, a "new type of reading accelerator, called xReader, for which the university has

filed another patent application" (University of Nevada, LasVegas, 2013, p. 17). The

program helps one move efficiently through dense scientific articles, offering definitions of

words and their associated images unfamiliar to the reader, a boon for someone just

diagnosed with a disease and referring to scientific and medical journals for information.

Not only do these technologies stimulate the economy, each offers life-enhancing, and

perhaps lifesaving, opportunities—all because of UNLV research scientists and the

support of their new Division of Research and Economic Development.

     The second technology touted in the publication is the EM Dot, an electric and

magnetic sensor. The application of this technology is unclear because the company that

owns the license "has kept their plans . . . mostly under wraps to maintain their competitive

business edge" (University of Nevada, Las Vegas, 2013, p. 19). However, the researcher at

UNLV offers a glimpse into the potential applications. For instance, the EM Dot could

detect and locate leaks in underground pipes through continuous monitoring "based on

radio wave signals without acoustic noise signatures that are generated when a shower is

turned on or toilet is flushed" (p. 19). A further application of the EM Dot is "the detonator

defeat system" which "has the potential to disarm detonators of explosive devices without

actual physical contact" (p. 19). The benefits of this technology are clear to law

enforcement and the military. The third example is of a c. diff—a common but deadly

secondary infection—prevention drug. The particular medication blocks the germination

of spores that cause the infection, and thus serves as a prophylactic measure for those in

hospitals or nursing homes with weakened immune systems. Thus, the promise of the

medicine is one of prevention of disease rather than treatment.

This limning of "From Breakthrough to Business: Faculty Discoveries with

Commercial Potential" (2013) draws out the what I believe is the primary function of a

research magazine—to mediate between the university and the reader an understanding of

how research moves "humanity" forward in its response to crisis—i.e. cures to diseases,

the crisis of capital, and global competition. In this way, the university research magazine

serves to legitimate the entrepreneurial university as a mediator of crisis. It is through this

that my depiction of the university research magazine circles back to the theoretical

framework; the mediation of crises in our personal interactions with the cognitive overload

of postmodern life, both in the contradictions of separate state and market logics, but also

the cognitive overload experienced in a society of hyper-commodification.

The Study

My study employs critical discourse analysis and corpus linguistics to examine the

university research magazine's presentation of what Barosso (2005) calls "the imagination

and creativity of millions of people, through technological innovation and scientific

process" (p. 17). The chosen method is uniquely suited to the analysis of the research

magazine as a factor in the technology of the sublime and its conjunctive crisis of competition because of its consideration of texts in their social contexts:

> to systematically explore often opaque relationships of causality and determination between (a) discursive practices, events and texts, and (b) wider social and cultural structures, relations and processes; to investigate how such practices, events and texts arise out of and are ideologically shaped by relations of power and struggles over power. (Fairclough, 1995, p. 132)

Simply put, critical discourse analysis sees discourse as shaped by social groups and institutions. Texts are shaped and informed by a dialectic of discourse in which we can relate meaning—identification, action, and representation—to issues of power and knowledge (Fairclough, 2003). Discourse and its network of practices inform and are informed by ideologies and struggles for power. The university research magazine is a genre in a network of practices, which Chouliaraki and Fairclough (2002) describe as "habitualised ways, tied to particular times and places, in which people apply resources (material or symbolic) to act together in the world" (p. 21). I look specifically at the three main ways discourse "figures" in genre. According to Fairclough (2003), genres are ways of interacting discoursally, such as the genre of the interview or hortatory speech; styles are ways of being, such as speaking as a "manager" or "teacher"; and discourse is a way of representing a social practice particular to a time, place, or perspective. Corpus linguistics will be applied to a corpora of university research magazines to qualitatively and quantitatively inform the critical discourse analysis. University research magazines use the medium to tout opportunities for academic entrepreneurship in the sciences such as

technology transfer, what I argue is a social practice that mediates crises—the crises of competition involving education, innovation, and capital accumulation.

Conclusion

At stake in my research is an understanding of how the university mediates the crisis of competitiveness through its representation of technological and scientific developments. I will theorize the entrepreneurial university in Chapter II, and in Chapter III explain in detail the methods I plan to use in investigating my primary data, university research magazines. Framing my work within cultural political economy and the technological sublime—a theoretical lens for understanding the fear and awe felt in the midst of a crisis of fast-paced, and competitively driven technological and scientific change—allows us to situate the entrepreneurial university at the crux of a culture of competitiveness.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review offers the study of the entrepreneurial university as an emerging form of the political, economic, and cultural conditions that inform science practices. A key point in the literature review is the need to bring the issues of power and knowledge to the study of science policy. In doing so I follow a Marxian critique of how the university, within the institutional ensemble of the state, legitimizes entrepreneurial science. I argue that, as universities are essential pieces to the global trade competition, a critical study of discourse can provide specific insights into the way science in the entrepreneurial university has been re-contextualized within the context of a knowledge-based economy of competitiveness. I propose a third element to the study of the entrepreneurial turn, one concerned particularly with the semiotic order of a culture of competitiveness.

My initial discussion of the entrepreneurial university consists of two parts: the economic theories intrinsic to the notion of entrepreneurship and their application to higher education, and the power at stake in legitimizing discourses surrounding entrepreneurial universities. I then offer the theories of the triple helix, academic capitalism and cultural political economy to indicate the entrepreneurial university's trajectory towards the mediation of crisis, particularly in its representations of science and technology at once solving pressing human needs and providing the motive for capital accumulation as seen in

the university research magazine. Linking the study of the entrepreneurial university and the discourse of science policy post-1980—the same year as the passing of the Bayh Dole Act which encouraged the marketization of government-funded research at the university—I underscore their role in the political, economic, and cultural conditions of the cultural political economy of research and innovation. I propose using cultural political economy and the "technological sublime" to theorize the semiotic moments of entrepreneurship in the university.

Entrepreneurship

Economic Theorists

Economic historians Hebert and Link (2009) provide an exhaustive review of entrepreneurship theory, clearly indicating their debts to the 18th century French philosopher Richard Cantillon. Cantillon's entrepreneur invests at a certain price to face an outcome of either profit or loss, establishing a thread seen throughout entrepreneurship theory—the link between entrepreneurship and uncertainty. Noted by Hebert and Link (2009), the task of Cantillon's entrepreneur is to predict the wants of the consumers, to be alert to the relation of supply and demand and to act when the market is not in equilibrium. I will address one theorist from each tradition that have the most influence on higher education research.

Schultz. T. W. Schultz approached the theory of entrepreneurship from a human capital perspective, arguing that previous notions of the entrepreneur failed to take into account the non-economic factors of entrepreneurship. Relying on the definition of an entrepreneur as one who deals with disequilibria, Schultz argued that this definition

included those who managed their households and those who exhibited exemplary time management. Schultz also suggested that education furthered people's ability to deal with disequilibria, thus first mentioning the connection between education and entrepreneurship.

Schumpeter. Schumpeter and Opie (1934) is unique in that he leaves out risk and uncertainty from his definition of the entrepreneur, claiming "risk falls on the capitalist . . . or the owner of goods, not on the entrepreneur qua entrepreneur" (p. 74). Schumpeter did not see the entrepreneur as necessarily having capital. Not always interested in financial gain, entrepreneurs are motivated by a substantial legacy, the will to conquer, and the joy of creativity—"exercising one's energy and ingenuity" (Schumpeter & Opie, 1934, pp. 93–94). Schumpeter (1947) describes the process through which entrepreneurs drive the economy as creative destruction—when a new creation challenges the status quo of the existing market. The innovative entrepreneur takes advantage of the new creation, building upon successful innovations. Moreover, the market share of the existing firms decreases as the new market increases in variety and scope.

Shackle. G. L. S. Shackle (1966) associated two roles with the entrepreneur, that of making decisions and bearing uncertainty. Imagination and ingenuity are bound up with making decisions, as is the acceptance of uncertainty. Time and uncertainty are bound together. Time is not boundless, but rather ordered and limited by the consequences of human actions, and in ordering time these actions make history. Uncertainty is characterized by human subjectivity—the extent to which humans are capable of acting creatively in the face of "bounded uncertainty" (p. 86). The enterpriser, a term Shackle

preferred over entrepreneur, is the decision maker and the bearer of uncertainty, thus making history.

Supply-side and Demand-side

Mars and Metcalf (2009) apply the theories of supply-side economics and demand-side economics to the discussion of entrepreneurialism in higher education research. The previous theorists saw the entrepreneur as an individual acting according to market (dis)equilibrium, risking failure to maximize their results on the marketplace. Supply-side economics argues that the individual's drive to behave in an entrepreneurial fashion, to craft an entrepreneurial identity and to share with others, constitutes entrepreneurialism. On the other hand, the demand-side theory looks at the environmental factors driving entrepreneurialism. The environmental factors are influenced at the "federal, regional, local and institutional levels" (p. 20). Market factors are included in demand-side analysis.

Mars and Metcalf operationalize these theories of entrepreneurship into a concise definition. Academic entrepreneurship combines "risk, innovation, and opportunity, particularly in times of uncertain resources" and is seen on a number of scales, such as "individuals (students, faculty, administrators), organizational units such as departments or colleges, or the entire institution." (p. 4). This accessible and applicable definition provides a general framework for conceptualizing entrepreneurship and the university.

Examples in the Literature

Students. The following are examples of literature in higher education focusing on individuals acting as entrepreneurs. The first, the "state-sponsored student entrepreneurs"

who take advantage of an institutional structure that scaffolds their developing enterprises (Mars, Slaughter, & Rhoades, 2008). The second, the social entrepreneurs addressing issues of the public good through "creative destruction" of the status quo (Mars, 2009). Examples include the student-led social entrepreneurship of Global Social Venture Competition at UC Berkeley, student eco-entrepreneurs who apply business solutions to problems in nascent sustainable markets, and U.S. student-led efforts to boost entrepreneurship in Mexico (Cutrer, 2005, Mars, 2009; Mars & Lounsbury, 2009).

Faculty. Scholars also study the role of faculty in entrepreneurship. Lee and Rhoads (2004) found institution-wide entrepreneurial activity. Faculties in the humanities and fine arts participate in freelance activities that are entrepreneurial, but different in nature to the entrepreneurial activities of faculty in the STEM fields. Mars et al. (2008) found materials science and engineering professors' conceptualization of entrepreneurship education closely tied to the market due to their encouragement of technology transfer and development of intellectual property. Humanities and social science faculty perceptions closely related to their disciplines' need for increasing enrollment, diversification of curricula, and alignment with the mission of the university, and demonstrated a social justice perspective.

Individuals in the university exercised influence to determine the rules regulating entrepreneurial science at the university. Analysis of archival records of patenting behavior in the life sciences at Stanford in the 1970's found that technology transfer practices formed before the policies regulating them—individual scientists engaged in unrelated entrepreneurial projects that operated using various practices and rationales about benefits

(Colyvas, 2007). Multiple views on how to participate in entrepreneurial activities formed amongst research labs and their administrators. One researcher agreed to patent his discovery only if the proceeds were donated to the university. Another scientist refused to patent basic research, but justified patenting devices by demanding the proceeds go back to the laboratory. A scientist threatened corporate partners that he will patent "everything in sight" as a way to thwart corporate profiteering. It is important to note that Colyvas (2007) finds that these changes did not necessarily hinder open science, rather they changed the means by which scientists protected their research and its public mission. The rationale and reward schemes were tweaked and re-justified as scientists engaged in entrepreneurial practices, thus recasting the practices of technology transfer (Colyvas, 2007). Moreover, as participation grew, so did the reputations of those involved. This process of recasting, and the increasing prestige of such practices became of a standard part of scientific behavior. Entrepreneurial science became a sign of engagement in the knowledge community, and thus an institutionalized practice in academic science (Colyvas & Powell, 2007).

Organization-wide. Clark (1998) argues that collective entrepreneurial action is at the heart of transformation in the university. The most significant change occurs when individuals—faculty, staff, students, stakeholders—at the unit level organize to enact change to the university's priorities or structure. An entrepreneurial university comes about when these efforts result in institutional bias towards change; no longer enacted through isolated groups, the university exhibits an integrated entrepreneurial culture tying entrepreneurial initiatives with the values and mission of the university. Using Clark's benchmark, Yokoyama (2006) found that universities in the U.K. and the U.S. trended

towards an integrated entrepreneurial culture. Similarly, Nelles and Vorley (2010) term the nexus of internal powers that interact to shape the entrepreneurial agenda of a university an "entrepreneurial architecture." These internal powers—structures, strategies, systems, leadership, and culture—interact to create the entrepreneurial architecture along with the integration of teaching and research responsibilities into the entrepreneurial mission. However, perspectives differ on how the entrepreneurial university is developing. In their studies on 17 Australian universities, Marginson and Considine (2000) determine that universities are becoming more like enterprises as reflected in increased use of external funding and the rise in top-down management styles. Clark (1998), Yokoyama (2006), and Nelles and Vorley (2010) see a more holistic entrepreneurial university. Marginson and Considine (2000) see the entrepreneurial university as a corporatist development.

Neo-liberalism. The entrepreneurial culture is wide-reaching. Collette, Frances, and Claire (2005) demonstrate how the notion of entrepreneurship is important at all levels. On the global level, we are faced with decreased barriers to trade and more open lines of communication and travel, and the concomitant uncertainty. On the societal level we are faced with privatization, deregulation, and concerns for our environment. On the level of the institution we are faced with decentralization, downsizing, mergers, and the need for a "flexible" work environment. On the individual level we are expected to work more for less, possess a wider set of skills, all with a shrinking social safety net.

The ideology of neo-liberalism "normalizes" the risks and uncertainties of our entrepreneurial culture. Drawing on the scholarship of Somers and Black (2005) on the U.S. 1996 Personal Responsibility and Work Opportunities Reconciliation Act, Mars and

Metcalf (2009) note that national law encourages the risk, innovation, and opportunity inherent in entrepreneurship as a possible answer. Moreover, Mars and Metcalf reference the deregulation of markets which indirectly encouraged universities to behave entrepreneurially for resources. The authors conclude by tying the notion of entrepreneurship to prevailing ideology, arguing that personal responsibility and deregulation, when incentivized legally and on the market, is characteristic of neoliberalism—"the belief that that private marketplace is the ideal catalyst for advancing economies and improving the overall conditions of society" (p. 5).

In Chapter I, I explained my intent to provide a Marxist critique using Jessop's strategic-relational approach which holds that the state is a social construction. Thus, I find fault with the critiques above because they leave out the semiotic moments of how the entrepreneurial university is legitimated. How is the entrepreneurial architecture legitimated discoursally? How do institutional actors (faculty and faculty leadership) legitimate their entrepreneurial behavior? I plan to answer these questions university research magazines as data. In Chapters One and in the introduction to Chapter Two I made clear my intent to study the entrepreneurial university's place in the institutional milieu using cultural political economy as a way of theorizing the semiotic moments of the entrepreneurial university. I will proceed to describe and critique what I see as the two major theorizations of the entrepreneurial university—Etzkowitz's "triple helix" and Slaughter and Leslie's "academic capitalism"—paying particular attention to the ways they describe academic entrepreneurship in the sciences. Following this critique, I propose a third element to the entrepreneurial turn which focuses specifically on the semiotic order

of competitiveness within which I locate the university research magazine. Their

representations of the university bringing life-saving discoveries to the public via

entrepreneurial activity is in part an answer to the "technological sublime," or the

representational insufficiency to explain the conjunctures of rapidly developing science

and technology and capital accumulation.

Theorizing the Entrepreneurial University

Triple Helix

The entrepreneurial university operates "with the objective of improving regional

or national economic performance as well as the university's financial advantage and that

of its faculty" (Etzkowitz, Webster, Gebhardt, & Terra, 2000, p. 313). Etzkowitz et al.

(2000) describe the trajectory of the entrepreneurial university across the U.S., Latin

America, Europe, and Asia, concluding that entrepreneurial universities derive from

different origins but share the same outward characteristics. Eastern European countries

developed entrepreneurial universities during financial crises, while U.S. universities

developed an entrepreneurial position because of the influx of money from the federal

government and legislated incentives for universities to market their research. Despite a

difference in origins, entrepreneurial universities are moving toward what Etzkowitz et al.

(2000) termed the "triple helix model" of university-industry-government relations. The

ideal entrepreneurial university pursues financing for research and projects within the

triple helix.

Second revolution. The entrepreneurial university operates as the nexus of

teaching, research, and the capitalization of knowledge—the latest phase in the historical

movement from medieval university where knowledge was preserved to one where knowledge is created, taught, expanded, and built into intellectual and human capital. What Etzkowitz (1983) termed the first academic revolution saw the infusion of the research paradigm into the university teaching mission. The second academic revolution saw the turning of knowledge created in the laboratory into marketable products (Etzkowitz, 1983, 2002; Etzkowitz & Webster, 1998).

Etzkowitz (1983) describes the history and the organizational pathways through which university presidents and entrepreneurial scientists have developed entrepreneurial initiatives. A major observation notes the similarities between professional scientists working in research and development groups in a firm, and academic scientists in "quasi-firms" within the university. While professional scientists of the former variety are distinctly set out of academia, scientists of the later variety remain in academic posts with no recognition of their differences from the traditional academic scientists. Etzkowitz writes, "Two classes are being created within the academic profession: those who produce knowledge which can be made the basis of business enterprises, and those who do not" (pp. 200). The traditional academic scientists' role of teaching and performing basic research has quietly faded, and the role of entrepreneurial scientist has come to the forefront.

University scientists themselves ushered in the era of entrepreneurial science in recognition of the personal and social gains that could come from their discoveries (Etzkowitz, 1983). Etzkowitz (1983) asserts that just as the entrepreneurial scientists started the trend, they can also name the terms going forward in order to protect the universities' interests as places of free-flowing networks of knowledge and emphasis on

the public good. As industry and the government depend more upon the research and development performed within the university, the university's power only increases. Thus the paradox of entrepreneurial science: universities and their scientific faculty have the power to decide if basic research continues as a mainstay of university science (Etzkowitz, 1983).

Etzkowitz and Webster (1998) suggest the second academic revolution foretells a new social compact between higher education and the state in which government support is contingent on the university's contributions to the new economy. This new compact blurs the lines between the traditional role of theory and practice which underlies academia, stating, "Recognition of a congruence between basic research and invention vitiates the ideological separation of these spheres of activity" (p. 42). Etzkowitz and Webster (1998) tell of a systemic change in the academic structure, where faculty are expected to perform basic and applied research with the intent of capitalization and academics not savvy to this change are placed into teaching or administrative roles.

Etzkowitz (2002) describes an "endless transition," in which basic research, applied research, and product development blend as more emphasis is placed on interdisciplinary research. The nature of the university-industry-government triple helix as a "spiral pattern of linkages" will "emerge at various stages of the process" (p. 139). Start-up firms beginning with the university in the form of quasi firms—research groups with firm-like qualities (Etzkowitz, 2003)—will be the outcome of this endless system of transitions and linkages. Universities, market players, and government bodies will grow closer, but universities will also experience more economic autonomy from the creation of

revenue sources after the quasi firms have been turned into fully operational enterprises. Etzkowitz (2002) argues that this will further enhance the former part of this endless transition, research and knowledge production. Research professors, benefitting from the revenue of start-ups, use revenues to support continued research. Practical applications in the marketplace inform research rather than dictating it.

      Triple helix in extremis. Albeit an exciting visual, the triple helix notion suffers from fatal shortcomings. Etzkowitz, in employing a term generally associated with geometry and the biology of DNA, overtly suggests congruence to the university-industry-government relationship that is reflective of something with discernible properties, if not existing in the "natural" world. The extent to which Etzkowitz takes this metaphor of the discernible and "natural" phenomenon of the entrepreneurial university is seen in his extension of it globally; the blanket application of the triple helix indicates the lack of rigor in unmasking the ideologies inherent when power and knowledge are at stake. The result of this, I argue, is what Jessop would call the separation of class struggles into boxes, i.e. economic issues explained by market logic, political issues explained through state logic. Though Etzkowitz's triple helix offers critique of the entrepreneurial university, criticisms of the lack of backbone on behalf of universities and faculty in the midst of industry and government are described as a tertiary effect of the triple helix, a solution to which rests in the realignment of the university in relation to its fellow helices. Rather than arising from any power or ideological issues, the problems and the answers rest with the university.

Still, the study of the entrepreneurial university owes no small debt to Etzkowitz's (2002) conceptualization of the triple helix. His description of a blending of basic research, applied research, and product development is essential to the understanding of the entrepreneurial university as a site of developing science and technology and capital accumulation. Etzkowitz's description of the "endless transition" informs my own argument: the centrality of science and technology within the entrepreneurial university allows its position as a mediator of crisis within the knowledge-based economy of competitiveness. However, studies have taken to a more critical turn, particularly in relation to academic capitalism and cultural political economy. The former allows us to see how universities are essential pieces to the global trade competition, and the latter demonstrating the needs for a third element to the study of the entrepreneurial turn, one concerned particularly with the semiotic order of a culture of competitiveness. I proceed to discuss each accordingly.

The University, The State, The Marketplace

Slaughter and Leslie (1997) and Slaughter and Rhoades (2004) are the seminal works on academic capitalism. Slaughter and Leslie (1997) discuss the policies and finance patterns in the context of academic capitalism—the "market and market-like" efforts used by universities, professors, and researchers to gain revenues from academic projects (p. 8 and 9). Slaughter and Leslie are careful to note, however, that academic capitalism describes not the day to day actions of those within the capitalist state, but rather the "reality of the nascent environment of public research universities, an environment full of contradictions, in which faculty and professional staff expend their human capital stocks

increasingly in competitive situations" (p. 9). In the academic capitalist regime, human capital is the university's fundamental addition to the market. Academic staffs consist of exceptionally well trained individuals whose skills are essential to the "development of the high technology and technoscience necessary for competing successfully in the global economy" (p. 11). Participation in knowledge production on the part of academic staff constitutes academic capitalism.

Academic capitalism. Slaughter and Leslie (1997) discern between the types of market activity in which academic staff participate. Market-like behavior is the competition for funding on behalf of the institution or individual faculty members. This includes competition for grants, contracts, endowments, funding for spin-off companies, even competition for students and their tuition and fees. This competition for funding is high-stakes; if you do not win the grants, contracts, funding, or attract the students, the money will not be recouped through bureaucratic measures. Measures meant specifically for profit, like university industry collaborations, patenting, and licensing agreements are termed market behaviors. Logos, sports paraphernalia, and profit sharing with services such as the bookstore, food service, and residential areas are termed market behavior.

Slaughter and Leslie (1997) trace the development of the academic capitalist regime as an interplay between national economic policies and global competitiveness. To describe national economies, Slaughter and Leslie employ the terms "industrial" and "post-industrial" economies. Former is the "high wage, mass production, and mass consumption" economy of Fordism's assembly line production and Taylorism's highly controlled human management; the latter mode of production, "flexible volume

production," uses fewer workers, more technology, a less rigid management scheme, and requires a more advanced knowledge base. Globally this dichotomy is less clear, for some benefit greatly from industrial to flexible volume production while others struggle; some countries have retained a Fordist manufacturing base and the pro's and con's of such a system.

The globalization defining the post-industrial society is roughly divided into three schools, academically speaking: the Chicago neoliberals, the post-Keynesians, and the post-Marxists. Neo-liberals see the state as merely a policeman for the world, ensuring that the playing field is level for unfettered trade amongst countries. An aim of neoliberal state policy is to reduce taxes and social welfare programs in order to free corporations from excessively burdensome taxes. These corporations in turn must act competitively on the global market place. Keynesian political economics relied on central governments to control the money markets to avoid economic depression. In the United States and Great Britain this was largely accomplished through warfare-welfare spending, but the mobility of money on the global market and the criticism of military spending to stimulate the economy saw a move away from government-controlled markets. Post-Keynesians seek to continue these federal regulated markets through a bottom-up scheme of development, supporting new, high-technology industries and the development of human capital to initiate and support such industry while staying out of economic "planning" measures. Post-Marxists see a new, international division of labor facilitated by nations, or multi-nation states encouraging of policies that offer low wages for workers but high incentives for multinational corporations. As discussed in Chapter One and my

introduction to this chapter, I provide a Marxist critique focusing on the ways state power is (re)produced through a selection of discourses that legitimate certain explanations of crises above others. I add to this critique the notion of the "technological sublime," which is also based off a critique of the technological and scientific discoveries driving capital accumulation.

In the academic capitalist regime, claim Slaughter and Leslie (1997), traditional dichotomies between types of knowledge like basic and applied, science and technology, discovery and innovation, no longer hold. Slaughter and Leslie (1997) connect this with post-industrial national policies focused on global competition. The term they use to describe this new knowledge scheme is technoscience, a way of blending science and product with the intent to create new industries or restructure old. Multinationals and nation states see intellectual property rights as a way of assuring profit from the development of technoscience through the development of legally binding, multinational trade agreements like the European Community, General Agreement on Tariff and Trade, and the North American Free Trade Agreement. These agreements, as seen through legal acts such as the Drug Export Amendment Act of 1986, the Omnibus Trade and Competitiveness Act of 1988, NAFTA of 1993, GATT of 1994 decreased regulation and bolstered intellectual property rights protection. These agreements specifically decreased regulation of biotechnology research which was encouraged by generous tax incentives that made lucrative the research on niche diseases like Huntington's chorea (Slaughter & Leslie, 1997). As sites of research and development performed by scholars, and the

training ground for the next generation of human capital, universities are essential pieces to the global trade competition.

The following describe the breakdown of the traditional dichotomies and incentives in science. Rogers and Bozeman (1997) argue that although it is more expensive, basic research is more commercializable than applied research. Universities financially benefit from publicly funded, basic research as it provides valuable information that can drive market research (Salter & Martin, 2001). Salter and Martin (2001) reference pharmaceutical companies and the chemical industry as beneficiaries of basic research. Furthermore, basic research provides students with the opportunity to learn their trade and develop professional versatility in laboratory-based problem solving. Salter and Martin (2001) find transfer of methodologies and instruments prevalent in basic research, as well as the development of professional networks and the creation of spin-off companies. Trends in research and development show that federal support for basic research grew by half during the 1980s, and remained steady at this rate throughout the 1990s (Geiger, 2004). As a share of GDP, basic research grew from .32 percent in 1980 to .40 percent in 1990 and to .48 percent in 2000 (p. 135). Universities provide two thirds of the basic research in the United States; even applied fields perform a considerable amount of basic research.

The reciprocal effects of applied and basic research indicate the inextricable effects of the market upon knowledge production. Geiger (2004) finds that three quarters of basic research is inspired by considerations other than knowledge for its own sake. In this way, rather than crowding out basic science, the new production of knowledge "includes an

indispensable role for academic research" (p. 139). Research generates further research, and the increasing interconnectedness of scientific research bolsters regeneration. Second, universities actively invest in their research infrastructure and the expertise of their faculty in ways private industry cannot afford. The academic core—the teaching, research and service function of the university—bolsters the university's position to offer both basic research and research tailored to more commercial interests. In support of this, Geiger (2004) points out that the academic core has managed to produce more research from 1980 to 2000 while expanding at a much smaller rate. Biotechnology has proven the most compelling example of how basic research and commercialization facilitate each other.

The term "biocapitalism," coined by Geiger (2004), capture the relationship between academic science and the biotechnology industry in which academic science, innovation, and the generation of capital work together. Universities and private industry work to develop the basic science necessary for research and development. Securing intellectual property rights is the innovative researcher's "upstream" attempt to publish, protect, and develop their work as it moves "downstream" toward the market—metaphors used to describe the movement of research from scientific research toward the market. The result is a "backflow" of revenues to the university to perform research. While secrecy issues abound in this environment, Geiger (2004) notes that clear guidelines encourage researchers to share their findings. Furthermore, Geiger (2004) notes that life scientists have "more to gain . . . from publishing widely and frequently" (p. 229). Biotechnology is the ideal type of university industry relationship, and the characteristics of university-industry relationships are context specific, depending largely on the discipline.

Geiger (2004) claims the successful case of the biotechnology industry is representative of the trends to build university-industry relationship that account for the university's prioritization of their public good focused academic missions.

Academic capitalism in redux. Slaughter and Rhoades (2004) theorize and describe academic capitalism by focusing upon non-profit higher education in the United States—public, private, and community colleges. The state, university, and marketplace are described as colluding in the reproduction of power through "networks of actors that cross boundaries among universities and colleges, business and nonprofit organizations, and state(s)" (p. 9). Another main strength of the work is the authors' ability to drill into particular sites in higher education where academic capitalism shapes and reshapes relationships between the university, corporations, and the state. The particular sites are analyzed with a theoretical lens that threads through the book and is appropriate for describing the trade in knowledge and humans on the academic capitalist market. The authors use Althusser and Gramsci to illuminate "how relationships among market, state, and higher education change as intellectual property becomes the cornerstone of a knowledge economy" (p. 106). Academic capitalism has repositioned the university as an "ideological state apparatus" that reproduces its power through intellectual property. Drawing on Foucault's "disciplinary regimes"—the description of the ways knowledge and power move throughout society—Slaughter and Rhoades discuss the primary roles "economic structures of power, such as business networks" play in the academic capitalist regime (p. 38). The authors depart from Foucault's intricate networks of power, focusing rather on a single network of power—the economic structure.

Slaughter and Rhoades (2004) most succeed at framing through specific examples how academic capitalism has re-positioned the university to reproduce its power. An example of this is their discussion of the university in terms of Castells' "milieu's of innovation" in which intermediating networks in the profit, non-profit, and public sector come together to resolve issues per the "economic structures of power" (Slaughter & Rhoades, 2004, p. 15). Universities and corporations profit from the privatization of knowledge, leveraged by public investment in higher education. The owners of the means of production benefit from this. For instance, Internet 2 is a members-only venture with corporations and universities to harness the internet for commercialization purposes. Universities provide funding, infrastructure, faculty and student support, and a testing environment. Much of the funding is received through federal and state dollars. The corporations are partners with the university, but contribute substantially less. The universities are the "milieus" of innovation for Internet 2; the commodity is developed using university infrastructure, staff and students, who actually test the products themselves (Slaughter & Rhoades, 2004, p. 204). The corporate members can use these innovations for the development of internet based sales and marketing products. This is a privatized venture using federal grants and other public goods to create new capital for the knowledge economy, in stark contrast to the "free world" that the internet was perceived to be in the past.

The Entrepreneurial Turn

Academics in higher education employ "the entrepreneurial turn" to describe the trends discussed above (Goldstein, 2010). "Triple helix" and "academic capitalism" are,

according to Mars and Rios-Aguilar (2010), two of the predominant frames for looking at the entrepreneurial university. Academic capitalism addresses the role of the university as a function of the state and its policies and international agreements. Thus, the university is imbued with the ideology of the state, and the predominant scholars in the academic capitalist camp map out its effects on the university. This sets the study of academic capitalism apart from the simple explanation of reciprocal agreements between the university, state and marketplace as posited by Geiger, and Etzkowiz's description of the triple helix as possessing natural-like properties—properties easily demarcated by market logic and state logic.

In this literature review I propose a third element to the study of the entrepreneurial turn, one concerned particularly with the semiotic order of a culture of competitiveness. This third element builds from the "triple helix" and "academic capitalist" theories in their examination of entrepreneurial science as it relates to the university. Their depictions of academic science in the knowledge based economy are essential to the conceptualization of the entrepreneurial university. But, rather than seeing entrepreneurial science as purely economic or state-driven in nature as do the "triple helix" and "academic capitalist" camps, I see its representation through university research magazines as a response to crisis through which certain discourses are selected and used to (re)produce power. I locate within this response the "technological sublime," or the representational insufficiency to explain the conjunctures of rapidly developing science and technology and capital accumulation. Below I present my own theory of the entrepreneurial university, focusing particularly on scholarship discussing the university in statist, regional, and global scales

using semiotics—a method for analyzing the social production of these networks of power. As such, the goal is to use extant sources and theories of cultural political economy to build a conceptualization of the entrepreneurial university as a function of trans-Atlantic competitiveness in the knowledge-based economy. I will begin by locating discourse as an element in the semiotic

Discourse in the entrepreneurial university. I mentioned in Chapter I Foucault's influence on my theoretical framework. I will reiterate here that Foucault saw the "art" of the state as a discursive practice in which the state monitors its populations and enforces compliance to state projects. I view the university—the state university—as one aspect of the state as a social relation, and thus view discourse as an important part of the legitimation of the entrepreneurial university. Discourse organizes languages and repackages it into reproducible modules (Foucault, 1984). Foucault (1984) breaks discourse down into elements—abstract speech rituals, societies of discourse, doctrinal groups, and social appropriations—but also sees these elements as establishing institutions. The institution of education, for instance, distributes and repackages discourse—educational institutions order discourse and distribute it (often selectively) to maintain social structure, distances, oppositions, and struggles. Education can be deconstructed into the components of discourse, but it also operates as a nexus of power where "discourse is at once controlled, selected, and organized and redistributed by a certain number of procedures whose role it is to ward off its powers and dangers, to gain mastery over it chance events, to evade its ponderous, formidable materiality" (p.109). The entrepreneurial university reproduces power through discourse, and locating this discourse

helps unpack what Foucault (1984) might call the structures, distances, oppositions, and struggles of ideology. It is through locating these discourses that I intend to take a small step toward answering how the university, as a state actor, legitimizes the entrepreneurial university.

I use the discourse of university research magazines to study how the entrepreneurial university legitimizes entrepreneurial science. However, it is important to note the caveat that discourse is not necessarily limited to language. For instance, Fairclough (2003) describes styles as the "discoursal aspect of ways of being," like the dress, behavior, and tone the meaning of which is realized in how a person identifies themselves and how others identify them. The meaning assigned through identification is inculcated in discourse, and thus has real effects on language. I bring this up as a method of contrast—to underscore my decision as a researcher to focus specifically on the language aspect of discourse. The study of language can shine a light on "traces of discourses," and the literature I present below demonstrates how to apply the study of language to detect different entrepreneurial discourses (Baker, 2006, p. 5). This decision also informs Chapter III and Chapter IV, in which I continue to note its consequences and implications. Below I lay out how Jessop's work on the cultural political economy provides a framework for studying the semiotic order of a culture of competitiveness.

Cultural Political Economy

Jessop. It is through the notion of cultural political economy that the university, state, and marketplace can be seen as intertwined in the politics of scale. Jessop (2008) describes cultural political economy as a "post-disciplinary current in institutional and

evolutionary political economy that makes a 'cultural turn' in economic and political studies to enhance their interpretive and explanatory powers" (p. 15). The cultural political economy turns to semiotics, defined by Jessop as "all forms of social production of intersubjective meaning," to interpret and explain the dynamics of capitalism. Jessop (2008) demonstrates a semiotic analysis of the knowledge-based economy as a "hegemonic economic imaginary" (p. 28) that intervenes through semiotics to order economic subsets. These orderings line up with economic and extra-economic material realities.

Jessop (2008) offers the "knowledge-based economy" as one such economic imaginary. The definition of the knowledge-based economy differs, but its implication is that, whether a so-called "public good" or a commodity, knowledge is a real factor in the political economy of a society. Jessop (2008) describes the trend towards entrepreneurial endeavors in the university as an economic and extra-economic material reality of the knowledge-based economy. Although the university and its denizens have historically faced pressure to operate entrepreneurially, the pressure has "been reinforced from the 1980s onwards with the result that many universities have reoriented their activities from teaching towards research to generate patents and royalties" (p. 33). The emphasis on external fundraising efforts like "patenting, technology transfer, research parks, commercial spin-offs, science and technology parks, incubators, consultancy services" have been associated with academic capitalism, a critical term describing the entrepreneurial university and its enterprising faculty. Indeed, kinship exists between academic capitalism and cultural political economy, although the latter adds key elements.

The university and the market co-evolve, in part, as a consequence of policy and practices related to higher education. Jessop's strategic relational approach as described in Chapter One posits that these policies and practices require instantiation and legitimation, and it is this process I wish to study as the mediation of crisis.

Jessop's approach to cultural political economy offers the state as one player in the power network. I will first present the conceptualization of the state as social relation, and then reinforce the need for semiotic analysis in studying how the entrepreneurial university—as a part of the institutional ensemble making up the state—is legitimated in its quest for knowledge and power through entrepreneurial science. The university is also tied to the state through the cultural political economy. As Jessop points out in his discussion of the knowledge- based economy, different nations demonstrate unique strategies in the take-up and implementation of related policies. More than policy intertwines the state and the university, though, for the state and university share a relationship based on the reproduction of knowledge and power. Defined by Poulantzas via Jessop, the state is a "social relation" constituting the balance of power between social forces, and an "institutional ensemble" of conflicting motives. Paraphrasing Poulantzas, Jessop writes "its different apparatuses, sections, and levels serve as power centers for different elements among the popular masses. Thus the state must be understood as a strategic field formed through intersecting power networks that constitutes a favorable terrain for political maneuver by the hegemonic fraction" (Jessop, 2008, p. 123). As a state apparatus, education establishes the national language and accepted modes of writing, as well as

reproducing the mental-manual division of labor, all reinforcing a balance of power favorable to maintaining the distribution of knowledge and power.

From the perspective of political economy, semiosis can both interpret and in part explain economic and political realities, and the "making and remaking of the social world" (Jessop, 2008, p. 16). The interaction of the market, state, and university in an entrepreneurial paradigm is manifest in the policies of the state and the university. Of particular interest to this paper is how the study of cultural political economy can interpret and explain the role of university in shaping science policy, asking how the entrepreneurial university makes and remakes the social world through discourse. Or, as described earlier, the selection of particular discourses to legitimate explanations of crises over others. I would like to take the time now to reinforce and restate the questions I used to critique the literature on the entrepreneurial university for ignoring the semiotic moment of legitimation: How did academic entrepreneurship in the universities become a way of answering to the pressing human needs? How is this made to seem normal? That is, how do actors within the institutional and organizational ensemble that makes up the state legitimize entrepreneurship through the type of discourses selected?

In trying to answer these questions I have brought into the discussion the theoretical literature on the entrepreneurial university. I first offered Etzkowit's "triple helix" of university, industry, government relations, and secondly Slaughter and Leslie's (1997) academic capitalism of the state, the university, and the market and the variations thereof all of which see the state, university, and marketplace as a relation largely grounded and shaped by national-level public policy. I critique each theory as seeing entrepreneurial

science as purely economic or state-driven in nature. I then introduced Jessop's description of the cultural political economy in which he calls us to examine how the university, as a part of the institutional ensemble of state power, semiotically (re)produces power. In these discussions we have arrived at what is at stake in the third leg of the entrepreneurial turn—the semiotic order of a culture of competitiveness.

Below I discuss the competition for prestige and resources inherent in science policy's quest to address global challenges such as economic crises and stagnations and climate change, and the boons of putting the cultural political economy of research and innovation in conversation with the entrepreneurial university. As informed by the examples of basic science turned entrepreneurial science, competitiveness is seen in a struggle for power and knowledge in the very functions of a university. I discuss how this has been applied to science policy, and expose a gap within the literature on science policy and the university vis-à-vis cultural political economy. I argue that in order to take the cultural turn seriously, as cultural political economy demands, studies of how the university legitimates entrepreneurial science need to take into account the "technological sublime" as a touchstone for the various crises which academic entrepreneurship in the sciences addresses.

<div align="center">**Competition for Knowledge and Power**</div>

Cultural Political Economy of Research and Innovation

The notion of the entrepreneurial university is a particular lens through which examine the university as a site of the reproduction of knowledge and power, because its legitimation rests on a selection of discourses that normalize academic entrepreneurship. A

cultural political perspective on science policy might demonstrate how issues of knowledge and power at stake in analyzing basic science in the entrepreneurial university by confronting issues effecting science policy previously back grounded, such as markets and exchange, and the relationship between the state, citizen, and government. Offering a "cultural political economy of research and innovation" as a socio-historical method for examining the trends of science policy, David Tyfield (2012) writes that "the challenge for contemporary science policy studies is thus how to examine, identify and hold to account an assemblage of science practices and their political/economic/cultural conditions that is still emerging and of uncertain forms" (p. 151). Tyfield works through three periods that shaped science policy.

The first, the techno-statist Keynesian governance, responded to the crisis of the defeated Fascists and the rising Soviets by forming state supported, but ideologically "free" division of science. The second, a neo liberal marketplace of ideas in which the search for knowledge is no longer sought for the sake of the "public good"—defined in techno-statist Keynsian terms as "material improvement to satisfy working populations, and defeat the Soviet Union militarily if necessary"—but rather market forces (Tyfield, 2012, p. 154). For Tyfield, neoliberalism means "a political project that must itself be constructed through a state, which in turn increasingly subjects itself to market discipline" (p. 155). Bob Jessop (2008) uses neoliberalism and the knowledge-based economy in the same breath; trans-national neo-liberalism is a part of a set of economic imaginaries oriented to a "globalizing knowledge-based economy" (p. 29). Slaughter and Leslie (1997) and Slaughter and Rhoades (2004) use neo-liberalism to theorize the notion of the

"academic capitalist/knowledge learning regime" (p.22). In response to the legitimate expert knowledge in technostatism, and the profit-maximizing of neoliberalism, a more contemporary paradigm of science and technology studies came on the scene. Co-productionists seek a broader discussion exploring the ways science and policy inform each other with the goal of fostering public participation in science policy. Tyfield's cultural political economy of research and innovation seeks to analyze science politics using the categories of market/exchange, and state/citizen government that have heretofore been neglected. Science policy does not exist in a vacuum, and an examination of the semiotic factors that drive science policy ala cultural political economy highlights the interplay between knowledge and power.

   Transitioning discourse of science. As suggested by Tyfield (2012), crises shape science policy, and these crises are driven by socio-cultural elements described in political economy. The "ideologies" of science have transitioned at a number of crucial points in history, like the transition from "pure" to "basic" science in the industrial age, the dawning of the scientific-public-government relationship during the interwar years, and the post-World War II era in which scientists expected both federal funding and the privileges of autonomy (Kline, 1995; Tobey, 1971; Greenberg, 1969). Of most concern to this paper is the transition of science policy from supporting the scientific norms observed by Robert Merton in 1942—universalism, communism, disinterestedness, and organized skepticism—to market-associated endeavors like technology transfer in the 1970's (Merton, 1973; Colyvas, 2007; Colyvas & Powell, 2007). For the purposes of explaining the response to crises in science policy I begin with the passing of the Bayh-Dole Act of

1980, which is referenced by a number of scholars in the field as the beginning of the

market-driven scientific research in universities (Mars & Metcalf, 2009). Owen-Smith and

Powell (2001) refer to the 1980s as the beginning of a "sea-change in relationships between

universities, industry, and the federal government" (p. 2). The next few paragraphs trace

this sea change through the discourse of university presidents speaking before Congress,

discourse on the function of the university, and the discourse of faculty and policymakers.

University presidents' speeches before Congress from 1980—1985 problematizes

the movement from basic research to applied research (Slaughter, 1993). During this

period the policies of the Reagan administration sought to deregulate, privatize and

commercialize science research (Slaughter, 1993). In 1981, President Robert Q. Marston

of The University of Florida spoke to the benefits of basic research, praising the

impartiality of a politically disinterested university performing research with state dollars

for the public good. According to Marston, the impartiality of science was necessary for a

civil society, thus making civil society beholden to the university; autonomous basic

science generated a public good that reached all regardless of social status, and upon which

the progress of society depended. President Wyatt's 1983 account of science differed from

Marston's (Slaughter, 1993). With the nation in recession, and non-military research and

development funds falling, the process of privatization of science was well under way.

Presidents of universities sought a type of basic research endeavor that accounted for the

needs of industry over the type of basic research led by autonomous faculty members.

Innovation was seen as a three-step process, from basic science research, to the

intermediate process of development, and finally to the creation of industry-specific

versions of the product. University presidents wanted to focus on the second step, believing that the trajectory of research was more important than basic discoveries. Slaughter (1993) argues that those in the public and private arena privileged to use public funding for the benefit of a small group of people comprise the institutional class.

Calvert (2006) discusses the changes in the discourse of basic research from the scientist's perspective as well as that of the policymakers. "Basic research" is defined in different ways within the same interview with scientists and policymakers prompting some to argue the futility of the basic/applied dichotomy. Calvert argues that these terminologies provide a useful "shorthand" for scientists and policymakers. Scientists use it to their benefit when interacting with policymakers. Policymakers see it as a useful tool the replacement of which would cause too much confusion, and subject policy makers to the criticism of undue influence upon the "norms" of science. Calvert writes that across disciplines basic research "is an important constituent of a broader ideology about what research should be and that it is intricately tied up with the image that is projected about what it is to be a scientist" (p. 217). Scientists protect their autonomy and knowledge seeking image by strategically employing the term "basic." Calvert (2006) leaves room for future research into the complexities of basic research.

The literature above discusses transitions in the discourse of science policy as they relate to a response to "political" crises. I suspect that a discourse of entrepreneurship in the university legitimates the entrepreneurial university as a response to crisis. Following the framework of Jessop's cultural political economy, which holds that the state is a social relation the legitimacy of which is the selection of particular sets of discourses, I propose

theorizing the semiotic moments of academic entrepreneurship. Moreover, I find it necessary to expand the notion of crises from its boxes of "political" and "economic" to one more appropriate for capturing the crises felt amidst the representational insufficiency to explain the conjunctures of rapidly developing science and technology and capital accumulation. Thus, Jessop's cultural political economy and the "technological sublime" serve as theoretical catalysts for the explanation of how discourses of entrepreneurship are legitimated—how they are taken as acceptable, commonsense, normal, and how they are needed by the public as a ways of dealing with crisis.

Conclusion

This literature review set up the discussion of the entrepreneurial university by discussing the need to bring the issues of power and knowledge to the study of science policy. As has been demonstrated throughout the review, the entrepreneurial university represents a confluence of social, economic, and political forces that seek to promote the neoliberal ideology through emphasis on personal choice in the marketplace and global competitiveness. This has led to the commodification of knowledge, turning the pursuit of science once thought of as "basic" into the pursuit of monetary gain. Although a supposedly "public good" agenda survives in the pursuit of science, the overall agenda has turned towards the generation of financial resources. Furthermore, academic capitalism has become a tool used for the pursuit of a trans-Atlantic notion of competitiveness in the knowledge-based economy, a trend which has brought on even more changes to the conceptualization of what an education means, and how knowledge is used in the university. Future research should focus on the North American side of this trans-Atlantic

competitiveness. I propose to do this through looking at how science, as a reflection of the

cultural political economy at work, has been couched in the discourse of the

entrepreneurial university as a response to the crisis of competitiveness.

CHAPTER III

METHODS

In this chapter I propose and justify a focus on the university research magazine as textual evidence of the mediation of crisis, the conceptual umbrella under which I locate the discourse of entrepreneurialism. I pose these two general questions: How does the genre of the university research magazine mediate the crisis of competitiveness amidst the variables of technology, health, and economy? In what ways do the generic features of university research magazines construe and construct the notion of academic entrepreneurship as a strategy for competition in the global, knowledge-based economy?

I ask these specific research questions:

RQ1. What is discursively unique about UNC Chapel Hill's *Endeavors*, NC State *Results*, and *UNCG Research* to the Corpus of Contemporary American English (COCA)?

RQ1A. What is lexically unique in each university's magazine?

RQ1B. How do these keywords cohere in thematic clusters across university magazines?

RQ2. Which, if any, of these salient lexical items indicate discourses related to entrepreneurialism?

RQ2A. What keywords indicate academic entrepreneurship in the sciences?

RQ2B. Which of the above keywords were most salient in describing activities related to academic entrepreneurship in the sciences?

RQ3. How do the generic features of these texts function toward the legitimation of the entrepreneurial university?

RQ3A. What are the semantic relations between sentences and clauses?

RQ3B. What are the semantic relations between words?

In answering these questions I use corpus linguistics to identify unexpectedly prominent lexical items compared to the Corpus of Contemporary American English to develop semantic categories related to entrepreneurialism. I use this information to identify texts with these lexical features, and then use critical discourse analysis' operationalization of genre to examine the texts in more detail.

The Corpus-based Approach

The combination of critical discourse analysis and corpus linguistics is a relatively new enterprise. I want to make clear from the beginning the overarching reasons to employ critical discourse analysis and corpus linguistics, the types of decisions inherent in their combination, and the questions that arise when these decision are made. Baker et al. (2008) write that neither critical discourse analysis nor corpus linguistics are associated with a specific methodology or set of methodologies, but are grounded in theoretical concepts. Critical discourse analysis employs qualitative and quantitative methods suited to the investigation of a socially situated problem, taking "into account analysis of the social, political, historical and intertextual contexts, which go beyond analysis of the language within texts" (pp. 273–274). Corpus linguistics employs quantitative and qualitative

methods and statistical testing on large collections of "naturally occurring," electronically coded texts (p. 274). While corpus linguistics analysis employs both qualitative and quantitative methods, the approaches to employing them differ greatly.

        The combination of critical discourse analysis and corpus linguistics speaks to decisions made by the researcher regarding their approach to the data—the decision made between a corpus-driven research design and a corpus-based research design. Stefan Th. Gries describes the former as a "bottom-up" approach to the corpus that aims "to build theory from scratch, completely free from pre-corpus theoretical premises" based "exclusively on corpus data," and the latter as approaching data with "moderate corpus-external premises" (p. 328). When a researcher builds a theory from an analysis of the corpus, the researcher is employing a corpus-driven approach. When a researcher starts the analysis with a theory that is not based on any analysis of the corpus, then the approach is corpus-based. The use of critical discourse analysis in corpus linguistics presupposes a corpus-based research design. I choose to approach corpus linguistics using the theories of critical discourse analysis, particularly as described by Norman Fairclough (1993, 1995, 2003, 2006) and executed in Mulderrig's (2011) corpus-based critical discourse analysis. I engage in a corpus-based approach. Because of this, I must grapple with the questions and issues surrounding my decision, and in particular how they speak to the combination of critical discourse analysis and corpus linguistics.

        Seldom do researchers take advantage of the useful "methodological synergy" offered by the combination of critical discourse analysis and corpus linguistics (Baker et al., 2008). Perhaps this is because of critical discourse analyst's unfamiliarity with the use

of computerized technology (Baker, 2006). Or, as Baker is quick to add, it could be because of a few nagging questions: What about words that are not present in the text? How can we examine the ideology in text if we do not know the context of production? How do we know that frequent patterns found in texts represent mainstream ways of thinking?

While Baker poses good questions, I find Elena Tognini-Bonelli (2001) brings the limits of critical discourse analysis and corpus linguistics to a boil. Tognini-Bonelli underscores the limits of a corpus-based approach, saying it focuses specifically on pre-existing categories and uses the corpus evidence as an "extra bonus rather than as a determining factor with respect to analysis" (p. 66). The researcher employing a corpus-based approach, Tognini-Bonelli suggests, relies on deductive reasoning that leaves out of the analysis much of what is said, and not said. Moreover, Tognini-Bonelli goes so far as to suggest that the corpus-driven approaches are more rigorous because they develop a theory based off inductive evidence, and because of the high standards for developing a theory computerization demands. My question, why should critical discourse analysts bother with corpus linguistics, given that corpus-based approaches might preempt statistical analysis by annotating their corpora, and truly corpus-driven approaches are unavailable to those applying critical discourse analysis?

Answering the questions involves value assumptions reflective of the difference between qualitative and quantitative researchers. I fall into the qualitative category, as my commitment to a theory of language—critical discourse analysis—informs the application of corpus-based analysis, and addressing this before any analysis goes under way is

paramount to ethical research. But even still, corpus linguistics forms a cornerstone of my analysis because it allows me to pinpoint keywords at a level of statistical significance. First, I use keywords to figure out what is unique about each magazine. Secondly, I use qualitative methods aided by information from quantitative analysis to select data points that indicate academic entrepreneurship in the sciences. Third, I use the tenets of critical discourse analysis to study how, in a selection of texts, genre features legitimate academic entrepreneurship. Throughout this methods section I will continue noting benefits to corpus linguistics and critical discourse analysis, but I wanted to make clear my grappling with the consequences of this decision, methodologically speaking, and my rationale for proceeding with this combination.

The following are the steps I take in my research:

1. I create a corpus of university research magazine using critical discourses analysis, which puts my research in the corpus-based approach.

2. In analyzing the data, I use corpus linguistics to identify themes within each university's research magazine. In doing so I apply the statistical analysis of corpus linguistics to identify keywords.

3. I analyze these keywords using concordance analysis and collocate analysis to verify their relationship to academic entrepreneurship in the sciences (collocation analysis also involves a statistical method). Using this data I select keywords relating to academic entrepreneurship in the sciences.

4. I use these themes to identify texts in which these themes are present. This will involve a systematic selection of texts, which will draw largely from the concordance and collocate analysis in number 3.

5. I use a critical discourse analysis lens to interpret my findings.

The diagram in Figure 2 illustrates how these steps line up with corpus-based approaches.

It is also important to disclose my decision as a researcher to explore the language aspects of discourse. As I mentioned in Chapter II, discourse, not necessarily limited to language, can be inculcated through certain ways of being (tone, dress, mannerisms, etc.). My use of corpus linguistics to detect traces of discourse in language follows in the work of Paul Baker (2006), whose work describes how lexical patterns within a text point to various discourses. For instance, a researcher can ferret out prevalent discourses by tracing the words that co-occur in a statistically significant way around a given subject, a process described later in this chapter as "collocation." It is in this vein that this dissertation seeks out discourse by analyzing lexical patterns.
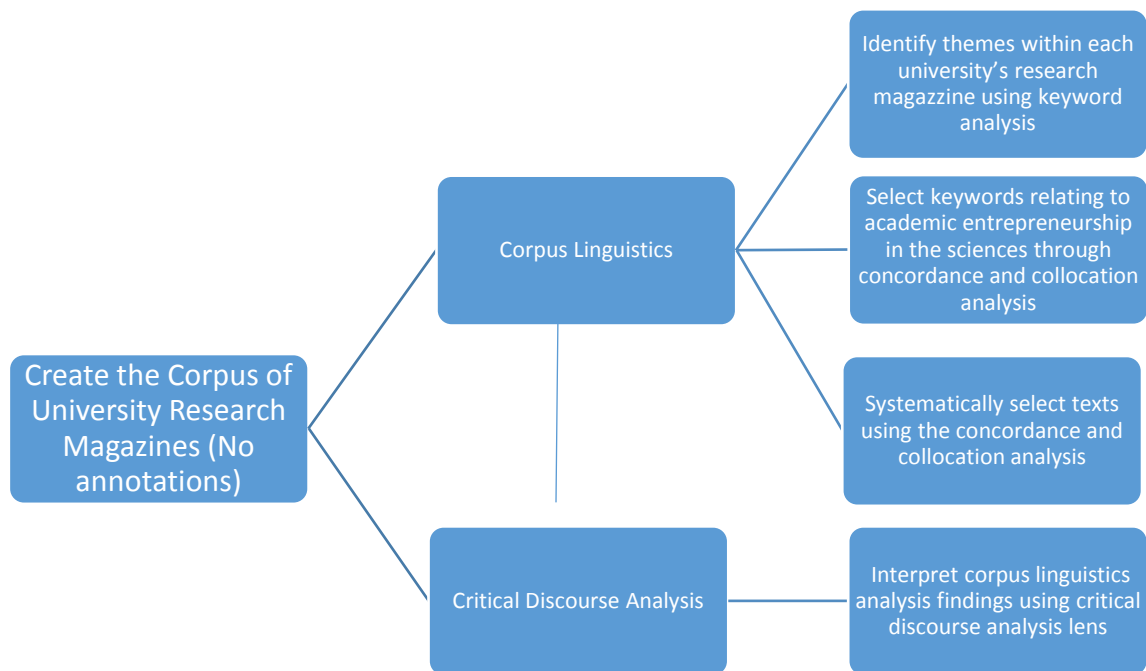
Figure 2. The Iterative Process of a Corpus Analysis with Features of a Corpus-based Approach.

Data Set

As mentioned in my discussion of the iterative process, I collected data in order to analyze the keywords in each university's set of publications, and then to select texts from each magazine related to themes of academic entrepreneurship in the sciences. This will involve describing the similarities and differences in the research magazines. I want to describe the universities from which I collected this data. I selected the university research magazine as data because of their textual representations of academic entrepreneurship as a response to crisis. Data include research magazines published by three public universities within the state of North Carolina: The University of North Carolina at Greensboro, The University of North Carolina at Chapel Hill, and North Carolina State University.

Table 1

Number of Publications in Intervals

Interval	NCSU	UNCCH	UNCG	Total
2003–2005	7	9	3	19
2006–2008	9	9	3	21
2009–2011	7	9	3	19
2012–2013	4	3	2	9
Total	27	30	11	68

Table 2

Word Count in Publications

Interval	NCSU	UNCCH	UNCG	Total
2003–2005	40,311	146,295	45,213	418,125
2006–2008	48,701	226,598	53,416	604,014
2009–2011	55,357	216,361	53,041	541,120
2012–2013	58,612	150,629	35,758	395,628
Total	202,981	739,883	187,428	1,130,292

The University of North Carolina at Greensboro is a public research university with high research activity, and "community engagement" in curriculum, according to the Carnegie Classification. The university offers three doctoral degrees in 18 areas of study, 72 master's degrees, four MFAs, as well as post-master's certificates and post-baccalaureate certificates. Its graduate student population totals 3,474 students; its undergraduate population totals 15,173 students. The universities most prominent research initiatives are the Gateway Research University Park, and the Joint School of Nanoscience

and Nano-engineering, both done in partnership with North Carolina A&T State University (North Carolina at Greensboro, 2013). According to The Office of Sponsored programs at the university, the total grant dollars earned during the 2009–2014 fiscal years was $956,636,285, making it the lowest earning of all three schools in this study (North Carolina at Greensboro, 2015). The University of North Carolina at Greensboro's research magazine, "UNCG Research," is published yearly through the Office of Research and Economic Development. Their mission is to "highlight UNCG excellence at the intersections of discovery, economic development, community engagement, and graduate and undergraduate education."

North Carolina State University is a research university with very high research activity, according to Carnegie classification. In 1987 the school created the Centennial Campus as a way to bring together "academic, corporate, government and nonprofit leaders to partner in teaching, research and economic development" (NC State, 2015a). The school's population consists of 9,473 graduate students, and 24,536 undergraduate students, and 8,080 faculty and staff.   The university offers 160 master's degrees and 60 doctoral degrees. According to their graduate school's website, NC State is "nationally recognized as a leader in science, technology, engineering, and mathematics" (North Carolina State, 2015b). They also offer degrees in "emerging" fields such as "geonomics, biotechnology, biomedical engineering, nanotechnology, natural resources, and geographic imaging science." According to the information in their Sponsored Programs and Regulatory Compliance website, their total grants received for fiscal years 2009–2014 total $1,581,900,000 (North Carolina State University, 2015b). North Carolina State

University's research magazine, "Results: Research, Innovation, and Economic Development" is published twice a year through the Office of the Vice Chancellor for Research, Innovation and Economic Development.

The University of North Carolina at Chapel Hill is the only AAU member in the UNC system. The university offers 112 master's degree program, 68 doctoral programs, and seven professional degree programs. There are 8,000 graduate students, 2,300 professional students, 17,500 undergraduates, and a faculty body of 3,600 (University of North Carolina at Chapel Hill, 2014). The university boasts a number of accolades in regards to their research activity, including first in an eight-way tie as the best national research university, ninth in federal research and development expenditures, eleventh in overall research and development expenditures, seventh among all universities in Health and Human Services expenditures, and is ranked 47th amongst the world's top 400 universities in Times-Higher Education rankings (University of North Carolina at Chapel Hill, 2015). The University of North Carolina at Chapel Hill earned the largest amount of grant dollars during the 2009–2014 period, at $4,645,365,962 (North Carolina at Chapel Hill, 2015). The University of North Carolina at Chapel Hill's research publication is titled "Endeavors." Published by UNC Research, the mission of the magazine is to "engage its readers in the intellectual life of the university by conveying the excitement of creativity, discovery, and the rigors and risks of the quest for new knowledge." Unique to this magazine is that in 2011 the print edition of the magazine was discontinued for a blog. The articles from the 2012-2013 blog entries were collected from the website and collated into yearly editions by the researcher.

Table 3

Reported Grant Dollars

Fiscal Year	NCSU	UNCCH	UNCG	Total
2009	$206,100,000	$716,274,113	$133,166,021	$1,055,540,134
2010	$266,100,000	$803,358,125	$198,769,044	$1,268,227,169
2011	$286,100,000	$788,025,111	$186,330,612	$1,260,455,723
2012	$286,100,000	$767,141,341	$171,196,278	$1,224,437,619
2013	$229,200,000	$777,838,266	$150,362,452	$1,157,400,718
2014	$308,300,000	$792,729,006	$116,811,878	$1,217,840,884
Total	$1,581,900,000	$4,645,365,962	$956,636,285	$7,183,902,247

Note. Figures are aggregated from reports: North Carolina at Greensboro, 2015; North Carolina State, 2015c; UNCCH, 2015b.

Corpus Linguistics

In describing my iterative process I laid out a very general explanation of corpus linguistics. In the following paragraphs I will describe the specific uses of corpus linguistics and its terminologies. I will also specifically address the research questions and the applications of corpus linguistics I use to answer them.

Corpus linguistics is the use of quantitative and qualitative methods to study large bodies of electronically encoded, and hence machine readable text to analyze patterns in naturally occurring text, what Baker describes as "using frequency information about occurrences of particular linguistic phenomenon" (Baker, 2006, p. 2). These bodies of texts generally consist of thousand to millions of words, and are often selected for their representation of a particular type of language. For instance, Baker et al. describe the *Discourses of Refugees and Asylum Seekers in the UK Press 1996–2006* as "a

140-million-word corpus of British news articles about refugees, asylum seekers, immigrants and migrants" (p. 1). A benefit of corpus linguistics is that large word counts and electronically encoded texts lend themselves to statistical analyses of word patterns and frequencies using a computer which may reveal non obvious meanings (Partington, 2010). It is important to note, however, that corpus linguistics involves both quantitative and qualitative analysis; as Biber, Conrad, and Reppen (1998) write, "Association patterns represent quantitative relations, measuring the extent to which features and variants are associated with contextual factors. However, functional (qualitative) interpretation is also an essential step in any corpus-based analysis" (p. 4). Associated patterns involve the sorting of words through collocation, key word or frequency analysis, and this is usually performed through a lexical analysis software capable of performing statistical tests. Functional interpretation involves the determination of which texts belong in the corpus, the techniques for analyzing the data, the cut off points for statistical significance, and an analysis of concordance. Each of these is qualitative in nature and inform the quantitative analysis of the texts; the researcher consults the texts to observe their relationship to the theoretical dimensions of the study and how best to operationalize the quantitative analysis.

Corpus linguistics analysis, when informed by critical analysis, intends to uncover hegemony through a systematic analysis of texts. There are a few benefits of performing this socially oriented analysis using corpus linguistics. Baker (2006) argues that the benefits of corpus linguistics as a method for critical discourse analysis is a reduction in researcher bias due to the use of computerized linguistic analysis, being able to uncover the

incremental effects of discourse (i.e., linguistic features that appear at a statistically

significant level versus those that are relatively rare), discourses resistant to hegemony,

and triangulation or the use of several methodologies to verify the findings. Research

benefits from using corpus linguistics as a verifiable and reproducible method for

uncovering hegemony in large bodies of work.

Corpus Linguistic Analysis

In my description of corpus linguistics I use a few key terms that require

explaining: collocation, key words, frequency, and concordance:

Key words are the words in the corpus whose appearances are different from those

of a reference corpus at a statistically significant level. Wordsmith's software defaults to

$p < .000001$. In constructing a keyword list, Baker encourages exploring different

significance levels to arrive at the most salient keywords. Once the keywords have been

determined using the test of statistical significance, a keyness score allows the researcher

to sort further. A positive keyness score indicates the word is that much more often to occur

by chance compared with the reference corpus; a negative keyness score indicates the

words are occurring that much less by chance that in the reference corpus. The reference

corpus is either a general reference corpus like the British National Corpus consisting of

"one hundred million words of written and spoken data" (Baker, p. 30), or a specialized

corpus like the Michigan Corpus of Academic Spoken English "consisting of transcripts of

spoken language recorded in academic institutions across America" (Baker, p. 26).

Mautner (2009) also describes "do-it-yourself corpora (DIY)" created to answer smaller

scale, specific research questions (p. 132). In Baker et al.'s description of the *Discourses of*

Refugees and Asylum Seekers in the UK Press 1996–2006 study demonstrates the grouping of keywords into "specific topics, metaphors or topoi" using concordance analysis (p. 278).

A c*oncordance* is the co-text of a keyword or cluster, usually within five words to the left or right of said keyword or cluster. While a lexical analysis software can display a concordance list, the significance of the concordance must be determined by the qualitative analysis of the researcher. Concordance analysis relies on the researcher's understanding of context, thus addressing many of the concerns that corpus linguistics ignores contextual issues in favor of quantitative analysis.

Collocation is "the above-chance frequent co-occurrence of two words within a pre-determined span, usually five words on either side of the word under investigation (the node)" (Baker et al., 2008, p. 278). The collocate is statistically determined by the "frequency of the node, the frequency of the collocates, and the frequency of the collocation" (p. 278). The use of collocation is to confirm or reject the assumption of a node's associated verbal loading, or what Mautner (2009) describes as "collocational 'baggage'" (p. 133). The collocation analysis is a way to explore the chance of certain words occurring next to each other.

Keywords and *collocates* are generally determined by statistical measurements. The log-likelihood is meant to determine how surprising a word is even if it occurs once in the text, and has been held up as a valid measurement of a the most "surprisingly frequent words" (Kilgariff, p. 239, 2001). The appeal of log-likelihood's ability to measure the "surprisingly frequent words" is that, according to Dunning (1993), it is the surprising words that have the largest impact on the significance of a text.

In corpus linguistics, words are necessarily grouped by *lemmas, word groups,* and *semantically related words*. Lemmas groups are those grouped together because they share a stem, like grouping entrepreneurship, entrepreneurial, etc., under entrepreneur. Word groups are those grouped together by a theoretical perspective of the researcher. Semantically related words are related by either preference or word choice. For instance, "glass of" shows a semantic preference for cold drinks (Baker et al., 2008), semantic prosody is described as the "consistent aura of meaning with which a form is imbued by its collocates" (Louw, 1997, p. 157), and discourse prosody spans over more than one collocate, like "causes" being associated with a negative word like "crashes," "cancer," "mayhem." Semantically related words are often determined by collocation analysis.

Identifying Lexical Items

I used corpus linguistics to answer RQ.1, RQ.2. In the following paragraphs I describe the exact steps I took to answer each question.

RQ1. What is discursively unique about UNC Chapel Hill's *Endeavors*, NC State *Results*, and UNCG *Research* to the Corpus of Contemporary American English (COCA)?

RQ1A. What is lexically unique in each university's magazine?

The following is the process I followed to create a keyword list for each university's magazine. Keywords are defined as words that are unexpectedly more frequent in a main corpus compared to a reference corpus. Wordsmith's keyword analysis produced a list of key words, in no less than 5% of the texts, minimum frequency of 3, $p < .0001$. I use log-likelihood to determine this measurement. I generated the reference list

from the COCA, which consists of 440 million words of full text data from 1990 to 2013. I

selected a sub corpus of the COCA, a collection of magazine text consisting of 429, 467

words, to compare to my collected text of university research magazines. The research

magazines and the reference corpus match in their intent to communicate to a larger

audience. The comparison of the sub corpus of the COCA's collection of magazines to the

university research magazines generated a keyword list for each magazine.

I lemmatized the keywords list to hone my understanding of what the corpus is

"about," as suggested by Baker (2006). Lemmatization is the process of selecting "a set of

lexical forms having the same stem and belonging to the same major word class, differing

only in inflection and/or spelling" (Francis & Kucera, 1982, p. 1). Additionally, I created

and applied a stop list of function words to further hone my understanding of "abouteness."

Baker (2006) suggests setting aside function words in favor of the lexical words in the

corpus. Function words include auxiliary verbs (do, does, did), conjunctions (however, as

long as, so . . . that, thus, but, instead, because), determiners (two, their, the, a number of,

one half, a little), prepositions (as, of, next to, in view of, until, circa, along, amid), and

pronouns (I, he, we, me, him, us). They are commonly used but of "ambiguous lexical

meaning" (Sequence Publishing, 2015), and as such reveal little about what is unique in a

corpus. I collected a set of function words from an on-line resource created by linguists

interested in providing software solutions for researchers (Sequence Publishing, 2015). I

used this file to create a stop list in the Wordsmith software. A stop list is defined by

Wordsmith as a list "of words which you don't want to include in analysis." Using the key

word list to which lemmas and stop list was applied, I removed any conjunctions of

functional words, like "Don" for "Don't," "ISN" for "ISN'T," etc. I also removed

abbreviations like "EDU" and "DR." I performed this for the first two hundred words, as

ordered by frequency. Also, non-standard portmanteaus like "therightidea," and single

letters were removed. I then removed proper nouns referencing specific universities,

geographic locales, and first and last names. I also removed words that one would expect to

find in a university publication, such as "professor," "assistant," "chancellor," "student,"

"dean." The results of the above process is shown in Appendix A.

RQ1B. How do these words cohere in thematic clusters across university

magazines?

To group keywords into meaning categories representing discourses, I qualitatively

coded groups of words across each university's magazine using concordance analysis to be

sure of how the word was being used, e.g. sorting out specific brands or procedures from

someone's last name. I selected the words by identifying a theme from one university's

collection and then searching for it throughout each magazine. Words were chosen that

could be collected into robust but easily discernable themes across the collection of words;

the word groupings needed to be general enough to span throughout the magazines, but

specific enough to fit into a readily identifiable group. To form a grouping the word had to

be used in at least one other collection. The need to account for differences and similarities

between the magazines was also take into account. The following are the groupings of

words: general local, campus based entrepreneurial initiatives, humanities, performing

arts, social categories, name of a specific company or product, living things other than

human, disease, energy related. The groupings were chosen to specify topical similarities

and differences between magazines. The differences between how these groupings play out across universities and represent missional differences will be discussed in Chapter Four. In the proceeding question, I am mainly interested in the theme of academic entrepreneurship in the sciences.

RQ2. Which, if any, of these salient lexical items indicate discourses related to entrepreneurialism?

RQ2A. What keywords indicate academic entrepreneurship in the sciences?

I selected key words from each university magazines having to do with academic entrepreneurship in the sciences, the main theme in the literature on the entrepreneurial university, as demonstrated by Chapter II (see Table 4, titled *Academic Entrepreneurship in the Sciences across Universities*). Looking at the data, I developed running hypotheses about which words represented academic entrepreneurship in the sciences. I tested these running hypotheses by using concordance analysis.

The above analysis produced different results for each university. The variations in keywords demonstrated through RQ1 demonstrate a difference in discourse and content among the university research magazine. This gives me the opportunity to explore the complexities in how each university's research is represented through their publication. "Grant" shows up in Chapel Hill and Greensboro's magazines. "Technology" shows up in NC State and Greensboro's magazine. Develop* shows up in all three magazines. "Drug" shows up in Greensboro and Chapel Hill's magazine, but "medicine" was used in Chapel Hill's magazine and NC States. It is also worth noting that I included "vaccine," "treatment," and "therapy" because of their close association with "drug" and "medicine."

The remaining words are descriptors of the process of academic entrepreneurship in NC State's list: innovation, industry, economic, commercialization, entrepreneurship, venture, innovative, startups, commercializing.

Table 4

Academic Entrepreneurship in the Sciences across Universities

NC State	Chapel Hill	Greensboro
TECHNOLOGY	MEDICINE	GRANT
INNOVATION	DRUG	TECHNOLOGY
DEVELOPMENT	VACCINE	DRUG
INDUSTRY	TREATMENT	DEVELOP
ECONOMIC	DEVELOPMENT	
COMMERCIALIZATION	DEVELOP	
TRANSFER	THERAPY	
ENTREPRENEURSHIP	GRANT	
VENTURE		
INNOVATIVE		
COMMERCIALIZING		
MEDICINE		

The particular words represent a trend in academic entrepreneurship in the sciences in which the pursuit of science is intertwined with commercialization. In the academic capitalist regime, claim Slaughter and Leslie (1997), traditional dichotomies between types of knowledge like basic and applied, science and technology, discovery and innovation, no longer hold. The term they use to describe this new knowledge scheme is technoscience, a way of blending science and product with the intent to create new industries or restructure old. The words selected as representative of academic entrepreneurship across universities indicate the ambiguous nature of the types of knowledge being produced; traditional

categories are still mentioned, but the presence of innovation, develop*, and technology suggest a blending of subjects to create new industries or restructure old.

Biocapitalism, another conceptualization of academic entrepreneurship that puts the words in Table 4 into perspective captures the relationship between academic science and the biotechnology industry produce research. Universities and private industry work to develop the basic science necessary for research and development. Securing intellectual property rights is the innovative researcher's "upstream" attempt to publish, protect, and develop their work as it moves "downstream" toward the market—metaphors used to describe the movement of research from scientific research toward the market. The result is a "backflow" of revenues to the university to perform research. Biotechnology is the ideal type of university industry relationship, and the characteristics of university-industry relationships are context specific, depending largely on the discipline. Geiger (2004) claims the successful case of the biotechnology industry is representative of the trends to build university-industry relationship that account for the university's prioritization of their public good focused academic missions.

> RQ2B. Which of the above keywords were most salient in describing
>
> activities related to academic entrepreneurship in the sciences?

I took the following steps to arrive at a list of "search words" for textual examples of academic entrepreneurship in the sciences. As in RQ2, I tested the hypothesis that the words were related to academic entrepreneurship in the sciences by performing a concordance and collocation analysis. I verified that the words were being used to this effect by qualitatively examining the concordance output, and the collocation analysis.

During this process I was able to parse out verbal loading, or what Mautner (2009) describes as "collocational 'baggage'" (p. 133). Words like innovation, industry, economic, commercialization, entrepreneurship, venture, innovative, start up, and commercializing were eliminated from the list through collocational analysis as they did not add anything new to the examples of academic entrepreneurship. Through this process I arrived at the search words in Table 5.

Table 5

Search Words

NC State	Chapel Hill	Greensboro
DEVELOP*	DEVELOP*	DEVELOP*
MEDICINE	DRUG	DRUG
TECHNOLOGY	THERAPY	GRANT
	TREATMENT	TECHNOLOGY

The verification of my hypothesis continued in my selection of texts. I used the concordance and collocation analysis previously performed on these words to draw out textual instances of them, and made qualitative judgements as to their relationship with academic entrepreneurship in the sciences. In the collocation analysis of each word I selected collocates that might indicate academic entrepreneurship in the sciences. For instance, "transfer" as collocate of "technology," or "company" as collocate with "drug." For each instance of this, I gathered textual examples of these collocations by clicking on the "total" cell in the appropriate collocation line, and commanding the software to show and highlight the concordances of each word. The exact steps for this are pictorially

explained in Appendix B. I used the concordance output and the "search" box to select

texts for analysis, vetting them for appropriate connection to the development of a

commercial product in the life sciences. This produced 49 articles.

In the above section I described how I used corpus linguistics to pinpoint salient

discourses and to identify texts which present these discourses. In this section I use critical

discourse analysis' operationalization of genre to examine the texts in more detail. First, I

will explain critical discourse analysis in more detail, then I describe genre—its functions

toward legitimation, masking assumptions, reproducing hegemony—and how analysis of

genre proceeds by studying semantic relations, relations across large stretches of text, etc.

Critical Discourse Analysis

Critical discourse analysis is a method for the linguistic analysis of texts situated

within a theorized social problem, which for this paper is the mediation of crisis. To repeat

Fairclough's (1995) purpose for critical discourse analysis from Chapter I:

> to systematically explore often opaque relationships of causality and determination
> between (a) discursive practices, events and texts, and (b) wider social and cultural
> structures, relations and processes; to investigate how such practices, events and
> texts arise out of and are ideologically shaped by relations of power and struggles
> over power. (p. 132)

Texts are shaped and informed by a dialectic of discourse in which we can relate

meaning—identification, action, and representation—to issues of power and knowledge

(Fairclough, 2003, p. 29). Discourses and network of practices inform and are informed by

ideologies and struggles for power.

Critical discourse analysis is a way of analyzing the relationship between discourses and institutions (Fairclough, 2003). Critical discourse analysis must combine analysis of recurrent patterns in discourse and the linguistic properties of particular texts. Discourse should be seen as elements of social practices that can be analyzed separately, but also analyzed as a system of meaning that spans particular forms, mediating events and structures. Fairclough (2003) breaks down the discoursal articulation of social practices into three different elements—genre, discourse, and styles:

Table 6

Discoursal Articulation of Social Practices

Elements of Social Practices	Articulation
Genre	Ways of Acting
Discourse	Ways of Representing
Styles	Ways of Being

Note. Fairclough, N. (2003) *Analysing Discourse: Textual Analysis for Social Research*. New York and London: Routledge, p. 26.

Fairclough (2003) defines the discourse aspect of social practices as an "order of discourse," "different types of social element which are associated with particular areas of social life—the social practice of classroom teaching in contemporary British education, for example" (p. 25). Social practices include discoursal and non-discoursal elements that are dialectically related to each other. The former being articulation of language; the latter the physical organization of the classroom, the attitude of the teacher, the religious or government affiliations of the school, and the types of student-student interaction; and each "in a sense contains and internalizes the other—social relations are partly discoursal in

nature, discourse is partly social relations" (p. 25). As such, social practices are not discrete but rather dialectically related. Social events, read texts, are "causally shaped by (networks of) social practices" (p. 23). The performance of social practices, conforming to or deviating from the network of practices in which they are situated, produce texts. Networks of practices can be identified with a particular institution, as well as cut across multiple institutions, thus social practices such as managerialism can be found in education. Discourse, as a link between these networks of social practices, is one way of understanding power and ideology.

Genres

Genres are realized by actional meanings and forms. Fairclough (2003) defines genre as "the specifically discoursal aspect of ways of acting and interacting in the course of social events" (p. 65). As ways of acting and interacting, the way people within a network of practices use language defines genre. Genre change comes about through new ways of acting and interacting within a network of practices. Analysis of genre, for Fairclough, consists of three funnel-like steps, an "analysis of genre chains; analysis of genre mixtures in a particular text; an analysis of individual genres in a particular text" (p. 66). Genre chains are texts from individual genres linked together, like "official documents, associated press releases or press conferences, reports in the press or on television" (216). Genre mixture refers to the fact that texts are not of one genre, but rather hybridized—a notion Fairclough describes as interdiscursivity, a characteristic not just of genre but of discourse and styles as well. I discuss individual genres below.

Genre chains and genre mixtures draw on various individual genres. Fairclough (2003) describes three different overall types of genre: pregenre, disembedded genre, and situated genre. Pre genres transcend a network of practices, like the narrative, argument, description, and conversation. These genres exist at a "high level of abstraction," meaning they cannot easily be assigned to a network of practices, but rather are shared by many. Disembedded genre is a genre which began in one network of practice, like the interview, but was disembedded for use in other networks. One example of this is the promotional genre disembedded from corporate networks to be used for cities and towns to attract investment. Situated genres are those like the ethnographic interview that belong in a particular network of practices. There can also be a hierarchical mix of genres in a text. For instance, the main genre could be an ethnographic interview, with sub genres of the argument and the report (p. 70). Texts and interactions are not in a particular genre, but rather draw from the "genres associated with a particular network of practices" from which "actual texts and interactions" are drawn (p. 69).

Activity. One method of analyzing genre is through its activity. This asks, what does the genre DO discursively? Fairclough (2003) writes that "looking at hierarchies of purpose is one way in which to see how a text or interaction figures within networks of practices," but is clear that not all genre is purpose driven, "genres vary in terms of the nature of the activity they constitute or are a part of, and that some activities but not others are strategic and purpose driven" (p. 72). We must watch over privileging purpose. Habermas (1984) distinguishes between two types of action, communicative and strategic, the latter intended for understanding and the former for producing results. A result of

modernity is the conflation of purpose driven genres with that of genre qua genre. Another effect of this is the familiarity with which larger institutions write their publications; they seek to ensconce purpose driven communication in language that resembles communicative action in order to reduce the distance between the institution and the individual. Habermas sees the infringmenet of purposive communication onto communicative interaction as a "colonization of the life world." I am interested in how the research magazine makes the entrepreneurial university seem legitimate through the mediation of crisis. In the following paragraphs I discuss how I will locate the linguistic and textual mechanisms that function toward the maintenance or production of legitimacy. This will help me answer the general question "what does the text do?" as well as "how does it do it?"

Linguistic feature. Genre can be realized at three different linguistic features of the text: first, at the text level through the generic structure of and organization of the text; second, at the above clause level through semantic relations between sentences and clauses, and the formal grammatical relations; and third, the clause level through "types of exchange (knowledge and activity), speech functions (statements, questions, demands, offers), and grammatical mood (declarative, interrogative, imperative" (Fairclough, 2003, p. 105). Analyzing these linguistic features is fruitful to critical discourse analysts when they are analyzed according to legitimacy.

Legitimacy is the attempt by a system of authority to legitimate the ordering of social life distinguished by four strategies: authorization, rationalization, moral evaluation, mythopoesis. *Authorization* operates through the reference to tradition, custom, law, and

the authority of certain individuals, *rationalization* through reference to institutional

effectiveness, *moral evaluation* the reference to a system of values, and *mythopoesis*

through narrative. Legitimation contributes to what Habermas (1984) calls instrumental

rationality, which "assumes certain agreed ends, and legitimizes actions or procedures or

structures in terms of their utility in achieving these ends" (p. 99). These strategies work

together to justify certain actions. Those paying a visit to their doctor must acquiesce to

certain examinations for the benefit of their health; a nation must implement certain

policies in order to remain globally competitive. One could take up an entire dissertation

analyzing just one of these strategies. I will identify these strategies as they appear during

analysis of the selected texts.

Contesting hegemony requires going beyond what is meant to seem "apparent" and

"commonsensical," and the examination of this requires studying the structure of genre and

its linguistic features. Semantics is the study of the meaning in language outside its specific

contexts. Semantic relations exist between clauses (reason, consequence, purpose,

conditional, temporal, additive, elaborative, contrastive/concessive) and between words

(synonymy, hyponymy, antonymy) (Fairclough, 2003, p. 222). The type of semantic

relations found in a text determine genre, a genre is what it is because of the semantic

relations drawn on. Understanding semantic relations leads to understanding how genre

functions toward establishing legitimacy.

This leads to a few general questions: How does the research magazine manipulate

generic features in ways that make competitiveness of the entrepreneurial university seem

like commonsense? How does it mask assumptions? How does it assume consensus when

perhaps there is none? It is in this vein of thought that I constructed my third research

question and sub-questions:

RQ3. How do the generic features of these texts function toward the legitimation

of the entrepreneurial university?

RQ3 A.   What are the semantic relations between sentences and clauses?

Sentences and Clauses. The study of semantic relations uncovers the acts of

legitimation. The main semantic relations between sentences and clauses are classified as

causal (the explanation of reason, consequence, and purpose), conditional (if), temporal

(when), additive (and), elaboration (the act of exemplification and rewording), and

contrastive/concessive (This happened, but . . .).

I systematically code the forty-nine articles according to Fairclough's (2003)

summary of semantic relations between clauses and sentences: causal (the explanation of

reason, consequence, and purpose), conditional (if), temporal (when), additive (and),

elaboration (the act of exemplification and rewording), and contrastive/concessive (This

happened, but . . .). The coding followed the process of constant comparative analysis as

described in Birks and Mills (2011), which includes the comparison of incidents with

incidents to generate codes, the comparison of codes, the collapsing of codes into groups,

and the comparison of groups.

RQ3 B.   What are the semantic relations between words?

Words. Synonymy, hyponymy, and antonymy are evidence of re-wording in the

text or uses of different nouns and pronouns and their relations, and classify the world in

certain ways: *Hyponyms* are words, often nouns, within the same semantic field like eagle,

cardinal, and hawk are all birds. *Synonymy* is equivalence established between terms, i.e. The captain began the procedure and the attack commenced. *Antonymy* is the difference established between terms. *Metaphor* is using A as a reference to B. There are different types of metaphor: 1. Lexical metaphor, i.e. "Our CEO is a lion," "A dead hit," for a CEO cannot be a lion, and only something that was once living can be dead. 2. Grammatical metaphor—using one "part of speech" in the place of another, i.e., "He succumbed to unemployment." Studying semantic relationships allow us to examine how certain aspects of social life—like the process of unemployment or the identity of a CEO—can be glossed over with ideological effect.

University research magazines work to explain the research process, employing various semantic techniques, as described in RQ 4. These semantic techniques indicate an attempt to bring the process of academic entrepreneurship in the sciences to the public. Their primary focus is to narrate ways in which an idea becomes research, research becomes a marketable product, and this product is then sold to save lives, or otherwise increase quality of life. However, this process is often collapsed in order to bring out the end results. I argue that this is a process of legitimation done on behalf of the entrepreneurial university, and that articles having to do with academic entrepreneurship in the sciences are particularly useful for legitimation. Moreover, through the process of legitimation of the entrepreneurial university, research magazines mediate crises, as seen in the narration of academic entrepreneurship in the sciences leading to life saving technologies.

Conclusion

I began the chapter with a series of general questions regarding the university magazine and their role in mediating the crisis of competitiveness in the entrepreneurial university. To wit: In what ways do university research magazines reflect the notion of academic entrepreneurship as a strategy for competition in the global, knowledge-based economy? How does the genre of the university research magazine mediate the crisis of competitiveness amidst the variables of technology, health, and economy? These questions were then refined according to the theories behind critical discourse analysis and corpus linguistics, and the suggested methodologies of Fairclough (2003) and Baker (2006). As shown in Table 7, each operationalization of these methodologies is accompanied by a particular research question they answer. In answering these questions I discovered that those involved in the publication of university research magazines do attempt to explain the research process, and in doing so legitimate the entrepreneurial university, and also mediate the crisis in their depiction of technology, health, and the economy. I plan to flesh this out in a more detailed analysis of the findings.

Table 7

Methods

	Research Question	Analytical Procedures	Results
RQ1. What is discursively unique about UNC Chapel Hill's Endeavors, NC State Results, and UNCG Research to the Corpus of Contemporary American English (COCA)?			
RQ1A.	What is lexically unique in each university's magazine?	Keyword analysis comparing corpus of each magazine with the Corpus of American English.	Wordsmith's keyword analysis produced the top 255 words, in no less than 5% of the texts, minimum frequency of 3, $p < .0001$.
RQ1B.	How do these keywords cohere in thematic clusters across university magazines?	I grouped keywords across magazines by first verifying their use in the texts through concordance analysis, and then identifying themes in each magazine present in at least one of the other magazines.	Thematic Clusters
RQ2. Which, if any, of these salient lexical items indicate discourses related to entrepreneurialism?			
RQ2A.	What keywords indicate academic entrepreneurship in the sciences?	I used collocation analysis to be sure these words were in fact related to academic entrepreneurship in the sciences.	Key Words on Academic Entrepreneurship in the Sciences
RQ2B.	Which of the above keywords were most salient in describing activities related to academic entrepreneurship in the sciences?	Concordance and collocation analysis; steps described in Appendix B.	Develop*; medicine; drug; technology; therapy; grant; treatment.

Table 7

(Cont.)

Research Question		Analytical Procedures	Results
RQ3. How do the generic features of these texts function toward the legitimation of the entrepreneurial university?			
RQ3A.	What are the semantic relations between sentences and clauses?	Systematically code and indexed the 51 articles by semantic relations	Overarching "problem-solution" semantic relation, setting up the "problem" using temporal or conditional relations. The "problem" is or will be resolved through causal, and elaborative relations. Logic of appearances.
RQ3B.	What are the semantic relations between words?	Organization of metaphors into nodes.	Three patterns in terms of their legitimation of the entrepreneurial university—the assigning of value to research based on its availability to the market, the extension of the research process to marketization, and the highlighting of the capacity of the entrepreneurial university to bring to the market solutions to pressing issues.

CHAPTER IV

FINDINGS

My study focuses on the university research magazine as textual evidence of the mediation of crisis—a crisis of fast-paced, and competitively driven technological and scientific change. Jessop's cultural political economy calls us to examine how the university, as a part of the institutional ensemble of state power, semiotically (re)produces power. From the application of cultural political economy to education, scholars fleshed out the concept of the knowledge-based economy, and its conjunctive crisis of competitiveness—the imperative, often made through comparison, for economic regions (e.g., the European Union, Southeast Asia, the United States) to succeed in a global economy through the production of knowledge-based goods and services. To this critique I added the notion of the "technological sublime," which is also based off a critique of the technological and scientific discoveries driving capital accumulation. Located within this network of socio-political forces, the entrepreneurial university offers a high-yield for examining how science has been couched in the discourse of the entrepreneurial university as a response to the crisis of competitiveness. I argue that the entrepreneurial university is legitimized as a lynchpin in the development of scientific research meant at once for human and capital regeneration.

The purpose of this findings section is to examine how the university research magazine legitimates the entrepreneurial university within the culture of competitiveness.

Thus, I want to take the time to remind the reader, again, of the larger question I am asking in this dissertation, as rephrased in Chapter II: How did academic entrepreneurship in the university become a way of answering to pressing human needs? How is this made to seem normal? That is, how do actors within the institutional and organizational ensemble that makes up the state legitimize entrepreneurship through the type of discourses selected?

The following are the findings from my study employing corpus linguistics and critical discourse analysis on a corpus of 1,130,292 words from a collection of three university magazines—UNC Chapel Hill's *Endeavors*, NC State *Results*, and *UNCG Research*. The organizational strategy of this section follows the research questions as expressed in Chapter III. Given the nature of the analysis, I described some findings in Chapter III, but I will now go into more detail and state all salient findings relating to the intent of the study—to explore how discourses of entrepreneurship are legitimized in the texts. I demonstrate the following:

1. How a fundamental singularity of research universities in the KBE (knowledge based economy) is the representation of their research as directly answering to pressing human needs.

2. How answering to these needs results not from society but from the participation of university actors in entrepreneurial behavior.

3. How discourses of entrepreneurship derive legitimacy not explicitly through logics of explanation but through logics of appearance and through authorization vis-à-vis the university's relation to the market.

I argue that the genre of the university research magazine functions towards the

legitimation of the entrepreneurial university by presenting entrepreneurship and the

growth of technologies as opportunity for human connection and regeneration. I bring into

each discussion of my findings the literature of the entrepreneurial university as expressed

in Chapter II.

What is Discursively Unique about UNC Chapel Hill's *Endeavors*, NC State *Results*, and *UNCG Research* to the Corpus of Contemporary American English (COCA)?

What is Lexically Unique in Each University's Magazine?

I derived my findings by comparing the corpus of research magazines to the Corpus

of Contemporary American English to find keywords—words exceptionally prominent at a

significant statistical level ($p < .0001$). I commanded wordsmith's keyword analysis to

produce a list of key words, in no less than 5% of the texts, with minimum frequency of 3,

p<.0001. I use log-likelihood to determine this measurement. I combined keywords

"having the same stem and same major word class" by lemmatization (Francis & Kucera,

1982, p. 1), removed function words (i.e. do, does, did; however, as long as, so . . . that,

thus, but, instead, because; two, their, the, a number of, one half, a little; as, of, next to, in

view of, until, circa, along, amid; I, he, we, me, him, us), removed proper nouns, and

removed words representing officers of the university (i.e., "professor," "assistant,"

"chancellor," "dean"). I found 255 keywords that, when compared to the COCA, were

exceptionally prominent at a significant statistical level ($p < .0001$). These keywords are

listed by research magazine in Table 8. Keywords are unique to each publication when

compared to the COCA, but this does not mean that the key words were not used in the

other publications. For instance, "community" is a key word in *UNCG Research*, but it is

not a keyword in *Endeavors* or *Results*. This finding does not mean that "community" is

not used in either publication, just that it was not statistically more or less prominent. These

findings show what discourses are engaged by the publications.

Table 8

Keywords by Research Magazine

UNCG Research	Endeavors	Results
ACADEMIC	ABECEDARIAN	AGRICULTURAL
ACL	AEROTROPOLIS	AGRICULTURE
ACTIVITY	ANTISENSE	BIOFUELS
AFRICAN	AUTISM	BIOMEDICAL
BEHAVIOR	BACTERIAL	BIOMOLECULAR
BIOCHEMISTRY	BLOOD	BONES
BONOBOS	BONE	CARBON
BUDDHISM	BRAIN	CENTENNIAL
CANNABINOID	BREAST	CHEMICAL
CANNABINOIDS	CANCER	CHONDROCYTES
CERAMICISTS	CHEMOTHERAPY	CLEANTECH
CHILDCARE	CILIA	COMMERCIALIZATION
CLASSROOM	CLINICAL	COMMERCIALIZING
COLLABORATION	COLLATERALS	COMPUTER
COLLABORATIVE	CORAL	CREATE
COLLABORATORY	CYSTIC	DESIGN
COMMUNICATION	CYTOCHROME	DETERMINE
COMMUNITY	DISEASE	DOCTORAL
COMPOSER	DNA	DUCKWEED
COUNTY	ENZYME	EDUCATION
CREATIVE	EPIDEMIOLOGY	ELECTRICAL
CULTURAL	ERBITUX	ENERGY
DANCE	FACETOP	ENTREPRENEURSHIP
DEVELOPMENTAL	FIBROSIS	ENVIRONMENTAL
DIABETES	GENE	ETHANOL
ECOGENOMIX	GENETIC	EXTENSION
ECONOMICS	GENOME	FIBERS
ENGAGEMENT	HEMAGLUTININ	FOUNDATION
EVALUATION	HERBARIUM	FUEL
EXCELLENCE	HISTOPLASMA	GALLIUM

Table 8

(Cont.)

UNCG Research	Endeavors	Results
EXONERATION	HOG	GRID
EXONEREES	HYDROGEN	HITEC
GERIATRIC	IMMUNE	IMPROVE
GUILFORD	IMMUNOLOGY	INCUBATOR
HERP	INFLAMMATION	INDUSTRY
HERPETOLOGY	INTERNEURONS	INNOVATION
INFORMATION	JOURNALISM	INNOVATIVE
INTERVENTION	LATENCY	LABORATORY
INVESTIGATOR	LOT	LIPOSCIENCE
JSNN	LUNG	MANAGEMENT
KINESIOLOGY	MARINE	MATHEMATICAL
KNOWLEDGE	MICROBIOLOGY	MATHEMATICS
LATINA	MICROSCOPE	MECHANICAL
LAXITY	MOUSE	NANOFIBERS
LITERACY	MUCUS	NANOSCALE
LITERATURE	NANOPARTICLES	NANOTECHNOLOGY
LONGITUDINAL	NITROGEN	NATIONAL
MALS	NUTRITION	NATURAL
MANGANESE	PAIN	NONWOVENS
MARITAL	PATHOGENS	NOROVIRUSES
MEDICI	PATIENT	NSF
MEDICIS	PLATELETS	PENTAIR
MENTAL	PROTEIN	PHYSICAL
MOZART	RADIATION	PLANT
MUDSLIDES	REPLICATION	POLYMER
NANO	RESEARCHER	POTENTIAL
NANOENGINEERING	RNA	PROCESS
NONSTANDARD	SCHIZOPHRENIA	PRODUCE
OFFENDER	SCIENTIST	RENEWABLE
PEOPLE	SICKLE	RIVERNET
PIEDMONT	SOLAR	RUNOFF
PLEYEL	SPECIES	SEMICONDUCTOR
PREVENTION	SPERM	STARTUPS
RURAL	TB	STORMWATER
SCHOLARSHIP	THERAPY	SYSTEM
SOCIAL	TOBACCO	TEST
TELESPEECH	TRANSPLANT	TEXTILE
TRIAD	TREATMENT	TRANSFER

Table 8

(Cont.)

UNCG Research	Endeavors	Results
UNDERSTANDING	TRIAL	TRIANGLE
VIOLENCE	TUMORS	VENTURE
WATERCHIP	VACCINE	VETERINARY
WELLNESS	VIRUS	
YOUTH	WIKIMEDIA	
ZULU		

Notes. p < .0001

The center of the Venn diagram in Figure 3 numerically illustrates the 100 keywords shared by *Endeavors*, *UNCG Research*, and *Results*; the adjacent sections of the circle numerically represent words shared by *Endeavors* and *UNCG Research*, *Endeavors*, and *Results*, and *UNCG Research* and *Results*; the outer section numerically represent the words unique to each magazine.
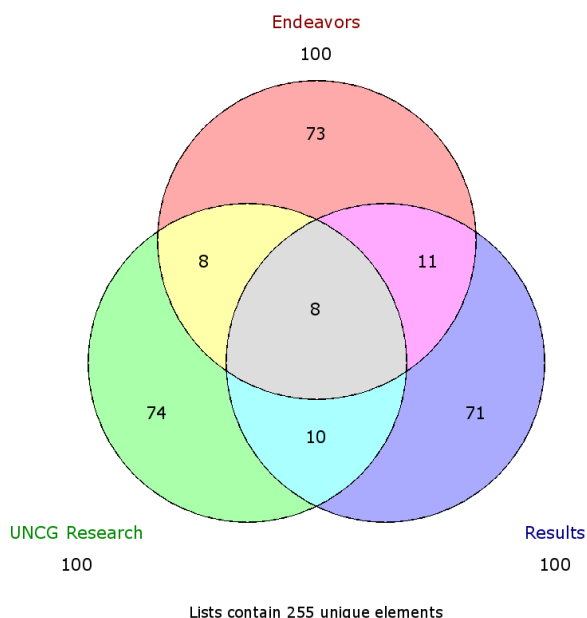
Figure 3. Venn Diagram of Keywords.

Table 9 indicates the shared keywords amongst all three magazines, *UNCG Research* and *Endeavors, Endeavors* and *Results*, and *UNCG Research* and *Results*. The first column lists words that appear in each of the publications, and subsequent columns list keywords that only appeared in one of the publications.

Table 9

Shared Keywords amongst UNCG Research, Endeavors, and Results

Common	*UNCG Research* and *Endeavors*	*Endeavors* and *Results*	*UNCG Research* and *Results*
BIOLOGY	BOOK	BACTERIA	AWARD
CHEMISTRY	DRUG	CELL	CENTER
DATA	HEALTH	DEVELOPMENT	ECONOMIC
DEVELOP	HELP	INSTITUTE	EXPERTISE
GRANT	HIV	MEDICINE	IMPACT
LAB	HUMAN	MOLECULAR	INTERDISCIPLINARY
PROJECT	RECEPTOR	PHYSICS	NANOSCIENCE
SCIENCE	WORK	STUDY	PARTNERSHIP
		TEAM	PROGRAM
		TISSUE	TECHNOLOGY
		WATER	

How do These Keywords Cohere in Thematic Clusters across University Magazines?

Answering this question is an interpretive process guided by corpus linguistics techniques. I grouped keywords across magazines by first verifying their use in the texts through concordance analysis, and then identifying themes in each magazine present in at least one of the other magazines. As discussed in methods, and shown in Appendix A, the following are the groupings of words: general local (e.g., Guilford, community, Triad, Triangle), campus-based entrepreneurial initiatives (e.g., Centennial, incubator, hitec), humanities (e.g., Journalism, literature), performing arts (e.g. dance, composer, Mozart),

social categories (e.g., Latina, geriatric, researcher, patient, Aerotropolis), name of a specific company or product (e.g., Waterchip, Ecogenomix, Pentair, Erbitux), living things other than human (e.g., duckweed, plant, bacteria), disease (e.g., cystic, sickle, schizophrenia), energy-related (e.g., carbon, grid, fuel). I chose the groupings to specify topical similarities and differences between magazines.

Table 10

Thematic Clusters

	General Local	Entrepreneurial	Humanities	Performing Arts	Social Category	Company/Product	Living/Non-human	Disease	Energy	Total
Results	1	3	X	X	2	2	3	1	5	17
Endeavors	X	X	1	X	4	2	5	13	1	26
UNCG Research	5	X	2	3	9	2	3	2	x	26
Total	6	3	3	3	15	6	11	16	6	69

I observed the lowest total references to these themes in *Results*, the publication in which I also observed the highest reference to the "campus based entrepreneurial initiatives" and "energy" themes. I observed that *Endeavors* referenced most the "living things other than humans" and "disease" themes. I observed that *UNCG Research* referenced most the "general local," "performing arts," and "social category" themes. It was the only magazine to reference "performing arts," and the only magazine to not

reference "energy." References to the "social category," "company/product," "living things other than human," and "disease themes" were observed in all three publications.

NC State, UNC Chapel Hill, and UNCG use their research magazines to draw out the strengths of their programs and mission. The thematic clusters bring out strengths of each university. UNCG is recognized by the Carnegie Foundation for its community engagement; I observed in *UNCG Research* high incidences of words belonging to the "general local" and "social category" themes. NC State is known for their engineering programs; I observed in *Results* the highest reference to the "energy" theme. UNC Chapel Hill has a medical school; I observed in *Endeavors* a high presence of words fitting in the "disease" theme. The presence of such different keywords and associated themes indicates that research magazines draw on the strengths of the university, and as such any entrepreneurial endeavor written about in the magazine will be aligned with this perception.

Discussion

In the literature review I asked: How is the entrepreneurial architecture legitimated discoursally? How do institutional actors (faculty and faculty leadership) legitimate their entrepreneurial behavior? Considering my findings above, I argue that institutional actors legitimate entrepreneurial behavior by connecting their diverse research interests to answering to pressing human needs. I argue that this finding contributes to the literature on the entrepreneurial university by taking seriously the discoursal representations of individual academic interests as answering to pressing human needs. Thus, the entrepreneurial university is not only "realized" by state actors participating in

institutionally specific structures adhering to the entrepreneurial turn, but by state actors aligning their particular research interests to the application of pressing human needs. Below I connect my findings to literature on the development of the entrepreneurial university, arguing that that the diversity in keywords indicate the development of an entrepreneurial culture around existing structures and research agendas.

The findings in regards to unique lexical items and thematic clusters speak to the variations between entrepreneurial universities that are a result of an integrated entrepreneurial culture. The integrated entrepreneurial culture effects the ways the university represents itself as answering to the pressing needs of society; the entrepreneurial culture of a university can be specific to its pre-existing mission and values. As mentioned in Chapter II, Clark (1998) argues that an entrepreneurial university comes about through an integrated entrepreneurial culture, tying entrepreneurial initiatives with the values and mission of the university. Yokoyama (2006) found entrepreneurial initiatives were built around the existing structures of the university. Nelles and Vorley (2010) term the nexus of internal powers that interact to shape the entrepreneurial agenda of a university an "entrepreneurial architecture." These internal powers—structures, strategies, systems, leadership, and culture—interact to create the entrepreneurial architecture along with the integration of teaching and research responsibilities into the entrepreneurial mission. The development of entrepreneurial science in the university reflects this entrepreneurial culture built off the pre-existing ethos of university actors. As university research scientists began engaging in entrepreneurial science, they steered the process of the institutionalization of the entrepreneurial process (Colyvas, 2007). Although

these practices eventually became a part of the institutional apparatus, the entrepreneurial culture resulted, in part, from the actions of individual entrepreneurs (often faculty) who saw its benefits to the pursuit of knowledge.

The structural implementation of an entrepreneurial culture according to its pre-existing internal powers mirrors the transition discourse of science as discussed in Chapter Two. As universities were faced with a crisis of relevancy amidst a competitive environment for research dollars, presidents of universities sought a type of basic research endeavor that accounted for the needs of industry over the type of basic research led by autonomous faculty members. Innovation being a three-step process—from basic science research, to the intermediate process of development, and finally to the creation of industry-specific versions of the product—university presidents wanted to focus on the second step, believing that the trajectory of research was more important than basic discoveries. This transition to a focus on application indicates that the discourse of the entrepreneurial university followed from a focus on the applications of pre-existing research projects.

Despite the differences that may result from a university's representation of their research, a fundamental singularity is the presentation of their research as answering to pressing human needs. Moreover, the university research magazine draws from the institutional strengths of the university to present their research as answering to these needs. This can be directly tied to studies on the institutional structure of the entrepreneurial university, which is integrated with the existing structure of the university to create an entrepreneurial architecture, and the transitioning discourses of science to an

applied focus amidst crises of competitiveness. I argue that the entrepreneurial university's

mediation of crisis by answering to pressing human needs is a direct result of an

entrepreneurial culture that draws from the pre-existing structures of the university to

mediate crisis.

Which, if Any, of These Salient Lexical Items Indicate Discourses Related to Entrepreneurialism?

What Keywords Indicate Academic Entrepreneurship in the Sciences?

I developed a running hypotheses about which keywords represented academic

entrepreneurship in the sciences. I used collocation analysis to be sure these words were in

fact related to academic entrepreneurship in the sciences. The results are shown in Table

11.

Table 11

Key Words and Collocates Regarding Academic Entrepreneurship in the Sciences

Node	Collocate	Relations
Technology	Transfer	14326.354
	Office	666.629
	Development	347.52
	State	337.03
	Science	331.777
	New	291.624
	Information	256.317
	Developed	189.481
	Innovation	156.859
	Commercialization	134.149
	Research	125.987
	Based	113.286
	Medal	110.58
	President	110.428
	Chancellor	108.527
	University	97.076

Table 11

(Cont.)

Node	Collocate	Relations
Technology (cont.)	ADVANCED	95.008
	CENTER	87.197
	SERVICES	86.539
	EDUCATION	86.162
	NATIONAL	85.95
	ENGINEERING	82.363
Innovation	RESEARCH	523.187
	ECONOMIC	493.032
	DEVELOPMENT	408.448
	TECHNOLOGY	160.889
	ENTREPRENEURSHIP	165.259
	EDUCATIONAL	122.211
	INSTITUTE	83.175
	OFFICE	87.659
	NATIONAL	69.076
	CAMPUS	49.127
	RESULTS	44.602
	SPRINGBOARD	95.655
	COLLABORATION	59.356
	MANAGEMENT	43.577
	CENTENNIAL	51.445
	BUSINESS	30.589
	INDUSTRY	29.157
	ECONOMIES	47.908
	OPPORTUNITIES	32.991
	RESOURCES	25.748
Develop*	ECONOMIC	2,206.657
	RESEARCH	775.001
	INNOVATION	387.675
	TECHNOLOGY	347.520
	HUMAN	240.145
	CHILD	218.061
	TECHNOLOGY	189.481
	FAMILY	152.902
	SOLUTIONS	130.856
	BRAIN	129.024

Table 11

(Cont.)

Node	Collocate	Relations
Develop* (cont.)	EARLY	125.207
	STUDIES	125.048
	CANCER	123.024
	PSYCHOBIOLOGY	116.042
	SUSTAINABLE	112.229
	METHOD	111.620
	PRODUCT	105.206
	TECHNIQUE	92.760
	WORKFORCE	92.315
	PROGRAM	91.421
Industry	TEXTILE	240.203
	LEADERS	152.278
	RESEARCH	151.998
	PARTNERS	122.080
	GROWING	89.564
	FURNITURE	85.073
	PHARMACEUTICAL	83.290
	JOBS	81.136
	NEW	80.808
	TECHNOLOGY	80.025
	SPONSORED	77.373
	MUSIC	76.577
	APPAREL	69.404
	EXECUTIVES	63.542
	TOURISM	61.428
	HOG	60.501
	PARTNERSHIPS	57.502
	ACADEMIA	56.305
	FUNDING	51.510
	MEDICAL	48.316
Economic	DEVELOPMENT	2,495.521
	INNOVATION	493.032
	CHANCELLOR	437.331
	OFFICE	352.712
	IMPACT	216.336
	GROWTH	200.237

Table 11

(Cont.)

Node	Collocate	Relations
Economic (cont.)	ENGINE	193.405
	ENGAGEMENT	162.887
	SOCIAL	162.117
	EXTENSION	125.020
	OPPORTUNITIES	122.291
	RECOVERY	115.929
	POLITICAL	98.449
	ENVIRONMENTAL	82.576
	COUNTY	81.406
	INVESTMENT	72.215
	BUSINESS	71.604
	CULTURAL	70.399
	CONTRIBUTE	63.440
	EDUCATIONAL	56.643
Commercialization	TECHNOLOGY	137.015
	PROGRAM	68.570
	EDUCATION	59.839
	ISSUED	58.168
	INTELLECTUAL	53.094
	PATENTS	52.317
	TEC	46.222
	TRANSFER	46.203
	AGREEMENTS	40.297
	LAUNCHED	38.869
	INVENTIONS	38.076
	PROPERTY	35.833
	NANOTECHNOLOGY	34.538
	FOREIGN	34.077
	NANOTECH	30.927
	UNIVERSITY	29.059
	INNOVATION	28.533
	STARTUPS	26.524
	ACHIEVE	25.767
	INSTITUTE	25.648

Table 11

(Cont.)

Node	Collocate	Relations
Transfer	TECHNOLOGY	101.28
	OFFICE	32.703
	DISCLOSURES	29.607
	COMMERCIALIZATION	29.274
	RESEARCH	17.847
	INVENTION	16.584
	INNOVATION	13.778
	BIOTECHNOLOGY	13.735
	TECH	13.089
	INTELLECTUAL	11.831
	PATENTS	11.500
	DEVELOPMENT	10.240
	SPURRING	7.784
	INDICATES	7.743
	VENTURE	6.398
	ENTREPRENEURSHIP	5.841
	INVENTORS	5.672
	GRANT	5.542
	INSTITUTE	5.287
	ECONOMIC	3.253
Entrepreneurship	INNOVATION	165.259
	TECHNOLOGY	74.857
	STIMULATES	66.504
	SUPPORTS	57.960
	SPONSORED	51.676
	INITIATIVE	50.504
	CAPITAL	50.148
	BUZZWORDS	34.815
	GATEWAY	34.815
	NITRONEX	29.929
	PROFESSOR	26.508
	COMMERCIALIZATION	24.481
	PROGRAM	23.824
	DEVELOPMENT	23.418
	STRATEGY	23.409
	PROFESSIONAL	23.332
	RESEARCH	20.868

Table 11

(Cont.)

Node	Collocate	Relations
Entrepreneurship (cont.)	TRANSFER	20.093
	CULTURE	19.155
	PARK	18.820
Venture	CAPITAL	45.943
	LAUNCHING	20.755
	CUSTOMIZED	14.749
	ATTRACTING	13.831
	INVESTMENT	9.123
	BULLISH	8.284
	JOINT	7.707
	FIRMS	7.533
	IMPROVED	7.530
	LAB	7.318
	SEED	7.281
	CAPITALISTS	7.159
	STIMULATES	6.769
	TRANSFER	6.398
	STUDENTS	5.744
	GENETICS	5.189
	OFFICE	4.321
	SUPPORT	4.190
	ENTREPRENEURS	4.105
	INVESTING	3.540
Medicine	IMMUNOLOGY	359.032
	ENGINEERING	198.716
	PATHOLOGY	180.200
	TEXTILES	123.731
	LABORATORY	120.932
	SPORTS	115.894
	MICROBIOLOGY	111.916
	PHYSIOLOGY	106.812
	SOCIAL	99.497
	PERSONALIZED	98.181
	FAMILY	97.185
	HEALTH	96.553
	EPIDEMIOLOGY	96.162

Table 11

(Cont.)

Node	Collocate	Relations
Medicine (cont.)	SCIENCES	93.686
	SURGERY	78.452
	EMERGENCY	78.316
	PEDIATRICS	72.560
	GYNECOLOGY	72.526
	TRANSLATIONAL	70.043
	MEMBER	67.796
Drug	PATIENTS	47.532
	RESISTANT	43.504
	DISCOVERY	40.202
	DELIVERY	35.882
	ADDICTION	23.522
	THERAPIES	20.118
	OVERDOSES	19.770
	ANTIRETROVIRAL	19.199
	DISCOVERING	18.829
	INJECT	18.491
	TOXICITY	17.793
	MUTATE	17.612
	NANOPARTICLES	17.438
	TARGETS	17.376
	APPROVED	16.650
	ABUSE	15.615
	DETERRENCE	14.713
	REGIMENS	14.573
	CLINICAL	14.333
	INTERACTIONS	13.289
Grant	Contract	1009.915
	RESEARCH	967.139
	NATIONAL	662.239
	RECEIVED	622.345
	STATE	595.654
	FOUNDATION	520.907
	MILLION	510.213
	FEDERAL	500.066
	DOLLARS	463.138

Table 11

(Cont.)

Node	Collocate	Relations
Grant (cont.)	RESEARCH	406.334
	SCIENCE	328.371
	HEALTH	284.528
	SPONSORED	222.337
	PROGRAM	200.158
	NATIONAL	197.707
	DEVELOPMENT	196.845
	RESEARCHERS	192.215
	TECHNOLOGY	154.818
	NIH	147.363
	FUNDS	147.272
Vaccine	VIRUS	67.553
	SMALLPOX	61.558
	DEVELOP	59.459
	HIV	59.135
	RESEARCH	52.987
	IMMUNE	45.109
	DISEASE	40.955
	HUMAN	39.505
	CURE	39.154
	DEVELOPING	37.925
	SCIENCE	35.437
	DISEASES	35.390
	PREVENT	34.370
	SALMONELLA	33.513
	HUMANS	32.278
	IMMUNIZING	32.129
	RESEARCHERS	30.769
	ANTIBODIES	29.032
	IMMUNIZE	28.996
	INSTITUTES	28.222
Treatment	PATIENTS	112.172
	RESEARCH	87.844
	RESEARCHERS	79.564
	THERAPY	75.788
	CANCER	74.041

Table 11

(Cont.)

Node	Collocate	Relations
Treatment (cont.)	CLINICAL	70.259
	DOCTORS	68.290
	PATIENT	66.918
	CHEMOTHERAPY	66.061
	DRUGS	60.812
	EFFECTIVE	57.059
	DRUG	56.300
	DISEASE	53.345
	HIV	50.293
	FIBROSIS	46.673
	MEDICINE	46.532
	TUMORS	43.852
	MEDICATIONS	43.139
	FINDINGS	42.905
	LUNG	37.978
Therapy	PATIENTS	90.483
	PATIENT	85.808
	TREATMENT	75.788
	CELLS	65.708
	VIRUS	64.448
	THERAPIES	56.309
	TRIALS	51.754
	DRUG	47.690
	TREATMENTS	46.790
	CANCER	46.012
	CLINICAL	44.801
	DOCTORS	43.081
	RADIATION	39.572
	RESEARCHERS	37.480
	ANTIRETROVIRAL	37.103
	CLINIC	33.987
	DELIVER	30.692
	DISEASES	30.115
	CHEMOTHERAPY	29.713
	MEDICATION	28.591

The following explanations of the keywords' relations to academic

entrepreneurship in the sciences comes from the process of concordance analysis as

described above. "Technology" and "transfer" relate to the function of technology transfer,

or the movement of research from the university to the marketplace. In the same vein,

"commercialization" indicates the marketization of university research. "Innovation,"

"development," and "develop" indicate a futures aspect of academic

entrepreneurship—investing in research and programs in the hopes of generating further

research, programs, and profits in the future. "Grant" indicates the onus on the academic

entrepreneur to pursue funding opportunities for research. "Industry" and "medicine"

indicate the focus of the entrepreneurial endeavors in healthcare, and the potential

academic entrepreneurship in the science holds for resolving health crises. "Economic" is

in reference to both the "economic" pressures facing universities and scientists, and the

"economic" development offices that oversee technology transfer, commercialization.

Which of the above Keywords Were Most Salient in Describing Activities Related to Academic Entrepreneurship in the Sciences?

The previous question involved confirming a keyword's general association with

academic entrepreneurship in the sciences, but the current question requires a more

focused look at the keywords' salience in describing academic entrepreneurship in the

sciences. This involved the use of concordance analysis and collocation analysis. I tested

the extent to which the keywords related to academic entrepreneurship in the sciences by

performing a concordance and collocation analysis. Concordance analysis displays the

co-text of a keyword or cluster, thus the significance of the concordance must be

determined by the qualitative analysis of the researcher. I then used collocation analysis

(statistical data) to confirm or reject my qualitative analysis regarding a keywords-associated verbal loading. The relation statistic for the collocation analysis allowed me to determine "how strongly each collocate relates to the search word near which it was found" (Lexically). To perform the collocation analysis I commanded Wordsmith software to search for words to the left and to the right of the node by five words, using a log likelihood for the statistical analysis (Lexically). A higher relationship statistic indicates a strong relationship between the search word and its collocate. Thus I was able to use the collocation analysis to verify my concordance analysis by comparing the qualitative results regarding how the words were used to describe academic entrepreneurship in the sciences with the quantitative analysis of which words were more likely to be collocates. Below, Table 12 is meant as an example of the data used to determine a keyword's fit with academic entrepreneurship in the sciences with concordances and collocation statistics. Appendix B is also a pictorial example of how I used concordance and collocation analysis to answer this question.

It is through these qualitative and quantitative analyses I was able to determine the full profile of a word's use in the research magazine. Words like "innovation," "industry," "economic," "commercialization," "entrepreneurship," "venture," "innovative," and "commercializing" were eliminated from the list through concordance and collocational analysis as they did not add anything new to the examples of academic entrepreneurship. Neither analysis indicated the word "entrepreneurship" was salient in describing activities related to academic entrepreneurship in the sciences, rather just institutional operations. I needed to find keywords indicating discourses of academic entrepreneurship, not words

merely indicating that entrepreneurship exists in the university. The words I chose as salient in describing the discourses of entrepreneurialism are described in Table 5. "Search Words." They consisted of the words "develop*," "medicine," "technology," "therap*," "treatment," and "grant." These terms indicate different entrepreneurial discourses which are present in the magazines.

Table 12

Top Twenty Collocates of Technology and their Concordances

Collocate	Relation	Example Concordance
Transfer	14326.354	Vice chancellor for information technology, planning, and tech
Office	666.629	Industry Alliances, Office of Technology Transfer, Research
Development	347.52	1 million study. The Office of Technology Development (OTD)
State	337.03	combined state-of- the-art technology with the state's
Science	331.777	Partnerships; Small Business Technology Development Center;
New	291.624	technology was translated to new technology and new processes
Information	256.317	information." the more information technology becomes a part of o
Developed	189.481	but they are linked by a technology developed through a
Innovation	156.859	received a National Medal of Technology and Innovation. "Th
Commercialization	134.149	Commercialization of Technology; Blackstone Entrepr
Research	125.987	Fields Research Centers New Technology Ideas Research Park
Based	113.286	tion, adding, "As we grow our technology-based industry clus
Medal	110.58	President's National Medal of Technology. Drs. Harald Ade, J
President	110.428	associate vice president of technology and professor of na
Chancellor	108.527	associate Vice chancellor for technology development & innov
University	97.076	University of Science and Technology. That's just this y
Advanced	95.008	looks like the most advanced technology in the Alterovitz l
Center	87.197	at a time when wireless technology is at the center of
Services	86.539	Client Services Information Technology Services Dr. Debra
Education	86.162	professor of Math, Science and Technology Education, getting
National	85.95	President's National Medal of Technology. Dr. Jim E. Riviere
Engineering	82.363	for excellence in science, technology, engineering, and m

Above I looked at lexis, or the vocabulary relating to academic entrepreneurship. I also examine text-level linguistic mechanisms to gain a qualitative understanding about how these discourses are deployed. In Chapter II and Chapter III, I mentioned my choice as a researcher to use language as a way to uncover traces of discourse. Collocation analysis allowed me to sort out the words which pointed to discourses of entrepreneurship. I used the concordance and collocation analysis previously performed on these words to draw out textual instances of them. As before I looked for words indicating discourses of academic entrepreneurship; not just words indicating the practice exists, but how the practice is represented. For instance, "transfer" as collocate of "technology," or "company" as collocate with "drug." For each instance of this, I gathered textual examples of these collocations by clicking on the "total" cell in the appropriate collocation line, and commanding the software to show and highlight the concordances of each word. I used the concordance output and the "search" box to select texts for analysis, vetting them for appropriate connection to academic entrepreneurship in the sciences. The steps for this are explained pictorially in Appendix B. I collected the articles in the table below:

Table 13

Texts in Which Discourses of Entrepreneurship Appear

Article	Publication	Date of Issue
Handedness	*UNCG Research*	Spring 2009
The Economic Engine That Could	*UNCG Research*	Spring 2007
Super Models	*UNCG Research*	Spring 2005
The Next Wave	*UNCG Research*	Spring 2003
Kotra works to develop a new diabetes drug	*UNCG Research*	Spring 2009
Dirty, Rotten Science	*UNCG Research*	Spring 2010
The cannabinoid code	*UNCG Research*	Spring 2007

Table 13

(Cont.)

Article	Publication	Date of Issue
Small Size, Big Plans	*UNCG Research*	Spring 2008
Health Innovations and Helping Others	*UNCG Research*	Spring 2013
Life and Death by the Numbers	*Endeavors*	Sept 2009
Honey, I Shrunk the Lab	*Endeavors*	July 2006
A 3-D Map For Radiation Therapy	*Endeavors*	Jan 2009
Stop the Bleeding, Now	*Endeavors*	May 2004
The Physics of Clarity	*Endeavors*	Sept 2005
Predicting A Breast Cancer's Aggression	*Endeavors*	May 2009
Digging for Relief	*Endeavors*	Jan 2009
Chasing Proteins	*Endeavors*	Dec 2005
Send in the Cells	*Endeavors*	Sept 2010
Learning To Bust Drug-Resistant Bugs	*Endeavors*	Sept 2009
Tiny Particles Designed to Deliver a Cure	*Endeavors*	Sept 2005
Convergent Care	*Endeavors*	August 2013
Now We're Talking Synths	*Endeavors*	April 2011
Heart Break Hill	*Endeavors*	Sept 2011
How Old Are You really?	*Endeavors*	Jan 2011
Cancer and Addiction in 2050	*Endeavors*	Sept 2006
Special Delivery, Destination: The Brain	*Endeavors*	Sept 2003
Thick and Thin	*Endeavors*	Jan 2009
T-Cell Mutiny	*Endeavors*	Jan 2010
Signal to Noise	*Endeavors*	Jan 2012
Branching Out	*Endeavors*	Sept 2004
Picture Perfect Proteins	*Endeavors*	May 2007
Man in a Mouse	*Endeavors*	Jan 2011
Digital Drug Hunting	*Endeavors*	Sept 2007
Stop the Bleeding Now	*Endeavors*	May 2004
Predicting a Breast Cancer's Aggression	*Endeavors*	May 2009
The Passion Behind the Business	*Endeavors*	Sept 2006
Tech Transfer Supermodel Attracts Attention	*Results*	Spring 2004
Chancellor: Tech Transfer a Win-Win for State, NCSTATE	*Results*	Spring 2004
Array Express on the Right Track	*Results*	Spring 2004
Trafficking on the Innovation Superhighway	*Results*	Spring 2004
Creating Entrepreneurs, Building Companies	*Results*	Spring 2004
Liposcience Finds Success in Numbers	*Results*	Spring 2004
Venture Funds Bullish on Start Up Adventures	*Results*	Spring 2004
Platinix Quickly Earning Honors	*Results*	Fall 2013

Table 13

(Cont.)

Article	Publication	Date of Issue
Idea to Agile Science	*Results*	Spring 2013
Nanoprotection Against Viral Infection	*Results*	Fall 2007
NC State, WakeMed, Team in Device Hunt	*Results*	Winter 2009
Japan Dogs Test Therapy to Scratch Allergy's Itch	*Results*	Spring 2008
The Transformers	*Results*	Fall 2012
Sicel Sensors in Pivotal Trials	*Results*	Summer 2003

I selected 51 articles based on the presence of words I systematically identified as representative of the discourses of entrepreneurialism.

The particular words in Table 4 and Table 5 underscore the trend in which the pursuit of science intertwines with entrepreneurship. I grouped examples according to their variations on the discourse of entrepreneurship. I will provide examples and discussion below.

The first set traced using the word "develop" and its collocates "technology" and "therapy," consists of exemplars of a commodity discourse of entrepreneurialism in which research heading to the market is imbued with a higher calling. In the first two examples, "develop" suggests the process of taking research to the market:

> It's a tougher and much longer process to develop a pharmaceutical product that wins FDA approval and succeeds in the market. It takes the research and development power of a business—a well-funded business—to see a potential drug through the federal approval process. (*NC State Results*, "Agile Sciences: From Ideas to Enterprise," Spring 2013, p. 12)

"Develop" acts as the lexical lynchpin between basic research and the market. In the third

example, "technology development" is used alongside "science" in referencing a

state-funded agency focused on supporting the biotechnology industry:

> That expertise is vital, says Maria Rapoza, vice president of science and technology development at the North Carolina Biotech Center, a state-funded organization that supports North Carolina's thriving biotechnology industry. (p. 13)

It is through this "technology development" arm of the state that expertise is termed

"vital," elevating technology development to the highest echelon of research. In the next

example, a faculty member works with pharmaceutical companies to "develop medicinal

and therapeutic uses" of marijuana:

> By explaining how cannabinoids affect the nervous system and appetite, Dr. Reggio's research helps pharmaceutical companies develop medicinal and therapeutic uses of specific components contained in marijuana that bypass its psychoactivity or other adverse effects. (*UNCG Research*, "The Cannabinoid Code," Spring 2007, p. 7)

Here, Reggio's "research" is conflated with development of pharmaceuticals for market

purposes, the object of which is medicinal and therapeutic uses, presumably to be

monetized. In the below example, "developing" is used next to "commercializing," and the

products are therapies and pharmaceuticals:

> "We really believe this work will have a profound positive impact down the road on human health care," says DeSimone, who is developing and commercializing PRINT with colleagues and Carolina through Liquidia Technologies, the company he co-founded with doctoral students Jason Rolland and Ginger Denison. "This includes, but is not limited to, chemotherapy, gene therapy, disease detection, and drug delivery." (*Endeavors*, "Tiny Particles Designed to Deliver a Cure", Fall 2005)

The aforementioned examples are of a discourse of academic entrepreneurship in which the research itself is conflated with a marketable product, i.e. pharmaceutical technologies and therapies. Associating "develop" with life-saving technologies and therapies that make it to the market assigns more value to this type of research than to what is traditionally understood as "basic research."

There also exists a speculative discourse of academic entrepreneurship in the sciences as traced through the words "grant," "medicine," and "technology." This discourse alludes to a market where research aligned with the market generates more funding as the research process continues, thus encouraging speculation on the part of researchers for what research will attract market attention. The stakes get higher as the research progresses, and this requires an increase in the money needed to continue the work. Thus, the research process is not just about getting grants, but about getting larger grants:

> It takes data to get funding—but it also takes funding to get data. So NC TraCS and other institutions have created pilot awards to help scientists generate the data they need to get bigger grants more quickly and keep their projects on pace. (*Endeavors*, "Heartbreak Hill," Fall 2011)

This is a type of speculation, in that researchers must take a gamble that the data they generate using one funding source will lead to another, more generous funding source, allowing them to continue their research. In the next example, when a grant is not available and the research is not ready to be picked up by a pharmaceutical company, the researcher starts a company:

> "You get to the point where it's very difficult to keep going, because you need large amounts of money the typical grant mechanism can't cover, and yet pharmaceutical companies aren't ready to partner with you," DeMore says. "So how do you bridge that gap? My goal as a surgeon who treats patients with breast cancer is to take discoveries out of the lab and into the clinic. To me, it seemed like starting a company was the only option to get that done." (*Endeavors*, "Heartbreak Hill," Fall 2011)

Research and the search for money are a speculative process. In another example, "medicine" is used between the words "translational" and "entrepreneurship" to indicate the speculative and futuristic nature of academic entrepreneurship in the sciences:

> The ability to try something new, to get out of your comfort zone, and even be willing to fail, is essential to translational medicine and to entrepreneurship. (*Endeavors*, "Heartbreak Hill," Fall 2011)

The speculative and future-oriented theme continues, this time with the combination of engineering and "medicine" to create new and regenerative "technology":

> At NC State, colleagues in engineering and veterinary medicine have combined to design, build and demonstrate new technology that may be transferrable to human medicine. (*Results*, "The Transformers," Fall 2012, p. 3)

Indeed, entrepreneurship is a speculative endeavor, and I suspected this to be present in the texts. Apart from this, examples above are unique in their presentation of speculation in that the academic entrepreneurs are not only creating new ventures, but using technologies and techniques previously used on non-humans to treat humans. Research is not an enterprise of knowledge generation for its own sake, but rather a process for the generation of profit-making businesses.

I also discovered an institutional based discourse of academic entrepreneurship in the sciences, a discourse I traced using the words "develop," "grant," "technology," and "therapy." This discourse reifies academic entrepreneurship as a function of the institution. First, to explain how universities became entrepreneurial, grants are coupled with commercialization and development:

> The Bayh-Dole Act of 1980 allowed universities, for the first time, to own the intellectual property they developed with the sponsorship of federal grants. (Results, Spring 2004, http://ncsu.edu/research/results/vol6/gifs/RESULTS.pdf)

Commercialization of intellectual property became an institutional goal after the Bayh-Dole Act of 1980. In the following example a university's research unit specializing in gene therapy serves as the catalyst for turning "research-grade" technologies into "clinical-grade" technologies:

> The hitch, though, was that while Samulski's lab could produce "research-grade" viral vector easily enough, he needed to methodically produce reams of paperwork to document the production of the same material as "clinical-grade" vector. The difference: $2,000 for research-grade, $200,000 for clinical-grade.
>
> No companies are able to provide AAV production as a commercial service, Samulski says. "That's not what universities do for a living, but this is what's required to move this type of technology into the clinic." So the UNC-Chapel Hill Gene Therapy Center and its Human Applications Lab stepped up. And that service was superb, Leone says. (*Endeavors*, "Special Delivery, Destination: The Brain," Fall 2003)

Not only are research units described as behaving as entrepreneurial entities, but so are the professors. The following example defines an entrepreneurial professor as one who seeks research and grant funding to develop products:

> A study in entrepreneurship. A professor at the fore. Building a company. Taking ideas and research and grant funding and propelling it all forward into products that you continue to develop and see do a great deal of good. (*UNCG Research*, "The Economic Engine that Could," Spring 2007, p. 17)

The institution, its research units, and its professors have become defined by their involvement with commercialization of research through an institutional-based discourse of academic entrepreneurship in the sciences.

Discussion

I intend to examine how discourses of academic entrepreneurship in the sciences are selected and used in the university research magazine to (re)produce power. I am particularly interested in how these discourses legitimate the entrepreneurial university. In order to do this I selected salient lexical items indicating discourses related to academic entrepreneurship in the sciences, and used these lexical items to select texts to pinpoint and examine discourses. I found three dialectically related categories within the discourse of entrepreneurship: commodity discourse of academic entrepreneurship in the sciences, speculative discourse of academic entrepreneurship in the sciences, and institutional-based discourse of academic entrepreneurship in the sciences. Each variation indicates a reinterpretation and redefinition of academic research as a process in which life-saving solutions are brought to the public through entrepreneurial means.

I argue that these findings call for an adjustment of our understanding of the knowledge regime in the culture of competitiveness. In Chapter II, I discussed how dichotomies between types of knowledge like basic and applied, science and technology, discovery and innovation, are back grounded in favor of grant funding, development, and

the marketization of medical techniques and other technologies. Slaughter and Leslie (1997) use the term technoscience to describe this new knowledge scheme, a way of blending science and product with the intent to create new industries or restructure old—technoscience is a capillary of the academic capitalist regime. In the same vein, Geiger (2004) coined the term "biocapitalism" to capture the relationship between academic science and the biotechnology industry in which academic science, innovation, and the generation of capital work together. "Technoscience" and "biocapitalism" could easily be applied to the research described in the discourses of entrepreneurship, and indeed, the study of the entrepreneurial university owes a lot to these reconceptualizations of knowledge within the academic capitalist regime. I owe, in part to "biocapitalism" and "technoscience," my own introduction of the "technological sublime" to my theoretical framework. My findings, however, add more to the academic capitalist explanation of a new knowledge regime.

My interpretation of the entrepreneurial turn, one concerned particularly with the semiotic order of a culture of competitiveness, demands more than economic explanations for the breaking down the barriers of academic disciplines and their connections to industry. My theoretical framework, being informed by two theories that explain the (re)production of power in cultural terms, demands it. Rather than seeing entrepreneurial science as purely economic or state-driven in nature, it is university actors behaving entrepreneurially in a response to crisis. My findings indicate that state actors within the university are asked to focus on research applicable to the market, and engage in entrepreneurial activity to ensure these applications are realized on the market. Thus, the

role of these university actors is not only to create applicable knowledge but to be sure it makes it to the market. This behavior is not just indication of a university-industry-government relations (triple helix) or an academic capitalist regime in which research is pipelined to the market, but an identification of academic research as inherently risky. The academic scientists, behaving as entrepreneurs, take on this risk with their research. Discourses of entrepreneurship in the university research magazines legitimate the entrepreneurial university by depicting university actors who behave entrepreneurially answering to pressing societal needs.

How Do the Generic Features of These Texts Function toward the Legitimation of the Entrepreneurial University?

What are the Semantic Relations between Sentences and Clauses?

As was elaborated by Fairclough (2003) and presented in detail in previous chapter, genre can be realized in a few different ways—the text level, the above clause level, and the clause level. For the purposes of answering this question, I use semantic relations—or the relations between sentences and clauses—to identify discoursal features of the genre of the university research magazine. Examining semantic relations illuminates how genre functions toward establishing legitimacy, and this study intends to determine how, in the genre of the university research magazine, discourses of entrepreneurship function towards legitimation. Semantic relations in part comprise discourses and genres, and as such semantic relations can be analyzed for explanations and justifications towards the legitimacy of the entrepreneurial university.

Semantic relations. Through a qualitative analysis of the selected university research magazine articles I found that the dominant logic of the university research

magazine is a logic of appearances. Fairclough (2003) allows us to trace a logic of

appearance through semantic relations by his description of this logic as a "social

(economic, political) analysis, which does not go beyond 'surface' appearances to

'underlying' realities, takes things at face value rather than considering them as causal

effects of structure" (p. 88). I drew from the process of constant comparative analysis as

described in Birks and Mills (2011) to code my data—comparing incidents with incidents,

establishing codes, comparing codes, collapsing codes into categories, and then comparing

categories. I position myself methodologically through critical discourse analysis as

described in Fairclough (2003), thus informing my constant comparative analysis. Through

this process I identified the configurations discussed below as dominant trends within the

data. The example below represents my findings that semantic relations legitimate the

entrepreneurial university through the following set of configurations—a narrative with an

overarching "problem-solution" semantic relation, setting up the "problem" using

temporal or conditional relations, and proceeding to describe how the "problem" is or will

be resolved through causal, and elaborative relations.

Problem-solution. The example below from "The Next Wave" is the exemplar of

the problem-solution configuration in which the analysis of the social, political, and

economic factors at play is surface-level:

> TEMPORAL Today, bolstered by the federal Bavh-Dole Act of 1980, which
> encourages universities to license and market their discoveries, 43 states have
> biotech initiatives in place. The results are undeniable. TEMPORAL As recently as
> 1999, the Association of University Technology Managers estimated biotech
> initiatives had generated $40 billion and 270,000 jobs. ELABORATION Google,
> the hugely successful Internet search engine, is one example, having been created
> at Stanford University. ELABORATION Closer to home, technology-rich North

Carolina has become one of the brightest stars in the biotech firmament, and between them, UNC Chapel Hill, NC State, and Duke have combined to spin off 65 biotech companies. Dozens more are in the offing, (CAUSAL) and the UNC system has undertaken a series of conferences to guide university researchers and administrators through the unfamiliar territory of patents, licensing agreements and corporate finance.

The guide at UNCG is Jerry McGuire, who brought with him more than 30 years of experience in the marriage of technology and commerce when he arrived in 2002 to head up the Office of Technology Transfer. Unabashedly enthusiastic and unstinting in his candor about the realities of technology transfer, he will tell you "this is about trying to leverage the fruits of research to generate economic income." That leverage can be years in the making, and EcoGenomix, which is already licensed, is unusual in that it has made it to the licensing stage much faster than anyone expected. CAUSAL The reason, McGuire says, is that the basic technology is already established.

CONCESSIVE But even with established technology, he will also tell you that you have to pick your battles carefully. ELABORATION "Every startup that I know of," he says, "is a fragile beast. The key is not just technology. ELABORATION You've also got to have management and finances." ELABORATION And you've also got to build the better mousetrap, CONDITIONAL because if you fail to find the right commercial niche, (CONSEQUENCE) then in a world with 43 biotech initiatives, McGuire says, "there will be some (EXEMPLIFICATION) winners, but there will also be a lot of losers." (*UNCG Research*, Spring 2003, p. 8)

The example begins with the description of the research market post-Bayh-Dole Act of 1980, a temporal semantic relation meant to demonstrate a before and after. The article proceeds to elaborate on the results of this legislation and its consequences to the university. The "problem" is the competition for research funding and startups. Using causal, additive, and elaborative semantic relations the article works its way through the consequences of the Bayh-Dole Act of 1980 on the university—the university fairs well in this environment. However, the concession is made that even well-resourced startups face failure. The selection works hard to explain the proliferation of startups post Bayh-Dole Act of 1980, but provides no explanation that the law allows universities to patent the

technologies created with federal research dollars and thereby effectively creating a competitive market for federal dollars. The last sentence elides any responsibility for explaining the success or failure of startups by merely explaining that in such a competitive marketplace, there will be winners and losers. The exemplification of success and failure as "there will be some winners, but there will be a lot of losers" is unique to this example, as other articles do not go so far to label startups in such general terms. However, it represents the dominant trend in the article of a "logic of appearances." We are not told why or how winners and losers come about, or who usually wins and who usually loses. The problem-solution configuration exemplified here legitimizes the entrepreneurial university by presenting a problem to solve, and the ways the entrepreneurial university is uniquely situated to solve it. In this particular example, the problem is competition in the research marketplace, and the solution is the scaffolding the entrepreneurial university gives to startups through the Office of Technology Transfer. In the following subsections I provide further explanation of how temporal, conditional, causal, and elaborative relations work together to affect the higher level semantic relation of "problem-solution."

Temporal. Problem-solution scenarios often begin with a simple "when" to describe a time when a problem was brought to the fore—the solution to which is a main point of the text, cueing the entrance of the entrepreneurial university. It is also important to note that as a general finding, the instances of "when" to set up a "problem-solution" scenario was not always found at the beginning of the article, but interspersed throughout the texts. For instance, the problem in "Array Express on the Right Track" is set up as follows: "When other researchers and companies began asking if they could use his

system, van Zyl asked the Office of Technology Transfer whether he could provide his technology to them" (Results, Spring 2004)   The researcher hardly considers the choice to release his discovery in the domain of the "public good," but rather asks the Office of Technology Transfer—one of the most explicitly entrepreneurial offices in the university.

Other temporal semantic relations begin with a scenario that is firmly rooted to a particular time, using the past or future tense to ask the reader to put themselves into a particular scenario. "Thick and Thin" begins this way: "My father-in-law woke up one morning with his right calf muscle twice as big as the left. He called his doctor, who said, 'Go to the emergency room right now'" (*Endeavors*, Winter 2009). Although not flagged with a temporal conjunction, the article begins with a reference to a particular place and time when a problem was discovered. In "Honey, I Shrunk the Lab," we are asked to imagine a time when the problem the article seeks to address is solved:

> Mike Ramsey has a dream: one day you'll be able to walk into a pharmacy and pick up a microchip for the blood test you need. You'll take the chip home, insert it into an analyzer, and place your finger on it to extract a tiny sample of blood. Instant results (*Endeavors*, Winter 2006).

Mark Ramsey's dream asks us to imagine a time when the problem of waiting for lab results is gone. The use of a temporal relation is key to setting up the "problem-solution" theme that runs throughout the text; the temporal relation cues the entrance of the entrepreneurial university.

Conditional. I found the trend of using conditional semantic relations. The conditional semantic relation also sets up a "problem-solution" theme, but often adjusting the spatio-temporal relation between the reader and the article. In "Now We're Talking

Synths," a three part article about synthetic cells, substances and systems, "If you've ever

had a tooth knocked out or lost one to decay, you might have had to endure a dental

implant" (Endeavors, Spring 2011). As the reader you are being asked to think of a time

when you experienced dental issues. This works to set up the "problem" through inducing

in the reader a feeling of empathy. After telling of a particularly trying scenario on the

battlefield, "Stop the Bleeding, Now" asks:

> What if medics had a reliable tool to stop internal bleeding? What if that product
> kept, fresh and sterile, for years? What if they could just grab a pack of preserved
> platelets, insert a syringe of saline, then infuse it into their patients? And what if
> those preserved platelets stopped the bleeding quickly? (*Endeavors*, Spring 2004)

The posing of the conditional "if" points to a "problem" to be solved, with dramatic effect

added by the description of a scenario in which these "problems" arose. Much like the

"temporal" semantic relation, the use of the conditional semantic relation legitimates the

entrepreneurial university as a place where these "if" scenarios are addressed.

> ***Causal and elaborative.*** The "problem" is resolved through a dialectical

relationship between temporal or conditional semantic relations, causal relations, and

elaborative relations. Take, for instance, posing the "What if" questions in "Stop the

Bleeding, Now":

> What if medics had a reliable tool to stop internal bleeding? What if that product
> kept, fresh and sterile, for years? What if they could just grab a pack of preserved
> platelets, insert a syringe of saline, then infuse it into their patients? And what if
> those preserved platelets stopped the bleeding quickly?

After posing these questions, the article explains a potential solution:

> Tom Fischer, associate professor of pathology and laboratory medicine at UNC-Chapel Hill, and Arthur Bode, professor of pathology and laboratory medicine at East Carolina University, ELABORATIVE think that they have almost perfected such a product — ELABORATIVE REWORDING lyophilized, or freeze-dried, blood platelets.

The solution is immediately addressed through elaboration, and from that point on the article takes on the task of describing "lyophilized, or freeze-dried, blood platelets," and how the scientists discovered their potential to preserve blood platelets. After descriptions of the research and development necessary for developing their ideas, "Stop the Bleeding, Now" hits on a particular moment of temporal, causal, and elaborative relations:

> TEMPORAL In 2001, Centeon had problems with one of its other products, CAUSAL and for financial reasons had to pull out of the platelet project. TEMPORAL Carolina reclaimed the license in 2001. Two years passed. CAUSAL With the help of Carolina's Office of Technology Development, Fischer and Bode became convinced that CONDITIONAL if they were going to get these platelets into clinical trials, CAUSAL they'd have to start their own company. Fischer took a Carolina Kenan-Flagler Business School class CAUSAL intended to help faculty understand the business side of commercializing inventions. CAUSAL Through that class he met entrepreneur Stan Eskridge, who helped form their company, Hemocellular Therapeutics, which was founded in 2002. ELABORATIVE Eskridge is president, and Dana Fowlkes, a former Carolina pathology professor who has formed several businesses, serves as CEO.

The passage from "Stop the Bleeding Now" is an exemplar of the dialectical relationship of the temporal, causal, and elaborative relations. The general lexical pattern of the trend is thus: Certain events or meetings located in a specific time (TEMPORAL) led to (CAUSAL) a discovery or partnership, all tied together at the end with an elaboration (ELABORATIVE). Temporal semantic relations and conditional statements lead to an

explanation based on causal and elaborative semantic relations. The temporal, causal, and elaborative dialectic works to systematically deploy the "problem-solution" scenario, thus legitimating the entrepreneurial as a catalyst for the resolution of pressing societal problems.

Logic of appearances. The dominant logic of appearance in the texts ties the scientific research done to advance society to marketization of research, without explaining alternatives or drawbacks to marketization. We've already seen this in "The Economic Engine that Could," in which successful transition of research to the market makes one a "winner" or "loser." There is no explanation of market forces at work in the success or failure of technology transfer, nor is there an explanation of just who benefits from marketization.

The logic of appearance bolsters the "problem-solution" semantic relation described in the previous section. A dominant configuration of the logic of appearance is the presentation of a problem, and the resolution of that problem through technology transfer. An example of this is "Predicting a Breast Cancer's Aggression:"

> Women diagnosed in any stage of breast cancer will soon be able to get a more comprehensive test that will help doctors plan their treatment. Developed by Charles Perou and colleagues, the test predicts the aggressiveness of breast tumors and anticipates how cancer will respond to chemotherapy.
>
> The test uses fifty genes to classify a tumor as one of four subtypes that vary in prognosis and drug susceptibility, and require different courses of treatment. For example, the test can identify estrogen-receptive tumors, helping some patients who might traditionally have been given chemotherapy avoid it in favor of hormone-blocking drugs. Other tumors of the aggressive Luminal B subtype don't respond well to chemotherapy or to hormone-blocking drugs, making them good targets for cutting-edge therapies.

> Although the new test looks for a complex set of traits, it uses technology that's already in many pathology clinics. "Instead of sticking with the microarray platform that we used to discover the genes, we chose a platform called quantitative RT-PCR," Perou says. "Some labs may already have much of the equipment needed to run the assay."
>
> A study of about seven hundred patients published in February 2009 confirmed the test's ability to predict how tumors will respond to chemotherapy. Larger clinical trials are under way. The patent-pending test is being marketed by University Genomics and ARUP Laboratories as the Breast Bioclassifer, and will be available commercially in summer 2009. (*Endeavors*, Spring 2009)

The problem, breast cancer, will be mitigated by technology developed to predict a breast cancer's response to chemotherapy. After some considerable explanation of the science behind this technology, and the mentioning of a study that confirms the test's results, the article promises that this technology's availability in the market is imminent. The logic of appearance comes to play in that we are not quite sure of the process for bringing the technology to the market, nor are the implications of bringing the technology to the market made explicit. We are meant to infer that the technology, being made "available commercially," will be available for public use. The leap from a lengthy explanation of the science behind a discovery to the statement that it will be made commercially available in the very last sentence indicates a logic of appearances in which the reader must decide that a medical discovery being made commercially available means it will improve his or her health outlook. There is no room to question why this is the case, just to accept.

I have described the dominant local and more encompassing semantic relations and their specific lexical formations that legitimate the entrepreneurial university. My general finding was that the entrepreneurial university is legitimated through a "problem-solution" semantic relation that is realized through configurations of temporal, condition, and causal

and elaborative semantic relations. I have also noted the dominant logic of appearances that interacts dialectically with the "problem-solution" semantic relation to generate an implicit trust in the entrepreneurial university to bring potentially life-saving solutions to the market, and implicit trust in the market to disseminate these solutions effectively.

What are the Semantic Relations between Words?

In Chapter III, I covered hyponyms, antonyms, synonyms, lexical metaphors, and grammatical metaphors along with examples of how these semantic relations are used in the data. For the purposes of recapping, I will define these terms below and provide examples of how they appear in the data. I will then move on to a more systematic description of how these semantic relations appear in the data.

Hyponym: the use of two words within the same family. Textually speaking, the "best and brightest minds and the best tools" are hyponyms of being entrepreneurial and competitive: "You have to have the best and the brightest minds and the best tools. You must think ahead of the curve, be entrepreneurial, to be competitive."

Synonym: Refers to one thing that is equated with another thing, like in the following example where "technology transfer" and "well-trained graduates" are synonyms: "In fact, our most effective technology transfer is accomplished at graduation each year when we send well-trained graduates into the workforce."

Metonyms: Where a word closely associated with an entity is used as a link to it through the context of writing and speaking. Textual instances of this is the metonymy of "taking chairs" or "sits on its board" for leadership of a company. Although a "chair" or a "board" can be also understood with the skill of a musician in a symphony (chair) or the

place where a priest administers transubstantiation (board), it can be understood through

context that referring to "chair" and "board" is linked with leading a company.

Synechdoche, a type of metonym, uses a part to refer to the whole, like "quick dime" for

an ostensibly larger amount of money.

      Antonymy: The lexical presentation of opposites. The following statement from

the texts is a form of antonymy: "the heavy lifting in this attempt to unscramble the

workings of complex natural systems will fall to neither super computers nor banks of

space age equipment. . . . but will be the microbial organisms that form the most basic tiers

of life on our planet." This description of our future is based off the description of what is

not our future, supercomputers and space-age equipment, with what is, microbial

organisms.

      Lexical metaphors are "words which generally represent one part of the world

being extended to another" include "tailoring" for creating a virus that helps us understand

treatments, "landscape" for the market, "beast" for start-up, "marriage of technology and

commerce" as technology transfer (Fairclough, 2003, p. 131). Through **grammatical**

metaphor, meaning is constructed in a different way through a different grammatical

construction. For instance, one article reads, "Among the enticements UNCG offers

prospective faculty is generous revenue sharing." Revenue sharing is a coded phrase for

the exacting of a fee by the university on the researcher for the licensing of research. While

the subject (the university) and the object (the researcher) are mentioned in the clause, the

grammatical metaphor itself elides explanation of the process.

I found that market metaphors dominated the data, and that market metaphors could be organized into three patterns in terms of their legitimation of the entrepreneurial university—the assigning of value to research based on its availability to the market, the extension of the research process to marketization, and the highlighting of the capacity of the entrepreneurial university to bring to the market solutions to pressing issues. I also found that other semantic relations (discussed above) can be organized within these nodes. The presentation of my findings in nodes allow me to show how market metaphors and associated semantic relations work together to legitimate the entrepreneurial university. I argue that this is done through the legitimating strategy of authorization—legitimation by reference to the authority of the university to function as an enterprise, and the overarching trust in the capitalist system to disseminate solutions to pressing human needs. In the following paragraphs I explain the three nodes of legitimation and the ways they are operationalized in the data (Fairclough, 2003). These nodes are directly related to the legitimation strategy of authorization vis-à-vis the university's relation to the market.

Figure 4 is a figural depiction of how I see semantic relations between words relating to the dominant logics I found in the texts, and the nodes I identified in classifying them. The circles represent "semantic relations between words." These circles indicate the variety of semantic relations, and their circumferences represent the varying degrees to which certain semantic relations may appear in the text. The semantic relations between words are then deployed using certain "logics." Then, as a researcher, I observed these semantic relations between words and their logics in certain nodes. The nodes are

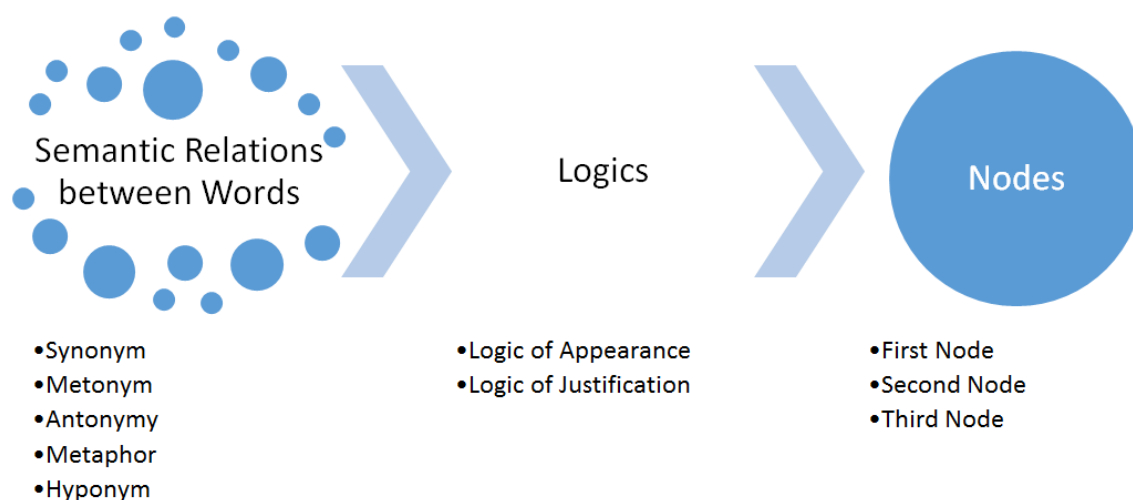represented by a larger circle, because they are not exclusive of each other, but rather interrelated.

Figure 4. Process for Selecting Semantic Relations.

First node. The first node in the legitimation of the entrepreneurial university is the assigning of value to research based on its availability to the market. This is operationalized by qualitative judgements that classify different types of research based on their availability to the market. Thus, the market becomes the authority to which the entrepreneurial university is legitimized. For instance, a lexical metaphor associating the action of "someone accidentally does something with it" with technology transfer:

> In the past, a lot of the extremely basic science has been done and published, and then you just hope someone accidentally does something with it. We can do better. (*Endeavors*, "Heartbreak Hill," Fall 2011)

Through this metaphor we get the sense that scientists who do not create knowledge meant for the market are not fulfilling their duty, and whose work is only profitable by "accident."

There is a trend of similar metaphors for moving discoveries to the market, such as

"pushing" and "harnessing"—common metaphors using physical action to represent a

process involving many types of action. A more pronounced expression of judgment upon

research can be seen in the lexical metaphor of "the valley of death" for research that is not

actively on its way to the market:

> Only 14 percent of medical research findings turn into beneficial clinical changes.
> And it can take up to seventeen years to turn a discovery into a treatment—a stretch
> of time some researchers call the valley of death. Few scientists attempt to cross it,
> and even fewer succeed. (*Endeavors*, "Heartbreak Hill," Fall 2011)

Academic research unavailable to the market leads to death, and by implication, academic

research brought to market leads to life. More than just dramatic effect, this metaphor

privileges marketized research as a matter of "life" over "death." My third example

employs metaphor, antonymy, and hyponymy—the use of words within the same semantic

field:

> Unlike many American universities, where much major research languished,
> unknown and unutilized, in what has been called "the academic brickyard," the
> Japanese developed a systematic database that matched technological
> breakthroughs with commercial applications. It was a question, says McGuire, "of
> combining creativity and productivity." (*UNCG Research*, "Next Wave," Spring
> 2003, p. 9)

The lexical metaphor of American research universities as the "academic brickyard"

intertwines and bolsters the antonymy of languishing research and the "technological

breakthroughs with commercial applications" of the Japanese university system. The tonic

to this is presented through the hyponymy of "technological breakthroughs" and

"creativity," and "commercial applications" with "productivity." As hyponym of

"creativity" and "productivity," "technological breakthroughs" and "commercial

applications" attain a nobler purpose.

I want to present one more finding of how grammatical relationships between

words foist qualitative judgements upon types of research—a grammatical metaphor for

the marketized end product:

> "We're proud of our relationship with Xintek," says Jim Deane, a project manager
> at OTD who has worked with Zhou. "As a licensee, they are successfully filling our
> number-one mission, which is to create new products and make their benefits
> available to the public." (*Endeavors*, "The Physics of Clarity," Fall 2005)

The last clause in the Office of Technology Development's mission, "make their benefits

available to the public," serves as a grammatical metaphor for seeing the results of

marketing a product. The grammatical metaphor indicates the judgement that research

heading to the market is the optimal type of research based on its availability to the public.

Coming from an office charged with technology development, this is no surprise, but what

makes this finding significant is the choice of grammatical metaphor over an explanation

of market considerations.

"We can do better" than just conducting and publishing research; research not

marketized languishes in the "valley of death"; American research ended up in the

"academic brickyard" while Japanese research was marketized, a difference ascribed to the

application of creativity and productivity. It is not enough to do research and publish it; in

fact, openly published research is less valuable than commodified research. This represents

the first node in the process legitimation—assigning a higher value to research heading to the market.

Second node. The second node of the legitimation strategy is the extension of the research process to marketization. My findings on semantic relations between words indicate that the primary focus of the research magazine is to narrate ways in which an idea becomes research, research becomes a marketable product, and this product is then sold and becomes a tool used to save lives, or otherwise increase quality of life. However, this process is often collapsed in order to bring out the end results and market connections. The semantic relations between words work to collapse the research to marketization process as described by Geiger (2004)—development of basic research necessary for research and development, securing intellectual property rights on the part of the researcher in order to publish, protect, and develop the work as it moves towards the market. Emphasis is placed on the end product as a result of this bracketing of the research process.

I found variations on "translation" as a description of moving research from the lab to the market. The first variation suggests that "translational medicine" and "entrepreneurship" are within the same semantic field:

> The ability to try something new, to get out of your comfort zone, and even be willing to fail, is essential to translational medicine and to entrepreneurship. That's something Cam Patterson learned when he started studying business. (*Endeavors*, "Heartbreak Hill," Fall 2011)

"Translational medicine" and "entrepreneurship" become co-hyponyms of risk-taking, bridging the difference between the study of medicine and entrepreneurship. The next

example employs the grammatical metaphor of "translation" for the process of bringing

research from one stage to another:

> Making some-thing actually translate to the science and technology field from a lab, to the stage where a common man in the community can use it, takes a lot of time, a lot of talent and a lot of dough. (*UNCG Research*, "Kotra," Spring 2009, p. 26)

We see two metaphors related to the market—"translation" for marketization and "dough"

for money—and also the "common man" as a metonym for the general public. A metonym

is a type of synonym, and is used to refer to something of similar properties not of its own

name. "Translating" a finding from the lab to the marketplace brings to the "common man"

what he needs to make his life better. The déclassé metaphor for money, "dough,"

backgrounds the materials needed for this "translation," perhaps to relieve those worried

about "dough" by underscoring the social benefits of technology transfer. The "translation"

metaphor, the most prominent grammatical metaphor throughout the magazines,

metaphorically represents the complicated process of technology transfer as another step in

fulfilling the intellectual and social mission of the university.

The metonym in the previous example referred to the general public as a "common

man in the community." Synecdoche, a figure of speech using a part to describe the whole,

is also a part of metonymy, and I also see this at work in extending the process of research

to marketization. In the following example "quick dime" acts as synecdoche describing

just one part of a presumably larger sum of money, and "quick buck" is a metonym for

what we can understand contextually to mean a larger sum of money:

> They didn't look at how we could make a quick dime, they looked at how we could really advance the technology and improve the state's economy. It's not about just making money off a patent, it's about creating a company with longevity that provides jobs and opportunities. That's much more profound than a quick buck. (*Results*, "Agile Sciences," Spring 2003, p. 12)

The synecdoche and metonymy ascribe a pejorative hue to their referent, the generation of capital, thereby setting up the alternative, "jobs and opportunities," as something more palatable. At work in this example is the justification of marketization of research from a "public good."

The synergy metaphor, my final examples, compare the research process to elements combining to make a whole in the natural world. The metaphor suggests that "commercialization" and "technology" in part make-up this "natural" process:

> Chancellor: Research and the commercialization of new technology are key synergies of our educational mission, not competitors. Students learn both in the classroom and in the laboratory—theory and application—and these activities complement each other. (*Results*, "Chancellor: Tech Transfer A Win-Win for State, NC State," Spring 2004)

Through the "synergy" metaphor, research and commercialization become co-hyponyms of "educational mission," as each works together to support the lessons on "theory and application." Other examples of this include metaphors for the market as a landscape, an ecosystem, and world (i.e. business world). The relationship between words in the research magazines collapses the research process and naturalizes the extension of the research process to technology transfer.

Third node. The third node is the narration of academic entrepreneurship in the sciences leading to life saving technologies, as well as boons to the economy. The

examples below demonstrate this type of legitimation using semantic relations between words. In discussing the necessity of a state-of-the-art research facility, a researcher makes a simile comparing the facility to a Ferrari, stating, "It's like having the fastest and greatest Ferrari in the world. If you don't have the greatest and the fastest driver, it's no good." The simile goes further than comparing a high price facility to a high performance automobile, but suggests that the research process is a race to be won. Earlier examples of semantic relations have also hinted at the race theme. For instance, the mention of "winners" and "losers" in describing startups in the preceding section. This plays out in metaphors describing the research process as a race. The first example is the race metaphor described in Chapter III:

> The goal is to transform the way biomedical research is done so scientists can more easily take their breakthroughs to the finish line. (*Endeavors*, "Heartbreak Hill," Fall 2011)

Researchers are in a race against other researchers, and in a race against the diseases they are researching. Moreover, the lexical metaphor of "gap from bench to bedside" for the trouble converting basic science into market-active products indicates that academic entrepreneurship in the sciences brings life-saving discoveries to your hospital bed:

> Fischer took the course many years ago and says that the experience gave him the training he needed to start his business. And that business was critical when he faced the infamous gap from bench to bedside. (*Endeavors*, "Heartbreak Hill," Fall 2011)

Another example is the lexical metaphor of the university as an "incubator" of ideas and small businesses:

> So it may well be that in addition to being an incubator of ideas, the university may yet become an incubator of small businesses that will carry UNCG's reputation far beyond the Piedmont. (*UNCG Research*, "The Next Wave," p. 9)

Universities, in this example, generate a tax base through their support of industry and job creation. This activity can be perceived as a response to economic crises like unemployment—the same article employs a grammatical metaphor to indicate that universities work to stave off such economic woes:

> With outsourcing of jobs and offshoring of responsibilities—and with many corporations having headquarters in various countries—the world is undergoing a seismic shift. Capitalism has won—in a big way. Which means, we could lose. (*UNCG Research*, "The Economic Engine That Could," Spring 2007, p. 19)

"We," i.e., the universities and their stakeholders, face the economic pressures of "outsourcing," "offshoring," and the outcomes of either winning or losing. "Outsourcing," "offshoring," "won," "lose" act as grammatical metaphors for economic processes the cause and effects of which remain unexplained, but the solution to which universities through academic entrepreneurship are supposed to present. Although it does not explicitly use the metaphor of runners in a race, it suggests the need for a response to some looming economic crisis. The research process results in the creation of some good that meets pressing needs, such as healthcare products or economic rejuvenation. Moreover, the products of the research process are not just isolated to researchers, staff, and students, but rather a function of the university itself.

Discussion

My third and last research question asks about the generic features of the university research magazine and how they function towards the legitimation of the entrepreneurial university. In my previous questions I demonstrated that university research magazines legitimate the entrepreneurial university through the discourse of entrepreneurship, but not explicitly HOW, i.e., deploying what linguistic mechanisms. Through the study of how the entrepreneurial university is legitimated I seek to explain the linguistic mechanisms through which state power is (re)produced through a selection of discourses that legitimate certain explanations of crises over others.

I looked at semantic relations between clauses, sentences, and words to answer how the generic features of the university research magazines function toward the legitimation of the entrepreneurial university. In terms of the semantic relations between clauses and sentences, I found that the entrepreneurial university is legitimated through a "problem-solution" semantic relation realized through configurations of temporal, condition, and causal and elaborative semantic relations. I also found a dominant logic of appearances that interacts dialectically with the "problem-solution" semantic relation to generate an implicit trust in the entrepreneurial university to bring potentially life-saving solutions to the market, and implicit trust in the market to disseminate these solutions effectively. In my analysis of semantic relations between words, I found market metaphors dominated, and argue that this is done through the legitimating strategy of authorization—legitimation by reference to the authority of the university to function as an enterprise, and the overarching trust in the capitalist system to disseminate solutions to

pressing human needs. Altogether, I found that discourses of entrepreneurship derive legitimacy not explicitly through logics of explanation but through logics of appearance and through authorization vis-à-vis the university's relation to the market.

Conclusion

In this chapter I examined the ways the entrepreneurial university was legitimated through discourse in the university research magazine. I found that discourses varied significantly by university. This suggests to me that the discourses used to legitimate the entrepreneurial university are directly related to the observation of the integrated entrepreneurial culture—the entrepreneurial architecture is built off the already existing structure of the university. In this way, the selection of discourses to legitimate the entrepreneurial university may be influenced by the already existing structures of the university and their relationship to the entrepreneurial culture. In answering my second question I found that the discourse of entrepreneurship presents university actors as answering to the pressing needs of society, rather than society itself. In the execution of these discourses, the university is to answer to the pressing needs of society by generating economically competitive research. In answering my third research question I described how university research magazines legitimate the entrepreneurial university through a dominant logic of appearances that interacts dialectically with the "problem-solution" semantic relation to generate an implicit trust in the entrepreneurial university to bring potentially life-saving solutions to the market, and implicit trust in the market to disseminate these solutions effectively. I also found that market metaphors were deployed

to support a logic of authorization, by which the entrepreneurial university was legitimated through its connection to the logic of the market.

CHAPTER V

CONCLUSION

In writing this dissertation I hope to move ahead the scholarship of the entrepreneurial university in answering two broad questions. First, what role does the university play in mediating an ever expanding notion of competitiveness and the concomitant burgeoning of technological and scientific innovation? Second, how does the university frame itself as a hub of technology and intellectual capital development and dissemination? I argue that the entrepreneurial university mediates the crisis of competitiveness through its representation of technological and scientific developments in university research magazine. In these representations the entrepreneurial university brings life-saving discoveries to the public by way of the market.

My theoretical framework draws from cultural political economy and the technological sublime. My application of cultural political economy to this study was informed by Bob Jessop's "strategic-relational approach" which views the state as a social relation, whose power is (re) produced through a selection of discourses that privilege certain explanations of crises over others. I also framed my research within the notion of the technological sublime—a theoretical lens for understanding the fear and awe felt in the midst of a crisis of fast-paced, and competitively driven technological and scientific change—to situate the entrepreneurial university at the crux of a culture of competitiveness. I argue that the university research magazine serves to legitimate the

entrepreneurial university as a mediator of crisis. Thus, my work in describing the genre of the university research magazine circles back to my theoretical framework; the mediation of crises in our personal interactions with the cognitive overload of postmodern life, both in the contradictions of separate state and market logics, but also the cognitive overload experienced in a society of hyper-commodification.

In my literature review, I covered the scholarship on the entrepreneurial university, its success in tying the entrepreneurial university to the burgeoning in the demand for science and technology and its participation in a new knowledge regime that cinches the university to the global trade competition. First I present Etzkowitz's (2002) "triple helix" of university-government-industry in which basic research, applied research, and product development blend as more emphasis is placed on interdisciplinary research. Second, Slaughter and Leslie's (1997) and Slaughter and Rhoades's (2004) depict an academic capitalist regime in which academic staff compete for grants, contracts, endowments, funding for spin-off companies, and competition for students and fees. Scholars of the academic capitalist vein describe a new knowledge scheme in which technology blends with sciences, i.e., Slaughter and Leslie's (1997) technoscience, a way of blending science and product with the intent to create new industries out of old, and Geiger's (2004) biocapitalism, which captures the relationship between academic science and the biotechnology industry in which academic science, innovation, and the generation of capital work together. Each of these sources describes the importance of academic entrepreneurship in the sciences to the development of the entrepreneurial university. However, I find that the sources discussed above ignore the semiotic moments of the

culture of competitiveness. My study develops the connection between these technological and scientific innovations made through academic entrepreneurship in the sciences and the selection of discourses to legitimize the entrepreneurial university. I propose a third leg of the entrepreneurial turn, one concerned specifically with the semiotic order of the culture of competitiveness.

The university research magazine legitimates the entrepreneurial university as a mediator of crisis. As mentioned above, Bob Jessop's strategic-relational approach views the state as a social relation, whose power is (re) produced through a selection of discourses that privilege certain explanations of crises over others. Following in this vein, David Tyfield (2012) argues that as solutions to crises such as environmental degradation are demanded of science, the study of how science policy and science practices emerge within the cultural, political, and economic milieu is ripe for the analysis of the (re)production of power . I answer to Tyfield's call for an analysis of the power and knowledge at stake in science policy's response to crisis with my own examination of the discoursal representation of technological and scientific development in the university research magazine, and the findings as they relate to the mediation of crises. Furthermore, I examine my findings on a more theoretical level by revisiting the technological sublime and its applications to the entrepreneurial university.

The Study

Summary

For the purpose of exploring these representations, I collected a corpus of 1,130,292 words from a collection of three university magazines—UNC Chapel Hill's *Endeavors*, NC State's *Results*, and *UNCG Research*. Three questions guided my research:

RQ1. What is discursively unique about UNCG magazine, NC State magazine, UNC compared to the Corpus of Contemporary American English (COCA)?

RQ1A. What is lexically unique in each university's magazine?

RQ1B. How do these keywords cohere in thematic clusters across university magazines?

RQ2. Which, if any, of these salient lexical items indicate discourses related to entrepreneurialism?

RQ2A. What keywords indicate academic entrepreneurship in the sciences?

RQ2B. Which of the above keywords were most salient in describing activities related to academic entrepreneurship in the sciences?

RQ3. How do the generic features of these texts function toward the legitimation of the entrepreneurial university?

RQ3A. What are the semantic relations between sentences and clauses?

RQ3B. What are the semantic relations between words?

Answering these questions help answer the more general questions: How did academic entrepreneurship in the university become a way of answering to pressing human needs? How is this made to seem normal? That is, how do actors within the institutional and

organizational ensemble that makes up the state legitimize entrepreneurship through the type of discourses selected?

In Chapter II, I theorize the entrepreneurial university as an emerging form of the political, economic, and cultural conditions that inform science practices. I look at how science, as a reflection of the cultural political economy at work, has been couched in the discourse of the entrepreneurial university as a response to the crisis of competitiveness. I discuss transitions in the discourse of science policy as they relate to a response to "political" crises, and posit that a discourse of entrepreneurship in the university legitimates the entrepreneurial university as a response to crisis. In Chapter III, I explain in detail the theoretical and practical significance of combining the methodologies of corpus linguistics and critical discourse analysis in investigating my primary data, university research magazines. I explain how I use keywords to figure out what is unique about each magazine, how I use qualitative methods aided by information from quantitative analysis to select data points that indicate academic entrepreneurship in the sciences, and I use the tenets of critical discourse analysis to study how, in a selection of texts, genre features legitimate academic entrepreneurship. In Chapter IV, I presented the data and described its relevance to the literature on the entrepreneurial university. I will now explain the significance of my findings and expound upon how the entrepreneurial university mediates crisis.

RQ1: What is discursively unique about UNCG magazine, NC State magazine, UNC compared to the Corpus of Contemporary American English (COCA)? Answering this question involved comparing a list of keywords from each

university magazine to the Corpus of Contemporary American English (p. 0001). The significance of the findings is a glimpse into how entrepreneurial structures flourish within different institutions. Each university presented with different unique lexical items. Furthermore, I found that when I grouped keywords according to themes across the university research magazines the themes corresponded with the university's missional values.

Differences may result from a university's representation of their research, but a fundamental singularity is the presentation of their research as answering to pressing human needs. In presenting research in this way, the university research magazine draws from the institutional strengths of the university to present their research as answering to these needs. This can be directly tied to studies on the institutional structure of the entrepreneurial university, which is integrated with the existing structure of the university to create an entrepreneurial architecture, and the transitioning discourses of science to an applied focus amidst crises of competitiveness. I argue that the entrepreneurial university's mediation of crisis by answering to pressing human needs is a direct result of an entrepreneurial culture that draws from the pre-existing structures of the university to mediate crisis.

RQ2: Which, if any, of these salient lexical items indicate discourses related to entrepreneurialism? First, I uncovered a set of keywords indicating academic entrepreneurship in the sciences. I accomplished this by developing a running hypothesis about which keywords represented this topic by using concordance and collocation analysis. I arrived at a set of keywords, and used the concordance and collocation analysis

to confirm or reject their salience to the topic. I then used the concordance and collocation analysis to find textual instances of these words. The articles in which I found these textual instances were then explored for the variations of the discourse of entrepreneurship within them. I found a commodity discourse of academic entrepreneurship in the sciences, a speculative discourse of academic entrepreneurship in the sciences, and an institutional-based discourse of academic entrepreneurship in the sciences. Within each discourse of entrepreneurialism, academic research was redefined and reinterpreted as a commodity. Moreover, within these discourses traditional dichotomies of academic research, i.e. basic and applied, were backgrounded in favor of grant funding, development, and the marketization of medical techniques and other technologies. The subject matter of university magazines reflects the theories of "technoscience" and "biocapitalism" as expressed in the literature on the entrepreneurial university.

My findings, however, add more to the academic capitalist explanation of a new knowledge regime. I argue that the role of these university actors is not only to create applicable knowledge but to be sure it makes it to the market. This behavior is not just indication of a university-industry-government relations (triple helix) or an academic capitalist regime in which research is pipelined to the market, but an identification of academic research as inherently risky. The academic scientists, behaving as entrepreneurs, take on this risk with their research. Discourses of entrepreneurship in the university research magazines legitimate the entrepreneurial university by depicting university actors who behave entrepreneurially answering to pressing societal needs.

RQ3: How do the generic features of these texts function toward the legitimation of the entrepreneurial university? To answer this question I looked at semantic relations between sentences and clauses, and semantic relations between words. Studying semantic relations uncovers traces of the logics deployed to legitimate the entrepreneurial university, and the gleanings from this examination contributes to answering "What does the genre do discursively?" I drew from the process of constant comparative analysis as described in Birks and Mills (2011) to code my data—comparing incidents with incidents, establishing codes, comparing codes, collapsing codes into categories, and then comparing categories. I position myself methodologically through critical discourse analysis as described in Fairclough (2003), thus informing my constant comparative analysis.

Semantic relations between sentences and clauses. The main semantic relations between sentences and clauses are classified as causal (the explanation of reason, consequence, and purpose), conditional (if), temporal (when), additive (and), elaboration (the act of exemplification and rewording), and contrastive/concessive (This happened, but . . .). I found that semantic relations legitimate the entrepreneurial university through the following set of configurations—a narrative with an overarching "problem-solution" semantic relation, setting up the "problem" using temporal or conditional relations, and proceeding to describe how the "problem" is or will be resolved through causal, and elaborative relations. Moreover, a dominant logic of appearances interacts dialectically with the "problem-solution" semantic relation to generate an implicit trust in the entrepreneurial university to bring potentially life-saving solutions to the market, and

implicit trust in the market to disseminate these solutions effectively.   Discursively, the genre of the university research magazine mediates crisis by employing semantic relations to set-up a "problem-solution" narrative in which the university introduces life-saving solutions to the market.

What are the semantic relations between words? In Chapter III, I covered hyponyms, antonyms, synonyms, lexical metaphors, and grammatical metaphors along with examples of how these semantic relations are used in the data. **Hyponym:** the use of two words within the same family. **Synonym:** Refers to one thing that is equated with another thing. **Metonyms:** Where a word closely associated with an entity is used as a link to it through the context of writing and speaking. **Synechdoche,** a type of metonym, uses a part to refer to the whole, like "quick dime" for an ostensibly larger amount of money. **Antonymy**: The lexical presentation of opposites. **Lexical metaphors** are "words which generally represent one part of the world being extended to another" include "tailoring" for creating a virus that helps us understand treatments, "landscape" for the market, "beast" for start-up, "marriage of technology and commerce" as technology transfer (Fairclough, 2003, p. 131). Through **grammatical metaphor**, meaning is constructed in a different way through a different grammatical construction. I organized the dominant market metaphors and their associated semantic relations into three patterns in terms of their legitimation of the entrepreneurial university—the assigning of value to research based on its availability to the market, the extension of the research process to marketization, and the highlighting of the capacity of the entrepreneurial university to bring to the market solutions to pressing issues.

Significance of the Study

I want to revisit the argument I made regarding the university research magazine in Chapter I. After a description of UNLV's magazine, I posited that university research magazine's primary function is to mediate between the university and the reader an understanding of how research moves "humanity" forward in its response to crises—i.e., cures to diseases, the crisis of capital and global competition. In this way, the university research magazine serves to legitimate the entrepreneurial university as a mediator of crisis. Indeed, my findings support this hypothesis. In my discussions on the significance of the findings, I tried to bring mention to the theoretical frameworks. But, I want to reiterate my theoretical framework's close relation to the findings. My theory that the entrepreneurial university mediates crisis through its presentation of market-oriented solutions holding strong, I want to mention the fruits of cultural political economy and the technological sublime. The entrepreneurial university is not merely realized through the notion of entrepreneurship qua entrepreneurship, but through a culturally-oriented approach relating academic science to the cognitive overload of postmodern life. As mentioned after my explication of UNLV's magazine in Chapter I, this ties together cultural political economy and the technological sublime in that it answers to the contradictions of separate state and market logics, and the cognitive overload experienced in an age where technological and scientific innovations are hyper-commodified. My next section on the "technological sublime" explains why the representation of the mediation of crisis is key to the legitimation of the entrepreneurial university.

Technological Sublime

In my introductory chapter I used the notion of the "technological sublime" to explore the conflation of crises and science. I argue that the notion of the technological sublime allows scholars to theorize the entrepreneurial university's purpose as a hub of scientific and technological development. I will now recap the technological sublime, and then discuss how this notion helps explain general patterns within my findings.

Historically a reference to the cognitive overload stemming from facing unreckonable phenomena, the notion of sublime is often premised on the idea of "nature" as "other." However, contemporary scholars such as Frederick James posit that "technology" and the contradictions of capital contribute to the cognitive overload of postmodern life. Using a more constructive notion of sublime, Henneberg (2011) rethinks cognitive overload as a space for human regeneration, and cites literary production as a space in which to do this. My study of discourses—a part of what Jessop calls "the making and remaking of the social world"—speaks back to this notion of the technological sublime, allowing the inference that the university, as a mediator of crises, participates in this process of rethinking cognitive overload as a space for human regeneration.

Problem-Solution

I discussed in depth the dominant configuration of the problem-solution scenario in Chapter Four. This particular configuration of semantic relations undergirds the university research magazine's presentation of the entrepreneurial university as a mediator of crisis. No longer are "problems" like the vagaries of economic competition ethereal notions. Rather, university research magazines bring them to the fore through the discourse of

academic entrepreneurship in the sciences; through discourse, the genre of the university

research magazine situates a problem in what appears as "reality" to the reader. As a result,

not only do these problems arise through a logic of appearance as a part of "reality," but the

solutions also arise through a logic of appearances. University research magazines mediate

crisis by operationalizing semantic relations configured within a problem-solution

scenario. The university research magazine discoursally constructs space for human

generation by situating the sublime of postmodern life (i.e. technologies and the

contradictions of capital) as a problem to be solved by the university.

Translation

In Chapter IV I noted the presence of the word "translation." The "translation"

metaphor, the most prominent grammatical metaphor throughout the magazines,

metaphorically represents the complicated process of technology transfer as another step in

fulfilling the intellectual and social mission of the university. Variations of "translation"

are also used to describe the "translational medicine" process—the movement of

therapeutic techniques from some other area of science to its human applications in

medicines. I believe the "translation" metaphor uniquely captures the "technological

sublime" as human regeneration because of the complicated processes it represents.

"Transfer" connects cutting-edge research with humans through scientific and market

applications; taking an abstract technological or scientific development and placing it in

the hands of the public, "transfer" metaphorically turns the unreckonable phenomena of the

sublime into a sense of human regeneration.

Reflection on Research

Limitations of My Study

I identify the primary limitation of this study as being my own subjectivity as a researcher. Although I followed corpus linguistics to select keywords and texts in which they appear, I am still limited in doing so by my own subjectivity. Simply put, I still chose certain words above others that I theorized as representing academic entrepreneurship in the sciences. I then followed a methodology to confirm or deny this hypothesis using all keywords, but I still arguably could have chosen a different set of keywords with similar results. Moreover, I select properties of corpus linguistics following the instructions of researchers whose very research agenda is the establishment of a "useful methodological synergy" of corpus linguistics and critical discourse analysis (Baker, Gabrielatos, Khosravinik, Krzyzanowski, Mcenery, & Wodak, 2008). However, this limitation points to a strength of my paper, which is the iterative process I used to guide my primary research. The iterative process provided guidelines for my selection of keywords and texts, while also honoring my subjectivity.

My study was limited in the number and geographic scope of the universities I selected. Thus, I was not able to identify regional or national traits of the entrepreneurial university and their research magazines. The study was also limited in the consistency of magazine publications. Universities often ceased publication of their magazines, some began publishing on-line in blog format. Other universities started research magazines in the latter part of the decade. This contributed to the selective data pool, as I was looking for consistent publication throughout the decade.

Another limitation is my methodology's consistency with Jessop's methodology for the strategic-relational approach. Jessop's approach is strictly diachronic, meaning an analysis of how discourses change over time. I did not follow this line of questions, though if I had I certainly would have had to collect a larger body of magazines as suggested above. A diachronic analysis of university research magazines would have allowed me to engage in more of a conversation relating to historical trends in the discourse of entrepreneurship and its relation to perceived crises.

University Research Magazines

There is little research on the genre of the university research magazine. I would encourage anyone interested in matters of discourse studies as applied to higher education to pursue their own study of university research magazines. Indeed, a rich field of primary data exists for such a study. Some suggestions for future research might be that the researchers focus on a larger selection of universities. I would also suggest looking at universities that span geographic locations. If a researcher were to follow this advice, they could fulfill yet another recommendation of mine by including case studies of universities, thus flushing out more how a universities profile informs their university research magazines. This would also allow the researcher to explore more in depth how entrepreneurial initiatives cohere to the already established mission of the university.

WORKS CITED

Baker, P. (2006). *Using corpora in discourse analysis*. London, UK: Continuum.

Baker, P., Gabrielatos, C., Khosravinik, M., Krzyzanowski, M., Mcenery, T., & Wodak, R. (2008). A useful methodological synergy? Combining critical discourse analysis and corpus linguistics to examine discourses of refugees and asylum seekers in the UK press. *Discourse & Society, 19,* 273–306. doi:10.1177/0957926508088962

Barosso, J.-M. (2005). "Building an open Europe in times of change." *European Commission Press Release Database*, SPEECH/05/546. Retrieved from http://europa.eu/rapid/press-release_SPEECH-05-546_en.htm

Birks, M., & Mills, J. (2011). *Grounded Theory: A practical guide*. Los Angeles, CA: Sage.

Biber, D., Conrad, S., & Reppen, R. (1998). *Corpus linguistics: Investigating language structure and use*. Cambridge, UK: Cambridge University Press.

Calvert, J. (2006). What's special about basic research? *Science, Technology, and Human Values, 31*(2), 199–220. doi: 10.1177/0162243905283642

Center for Labour Studies. (2014, October 18). *Bob Jessop: States and state power: A strategic-relational approach* [video file]. Retrieved from https://www.youtube.com/watch?v=ASbFGrnERcY

Chouliaraki, L., & Fairclough, N. (2002). *Discourse in late modernity: Rethinking critical discourse analysis*. Edinburgh, UK: Edinburgh University Press.

Clark, B. R. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation.* Oxford, UK: IAU Press and Pergamon.

Colette, H., Frances, H., & Claire, L. (2005). Entrepreneurship education and training: Can entrepreneurship be taught? Part I. *Education + Training*, *47*(2), 98–111. doi.org/10.1108/00400910510586524

Colyvas, J. A. (2007). From divergent meanings to common practices: The early institutionalization of technology transfer in the life sciences at Stanford University. *Research Policy, 36*(4), 456–476. doi:10.1016/j.respol.2007.02.019

Colyvas, J. A., & Powell, W. W. (2007). From vulnerable to venerated: The institutionalization of academic entrepreneurship in the life sciences. *Research in the Sociology of Organizations, 25*, 219–259. doi.org/10.1016/S0733-558X(06)25007-9

Cutrer, E. F. (2005). Student social entrepreneurs: A classroom call to action. *Peer Review, 7*(3), 27–28. https://libproxy.uncg.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=17563769&site=ehost-live

Dunning, T. (1993). Accurate methods for the statistics of surprise and coincidence. *Computational Linguistics, 19*(1), 61–74. http://dl.acm.org/citation.cfm?id=J25

Etzkowitz, H. (1983). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva, 21,* 198–233. http://www.jstor.org/stable/41820527

Etzkowitz, H. (2002). *MIT and the rise of entrepreneurial science*. New York, NY: Routledge.

Etzkowitz, H. (2003). Research groups as 'quasi-firms': The invention of the entrepreneurial university. *Research Policy, 32*(1), 109–121. doi:10.1016/S0048-7333(02)00009-4

Etzkowitz, H., & Webster, A. (1998). Entrepreneurial science: The second academic revolution. In H. Etzkowitz, A. Webster, & P. Healey (Eds.), *Capitalizing knowledge: New intersections of industry and academic* (pp. 21–46). Albany, NY: State University of New York Press.

Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy, 29*(2–3), 313–330. doi:10.1016/S0048-7333(99)00069-4

Fairclough, N. (1993). Critical discourse analysis and the marketization of public discourse: The universities. *Discourse & Society, 4,* 133–168. doi:10.1177/0957926593004002002

Fairclough, N. (1995) *Critical discourse analysis*. London, UK: Longman.

Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. New York, NY: Routledge.

Fairclough, N. (2006). *Language and globalization*. London, UK: Routledge.

Foucault, M. (1984). The order of discourse. In M. Shapiro (Ed.), *The language of politics*. Oxford, UK: Blackwell.

Francis, W. N., & Kucera, H. (1982). *Frequency analysis of English usage: Lexicon and grammar.* Boston, MA: Houghton Mifflin.

Geiger, R. L. (2004). *Knowledge and money: Research universities and the paradox of the marketplace*. Stanford, CA: Stanford University Press.

Goldstein, H. A. (2010). The 'entrepreneurial turn' and regional economic development mission of universities. *The Annals of Regional Science, 44*(1), 83–109. doi:10.1007/s00168-008-0241-z

Greenberg, D. (1969). *The politics of American science*. New York, NY: Penguin.

Gries, S. T. (2010). Corpus linguistics and theoretical linguistics: A love–hate relationship? Not necessarily . . . *International Journal of Corpus Linguistics, 15,* 327–343.

Habermas, J. (1984). *The theory of communicative action*. Boston, MA: Beacon Press.

Hébert, R. F., & Link, A. N. (2009). *A history of entrepreneurship*. London, UK: Routledge.

Henneberg, J. (2011). Something extraordinary hovering just outside our touch: The technological sublime in Don DeLillo's *White Noise. Aspeers: Emerging Voices in American Studies, 4,* 51–90. http://www.aspeers.com/2011/henneberg

Jessop, B. (2008). *State power: A strategic-relational approach*. Cambridge, UK: Polity.

Jessop, B., Fairclough, N., & Wodak, R. (Eds.). (2008). *Education and the knowledge-based economy in Europe* (Educational futures: Rethinking theory and practice). Rotterdam, The Netherlands: Sense Publishers.

Kilgariff, A. (2001). Comparing corpora. *International Journal of Corpus Linguistics, 6,* 97–133. Retrieved from http://www.kilgarriff.co.uk/Publications/2001-K-CompCorpIJCL.pdf

Kline, R. (1995). Constructing technology as applied science: Public rhetoric of scientists

and engineers in the United States, 1880–1945. *Isis, 86,* 194–221.

http://www.jstor.org/stable/236322

Lee, J. J., & Rhoads, R. A. (2004). Faculty entrepreneurialism and the challenge to

undergraduate education at research universities. *Research in Higher Education, 4,*

739–760. doi:10.1023/B:RIHE.0000044229.70457.ca

Lexically. (2015). Retrieved from http://www.lexically.net/wordsmith/

Louw, B. (1997). The role of corpora in critical literary appreciation. In A. Wichmann, S.

Fligelstone, T. McEnery, & G. Knowles (Eds.), *Teaching and language corpora*

(pp. 240–251). London, UK: Longman.

Marginson, S., & Considine, M. (2000). *The enterprise university: Power, governance,*

and reinvention in Australia. Cambridge, UK: Cambridge University Press.

Mars, M. M. (2007). The diverse agendas of faculty within an institutionalized model of

entrepreneurship education. *Journal of Entrepreneurship Education, 10,* 43–62.

Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?

doi=10.1.1.103.9115&rep=rep1&type=pdf

Mars, M. M. (2009). Student entrepreneurs as agents of organizational change and social

transformation: A grassroots leadership perspective. *Journal of Change*

Management, 9(3), 339–357. doi:10.1080/14697010903125597

Mars, M. M., & Lounsbury, M. (2009). Raging against or with the private marketplace?

Logic hybridity and eco-entrepreneurship. *Journal of Management Inquiry, 18*(1),

4–13. doi:10.1177/1056492608328234

Mars, M. M., & Metcalf, A. S. (2009). The entrepreneurial domains of American higher education. *Ashe Higher Education Report, 34*(5), 1–111.

Mars, M. M., & Rios-Aguilar, C. (2010). Academic entrepreneurship (re)defined: significance and implications for the scholarship of higher education. *Higher Education, 59,* 441–460. doi:10.1007/s10734-009-9258-1

Mars, M. M., Slaughter, S., & Rhoades, G. (2008). The state-sponsored student entrepreneur. *The Journal of Higher Education, 79*(6), 638.

Mautner, G. (2009). Checks and balances: How corpus linguistics can contribute to CDA. In R. Wodak & M. Meyer (Eds.), *Methods of critical discourse analysis* (pp. 122–143). Los Angeles, CA: Sage.

Merton, R. K. (1973). *The sociology of science: Theoretical and empirical investigations*. Chicago, IL: University of Chicago Press.

Mikkelsen, A. (1994). *University research magazines: Purposes and characteristics of a science-writing venue* (Unpublished master's thesis). Arizona State University, Tempe, AZ. Retrieved from http://www.urma.org/documents/mikkelsen1999.htm

Mulderrig, J. (2011). The grammar of governance. *Critical Discourse Studies, 8,* 45–68. doi:10.1080/17405904.2011.533570

Nelles, J., & Vorley, T. (2010). Constructing an entrepreneurial architecture: An emergent framework for studying the contemporary university beyond the entrepreneurial turn. *Innovative Higher Education, 35*(3), 161–176. doi:10.1007/s10755-009-9130-3

North Carolina State University. *Results*. Issues 2003–2013. Retrieved from

> http://research.ncsu.edu/results/pdf-versions/

North Carolina State University. (2015a). History and Tradition. Retrieved from

> https://www.ncsu.edu/about/history-and-tradition/

North Carolina State University. (2015b). *Sponsored programs and regulatory*

> *compliance.* Retrieved from http://research.ncsu.edu/sparcs/about-us/

> statistics/#glance

North Carolina State University. (2015c). *The Graduate School.* Retrieved from

> http://www.ncsu.edu/grad/about-grad/index.php

Owen-Smith, J., & Powell, W. W. (2001). To patent or not: Faculty decisions and

> institutional success at technology transfer. *The Journal of Technology Transfer,*

> *26,* 99–114.

Partington, A. (2010). Modern diachronic corpus-assisted discourse studies (MD-CADS)

> on UK newspapers: An overview of the project. *Corpora, 5,* 83–108.

Robertson, S. (2008). Embracing the global: Crisis and the creation of a new semiotic order

> to secure Europe's knowledge-based economy. In B. Jessop, N. Fairclough, & R.

> Wodak (Eds.), *Education and the knowledge-based economy in Europe* (pp. 63–

> 89). Rotterdam, The Netherlands: Sense Publishers.

Rogers, J., and Bozeman, B. (1997). Basic research and technology transfer in federal

> laboratories. *Journal of Technology Transfer, 22*(3), 37–48.

> doi:10.1007/BF02509161

Salter, A. J., & Martin, B. B. (2001). The economic benefits of publically funded basic research: A critical review. *Research Policy, 30,* 509–532. doi:10.1016/S0048-7333(00)00091-3

Schumpeter, J. A. (1947). *Capitalism, socialism, and democracy*. New York, NY: Harper & Brothers.

Schumpeter, J. A., & Opie, R. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press.

Sequence Publishing. (2015). Function words. Retrieved from http://www.sequencepublishing.com/academic.html

Shackle, G. (1966). *The nature of economic thought*. Cambridge, MA: Cambridge University Press.

Slaughter, S. (1993). Beyond basic science: Research university presidents' narratives of science policy. *Science, Technology & Human Values, 18,* 278–302. doi:10.1177/016224399301800302

Slaughter, S., & Leslie, L. L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university*. Baltimore, MD: Johns Hopkins University Press.

Slaughter, S., & Rhoades, G. (2004). *Academic capitalism and the new economy: Markets, state, and higher education.* Baltimore, MD: Johns Hopkins University Press.

Somers, M. R., & Black, F. (2005). From poverty to perversity: Ideas, markets, and institutions over 200 years of welfare debate. *American Sociological Review, 70,* 260–287. http://www.jstor.org/stable/4145370

Tobey, R. C. (1971). *The American ideology of national science*. Pittsburgh, PA: University of Pittsburgh Press.

Tognini-Bonelli, E. (2001). *Studies in corpus linguistics* (Volume 6: Corpus Linguistics at Work). Amsterdam, The Netherlands: John Benjamins.

Tyfield, D. (2012). A cultural political economy of research and innovation in an age of crisis. *Minerva, 50,* 149–167. doi:10.1007/s11024-012-9201-y

University of Nevada, Las Vegas. (2013). From breakthrough to business: Faculty discoveries with commercial potential. *UNLV Innovation: The Research Magazine of the University of Nevada, Las Vegas, 6*(1), 15–20. Retrieved from https://www.unlv.edu/sites/default/files/24/Research-Innovation2013.pdf

University of North Carolina at Chapel Hill. (2013). *Endeavors*. Retrieved from http://endeavors.unc.edu/

University of North Carolina at Chapel Hill. (2014). *About UNC.* Retrieved from http://www.unc.edu/about/

University of North Carolina at Chapel Hill. (2015). *Research funding.* Retrieved from http://research.unc.edu/about/facts-rankings/research-funding/

University of North Carolina at Greensboro. *UNCG Research*. Issues 2003–2013. Retrieved from http://research.uncg.edu/uncg-research-magazine/

University of North Carolina at Greensboro. (2013). *The history of UNCG.* Retrieved from http://www.uncg.edu/inside-uncg/inside-history.htm

University of North Carolina at Greensboro. (2015). *Sponsored programs.* Retrieved from http://sponsoredprograms.uncg.edu/awards/

University Research Magazine Association. (2015). http://www.urma.org/

Yokoyama, K. (2006). Entrepreneurialism in Japanese and UK universities: Governance,

    management, leadership, and funding. *Higher Education*, *52,* 523–555.

    doi:10.1007/s10734-005-1168-2

CODED SIMILARITIES AND DIFFERENCES ACROSS UNIVERSITY MAGAZINES

North Carolina State University		UNC Chapel Hill		UNC Greensboro	
Keywords	**Keyness**	**Keywords**	**Keyness**	**Keyword**	**Keyness**
TECHNOLOGY	1,610.39	STUDY	1482.04	PROJECT	852.33
SCIENCE	1,554.63	LAB	1330.30	COMMUNITY	789.44
INNOVATION	1,299.79	HIV	1135.79	TRIAD	515.30
ENERGY	1,117.98	CANCER	898.60	HEALTH	501.13
VETERINARY	1,079.18	CELL	865.26	SCIENCE	404.97
CENTENNIAL	944.46	BACTERIA	774.79	WORK	377.32
DESIGN	672.27	DNA	741.35	JSNN	321.31
DEVELOPMENT	650.62	MEDICINE	726.08	GUILFORD	303.00
MATHEMATICAL	593.54	DISEASE	664.88	CHILDCARE	259.01
GRANT	578.52	SCIENCE	642.42	HERP	237.56
CENTER	553.54	TEAM	617.68	EXCELLENCE	230.51
NANOTECHNOLOGY	541.11	LUNG	614.71	GRANT	224.48
INDUSTRY	537.07	VIRUS	578.95	LAB	213.61
AGRICULTURE	492.19	HEALTH	575.82	VIOLENCE	212.98
BIOMEDICAL	483.85	BLOOD	544.33	ECONOMIC	212.23
NONWOVENS	477.34	GENE	535.08	NANOSCIENCE	211.28
LAB	464.31	PROTEIN	531.13	MALS	197.31
MEDICINE	430.41	BRAIN	493.06	CENTER	191.30
TEAM	384.50	CLINICAL	481.91	AFRICAN	189.16
TEXTILE	383.76	MUCUS	420.46	CANNABINOID	183.71
ETHANOL	361.77	BIOLOGY	411.62	MOZART	182.14
EDUCATION	359.28	CILIA	398.49	MEDICI	182.03

North Carolina State University		UNC Chapel Hill		UNC Greensboro	
Keywords	Keyness	Keywords	Keyness	Keyword	Keyness
MANAGEMENT	353.97	DRUG	388.73	EXONEREES	173.01
DETERMINE	345.28	PLATELETS	384.61	WATERCHIP	173.01
CHEMICAL	327.80	MOUSE	376.28	TECHNOLOGY	170.45
DEVELOP	324.63	COLLATERALS	376.13	PROGRAM	168.66
STORMWATER	322.12	GENETIC	358.80	ZULU	167.58
NANOSCALE	316.02	VACCINE	342.18	ECOGENOMIX	160.66
NSF	315.08	IMMUNE	327.38	PLEYEL	160.66
BIOLOGY	314.97	PAIN	323.27	RECEPTOR	158.24
EXTENSION	307.04	DATA	322.83	BONOBOS	156.87
GRID	306.57	CHEMISTRY	306.28	INFORMATION	154.43
ECONOMIC	305.52	TB	302.45	EXONERATION	153.44
MOLECULAR	284.81	PATIENT	289.31	ACL	143.57
BIOMOLECULAR	277.20	WATER	276.66	COLLABORATIVE	142.49
COMMERCIALIZATION	274.28	TUMORS	270.69	CHEMISTRY	141.06
LABORATORY	272.27	INSTITUTE	269.04	COMMUNICATION	133.27
PHYSICAL	271.64	AEROTROPOLIS	250.59	MEDICIS	131.63
NATIONAL	265.86	WIKIMEDIA	250.59	DATA	131.18
ENVIRONMENTAL	255.58	EPIDEMIOLOGY	247.89	NANOENGINEERING	129.06
PENTAIR	255.53	TREATMENT	246.08	ACTIVITY	127.51
CHEMISTRY	254.59	HELP	236.80	KNOWLEDGE	126.00
CARBON	250.41	TRIAL	235.95	YOUTH	125.03
POLYMER	245.48	WORK	234.75	EXPERTISE	124.61
LIPOSCIENCE	243.37	FIBROSIS	227.52	DANCE	122.07
PROJECT	239.60	BACTERIAL	223.53	INTERDISCIPLINARY	121.08
PRODUCE	238.22	SCHIZOPHRENIA	222.81	NONSTANDARD	118.87
TRANSFER	237.50	RECEPTOR	222.30	CREATIVE	113.67
SYSTEM	237.00	PROJECT	219.65	CANNABINOIDS	112.78

North Carolina State University		UNC Chapel Hill		UNC Greensboro	
Keywords	Keyness	Keywords	Keyness	Keyword	Keyness
AGRICULTURAL	233.94	CYTOCHROME	219.47	INTERVENTION	111.22
FOUNDATION	223.14	CYSTIC	217.24	ACADEMIC	108.90
INSTITUTE	220.59	CHEMOTHERAPY	217.15	COMPOSER	105.73
RUNOFF	219.50	RESEARCHER	215.31	ECONOMICS	103.99
NANOSCIENCE	218.92	MARINE	208.31	LAXITY	103.50
DUCKWEED	217.81	INFLAMMATION	205.58	DRUG	103.12
ELECTRICAL	214.99	MICROBIOLOGY	203.38	COUNTY	102.18
PROGRAM	213.77	GENOME	199.63	AWARD	101.06
IMPROVE	211.92	DEVELOPMENT	199.54	BEHAVIOR	100.18
PLANT	206.32	JOURNALISM	196.16	MENTAL	98.25
DATA	203.98	MOLECULAR	193.37	HELP	97.12
BACTERIA	203.15	MICROSCOPE	186.72	SOCIAL	93.78
AWARD	202.35	SCIENTIST	185.57	DEVELOPMENTAL	93.50
TRIANGLE	198.87	DEVELOP	185.26	LITERACY	92.25
INTERDISCIPLINARY	192.92	AUTISM	185.22	IMPACT	91.20
NANOFIBERS	187.09	HISTOPLASMA	184.71	HERPETOLOGY	89.32
PARTNERSHIP	187.09	SPERM	183.12	COLLABORATORY	88.87
FIBERS	185.21	SICKLE	182.13	SCHOLARSHIP	87.24
FUEL	185.00	ABECEDARIAN	181.69	OFFENDER	84.68
SEMICONDUCTOR	184.97	RADIATION	179.39	PEOPLE	84.66
EXPERTISE	184.30	THERAPY	178.71	MANGANESE	84.04
CLEANTECH	182.58	SOLAR	176.83	EVALUATION	83.87
BIOFUELS	179.25	GRANT	176.18	PIEDMONT	83.66
ENTREPRENEURSHIP	177.41	SPECIES	175.91	PREVENTION	83.39
CREATE	177.19	NANOPARTICLES	175.06	COLLABORATION	83.05
NATURAL	174.56	BONE	174.64	HUMAN	82.69
MECHANICAL	168.97	HUMAN	173.95	BIOCHEMISTRY	81.63

North Carolina State University		UNC Chapel Hill		UNC Greensboro	
Keywords	**Keyness**	**Keywords**	**Keyness**	**Keyword**	**Keyness**
NOROVIRUSES	166.32	ERBITUX	168.57	NANO	81.36
GALLIUM	166.19	HERBARIUM	168.36	LONGITUDINAL	81.11
STUDY	160.82	RNA	167.40	BUDDHISM	80.87
COMPUTER	160.72	BOOK	166.81	HIV	80.21
POTENTIAL	160.41	ENZYME	164.71	BOOK	77.90
PHYSICS	160.30	CORAL	164.36	LITERATURE	77.63
RENEWABLE	159.04	HOG	162.18	DIABETES	77.08
IMPACT	157.80	NITROGEN	161.96	DEVELOP	77.00
DOCTORAL	157.12	IMMUNOLOGY	161.76	INVESTIGATOR	76.84
WATER	155.15	REPLICATION	159.93	CULTURAL	76.78
CELL	155.00	LOT	157.64	BIOLOGY	76.40
INCUBATOR	154.59	NUTRITION	156.12	PARTNERSHIP	76.14
CHONDROCYTES	154.53	FACETOP	154.26	CERAMICISTS	74.15
PROCESS	152.18	TRANSPLANT	154.21	TELESPEECH	74.15
TISSUE	151.50	TOBACCO	151.08	UNDERSTANDING	72.25
HITEC	151.01	TISSUE	149.62	MARITAL	71.23
VENTURE	150.99	BREAST	149.42	LATINA	70.73
MATHEMATICS	150.76	HYDROGEN	147.68	CLASSROOM	70.52
INNOVATIVE	148.28	LATENCY	144.58	WELLNESS	69.05
RIVERNET	148.27	PHYSICS	142.39	ENGAGEMENT	69.00
STARTUPS	146.02	ANTISENSE	142.29	KINESIOLOGY	68.33
COMMERCIALIZING	145.67	INTERNEURONS	141.98	GERIATRIC	67.98
BONES	143.04	PATHOGENS	141.68	MUDSLIDES	67.72
TEST	140.32	HEMGALUTININ	137.54	RURAL	66.69

USE OF CONCORDANCE AND COLLOCATION ANALYSIS

1. Highlight Total next to the collocates "transfer" and "technology." The collocation analysis can give us relation statistics in descending order.

N	Word	With	Relation	Set	Texts	Total	Total Left	Total Right	L5	L4	L3	L2	L1	Centre	R1	R2	R3	R4	R5
1	TECHNOLOGY	technology	14,326.354		65	875	8	8	5	1	2			859			2	1	5
2	THE	technology	1,576.155		60	458	300	158	34	46	83	40	97		2	47	45	31	33
3	TRANSFER	technology	1,473.483		23	113	5	108		1	1	1	2		104	1		1	2
4	AND	technology	1,134.540		60	314	145	169	14	20	21	26	64		64	32	19	31	23
5	OF	technology	1,097.447		55	303	254	49	23	38	32	45	116		5	10	15	19	
6	TO	technology	896.426		51	265	105	160	19	23	32	24	7		58	24	17	35	26
7	OFFICE	technology	666.629		23	73	69	4	2			67				2		2	
8	FOR	technology	428.867		43	117	57	60	6	16	9	19	7		27	8	8	9	8
9	IN	technology	365.639		48	139	70	69	14	14	12	22	8		27	11	5	11	15
10	DEVELOPMENT	technology	347.520		23	49	4	45	2	1	1				33	1	2	6	3
11	STATE	technology	337.030		13	63	43	20	6	18	3	6	10			1	4	11	4
12	SCIENCE	technology	331.777		27	52	49	3	2	4	1	34	8		1	1	1		
13	IS	technology	322.787		36	95	31	64	7	12	6	5	1		27	11	9	7	10
14	A	technology	321.383		44	138	74	64	13	16	9	20	16		1	14	25	18	6
15	NEW	technology	291.624		27	55	34	21		3	3	1	27			6	4	5	6
16	NC	technology	264.793		11	47	30	17	12	3	6	9			1	3	9	2	2
17	WITH	technology	261.325		30	75	40	35	9	12	5	10	4		5	8	6	9	7
18	INFORMATION	technology	256.317		20	36	33	3	1	2	1	1	28		1		1	1	
19	S	technology	250.190		34	88	67	21	10	11	24	5	17		1	6	3	6	5
20	DEVELOPED	technology	189.481		14	26	6	20	1	1		3	1		15	1	3	1	
21	HAS	technology	183.858		19	45	15	30	1	3	6	5			15	8	3	1	3
22	AT	technology	170.948		25	52	11	41	3	3	1	2	2		12	22	2	3	2
23	THAT	technology	169.658		31	75	28	47	6	6	6	5	5		26	12		7	2
24	INNOVATION	technology	156.859		10	21	6	15		2		3	1		4	11			
25	COMMERCIALIZATI	technology	134.149		6	13	3	10			1	2			2	2	6		
26	VICE	technology	133.502		14	19	16	3	2	11	3						1	2	
27	USE	technology	133.046		14	26	22	4	2	1	7	7	5				1	2	1

2. You will be asked to verify your command to "highlight TRANSFER as Total collocate of TECHNOLOGY."

3. The researcher can scroll through the concordance analysis, and trace the concordance output back to the main text by double clicking on the concordance line.

4. You are given access to the full text for the purposes of collecting the data.

Concord

File Edit View Compute Settings Windows Help

research and **something** called **technology** transfer. In a nutshell, it's what happens when disparate studies that might once have been maligned by cynics as the province of "so what" science converge to reveal scientific applications that transcend the campus and produce commercial products with the potential to create jobs, reinvigorate local economies and even attract global markets.

Angus Kingon, executive director of the **Technology** and Commercialization Program in the College of Management at NC State, calls this process "the front end of innovation," and with this sort of leverage in hand, handsome public relations and economic rewards are everywhere apparent. And in an era of tight budgets and flat economies, Raleigh News and Observer writer Jonathan Cox has noted it is no surprise university administrators are increasingly aware

that the creation of high profile university-sponsored spin-off companies "is a more concrete way to show their significance in local communities."

Today, bolstered by the federal Bavh-Dole Act of 1980, which encourages universities to license and market their discoveries, 43 states have biotech initiatives in place. The results are undeniable. As recently as 1999, the Association of University **Technology** Managers estimated biotech initiatives had generated $40 billion and 270,000 jobs. Google, the hugely successful Internet search engine, is one example, having been created at Stanford University. Closer to home, **technology**-rich North Carolina has become one of the brightest stars in the biotech firmament, and between them, UNC Chapel Hill, NC State, and Duke have combined to spin off 65 biotech companies. Dozens more are in the offing, and the UNC system has undertaken a series of conferences to guide university researchers and administrators through the unfamiliar territory of patents, licensing agreements and corporate finance.

The guide at UNCG is Jerry McGuire, who brought with him more than 30 years of experience in the marriage of **technology** and commerce when he arrived in 2002 to head up the Office of **Technology** Transfer. Unabashedly enthu-

uncg research

spring 2003

Dr. Parke Rublee, left, who has spent years studying fish-killing Pfiesteria, and Dr. Vincent Henrich, who has studied microarrays commonly used in cancer diagnostic tests, brought their knowledge together to create the WaterChip. After initial discussions, both took courses in the other's specialty to get a grasp on the science for the basis of the WaterChip.

siastic and unstinting in his candor about the realities of **technology** transfer, he will tell you "this is about trying to leverage the fruits of research to generate

concordance   collocates   plot   patterns   clusters   timeline   filenames   source text   notes

0%   23 found   research and something called technology transfer. In a nuts