A perfect storm: how biorenewables scientists are reading kairos, exercising agency, and locating a new scientific ethos that supports public engagement

by

Noel Holton Brathwaite

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Rhetoric and Professional Communication

Program of Study Committee:
Carl Herndl, Major Professor
Michael Mendelson
Margaret Graham
Dan Douglas
Clark Wolf

Iowa State University
Ames, Iowa
2010

Copyright © Noel Holton Brathwaite, 2010. All rights reserved.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS iii

CHAPTER 1. INTRODUCTION 1

CHAPTER TWO. THE CHEMURGY MOVEMENT 28

CHAPTER THREE. RHETORICAL AGENCY AND SCIENTIFIC ETHOS IN A MODE 2 WORLD 53

CHAPTER FOUR. FROM MANY VOICES, ONE VOICE 81

CHAPTER FIVE. CONCLUSIONS 112

APPENDICES 127

REFERENCES CITED 129
ACKNOWLEDGEMENTS

I dedicate this dissertation to all of those individuals who helped me tremendously along the way. I would like to thank my adviser for giving me all of the moral support and straight talk that I needed to complete this project. I would also like to thank my committee members for offering me crucial guidance and feedback. As for my family, I would be completely remiss if I didn’t thank my rock of a husband who has made it possible for me to continue to pursue my degree under some very challenging circumstances, and for helping me to laugh when I felt like crying. I also want to thank my mother who has always believed in me and in whatever it was that I wanted to do. Her faith in me is immeasurable and invaluable and I’ll never repay her as long as I live so I’ll include her here so she knows how much I love her. I also want to thank my closest friends who know how much completing my dissertation has meant to me, and for encouraging me to stay the course. And finally, I want to thank my son Miles Elombe for being my number one inspiration. You are too young now for any of this to mean anything to you, but one day you will understand how much your parents love you.
CHAPTER 1. INTRODUCTION

This project will use the rhetorical activities of the Bioeconomy Institute (BEI) at Iowa State University to examine the relationship between kairos, rhetorical agency and ethos. These rhetorical concepts appear to be useful in understanding what constitutes scientific public engagement. Public engagement is the opening up of academic discourse to the public in ways that can lead to meaningful social changes. I have (unabashedly) borrowed the term public engagement from Craig Calhoun, a professor of sociology at New York University. From my interpretation of Calhoun’s thesis on public engagement, to be publicly engaged is to step outside of one’s own disciplinary boundaries and develop a research agenda that could have a potentially broad societal impact. Kairos, which describes the “right” or “opportune” time for efficacious, powerful speech, and rhetorical agency, which describes the disruption of hegemonic forces via rhetorical performance, are critical tools for public discourse and activist research.

As I will discuss later in this chapter, Calhoun eschews the practice of separating academic research into the categories of pure, basic and fundamental research, on the one hand, and practical or applied research, on the other. He argues that this false dichotomy tends to value fundamental research over applied research, leading researchers away from public discourse and deeper into insulated disciplinary silos. Although there appears to be strains of Foucault’s universal intellectual in Calhoun’s call for scholars to become more publicly engaged, Calhoun isn’t advocating for a return to the glorification of the universal academic. Instead, he seems to share Foucault’s concern about the location and concentration of “truth” on scientific discourse and the power that such truth confers upon those within disciplinary power structures. Calhoun states: “This is not an argument against truth or for an anything goes relativism. But it is an argument for seeing science as a historical process, always open-ended in ways large as well as small. And this in turn is an argument for a more democratic vision of science, one in which possession of current “truths” is less of a trump card for certified experts to play in relation to lay people.” (5)
The Bioeconomy Institute

The desire to learn more about scientific rhetoric and public engagement lead me to my research site – the Bioeconomy Institute. The BEI is in many ways practicing public engagement by bringing together researchers from disciplines as diverse as chemical engineering, economics, agricultural studies, and biology. The Institute supports these researchers in their search for the most cost effective and environmentally sustainable ways to produce a plethora of goods from agricultural wastes. The BEI also encourages them to share information with each other and with the various “publics” or audiences rhetorically speaking that exist both on and off of campus. What specifically piqued my interest in the BEI was that its researchers weren’t waiting around for those audiences outside of the academy to discover what they were up to. Instead, they were employing some sophisticated rhetorical strategies to convince the public that what they were doing had the potential to revolutionize agriculture.

The BEI is an outgrowth of the Bioeconomy Initiative -- a campus-wide effort, launched in 2002 at the behest of university president Gregory Geoffroy. The mission of the Bioeconomy Initiative was to develop cross-disciplinary research, education, and extension programs that promote the greater and more efficient use of biorenewable resources for producing chemicals, fuels, materials, and energy. The other stated mission of the Initiative is to ensure that Iowa and Iowa State University (ISU) are seen as leaders in the emerging bioeconomy. To accomplish this task, the BEI has brought together over 180 affiliated faculty members at the university in the last several years, and has worked to strengthen the university’s ethos and reputation in the area of biorenewables (a term that encompasses numerous products such as biofuels and bioplastics). This dissertation project will analyze the rhetorical strategies of those involved with the Bioeconomy Institute to learn more about how the ancient concepts of kairos and ethos and the relatively modern concept of rhetorical agency influence one another.
Cultural Transformations and Rhetorical Agency

Issues related to kairos and rhetorical agency are becoming increasingly important for modern scientists. Unlike 20th century scientists, who could depend on huge government grants to fund their work, scientists in the 21st century must aggressively seek out funding sources. No longer are huge reservoirs of money available to university scientists to conduct basic research that broadens the scope of knowledge in their respective disciplines without necessarily lending itself to any practical application. Instead, federal, state and private organizations are increasingly interested in interdisciplinary scientific research that addresses social and economic challenges. As Steven Fuller explains in *The Philosophy of Science and Technology Studies*, this shift in funding criteria began about 20 years ago around the time of the decline of the Cold War. As Fuller argues, this shift represents a change in how science operates. Correspondingly, changes in funding patterns present significant rhetorical challenges for scientists like those at the BEI. Traditionally, ethos within the scientific community has been granted to scientists engaged in basic or fundamental science that is generally seen as being more “pure” than scientific research that is undertaken to solve a problem of practical value and of public concern. According to New York University professor of sociology Craig Calhoun, the latter type of research, commonly referred to as “applied” science, is relegated to a lower status level on a hierarchal food chain. He argues for the dismantling of the dichotomy between the “pure” and “applied” sciences by illustrating how detrimental such labeling can be:

…the commonplace notion of application is also misleading because it relies on an understanding of scientific knowledge as the accumulation of established truths. Not only are “pure” scientists held to work most completely in the realm of these truths (no matter where their funding comes from), the truths are held to be certain, settled, and independent of context or formulation. (5)

As a social scientist, Calhoun is interested in defining the role of the academic scientist in creating, shaping and informing public knowledge. He argues that academic researchers should become more engaged in public discourse, and less concerned with insular disciplinary professional interests when developing research questions and agendas.
The goal of this project will be to understand how the researchers who comprise the Bioeconomy Institute are attempting to leverage the current kairotic popularity of the renewable energy movement into a much needed infusion of funding for both applied scientific endeavors and basic research at the university. This study will examine how the BEI presents their research to both private corporations and state agencies interested in commercially viable technologies, and to the larger scientific community interested in the quality of their basic research.

**Shifting Concepts of Ethos**

Instead of relying on scientific images and genres that have traditionally aided scientific agency and conveyed scientific ethos, modern scientists must adapt to a changing rhetorical landscape and develop new rhetorical devices to establish ethos. Unlike their historical predecessors, scientists today are vulnerable to greater outside scrutiny of their research agendas. In *Modest_Witness @Second Millennium*, Donna Haraway provides a feminist critique of what she describes as a “crucial epistemological move” on the part of European scientists in the 17th century to bolster their scientific authority and protect their autonomy. She explains that these scientists were able to enhance their agency by adopting a “modest,” “invisible” persona that gave them a rhetorical cloak of transparency which then enabled their scientific reports to be readily accepted as “objective.” (32) While vestiges of the transparent, objective scientific voice remain in a good a deal of science writing genres such as the science report, writing about science, which is increasingly being done by scientists themselves, in such genres as grant and business proposals, speeches, articles for popular scientific publications and even press releases reveals a much more partisan and much less neutral voice that is more engaged with issues beyond science. In the wake of controversial disasters such as Chernobyl, thalidomide poisoning, genetic cloning and gene therapy deaths, the image of scientists in white lab coats neutrally investigating the mysteries of nature no longer affords the scientific community the agency to invisibly control their research agendas away from public comment. Instead, modern scientific researchers like the ones at the BEI cannot afford to ignore rhetorical considerations such as kairos. In fact, the rhetorical strategies employed by the BEI reveal an urgency to take advantage of a
confluence of circumstances that have cast biorenewables research, in general, and biofuels research, specifically, in a favorable light. As several members of the BEI’s Science and Engineering Board expressed to me on numerous occasions, the unpredictable nature of gasoline prices, anxiety over global warming and a desire for domestic sources of oil have all created what they refer to as a veritable “perfect storm” for the advancement of the biorenewables movement. In rhetorical terms, this confluence of historical circumstances constitutes a kairotic moment that can enhance the BEI’s agency.

In examining the interplay between kairos and agency in the biorenewables movement at Iowa State, the expanding role of scientific ethos has come into sharp focus. The changes that characterize its expansion have challenged modern scientists to reach beyond the boundaries that demarcate, as Latour would say, science from all that is not science. As Miller stated in her discussion of ethos and risk analysis, the newly transformed scientific ethos makes much broader use of the authority of scientific and technological experts than traditional scientific rhetoric. Miller argues that historically scientists have tended to deemphasize the ethos-based “argument from authority,” leaving those kinds of arguments to be made by individuals without logos i.e. nonscientists. (169) Ethos-based arguments are arguments that take into consideration the personal character of the speaker. According to Aristotle, when there are matters that can be disputed and opinions that can be divided, a speaker’s personal character and ethical reputation can be regarded as a distinct means of persuasion since we tend to trust people whom we believe to be good. Traditionally, scientists have eschewed the rhetorical appeal of ethos, choosing instead to persuade audiences of the veracity of scientific statements by employing the appeal of logos, which is delivered in what Miller refers to as “the rhetorical style of impersonality.” (185) This impersonal style describes the way that scientists have historically presented an objective or transparent image of themselves without any projection of emotionalism, partiality or personality. Thus, “mere opinions” can be seen as being removed from the scientific endeavor and replaced by a clear-eyed, empirical observance of the natural world, without any adornment or bias. In Miller’s words:

…the rhetorical style of impersonality, the denial of ethos, is itself an argument that
universalizes results originating in particularity: the scientist must seem fungible, so that her results could have been – and might be – achieved by anyone. Ideally, the facts speak for themselves and do not need an advocate; ethos should be unnecessary. However, if we understand this style of reasoning as itself a rhetorical choice that helps make an argument credible, we see that it constructs its own ethos, an ethos that denies the importance of ethos. The technical ethos – impartial, authoritative, self-effacing – is all the more powerful for its self-denial. So not only is ethos transformed into logos, but the favoring of logos becomes its own ethos. [Miller, 185]

While many rhetoric of science scholars have critiqued the objective, detached and disembodied scientific voice as it functions in such rhetorical genres as the scientific report, less studied are the ways that the scientific voice operates in public discourse. Before the Cold War and the shift in funding for the sciences began, the tendency of scientists to publicly negate their own ethos in favor of a rhetorically neutral, transparent, logos-based style wasn’t often challenged. However, just as there has been an interrogation of cultural hegemony in politics, in art and in education, in general, since the 1960s, there has also been a questioning of the cultural figure that Haraway refers to as the traditional “modest witness” in science. No longer is it acceptable for scientists to hide their ethos away behind logos, claiming that they are completely unbiased and impartial observers of scientific facts. Instead, as we shall see in this study, scientists have been challenged to situate and contextualize their ethos and address the material conditions of their cultural environments.

Finding a New Voice

One of the reasons the Bioeconomy Institute has piqued my interest as a rhetorician interested in agency is that the work of the researchers affiliated with the organization has the potential to loosen the hegemonic grip of oil companies on the production and distribution of fuel. Theoretically, at least, this could benefit the residents of rural communities if sustainability issues are adequately addressed. An argument could be made that the potential is there for significant social and economic transformation if biorenewables technologies could be successfully implemented on a large scale. That the BEI researchers face enormous technical and rhetorical challenges, however, is undeniable. There are many questions still to be answered, especially concerning the issues of scale and efficiency. Many are skeptical that
it will ever be possible to produce enough biofuels and bioplastics to make any significant impact on the world’s landscape, and then there is the question of whether the making of biofuels will always require more consumption of petroleum than it is worth, thereby negating any benefit to the environment. The researchers involved in the university’s Bioeconomy Initiative are busy trying to answer these questions and have made some impressive leeway. But in the coming months and years, who will know or care unless the researchers are able to get the funding they need to continue their work. Securing such financial support, however, is not simply a matter of putting together proposals that explain the technical merit of their projects. Instead, in the case of biofuels research, broad, interconnected audiences that contain scientists and nonscientists alike, technical experts and the technically challenged must be persuaded that the BEI’s work is valuable. These various audiences include corporations, farmers, environmentalists, university administrators, economists, scientific researchers at other universities and the average person whose primary concern is the price of gasoline. All of these audiences, which influence one another, are factors in the kairos that has created a rhetorical space for the renewable energy movement to flourish. For example, private corporations realize that at this kairotic moment in time, the renewable energy movement has captured the public’s attention. Working with researchers engaged in biorenewable energy is, if nothing else, a very good public relations move on their part. Therefore, the moment for BEI researchers to exercise rhetorical agency is now before the public’s attention has been diverted on to other issues.

The increasing interest in biofuels has recently bought federal and state agencies and private corporations to the doorstep of the university. These entities are keen to partner with researchers whose work holds the promise of technological advancement. The state sees the university’s work in biofuels as an engine of economic growth that will attract businesses to Iowa. The businesses that have shown an interest in biofuels research see a way to become more competitive within their industries provided they can acquire proprietary rights to the burgeoning technologies. While there is nothing new or unusual about businesses seeking agreements with scientists to hold exclusive rights to the knowledge produced by their research, what is interesting to note from a rhetorical perspective is how these contemporary
university scientists differ from scientists in the past in their willingness to communicate with broad audiences about the value of their work.

University biorenewables scientists, who find themselves in the position of having to seek funding from private sources, must establish a new rhetorical voice that embodies a newly defined ethos for themselves. This new voice must appeal to state legislators, small farmers, and corporate agriculture, while at the same time it must protect their traditional scientific ethos and freedom to pursue fundamental research that may or may not have any immediate commercial application. In creating this new voice, these scientists seem to be attempting to exercise agency to ensure the survival of fundamental research at the university by using the interest in biorenewables research to further their aims. This project will explore the space that exists between previous dichotomous theoretical locations of rhetorical agency. There is no place, for instance, for this newly defined ethos in Marxist, structuralist theories of agency, which negate the importance of rhetorical performance. Neither, however, is this new scientific ethos predicated on theories that attribute an enormous amount of agency to omnipotent individuals with supernatural rhetorical gifts. Instead, this newly defined sense of scientific ethos is dynamic and, truthfully, still evolving and grounded in the ever-shifting historical and material conditions that characterize the modern practice of science.

This dissertation project will focus on how the scientists affiliated with the BEI are able to take advantage of the kairotic moment at hand not only in terms of the current public interest in decreasing dependence on oil from abroad and reducing greenhouse gas emissions, but also of the current interest among funding sources in interdisciplinary, applied science projects such as theirs. The study will look at how the new scientific ethos has less to do with promoting scientific credibility via modesty, transparency and objectivity in public discourse, and more to do with an emphasis on the expertise and authority of scientific researchers. This new ethos uses kairos as a rhetorical tool to measure and contextualize specific research agendas. Unlike their predecessors, the scientists at the BEI are writing, albeit in subtle ways, about the materiality of their work. In the process of doing so, they are projecting a scientific ethos that embraces public engagement.
Back to the Future

To learn more about the relationship between kairos, agency and scientific ethos, I will look at the Chemurgy movement of the 1930s and 1940s that failed to convince the American public that agriculture could be valuable to the economy outside of the realm of food production. Because the Chemurgy movement was similar in many ways to the contemporary renewable energy movement, this comparison will help explore the specific elements of the current kairotic moment. I will use the rhetorical activities of the chemurgy movement as a case study to analyze what role kairos plays in determining agency and whether certain rhetorical strategies i.e. those that promote a more grounded and less “invisible” or transparent scientific ethos are more conducive to agency than others.

One of the biggest differences between the chemurgy movement and the biorenewables movement is that the university scientists involved in chemurgy were not nearly as engaged in either public policy debates or industry partnerships as the BEI scientists are today. Some of their reticence could be attributed to the fact that scientists of that era could conduct their research in a largely autonomous manner without having to worry much about competing for funding from private sources. Generously hefty government grants ensured that scientists were able to pursue pure, fundamental research with little regard to the commercial applicability of their findings. Scientists of that era would probably have a difficult time relating to modern scientists who spend a good deal of their time trying to convince federal funding agencies, and increasingly private corporations, that their research is valuable in commercial terms. In the next chapter, we will see how World War II offered a kairotic opportunity for rhetoricians to push the value of the chemurgy movement and how some in the chemurgy movement responded.

Given that the BEI scientists face a unique set of historical circumstances, I realize that using the historical example of the chemurgy movement as a comparative lens to get a clearer picture of effective and ineffective rhetorical strategies will have its limitations. Therefore, I will also turn to rhetoric of science theorists to deepen my understanding of the
tensions that exist between what Fuller refers to as an old guard Mode 1 approach to science that values fundamental research, purity and autonomy from all that is deemed “not science,” and a modern Mode 2 approach that is inherently more interdisciplinary, “messy” and concerned with the material realities involved in “doing” science than a Mode 1 approach.

The primary focus of my research will center on answering the following questions:

1) Assuming that there is an optimal kairotic time that is right for rhetorical agency to occur, how do rhetors “read” the opportunities that present themselves and position themselves rhetorically to effect change or become agents of change?

2) How do the rhetorical strategies employed by the BEI scientists capitalize on the kairotic popularity of the biorenewables movement?

3) What kind of ethos does the BEI project to outside audiences? Is this ethos static or does it change depending on the interests of the audience?

**The Relationship Between Kairos and Agency**

Although kairos by itself is a very useful concept in examining rhetorical strategies, its relationship to agency is what will drive this study’s investigation. For while kairos can help explain how rhetors adroitly use the prevailing material circumstances of their times to propel their arguments, it is a sense of agency that determines whether or not the rhetor’s arrow will hit its mark with force sufficient enough to engender substantial, paradigm-altering change. Kairos is a concept that helps scholars measure rhetorical sensitivity or the ability of a rhetor to read not only their audience, but also the historical conditions in which they find themselves, and what impact those conditions might have on the success of their rhetorical performance. Agency is also concerned with the impact of rhetorical performance and its ultimate success. These are how the two concepts are related. Based on the findings in this study, agency is greatly enhanced by a rhetor’s kairotic sensitivity. Agency reveals itself in a rhetor’s ability to act, and is thus concerned with a rhetor’s power and potency. Once a
rhetor has considered kairos and determined when the most opportune time to act might be, the rhetor must then determine the most effective means at hand to deliver their performance. To borrow a term from Kenneth Burke, agency can be viewed as a “tool” that a rhetor employs to maximize persuasion. As such, the concept of agency is a very profound and creative one in that nothing can be created, built or developed without the right set of tools. Choosing the right rhetorical tools, however, is not a simple matter. Before choosing tools, a sense of proportion; a sense of the potential impact of a speech act must be grasped by the rhetor. BEI director Robert Brown has referred to the biorenewables movement as “revolutionary” in several texts (which will be discussed in the third and fourth chapters). His use of this word to describe the potential impact of biorenewables research is indicative not only of his sense of the power of biorenewable energy to transform the economy, but also of his rhetorical savvy and grasp, however unconscious, of the concept of agency. For this word is often associated with change that is perceived as inevitable, unstoppable and total. That agency isn’t always within the control of a single rhetor or group of rhetors is where the concept of kairos becomes very important in the discussion of agency. It is just as often historical circumstances and not the skill of any individual rhetor that dictate what means or rhetorical tools are available to persuade an audience.

Exploring Kairos

The concept of kairos is a complex and ancient one. Its relevance to contemporary rhetorical scholars cannot be underestimated, however. One of kairos’ earliest modern proponents is James Kinneavy, who is, in fact, credited with reviving the concept from the ancients. Kinneavy states:

I am firmly convinced that rhetoric desperately needs the concept of kairos…..The concept of situational context, which is a term for kairos, is in the forefront of research and thought in many areas. The phrase ‘rhetorical situation’ has become almost a slogan in the field of speech communications since Lloyd Bitzer’s article on the subject appeared in 1964. (83)
In *Forecasting Opportunity*, Hunter Stephenson traces the origins of the Greek word kairos and finds that there are generally two meanings most commonly associated with the term—“right timing” and “due measure.” The root of the “due measure” meaning of the word can be traced back to archery where “kairos denotes the moment in which an arrow may be fired with sufficient force to penetrate the target.” The root of the second meaning, “right timing,” comes from weaving where “kairos denotes the moment in which the shuttle could be passed through the threads of the loom”.

Stephenson explains that there are two predominant views of kairos that are seemingly oppositional and dichotomous, but aren’t necessarily so. On the one hand, there are those who interpret kairotic moments as occurring independently of the rhetor. This Platonic interpretation of kairos, which is most in keeping with its temporal meaning, assumes that kairos is “out there somewhere” beyond the grasp or reach of the rhetor. Stephenson describes the other predominant view of kairos as Gorgian in that rhetors are seen as “creating their own kairotic moments.” As Stephenson adroitly points out, the question of agency lies at the heart of these varying interpretations. For the Platonic interpretation of kairos seems to leave little room for agency, while the Gorgian interpretation seems to put an inordinate amount of control in the hands of a single rhetor. Stephenson, however, urges students of kairos to view it as a tool that is neither completely out of the influence of rhetors nor completely manipulated by rhetors either. He argues that kairos helps rhetors shape their speech in order to “satisfy” their audience. According to Stephenson, “kairos exists independently of the rhetor but lacks independent volition. In other words, the rhetor must understand or “read” kairos in order for it to be useful in the production of texts.”

**Thoughts on Agency**

In exploring the epistemological dimensions of kairos, Kinneavy argues that there is a “common thread” that connects its various meanings and interpretations. According to Kinneavy, kairos is what “brings timeless ideas down into the human situations of historical time.” He argues that “rhetorical thought becomes effective only at the moment of
kairos….In both rhetoric and ethic, Plato’s world of ideas is brought down to earth by the notion of kairos.” (89) It is in this understanding of kairos as the intersection between “timeless ideas” and the temporal, physical world that the concept of agency takes precedence. In “Shifting Agency,” Herndl and Licona explain that from a cultural studies perspective, the examination of agency can be seen as “an attempt to theorize the possibilities of radical, counter hegemonic action, especially in the face of powerful, cultural formations.” (1) Kinneavy argues that kairos, while grounded in the historical situation or context, also provides the rhetor the freedom to flesh out a “dynamic idea” that can be brought to bear in the right circumstances.

Like Kinneavy, Carolyn Miller also sees the significance of kairos in its ability to help rhetors test drive their ideas in the real world so to speak, to exercise a measure of agency for themselves. Miller describes kairos in this way, “Kairos is the principle of timing or opportunity in rhetoric…. It shows us how discourse is related to an historical moment; it alerts us to the constantly changing quality of appropriateness.” (177) In looking at the way the temporal meaning of kairos is used in the rhetoric of science, Miller argues that science has traditionally, “figured for us not merely as an enterprise that changes over time, but as one that promotes change in a particular direction. Key terms in the conceptualization of science are growth and progress. Over time, knowledge about the natural world not only changes, but grows, and it not only grows, but improves or advances.” (178) It is in the rhetorical thrust of science towards growth, improvement and advancement that one can see how the concepts of kairos and agency are conjoined for what could be more powerful than the perception of science, and by extension scientists, as arbiters of progress and enlightenment?

According to Haraway, a feminist historian, science has traditionally employed an a-rhetorical narrative agency that promotes the perception of scientific transparency and impartiality. In her critique of contemporary technoscience, she traces the rhetorical activities of 17th century Royal Society of London members such as Robert Boyle. She describes how they created what she referred to as “the rhetoric of the modest witness, the
‘naked way of writing,’ unadorned, factual, compelling….” She goes on to explain how “only through such naked writing could the facts shine through, unclouded by the flourishes of any human author. Both the facts and the witness inhabit the privileged zones of ‘objective’ reality through a powerful writing technology. “ (26) In this way, the men of science who were a part of the Scientific Revolution were able to distance and distinguish themselves from a host of “others” who due to their class status, gender and color were unable to witness modestly and were, therefore, unable to acquire any scientific credibility for themselves. Once this scientific ethos was established, everything associated with it – maleness, elite standing, whiteness – served to enhance the agency of objectivity. Haraway even refers to the laboratory itself as a “theater of persuasion,” an “open” space for the “public” that, according to Haraway, was closely managed and regulated so that the “public/private” distinction so critical to the scientific ethos could be protected. Haraway explains that scientific credibility required “a special, bounded community” that still to this day requires spaces that are both “materially and epistemologically” structured in a manner that defines “what will count as the best science.” (26) Haraway does a wonderful job of juxtaposing and comparing the power of the modest male witness to the outsiders to science such as women:

Depleted of epistemological agency, modest women were to be invisible to others in the experimental way of life. The kind of visibility – the body – that women retained glides into being perceived as subjective, that is, reporting only on the self, biased, opaque, not objective. Gentlemen’s epistemological agency involved a special kind of transparency. Colored, sexed, and laboring persons still have a lot of work to do to become similarly transparent to count as objective, modest witnesses to the world rather than to their ‘bias’ or ‘special interest.’ To be the object of vision, rather than the ‘modest,’ self-invisible source of vision is to be evacuated of agency. (32)

Traditionally, the rhetoric of science has been quite effective in using the concept of kairos to create a space for science to operate with an enormous amount of agency. This agency has been most effectively achieved by the creation of rhetorical boundaries that demarcate what is “science” from what is “not science,” and what is pure, basic or fundamental science from the applied sciences and mere technical endeavors. Thomas Gieryn refers to this rhetorical struggle for scientific authenticity and autonomy as “boundary work.”
Gieryn is concerned with the ways that scientists employ rhetoric to expand the authority of science and garner resources for themselves. Borrowing from Marx and Manheim’s definition of ideologies as “providing ‘evaluative integration’ in the face of the conflicting demands, competing expectations and the inevitable ambivalences of social life,” Gieryn turns his attention to analyzing the rhetorical devices and ideological arguments used by scientists to enlist support from funding sources and the general public. (782) Gieryn points out that when scientists have to cross the boundary at the laboratory door that separates them from the rest of the world, they tend to draw upon a number of persuasive “cultural repertoires” available for constructing self-descriptions. These include “claims to the utility of science for advancing technology, winning wars, or deciding policy in an impartial way.” (783)

The dichotomous boundary between what is considered “social” and what is considered “scientific” is one that Latour explores in *Laboratory Life*. Latour argues that there is a tendency among scientists to look at social influences in science only when something has gone wrong. As Latour discovered, one of the important features of the process of how a fact is constructed as a fact is that it comes to be regarded as divorced from any social factors, which completely disappear once the fact has become established. (23) Latour goes on to argue that in a process not dissimilar to the de-socialization of facts that scientists erect frameworks, which function as boundaries, as a way to handle the “chaos” of scientific activity with its networks of social allegiances and influences. On frameworks, Latour states, “we argue that both scientists and observers are routinely confronted by a seething mass of alternative interpretations…. The solution by scientists is the imposition of various frameworks by which the extent of background noise can be reduced and against which an apparently cohesive signal can be presented.” (37) This metaphor of a noisy, seething mass of alternative interpretations from which scientists must protect themselves resonates with Latour’s fascinating “mind-in-a-vat” analogy that he articulates in *Pandora’s Box*. At the heart of this analogy is the Western intellectual tradition of separating and dichotomizing the mind and the body. Latour begins his discussion of his “mind-in-a-vat” analogy with the two philosophers, Descartes and Kant, and their questioning of reality.
When Descartes and Kant posed the question in their work of whether a shared, physical, corporeal reality actually exists or whether we just make up the details of such a world inside the recesses of our own minds, they expressed a sense of the mind’s disconnectedness from the body, which brought about what Latour refers to as the “mind-in-the-vat crises.” (9) According to Latour, the acceptance of the “mind-in-the-vat” theory leads to the isolation of the intellectual from the material. Scientists and all intellectuals who adopt scientific methodology are regarded as the observers of the way things “really are,” while all that is “not science” is considered unreflective, blind to rational thought, and at the mercy of unregulated passions. Latour explains that behind the mind-in-a-vat theory lies the fear of mob rule, of brute physical force, of material might over reason. (13) Given this dichotomy, Latour describes the discipline of the rhetoric of science or the social study of science as inhabiting, “a no-man’s land between two cultures.” On the one hand, there is science, the mind, the repository of knowledge and awareness. On the other hand, there is all that is not science, the body politic, the irrational social world.

….. Scientists always stomp around meetings talking about ‘bridging the two-culture gap,’ but when the scores of people from outside of science want to build just that bridge, they recoil in horror and want to impose the strangest of all gags on free speech since Socrates: only scientists should speak about science. (17)

Latour, however, sees evidence that the old agonistic culture of science, dedicated to guarding the boundary of “science” and “not science” is giving way to what he refers to as the culture of research. He describes the hybrid culture of research as being in many ways the opposite of the culture of science. Whereas “Science” was characterized by, “certainty, coldness, aloofness, objectivity, elevation, distance and necessity… Research is uncertain, open-minded, immersed in many of the lowly problems of money, and instruments of technicality and know-how.” (20)

In Pandora’s Box, Bruno Latour argues that the agonistic approach of “Science” (with a capital “S”) where boundaries between scientists and the public were guarded in the name of Cold War secrecy is being replaced by the “Research” approach where scientists
work in a cross-disciplinary manner on problems that have pragmatic goals. (20) This, of course, echoes Fuller’s Mode 1 and Mode 2 approaches.

Fuller argues that older Mode 1 scientists tend be uncomfortable working in an interdisciplinary fashion toward applied goals and generally find “it unseemly to justify research in terms of the income streams it generates, let alone the costs generated by its very pursuit.” (69) And yet as unseemly as it may appear to some older scientists, contemporary or Mode 2 scientists cannot afford to be unconcerned with the materiality of doing scientific research. For the last two decades, support for pure or basic scientific research has been shifting to more applied scientific pursuits, where scientists secure funding by focusing on issues of interest to the public. Increasingly complex contemporary global issues such as infectious diseases, threats to the environment and cultural conflicts invite new problem-solving approaches. These challenges, coupled with dwindling scientific funding, have compelled scientists to engage with those over the boundary walls in much more direct ways than in the past. The passage below from Fuller that describes the activities of Mode 2 scientists would resonate with many of the scientists at the BEI in that their typical weekly schedules are made up of just such activities. As Robert Brown’s communications specialist, I saw him engaging in all of these activities on a routine basis:

In this Mode 2 state, a greater proportion of a senior scientist’s effort is spent on activities that would have previously been regarded as peripheral or auxiliary to “science as such.” This includes incessant grant writing, the day-to-day-management and coordination of a non-trivial number of specialized researchers, not to mention conference presentations to potential funders, as well as colleagues. These are no longer seen as regrettable-but-necessary means to a nobler end, such as a Noble-prize winning discovery. Rather, the perpetuation of the research program…has become an end in itself. (70)

The modern climate of Fuller’s Mode 2 science or Latour’s hybrid culture of research seems to limit scientists’ agency in many ways in that they are now dependent on so many actors outside of their laboratories for their survival. Yet, this new culture does open up interesting rhetorical opportunities for scientists to gain a measure of agency for themselves provided that they are able to convince outside audiences that their work is worthy of
support. This new climate seems to be forcing scientists to view their work in new contexts, considering the broader social implications of their work in ways that they may never have before. This focus on the social utility and relevance of scientific research may, as in the case of biorenewables research, lead to unexpected sites of agency for marginalized groups such as farmers and environmentalists.

Some of the most compelling theories regarding agency conceptualize it not as something that individuals possess and use in predictable or even conscious ways, but instead agency is seen as a complex confluence of social forces that create opportunities for meaningful changes to occur. In *We Gotta Get Out of This Place*, Grossberg asserts that contrary to what other scholars have assumed about agency, it is not “merely a matter of the individual’s power to act.” (123) What must also be taken into account, according to Grossberg, is how effective that individual’s actions are from an historical point of view, and that cannot be viewed in the vacuum of an individual subject’s position. Grossberg defines agency as the “active forces struggling in and over history,” and he distinguishes agency from agent-hood, which he defines as “actors operating, whether knowingly or unknowingly, on behalf of particular agencies.” (123) While Grossberg rejects Althusser’s confining notion of interpellation that straightjackets individuals into subject positions, he doesn’t think that individuals are ever able, through their rhetorical gifts alone, to effect significant changes to the structure of society. He states: “History is not merely a matter of human whim and creativity. People are never free to produce any articulation imaginable…. For if human beings make history, it is always under conditions that they do not control.” (114) Similarly, Herndl and Licona describe agency as “the conjunction of a set of social and subjective relations that constitute the possibility of action. The rhetorical performance that enacts agency is a form of kairos, i.e. social subjects realizing the possibilities for action presented by the conjecture of a network of social relations.” (2)

By Fuller’s definition of MODE 1 science, which can be described as positivist, and MODE 2 science, which can be described as social constructivist, the 180 scientists affiliated with the BEI undoubtedly fall into both Modes. However, the multidisciplinary nature of
biorenewables research means that whether they like it or not, they must engage in various MODE 2 activities, many of which require rhetorical dexterity. This dissertation project will look at the relationship between a MODE 2 approach to science and shifting perceptions of scientific ethos. As Carolyn Miller eloquently argues in her study of risk analysis, ethos plays a vital role in scientific projects that involve speculation about future events. When scientists such as those involved in biorenewables research deliberate about the potential damage to the environment caused by fossil fuels and the benefits of a bioeconomy, they rely on their scientific credibility to persuade their audience. On Aristotle’s interpretation of ethos, Miller states:

His [Aristotle’s] reasoning is that someone who seems fair-minded is readily believed in any situation, and in situations of uncertainty, there may be little else to go on…… beyond what can be demonstrated factually, we put our trust in people who have good sense (phronesis), good moral value (arête), and good will toward us (eunoia). These are the constituents of ethos as he defines it: the character of the persuader understood against the character and the conventions of the culture. (167)

In the case of biorenewables research, scientists must find ways to communicate to multiple audiences not only about the inherent scientific and academic value of their research, but also about the commercial viability of the projects they are engaged in. This, of course, complicates traditional ivory tower notions of scientists as conducting their work far away from the maddening crowd, aloof to worldly concerns and only focused on how to advance knowledge within their narrow disciplinary domains. MODE 2 rhetorical activities also disrupt the MODE 1 culture’s use of the objective scientific persona or ethos. Modern scientists such as those affiliated with the BEI must engage in overtly rhetorical tactics designed to appeal to audiences of scientists and non-scientists alike in order to survive. Chapter three of this dissertation will look at how the BEI scientists attempt to do this while retaining their traditional MODE 1 scientific persona.

Although projecting a new, more localized and grounded scientific ethos may prove challenging, my dissertation will explore how the scientists affiliated with the Bioeconomy Institute are taking advantage of kairos to exercise a measure of rhetorical agency. As Eric
White posits in *Kaironomia*, “Kairos discovers in every new occasion a unique opportunity to confer meaning on the world.” (14) While there are certainly lessons to be learned from past failures and success i.e. the chemurgy movement, the BEI scientists cannot rely on historical examples alone as a roadmap to guide them. Instead, they would be wise to heed Gorgias’ interpretation of kairos as a “radical principal of occasionality,’ which implies a process of continuous adjustment to and creation of the present occasion, or a process of continuous interpretation in which the speaker seeks to inflect the given ‘text’ to his or her own ends at the same time that the speaker’s text is interpreted in turn by the context surrounding it.” (15)

**Methodological Influences**

I have been influenced by several theorists regarding my approach to methodology namely Kenneth Burke, Donna Haraway and Perkins and Blyler. All of these scholars view texts as inherently narrative i.e. rhetorical and dramatic in scope. Throughout *Modest Witness*, Haraway elaborates on the way that technoscientists engage in an a-rhetorical narrative that affords them a substantial amount of rhetorical agency. In much the same way, Perkins and Blyler argue in *Narrative and Professional Communication* that narratives can exercise an enormous amount of agency:

> Narratives organize and coordinate social and institutional arrangements and imbue them with meaning……they are implicated in a struggle over the ways that meaning gets ‘fixed’…….Narrative is thus implicated in politics and power, part of the complex and shifting terrain of meaning that makes up the social world – and part of the ‘transformative possibilities’ that come with a ‘contingent view of society.’(6)

Graham’s essay "The Business of Living: Letters from a Nineteenth-Century Landlady" in Perkins and Blyler similarly argues for the power of narrative agency. In this essay, Graham looks at the dichotomous boundaries between the public and private spheres and at how those distinctions have influenced humanities scholarship. Graham argues that this public/private boundary has had a huge impact on gender roles in that it limits women’s power to assume narrative agency and become "heroes of their own stories." (191) In my
textual analysis of both chemurgy and biorenewables publications, I plan to keep an eye on the “stories” that the chosen documents tell about their respective movements. I plan to investigate what role kairos and agency play in these narratives.

Burke’s theory of dramatism is closely related to the concept of narrative agency in that he thinks that people write (regardless of the genre) in ways that resemble plays. He believes that rhetors attempt to persuade their audiences of a particular view in much the same way that a play “creates a certain world or situation inhabited by characters who engage in actions in a setting. Through rhetoric, we size up situations and name their structure and outstanding ingredients. How we describe a situation indicates how we are perceiving it and the choices we see available to us…” (336, Foss)

I am interested in Burke’s theory of dramatism for its utility in discovering where the rhetors of the chemurgy movement seem to locate agency. For instance, do they locate it in a single agent, whose commitment to political negotiation promises to push their movement forward, or do they view kairos as the true site of agency, operating under the notion that when the timing is right for a scientific discovery or technology to be adopted, it will be provided that scientific logos is sufficient.

In collecting data for this project, I was also motivated by my understanding of the principles of critical ethnography, which, according to Janet Alsup is, “a culturally and socially active brand of qualitative research that explores the effects of race, class and gender on the social contexts and material lives of research participants and primary investigators.” (219) While I set out to conduct an ethnographic study of my research site, complete with thick descriptions of the physical location and my interaction with my participants, I ended up doing a textual analysis of several documents written by my participants, interspersed with narratives that provide contextual information about the texts and about my participants. The decision to focus on the texts was partially due to unforeseen time constraints. The decision, however, was also influenced by my realization of the role that kairos, ethos and rhetorical agency played in the creation of the selected texts. I will elaborate further on the
selection process, but first I will describe my motivation for attempting a critical ethnographic study and for including in my project (however brief) narratives.

I was initially drawn to critical ethnography for its rejection of the notion of ethnographic texts as “representing” or conveying the absolute truth about a culture. According to James Clifford, “to call ethnographies fictions may raise empiricist hackles. But the word as commonly used in recent textual theory has lost its connotation of falsehood, of something merely opposed to truth. It suggests the partiality of cultural and historical truths, the ways they are systematic and exclusive.” (6) Clifford then goes on to argue that ethnographic texts can legitimately be called “fictions” in that they are, in reality, constructed and, therefore, “made possible by powerful ‘lies’ of exclusion and rhetoric. Even the best ethnographic texts…… are systems, or economies, of truth. Power and history work through them, in ways their authors cannot fully control.” (7) Narrative ethnographies are considered critical ethnographies in that they seek to portray, as do all ethnographies, the local, the specific and contextual realities of their participants, while at the same time examining how larger political and social issues influence those realities.

The unorthodox methods employed by narrative ethnographers include disclosing personal information about themselves in their work, collaborating with participants to design research studies together, soliciting feedback from participants on early drafts and revisions, and looking for ways that they can impact, and ideally benefit, the communities they observe. These methods are designed to address the imbalance of power that often exists between the researcher and his/her participants or informants. According to Clifford, ethnographic writing is characterized by the fact that from a political perspective “the authority to represent cultural realities is unequally shared and at times contested.” (6) In *Feminism and Methodology*, Harding argues against an “objectivist” approach to ethnography that makes the researcher’s “cultural beliefs” invisible, while putting the research object’s beliefs on full display. (11) Harding states:
Thus the researcher appears to us not as an invisible, anonymous voice of authority, but as a real, historical individual with concrete, specific desires and interests. This is no idle attempt to “do good”……. Instead, it is a response to the recognition that the cultural beliefs and behaviors of feminist researchers shape the results of their analyses no less than do those of sexist and androcentric researchers. (11)

Given the fact that I am writing about the ways that scientific ethos is being transformed and about how that transformation impacts notions of scientific objectivity, transparency and agency, I thought it would be a good idea to keep such concepts in mind as I gather, code, interpret and present the data that I find at my research site. In fact, scholars such as Althup believe that the use of personal narration can bolster a writer’s appeal for ethos. Althup argues that, “self-reflexivity adds to the trustworthiness of qualitative research by making known the researcher’s social and cultural relationship to the participants and contexts of the study.” (222)

Committed to diminishing the asymmetry that can exist between an all-knowing and invisible researcher and an exposed and naïve research participant, I have tried to engage my participants in what narrative ethnographers refer to as “authentic dialogue.” By adopting a methodological approach designed to be collaborative, interactive and reciprocal, narrative ethnographers strive to make the research process as transparent and egalitarian as possible. Some of the methods involved in this approach include enlisting research participants to help design studies, soliciting feedback from participants on drafts and early revisions and sharing as much information with participants as possible. Kirsch and Ritchie, however, warn that perfect symmetry between researcher and participant is unlikely. They state:

To some degree, researchers cannot escape a position of power and the potential for appropriating or manipulating information……the point is to encourage researchers to view dissonances [with participants] as opportunities to examine deeply held assumptions and to allow multiple voices to emerge in their research studies, an act that will require innovation in writing research reports. (19)

While I was able to use some of the methods of a critical, narrative approach in my research, there are several areas where I fell short. For example, none of my participants has yet read any drafts or revisions of my work nor did they participate in the design of this
study. Nonetheless, I was able to share a good deal of information with them about some of my observations and plan to let them read the study in its entirety. I also plan to elicit their feedback on my conclusions and include their feedback in any article I submit for publication.

Qualifying Participatory Experience

I chose to conduct a qualitative, empirical study of the activities of the Bioeconomy Institute that uses elements of grounded theory. I chose this methodological approach because I felt that it offered me the greatest amount of latitude in my exploration of rhetorical agency i.e. its salient features and relationship to kairos, ethos and public engagement. I worked at the Bioeconomy Institute over a 21-month period that began in March of 2006 and ended in December of 2007. My title was Communications Specialist, and in my role, I performed a number of tasks that fell under the heading of communications. For example, I wrote press releases about events sponsored by the organization. I wrote their annual reports, newsletters, and marketing brochures, and I gathered and published electronic information (both textual and visual) for their Web site. I was also involved in organizing and publicizing their Growing the Bioeconomy Conference that attracts about 600 people annually to the university. Before being hired, I explained to BEI director Robert Brown my interest in using his organization as a research site. At that time, I wasn’t exactly sure what it was that I would be looking at so I was unable to give him detailed answers to his questions about why I wanted to observe the BEI. I shared with him what I did know at the time and it was that I felt that I could learn a lot about how a growing organization such as his managed to communicate highly technical information to ever-expanding audiences.

I hadn’t been there long, however, before I began learning about the important role that timing was playing in the rapid expansion of the organization. It seemed like every other day someone was referring to the “perfect storm” of circumstances that was making biorenewables research the most popular research on campus. That is when I began to realize that the rhetorical concept of kairos would somehow fit into my research. It also wasn’t long
before I discovered how much of this hottest, latest, cutting-edge research had actually been going on for a very long time. These scientists seemed to be attempting to exercise agency in that they wanted to ensure the survival of fundamental research at the university by using the interest in biorenewables research to further their aims. In this way, they reminded me of doctors who must label and describe certain medical procedures in health maintenance organization-approved terminology to get coverage for their patients. That is when I realized that rhetorical agency would also figure prominently in my research.

As you can see from the aforementioned experiences as a researcher, I went into this project with few preconceived ideas about what I might find. That is why some grounded theory methods worked well for me. As I mentioned earlier, I didn’t initially think that I would focus my study on a textual analysis of BEI’s documents. In fact, I didn’t think that it would be possible to analyze any texts that I had “written” myself, so I set about conducting and transcribing interviews with my participants. I started this project thinking in a very straightforward manner about the interviewing process. I created a set of questions that I planned on asking each participant and assumed that I would use these interviews as a jumping off point for further lines of inquiry. About a week into the data collection process, however, I knew that I was dealing with another kind of animal altogether. Although I was able to complete one interview in the traditional manner, a series of missed communications, crushing deadlines and unfortunate detours made me realize that I was not going to be able to “interview” my participants in the usual manner. Instead, what I managed to do was to have informal conversations with them where I gleaned the information I needed to know in a piecemeal fashion over the course of the observation period. I made sure that all of my participants signed their consent forms and understood that whatever conversations we engaged in might make their way into my study. They understood and agreed.

During these conversations with my participants, I realized how important the organization’s external documents were, not just in getting the message out about the organization’s purpose, but also in establishing old audiences, creating new audiences and securing support for a good deal of fundamental research at the university. It was at about
this time (a few months into my tenure) that I also realized that it would be a good idea to analyze BEI’s “live” documents, as well as “cold” documents i.e. ones that had already been created before I began working there. This is because I was able to directly observe the kairotic circumstances while they were still in flux with some of these documents, and I think that this observation helped me to learn a lot more about kairos and rhetorical performance than I would have with documents that had already been written. In “Writing for an Emerging Organization,” Doheny-Farina sates that the “invention processes in various nonacademic settings involve many types of social interactions, such as face-to-face dialogue, formal and informal meetings, brainstorming sessions, phone conversations, and so on. Through such [social] interactions, the writing process is influenced by interpretations of the organizational context.” (161)

The documents I chose to analyze, which include one “live” document and two “cold” ones, are listed below:

- The proposal to establish the Bioeconomy Institute from its previous incarnation – the Office of Biorenewables Programs (OBP) – cold document;
- The document entitled, “An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems” that was prepared specifically to entice representatives from a huge petroleum company to invest millions of dollars into biorenewables research at the university – live document;
- And the proposal submitted to the Iowa Department of Economic Development to create the New Century Farm and Research Park Incubator – cold document.

In the true spirit of grounded theory methodology, I approached absolutely everything that I encountered as data. Therefore, in addition to these documents, I also relied on notes taken during various meetings (most importantly the meetings of the BEI’s Science and Engineering Board), emails, and traditional interviews. Given the nature of my topic and my relationship to my participants (as an employee/colleague), I was in a unique position to observe and analyze the ways that those affiliated with the BEI position themselves rhetorically to take the best advantage of all of the attention that biorenewables research has
been getting recently. I was also, I soon realized, in a sensitive position in relation to my participants and a strong candidate for observer bias. First of all, it was very difficult not to like BEI director Robert Brown and his staff. I found him to be one of the most reasonable and appreciative bosses I’ve ever had. I also found his employees to be extremely helpful and kind. I soon realized though that not everyone shared my opinion, as I learned that a number of researchers resented being asked by the BEI to “market” their work, so to speak, to outside audiences. Although many of the conversations that I had with my participants revealed their strong commitment to fundamental research and agricultural extension, this commitment was sometimes incongruous with the corporate ethos of potential private investors, an outside audience whose influence couldn’t be ignored. I am not sure that at times my close relationships with my participants didn’t blunt the edge of my critical inquiry into the effects of this tension. However, I have endeavored to the best of my abilities to contextualize my observations, and therefore, ground and qualify them, while searching for useful rhetorical themes.
CHAPTER TWO. THE CHEMURGY MOVEMENT

This chapter is devoted to a rhetorical analysis of the chemurgy movement that began in the United States in the 1920s. Chemurgy is a branch of chemistry that deals with converting raw agricultural materials into industrial products. George Washington Carver laid much of the groundwork for the chemurgy movement by developing over 300 products derived from the peanut. The focus of this chapter, however, will be on the rhetorical progression of the formally organized chemurgic movement that peaked in popularity in the late 1930s and 1940s.

Chemurgy’s aims were nearly identical to those of the contemporary biorenewables movement in that both groups have endeavored to see agricultural wastes used towards commercial ends. The proponents of each movement, however, have chosen to employ different rhetorical styles and strategies to achieve their ends. Among the chemurgists, the rhetoric of chemist William J. Hale was especially pugnacious and strident. Unlike his academic chemurgic counterparts, Hale, who left the University of Michigan to work as a chemist at The Dow Chemical Company, eschewed the “a-rhetorical” narrative of science that conferred upon the scientist the elevated role of modest witness. Instead, Hale dove into his advocacy of the chemurgy movement with all of the partisan gusto he could muster. With the support of industrialists such as Henry Ford, the chemurgy movement could be characterized as a populist Republican movement in that many of its supporters such as Hale were critical of Roosevelt’s Democratic agricultural policies. As will be discussed later in the chapter, Hale was particularly vehement in his criticism unlike the three Iowa State University scientists – Leo Christensen, Ralph Hixon, and Ellis Fulmer – who wrote a pamphlet called *Power Alcohol and Farm Relief*. Although their voices were quite muted and modest compared to Hale’s booming baritone, they mounted a forceful argument in favor of chemurgy. They even occasionally strayed from the objective scientific writing style of transparently presenting the facts and displayed some unguarded passion for the chemurgic enterprise. And finally, there is the work of journalist Wheeler McMillen who wrote the tome *New Riches from the Soil: The Progress of Chemurgy*. Although he wasn’t a scientist,
McMillen grew up on a farm and had a solid grasp of the issues affecting farmers, as well as a facility writing about chemurgic research and technology. Like Hale, McMillan employs a narrative style when discussing the history and merits of chemurgy, but he avoided the acerbic and hostile critiques of government officials that Hale openly enjoyed. Arguably the chemurgist with the most sophisticated command of rhetorical agency, McMillen’s rhetorical style most closely resembles the rhetorical style favored by modern day biorenewables scientists.

Although Hale’s and Christensen et al.’s rhetorical styles were in many ways diametrically opposed to one another, they shared a MODE 1 scientific perspective. On the one hand, Hale, relying on ethos, vigorously argued that scientists should take the place of politicians and lead the nation as statesmen with nobler intentions than their political counterparts. On the other hand, Christensen et al. developed a logos-based argument for the adoption of biofuels that envisioned no such grand role for scientists. Their rhetorical choices, however, reveal the same belief in the ability of science to “objectively” uncover the “truth” of a matter, unencumbered by political bias. As Gieryn would say, their writing draws upon a number of persuasive “cultural repertoires,” including “claims to the utility of science for advancing technology, winning wars, or deciding policy in an impartial way.” (783) Despite the fact that Hale and Christensen et al. were clearly able to “read” the kairotic circumstances that gave chemurgy a national spotlight during World War II and tried to take kairotic advantage the historical situation, their shared MODE 1 perspective ultimately weakened their rhetorical agency.

Looking back at chemurgy’s fate is instructive for despite McMillen’s rhetorical insights, the chemurgy movement petered out after World War II. The kairotic forces that made using agricultural materials for the war effort attractive at the beginning of the war evaporated at the war’s conclusion.

Chemurgy seems ripe for a comparative rhetorical analysis in relation to the biorenewables movement for a number of reasons. First, both chemurgy and the
contemporary biorenewables movement have gained recognition during times of economic uncertainty in the U.S. Secondly, both movements have unfolded under the specter of military threats from abroad, which has led to a palpable sense of anxiety about the future security of the nation. And finally, both movements share the same essential claim, which is that using agricultural materials to develop commercial products is good for the United States. However, the warrants, appeals and evidence used to bolster this claim are quite different. Unlike their contemporary biorenewables counterparts, for example, the most outspoken rhetors of the chemurgy movement didn’t shy away from using pathos and ethos-based appeals that highlighted the plight of the American farmer. In many ways, the chemurgy movement could be characterized as a populist movement in that it emphasized the moral imperative of eradicating rural poverty and helping the “little guy” i.e. the farmer compete with big powerful industrial agents. Against the backdrop of the Great Depression, this argument undoubtedly resonated with chemurgy’s audiences in a much more compelling way than it might today, given that many people today associate farming with huge agricultural corporations. By contrast, those advocating for a “bioeconomy” or a bio-based economy tend to make primarily logos-based appeals that emphasize the efficiency and logic of using agricultural resources in lieu of fossil fuels. As will be explored in chapters three and four, much of what Iowa State’s Bioeconomy Institute communicates to audiences focuses on the feasibility – both technical and economic – of biorenewable energy and products. Despite their substantial use of logos, however, biorenewables proponents cannot completely avoid using pathos-based appeals, and, as we shall see in some instances, in fairly heavy-handed ways. For example, some of the discourse employed by biorenewables researchers distinctly plays on audiences’ anxieties over global warming, a threat that wasn’t nearly as ostensible to the public of the 1930s and 1940s as it is to modern audiences. For another example of how biorenewables advocates use pathos-based appeals, one need only consider the issue of national security. In 1939, pro-chemurgy chemist William Hale made this statement, “….henceforth, no national unit can long withstand the ravages upon its economy imposed by a dependence on foreign supplies” (Hale, 214). Over six decades later, scientists at Iowa State University chose, “Re-imagining Agriculture for National Energy Security” as the theme of the 2006 national bioeconomy conference. In his keynote
presentation, Jason Grumet, Executive Director of the National Commission on Energy Policy, pointed out that 82 percent of all of the oil that is produced in the world can be found in unstable nations, many of which are adversarial to the United States.

In order to look more closely at the rhetorical choices made by chemurgy advocates and at how those choices may have affected the outcome of the chemurgy movement, I will be looking at both congressional transcripts featuring testimony from prominent chemurgists and their detractors and at texts produced by the chemurgists themselves. These texts include William Hale’s 1939 book entitled *Farmward March*; a 1934 Iowa State University report called *Power Alcohol and Farm Relief*; and *New Riches From the Soil: The Progress of Chemurgy*, a book written in 1946 by McMillan, who also founded the National Farm Chemurgic Council in 1935 with the help of Henry Ford. Using the relationship between kairos and agency as my theoretical lens, I will be examining the rhetorical choices of these chemurgists. I will look at how they used the kairotic events of their day to make claims about chemurgy in an effort to buy some agency for the movement.

To get a better understanding of the rhetorical strategies employed by my BEI participants, I will look at how the chemurgy rhetors considered the kairotic circumstances of their time and viewed agency by looking at where they located it in their own narratives. For instance, I will look at whether they perceived that agency resides in a single agent, who could push their movement forward, or whether they viewed kairos as the key to agency, operating under the notion that when the timing is right for a scientific discovery to be accepted or a technology to be adopted, that it will be provided that the scientific logos is sufficient? In gaining a sense of the chemurgists’ varying perspectives on agency, I hope to learn more about why some rhetorical strategies seem more appropriate and/or successful in certain contexts than others. More specifically, I am interested in learning about why some rhetors may be better prepared to take advantage of kairotic moments than others, and thereby acquire/exercise agency. Herndl and Licona describe agency as “the conjunction of a set of social and subjective relations that constitute the possibility of action. The rhetorical performance that enacts agency is a form of kairos, i.e. social subjects realizing the
possibilities for action presented by the conjecture of a network of social relations.” (2) As we will see in our discussion of the chemurgy movement, agency often hinges upon a rhetor’s ability to articulate the significance of his/her historical circumstances in relation to the desired action.

Chemurgy in Context: A Comparative Look at Kairos

In his 1946 book *New Riches From the Soil*, Wheeler McMillen addresses the issue of kairos in a characteristically straightforward manner. He states:

A question naturally arises at about this point in the discussion of chemurgy. Agriculture is an ancient pursuit. Why hasn’t chemurgy been considered long before? Why does it come into sight at this particular time? The answer is that the tools for chemurgic performance have just recently come into view. (10)

McMillen then goes on to explain how three great “new tools” had emerged that made chemurgy not only possible, but also attractive for the first time in history. According to McMillen, the three conditions that gave rise to the chemurgy movement were the birth of the scientific disciplines of organic chemistry and plant genetics respectively, and what he referred to as the “art of the engineer.” To argue his point that chemurgy was an idea whose time had come given the scientific and technical advances that led up to the movement, he uses the example of how engineers created a combine harvester to cut and thresh soybeans, thus bringing the soybean to “agricultural and industrial eminence.” (11) McMillen’s focus on the “tools” that enabled chemurgy’s development is one that would seemingly support an almost a-rhetorical, objectivist scientific view of agency. In other words, McMillen seems to argue at this juncture that once these tools materialized, without any persuasion or attempt to garner widespread support, the chemurgy movement was launched. However, as McMillen himself goes on to explain later in his book, that interpretation of how the chemurgy movement took root couldn’t be farther from the truth. In fact, it was the heady mixture of kairotic circumstances and the rhetorical moves of chemurgy’s staunchest proponents (not the least of whom was McMillen) that brought the chemurgy movement into prominence. It took gifted rhetors who understood the historical, material circumstances and scientific challenges of their time to successfully articulate what important social transformations could
result from some seemingly irrelevant, at least to the general public’s mind, technical changes in the way certain crops were used.

One of these gifted rhetors was Mississippi Senator Theodore Bilbo, who represented a large number of Depression era Southern farmers eager to find new uses for their surplus of cotton crops. According to McMillen, Bilbo was so determined to secure federal funds for research into cotton utilization that he crafted legislation to build a federal laboratory in Mississippi. When this met with disapproval from other senators, who balked at the idea of using tax money from their state constituents to build a laboratory in Mississippi, he proposed building similar laboratories in each state. Instead, a bill was eventually drafted to build four regional laboratories whose purpose was to find new uses for agricultural products. The bill was passed under the Agricultural Adjustment Act of 1938, establishing labs in Wyndmoor, Pennsylvania, New Orleans, Louisiana, Peoria, Illinois, and Albany, California. The authorization for the labs made up only a small part of the bill. Section 202 stated the following:

The Secretary is hereby authorized and directed to establish, equip, and maintain four regional research laboratories, one in each major farm producing area, and, at such laboratories to conduct researches into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof.

The purpose of the labs was to find new uses and markets particularly for crops like wheat, cotton, milk, and potatoes, with “regular or seasonal surpluses.” Congress appropriated $4 million to be divided equally among the four regions for the construction and development of the laboratories. This obviously was a large sum of money in 1938 especially in light of the economic strain that the country was experiencing. There were several factors working in favor of Senator Bilbo, Wheeler McMillan and other chemurgy enthusiasts, however, which helped them promote their argument that chemurgic research was of vital importance. The most formidable catalyst for Congressional action was the crop surplus situation. Hubert Kelly, author of *Always Something New*, summed up the kairotic set of circumstances in this way:
Overproduction had been a vexing problem since World War I—a problem worsened by the loss of foreign markets for U.S. crops in the early stages of World War II. In the 1920's came inflation, followed by deflation and a crash in commodity prices. Also contributing to surpluses and low farm income was the growing productivity of the American farmer. Mechanization and better crop varieties year after year increased farm output per acre, per hour of labor, and per animal unit. (Kelly 52)

According to Kelly, it was the combination of the crop surpluses, USDA's proven record in research, and the influence of the farm chemurgy movement that led Congress to seek help in reducing surpluses from scientists and technologists.

Interestingly enough, there wasn’t much fanfare surrounding the creation of the labs. Kelly notes that in an article in Farmers in a Changing World, the 1940 Yearbook of Agriculture, there was only a brief reference to the labs that was quite restrained in its enthusiasm. (54) According to Kelly, Secretary of Agriculture Henry A. Wallace was also restrained when he commented on the significance of the labs, cautioning the public not to expect any quick results from the chemurgic research and instead to take a decades-long view of their ultimate value. (55)

Despite the understated arrival of the research labs, the term chemurgy, which had been coined in William Hale’s 1934 book The Farm Chemurgic, was becoming more familiar to the American public. There was, therefore, no great public backlash or outcry against the construction of the labs, which were in place by early 1941. Once World War II broke out later that year, however, all of the regional laboratories were then mandated to redirect their energies towards the war effort. While this may have been perceived as a setback at the time, the war proved to be a big (albeit brief) boon to chemurgy. According to McMillen:

Agricultural materials were of high importance for both food and nonfood war purposes….A literal fact is that no warship was launched, no airplane was flown, no tank or truck went to war, and no cannon was fired without agricultural products entering into its construction. In addition to feeding the workers and fighters, farm materials were also a prime necessity in the manufacture of explosives. (307)
During the war, the world’s natural rubber supply wasn’t accessible to the U.S. or other Allied Forces. A chemical base called butadiene, which could be made from either alcohol or petroleum, was needed to make synthetic rubber, and alcohol was the choice. An article that appeared in the Time magazine op-ed section on April 12, 1943 claims that the war completely changed the status of the chemurgy movement from one that was largely concerned with lifting poor farmers out of despondency by finding commercial uses for their surpluses to a movement besieged by the enormous increase in demand for agricultural products to supply the war efforts. The article explains the situation in this way:

For eight years the National Farm Chemurgic Council has tried to solve the farm problem by promoting diversified crops of use to industry. But today the farmer needs manpower, not new markets. It is industry that needs chemurgy, not the farmer. Without agricultural help, rubber, alcohol and explosives programs would be facing disaster. The ninth Chemurgic Conference of Agriculture, Industry and Science meeting in Chicago last fortnight, changed its outlook without blinking. The veteran farm crusaders were absent or silent. Research men from major industries—rubber, alcohol, paints and varnish, plastics—dominated the scene with talk of shortages, grim calculations……. Farmers are begging to be relieved of the alcohol and rubber burdens, praying for petroleum rubber to make its appearance, a complete reversal of their insistence a year ago on being included in the rubber program. (8)

By the end of the war, however, chemurgic products lost traction in the American marketplace. There was a return to the private, industrial sector for non-ethonal blended gasoline. Petroleum increasingly displaced biobased materials as the feedstock for paint, detergent, industrial alcohol, and other industries. There has been widespread speculation over the years that the rejection of chemurgic products was largely the result of the strident criticism directed at the Roosevelt administration by chemurgy proponents such as William Hale. Hale, in fact, went so far as to directly attack Roosevelt’s agricultural policies by saying:

But our present Government will have nothing that vitalizes agriculture. The dole is the order of the day; it secures votes, and votes are more valuable than souls…….Today’s system of doles is the work of Satan. The world owes no man a living save as he is willing and able to work for that living. (48)
Despite some inspired rhetorical choices on the part of chemurgy advocates, political miscalculations such as those made by Hale, indeed may have enervated the chemurgy movement. However, whatever role Hale’s aggressive rhetoric may have played in stanching a movement that once seemed so promising, it is important to take into account the forces that were aligned against chemurgy at that time. Even during the war, there were powerful industrial detractors who posed huge obstacles for chemurgy. In fact, several chemurgy proponents, including Hale, went so far as to testify before Congress that they believed that industrialists had infiltrated the War Production Board in an effort to undermine the ability of chemurgic products to compete with industrial ones after the war (U.S. Cong. Senate 25 Feb. 1943;1634) Hale’s rhetoric was often aimed at addressing the opposition, which is probably why its tone is so heated and acerbic. In addition to industrial foes, there were even some chemical engineers who didn’t think that chemurgic efforts were sound or deserving of federal support. Hale accused some of these scientists of being “sycophants” on the payroll of the industrialists (U.S. Cong. Senate 25 June 1943; 63). Nevertheless, on October 2, 1942, the Industrial Alcohol and Synthetic Rubber congressional subcommittee heard from a Massachusetts Institute of Technology professor who was highly critical of chemurgy. Ernst A. Hauser had, in fact, gone so far as to write a book in 1942 called *Rationed Rubber* condemning the movement. Before questioning Hauser on his position, committee members read aloud excerpts from the book, which appeared in the transcripts as follows:

> Now that an adequate [rubber] program has at long last been adopted, it will be a great pity if its execution is hampered by political consideration…… To a chemist, the idea of building costly plants out of sorely needed materials to operate an uneconomic process to produce a vital war necessity simply does not make sense. (1138)

One of the most forceful arguments put forth opposing the post-war, commercial use of agricultural products was that there simply weren’t enough agricultural materials available to meet commercial demands without impacting the food supply. Interestingly enough, that same argument is still being used today against biofuels. An article published in the July
2008 Guardian newspaper reported that the World Bank found that “biofuels have forced
global food prices up by 75 percent.” And just as there are those who today say that there is
no truth to there being a food shortage that is brought about by biorenewables, chemurgists
decried the notion of there being any dearth of agricultural materials. In fact, in 1943,
William McArthur, Director of the Grain Division of the Commodity Credit Corporation
testified before the Utilization of Farm Crops Subcommittee of the Committee of Agriculture
and Forestry and told them that there was more than enough corn, wheat and other crops to
make alcohol for fuel. (1638)

Like the linking of biorenewables to food shortages, some arguments against the use
of agricultural materials are nearly identical today to the ones lobbied against chemurgy
nearly 70 years ago. This chapter will examine the rhetorical strategies chosen by some of
chemurgy’s staunchest supporters to further the movement in light of considerable
opposition.

The Fiery Rhetoric of William J. Hale

That the chemurgists made the same claim about using agricultural materials to
replace petroleum that contemporary biorenewables proponents make today i.e. that doing so
will benefit the U.S. in numerous ways, is a fairly straightforward proposition. Where the
chemurgists differ not only with biorenewables proponents, but also with each other is in the
warrants that supported their claims. Hale made many provocative statements about the state
of agriculture during the 1930s and 1940s. In examining some of these statements, it appears
that the underlying warrant supporting his claim is that scientists are qualified to lead in areas
beyond their scientific, disciplinary domains. Hale’s rhetoric reveals his confidence in
science to inform social and economic policies and set political agendas. His warrant, one
that was quite controversial in his day, is scarcely less so today, but this didn’t stop Hale
from making numerous inflammatory remarks. For example, in speaking before the Gasoline
from Coal and Other Products Subcommittee of the Committee of Agriculture and Forestry
in 1942, Hale referred to the government’s policy of paying farmers not to use their land as
the “asinine agricultural act.” (U.S. Cong. Senate 25 June 1942; 60) Hale then went on to
testify that by resisting chemurgic methods, “every oil man” jeopardizes the outcome of the war in favor of greed. In fact, Hale goes so far as to call the oil men “war losers” and, as can be seen in the passage below, argues that their actions inadvertently aided Hitler:

Hitler calls them [the oil men] his “money mad cohorts.” Hitler has said openly in his book that the money mad American industrialists will win the war for him. He said the money mad American industrialist is so much more interested in making money for himself during the war and after the war that he does not give a damn who wins the war and therefore the oil companies are excellent Hitlerites. They want to lose this war. The rest of us who do not want to lose this war want to make more chemicals. We are not allowed to make more chemicals because the War Production Board have not the materials; they have not the iron. We can make it out of stones, brick, if they will just give us a priority on a few things… (U.S. Cong. Senate 25 June 1942; 66)

Later during the same testimony, Hale calls the oil industry men “oily greedsters” and accuses the oil and steel men of running the country. (67) During the same diatribe, he called industry leaders “just damned dumb.” (77) In contrast to the deficient state of affairs created by his opponents, Hale offered his own utopian ideas about handling the nation’s affairs:

In other words, if I were running this county, all of the coal mines and oil wells would be closed within a year and only tapped as a reservoir. That is what the Lord put them there for. I would grow everything on the surface of the land and everybody would be prosperous. That is what we know we can do. (71)

Throughout Hale’s \textit{Farmward March}, Hale displays his belief in the scientist as agent. In fact, the agency that he ascribes to scientists is so extensive that even modern audiences who don’t buy into the MODE 1 image of a scientist as politically neutral and objective might find disconcerting. Hale insists on positioning the scientist/agent in the role of protagonist in the rhetorical drama that he stages. In the passage below, we see Hale advocating for scientists to play a primary role in national affairs.

The impotence of present-day democracies lies in their inability to adjust themselves to a new order – the world of science…… In scientifically administered authoritarian states, there is general acceptance of authoritative interpretations governing policies to be pursued. In democratic states, there can be no accord on anything till all
branches of the government concur therein; and if the policy is not immediately palatable to the public, the general hubbub and turmoil that follow will certainly vitiate any chances for its acceptance. But the rise of some powerful and popular leader can save the day. (216)

In a later passage, Hale even more emphatically extols the virtues of science to solve all of the nation’s problems. He also predicted the post-war golden age that science was about to enter in 1939 when his book was published where the scientist as agent was given a relatively large amount of autonomy and regarded as a powerful figure.

Possibly future generations will look upon the Second World War as instrumental to the reign of science…… New World democracies need to gird up their loins and enter chemurgic activities if they would gain self-sufficiency and full employment and head off the catastrophe that threatens democracies abroad. Our duty, before all else, is the expulsion of cowards and misfits and the readjustment of our national economy upon a strictly scientific basis. (217)

In many ways, Hale resembles Fuller’s MODE 1 scientist in his view of the primacy and unadulterated authority of the organic chemist. He is critical and quite distrustful of nonscientists, specifically the policy makers and politicians who populate the noisy, messy, corporeal world beyond the boundary of scientific discourse. His Mode 1 approach supports his view of scientists as agents, ideally suited to influence the actions of the public and, as he argues, to lead the nation. He seems to view scientists as potential philosopher kings. In seeking to cross over the threshold that demarcates the boundary between science and nonscience, however, Hale forfeits his position as modest witness and becomes implicated in the very rough and tumble political fray he so disdains. In Hale’s rhetoric, we see him revealing his reverence for an idealized notion of science and by extension scientists as superior to those who don’t adhere to scientific principle. In the first part of the passage below, we see Hale brilliantly using kairos to create a space for chemurgy. However, by the end of the passage, Hale foreshadows what seems to be most problematic with his rhetorical approach. He writes:

The birth of chemurgy gives us a peek into the future. The vision is perfectly clear to modern organic chemists. It is not a mirage of the unattainable. Those who come after us will find the paths well marked and will gaze upon greater and more beautiful
vistas. Progress is absolutely assured if we can keep our head and not succumb to the debasing influences around us. (48)

Hale’s words reflect his seeming inability to stifle his disregard for non-scientists, particularly those non-scientists who were involved in developing agricultural policies. In his idealistic vision, there is absolutely no place for scientific outsiders. In the final passage of the “Birth of Chemurgy” chapter, we see Hale’s idealism really coming to the fore, and perhaps inadvertently changing the course of the chemurgic movement. He writes:

Happily, the chemurgic movement gathers momentum as it advances. It cannot be stayed nor can it be diverted……… Those without the fold will merit no sympathy from those within. Our advancing phalanxes are suffused with a new spirit and zeal that make for a better understanding of that which never can be other than chemical – this little world of ours. (49)

An analysis of Hale’s writing points to the fact that it might have been his fiery and exalted rhetoric that helped to derail his beloved chemurgy movement. His choice to idealize the role of science, in general, and the role of the organic chemist, specifically, seems to have alienated potentially powerful allies.

Another reason that Hale may have felt comfortable sharing his opinions regarding agricultural policy with the public is that his habitus as a formal academic organic chemist was informed and ultimately diminished by his experience as an industrial chemist at The Dow Company. Bourdieu’s theory of habitus is one that allows scholars to look beyond unyielding hegemonic structures to consider the impact of social practices or what he refers to as durable sets of “dispositions that incline agents to act and react in certain ways” from one situation to another. According to Bordieu, these dispositions “generate practices, perceptions and attitudes which are regular without being consciously coordinated or governed by any ‘rule.’ “ (12) In addition to the academic and disciplinary habitus that Hale undoubtedly developed during his years of training in the academy, Hale was perhaps emboldened by his experiences at a large company where one is encouraged to be an agent of change in the realm of innovation and commercialization. For this reason, he probably didn’t
feel as rhetorically inhibited by his disciplinary habitus as his university peers. His ethos as an industrial scientist may have encouraged him to relinquish his role as a modest witness in favor of his role as an entrepreneur whose combined knowledge of agricultural practices, organic chemistry and industrial processes informed his sense of rhetorical agency.

While Hale was certainly rhetorically out of step with his chemurgy counterparts at the university, he does have some things in common with contemporary scientists promoting biorenewables research. One of the things that both share is the recognition of their respective movements’ potential for disrupting the hegemonic grip that oil companies have exercised on the economy for decades, and the kairotic opportunity to inform the public of alternative sources of energy. In doing so, both Hale and the BEI adopt the scientific, objectively neutral voice to highlight the commercial feasibility and viability of using agricultural waste for fuel.

**How the Ratio of Scene or Kairos Propels Hale’s Scientific Agent**

In casting the scientist as agent in his chemurgic narrative, Hale skillfully uses kairos and agency to argue that the scientist is compelled to action, not out of any sense of ego or self-glorification, but instead by merely being responsive to what he describes as historical mandate. In the third chapter of *Farmward March*, entitled “Birth of Chemurgy,” Hale introduces us to the chemurgic scene by first examining the ways that agricultural operations had changed over the course of the 19th and 20th centuries. He defines these operations as the technological and scientific improvements that allowed farmers to achieve the “principal aim” of agriculture, which is the “provisioning of man with food, raiment and shelter.” (35) In describing what he refers to as the “farm problem,” Hale uses kairos to build his case for the proposed ‘action’ featured in *Farmward March*, which as far as he is concerned is the chemurgic solution:

> Superabundance of foods throughout the nation is an accepted fact. If comestibles, therefore, are eliminated from further consideration, it behooves us at once to inaugurate all possible adaptations that will open industrial avenues to farm output. (40)
According to Hale, the greatest challenge to agriculture in his day was one of overproduction. By pointing out the limitations of the historical situation, he is attempting to exercise rhetorical agency by leading his audience towards the acceptance of a chemurgic solution to the farm problem of “superabundance.” Thanks to technological advancements in the 19th and early 20th centuries, farmers were able to provide not only enough for themselves and their families, but also enough for dozens of other families. After discussing the role of science and technology in improving agricultural yields, Hale introduces chemurgy as the best possible solution to make use of all of the agricultural overproduction. Hale draws upon history to create a sense of kairotic destiny for chemurgy. Hale explains that while farmers in the Colonial period had little to worry about as far as dwindling demand for their goods, farmers in the 1930s were left pondering what to do with their surplus. Given this set of circumstances, Hale argues that, “a breakdown in agriculture became inevitable.” (36) Hale then goes on to chronicle agriculture’s breakdown. He starts with the replacement of livestock, which were fed with grains from the farm, with automobiles and tractors. As one would expect of a rhetor with a scientific background, Hale develops a logos-based argument, buttressed by quantifiable measurements of U.S. land acreage, to lend credence to his description of the scene. After introducing and quickly refuting a proposed policy initiative of the times to reduce the amount of cultivated acreage so that agricultural production could have achieved parity with agricultural demand and consumption, Hale proposed what he referred to as the “only rational course,” which “takes root in sound chemical facts.” (39) He then posited that U.S. industry could use the agricultural surplus derived from overproduction by substituting organic chemical materials for inorganic materials. By so efficiently emphasizing kairos in his discussion of the agricultural situation of his time, Hale rhetorically paves the way for his ideal agent – who in his narrative happens to be the organic chemist – to lead the nation to a more prosperous future.

Chemurgists in the Academy

In *Power Alcohol and Farm Relief*, three Iowa State University chemistry professors – Leo Christensen, Ralph Hixon, and Ellis Fulmer – debunk many of the myths, still in
circulation today, surrounding the efficacy of using biofuels in automobiles. Unlike Hale or McMillen, the professors refrain from using the subjective voice or any narrative flourishes, preferring instead to use standard academic prose to dismantle the arguments of those opposed to the adoption of chemurgic methods. Despite the fact that they dutifully maintain the “objective” voice throughout their book, their passion for their subject is evident. In the book’s the tenth chapter entitled “Arguments of the Opponent,” the professors agonistically tackle the fallacies surrounding biofuels by focusing on the kairotic circumstances that were aiding the chemurgy movement both in the United States and abroad. Leo Christensen was a bacteriologist who developed methods to improve distillery efficiency at an experimental plant run by the University of Idaho’s College of Agriculture. He was able to significantly boost alcohol yields using his methods. He gained a national reputation in 1936 with the publication of *Power Alcohol and Farm Relief* (Anderson, 91)

Christensen et al. use the description of the economic and political conditions in several European countries following the First World War in much the same way as Hale. That is to say they recognized the interdependence between kairos and agency. However, while the importance of agency is well addressed in *Power Alcohol*, it doesn’t figure as prominently in the text as does kairos.

By giving readers the historical context of European biofuel use, Christensen et. al. attempt to persuade their audience that a biofuels movement could also be successful in the United States. Their argument in favor of power alcohol i.e. that it had already been performing in European markets either as an additive or replacement to gasoline, allows the authors to rhetorically challenge the hegemonic grip of the oil industry in the U.S. This rhetorical strategy might be described as “agency by kairos.” Christiansen et. al. seemed to think that the best way to convince their readers that they had the ability to effect the course of the domestic chemurgy movement was to highlight the similarities between the obstacles that they faced at home with those that were encountered by their European counterparts abroad. Of course, the university scientists never used the term “movement” or engaged in the kind of overt “call to arms” that Hale excelled at. This was undoubtedly due to the fact
that the university professors’ MODE 1 notion of agency was tightly bound up with their ability to modestly witness and be seen as being devoid of political bias. Nonetheless, they argued just as strenuously in favor of a chemurgic solution to the agricultural crises as did Hale. They simply used a rhetorical approach that was more in keeping with their particular academic habitus. Throughout *Power Alcohol*, the authors develop a logos-based argument that is essentially pathos-free and reflects their ethos through their “objective” scientific voice. Instead of engaging in any pointed political attacks on the U.S. administration, Christensen et. al. invite their audience to draw their own conclusions based on the facts that they present.

They begin their argument by showing readers how widespread European biofuel use was at the time their book was published, despite significant obstacles. The very first sentence of their chapter addressing the arguments of biofuels’ opponents reads:

The present utilization of power alcohol, amounting to more than 100,000,000 gallons annually in European countries alone, has not been attained without a considerable amount of opposition from certain petroleum industries. (135)

When Germany began using alcohol-gasoline blended fuels in 1923, rumors began to spread that there were disadvantages to using alcohol in one’s motor. The suspected corporate interests behind the rumors, “tried to back up the statements by alluding to the dangers of separation, corrosion, thinning of lubricants, increased wear and tear on the engine…..” (140) Christensen et al., however, report that these assertions were found to be baseless, and that instead, “smoother running of the engine and cleaner combustion when alcohol is used, lead, to the contrary, to a longer life for the engine.” (140)

As Christensen et al. compare the scene in Europe to the scene in the United States, they are especially descriptive of the material conditions that were blocking the adoption of power alcohol stateside, on the one hand, while paving the way for a biofuels market in Europe, on the other. They explain:
In the European countries, the agricultural interests and the alcohol manufacturers have been allies in the cause, but in the United States the alcohol manufacturers have remained neutral because the largest single market for their products is in the form of radiator alcohols, handled by the distribution agencies of these same petroleum industries. Thus, in the United States, it is only the agricultural interests who have taken an active part in the campaign looking toward the use of power alcohol as a farm relief measure and as a part of the planned agricultural development of the future. (136)

It is clear from their U.S./European comparison that the authors recognize the importance of kairos. The following passage reveals that they are also aware of the importance of agency and how, without a sense of agency, kairotic opportunities can be squandered. In discussing the state of the U.S. agricultural industry, they write:

They do not advertise extensively by newspaper and radio and consequently have little voice in the policies of such institutions; they have no war chest upon which to depend for financing a campaign of propaganda; they are so scattered that they cannot readily unite in a common cause; and being disorganized, they are easy victims to misinformation which is supplied to them…… (136)

Christensen et al., however, did recognize the potential for agency among U.S. agricultural interests. They argue that their dormant power could be activated if they would only unite:

On the other hand, they are well represented in State Assemblies and Federal Congress so that once they do join a common cause they can exert effective influence. (136)

As these passages reveal, the authors’ apparent reticence to make inflammatory remarks about public officials or directly criticize the U.S. government is in no way indicative of their political naïveté. Christensen et al. display a sophisticated understanding of kairos and agency as evidenced by their rhetorical emphasis on the efficacy of power alcohol, specifically its use as a desirable instrument with the power to upend the hierarchal influence of the oil industry. They clearly recognized the potential agency available to those in the U.S. agricultural industry and the role that rhetoric would have to play for that potential agency to be realized. In this regard, they share a lot in common with their modern biorenewables counterparts. It appears that despite the decades that separate their work, Christensen et al.
and the BEI rhetors share the same habitus as university scientists at large land-grant schools. This habitus conditions them to view agency not as something that one, lone scientist or even groups of scientists in one singular discipline can exercise. Instead, they seem to share the view that kairotic, historical forces must be measured and considered carefully before rhetorical agency can be realized. Inhabiting a MODE 2 professional environment, however, has freed the BEI researchers, to a certain extent, from the constraints of modest witnessing and placed them at the center of a dialogue with chemurgy’s traditional opponents – oil industry executives.

While Hale’s writing reveals his tendency to ascribe agency to the scientist/agent and Christensen et al. seem to think that under the right kairotic circumstances their modest, logos-based scientific arguments will secure agency for their chemurgic cause, McMillan has a much more subtle and nuanced perspective on agency. His writing suggests that he thinks that it will take more than a rhetorically gifted, outspoken scientist or group of “modestly” superior scientists to move chemurgy forward.

**Looking to the Soil for Answers: McMillan’s Eloquent Defense of Chemurgy**

Of the three rhetors discussed in this chapter, Wheeler McMillan is arguably the most effective at employing rhetorical agency. This may have been due to the fact that as a journalist, he was able to meet and interview a wide-ranging group of people and learn about the elements necessary to launch and sustain a movement. After working closely with powerful men such as Henry Ford, who was an early advocate of chemurgy, McMillan undoubtedly got a sense of the potent, socially and economically transformative nature of chemurgy. He also probably realized how important it was to have not only organic chemists and farmers engaged in the promotion of chemurgy, but also industry leaders, government officials and the general public. In this regard, McMillan’s rhetorical approach is one that most resembles the rhetorical strategies of the BEI in that the BEI also recognizes the importance of bringing together a host of potential stakeholders in order to take advantage of
kairos on behalf of biofuels. This bringing together of interested parties is a rhetorical exercise that requires a keen sense of one’s desired audience, which may be why, unlike Christensen et al. or Hale, McMillan choose to employ narrative in his texts, and avoid outright antagonism of any one group.

In stark contrast to Hale’s prose, there are no bitter diatribes in Wheeler McMillen’s chemurgic tome, *New Riches from the Soil: The Progress of Chemurgy*. The tone of McMillen’s book is, instead, genial and breezy. He favors a sweeping narrative style that manages to convey an astonishing breath of technical and scientific information in an uncomplicated manner. McMillen’s use of narrative may be explained, as Graham would argue, by his desire to give marginalized groups (i.e. farmers) a voice. (182) It may also be explained by his desire to reach as broad an audience as possible by making his writing accessible, an explanation that speaks to his habitus as a journalist. In analyzing McMillan’s rhetorical strategies in *New Riches from the Soil*, it must be noted that unlike Hale or Christensen et al., McMillen is not a scientist nor does he have a technical background in agriculture. Instead, he was the influential agricultural editor of the national publication *Farm and Fireside*, who advocated fiercely on behalf of the chemurgy movement. As a farm journalist, McMillen was tireless in his efforts to bring attention to the cause. Although his 1929 book *Too Many Farmers* received scant attention, being eclipsed by the stock market crash of that year, his numerous articles and speeches on chemurgy were well received. Although McMillen differs from Hale in many ways, he, nonetheless, shares with Hale a penchant for occasionally emphasizing the importance of the scientist as agent. In fact, the introduction of *New Riches from the Soil* seems as though it will reveal McMillen to be, much like Hale, devoted to an idealistic vision of individual agents i.e. scientists and engineers as the most important factor in any set of rhetorical circumstances. In the following passage, McMillen discusses the role that scientists played in chemurgy’s progress, clearly displaying his reverence for his scientific agents:

Like the agricultural engineer, the geneticist is the new expert on the land. Their two arts, when associated with the science of the organic chemist, join to open up the entire new vista of wealth and well-being towards which chemurgy is reaching. (14)
However, upon further investigation, one can see that McMillen recognizes that it is not individual scientific agents who propel popular movements forward. Although McMillen appreciates the important role that scientists have to play in helping to alleviate the plight of the farmer, McMillen doesn’t see the scientist as being all-powerful in the way that Hale does or as omnipotently persuasive in their modest witnessing as do Christensen at al. Instead, McMillen is much more concerned with bringing together various groups, not commonly viewed as sharing each other’s interests, to advance the chemurgic movement.

**McMillen’s Skillful Use of Kairos**

Like Hale, McMillen uses kairos and agency in an interdependent manner to argue that the appropriate “means or instruments” to use in any given rhetorical situation depend upon the specific historical circumstances of the scene being described. McMillen vividly evokes the notion of kairos in his description of what he refers to as the “farm crises.” His powerful narrative tone gives his audience a sense of the kairotic forces that had aligned themselves against the farmer in the 1920s and 1930s. His description of the historical agricultural scene practically demands that a chemurgic solution be applied to the problem of agricultural “overabundance” or “overproduction.” In a chapter of his book entitled “How Chemurgy Got Started,” he writes:

> The seeds of the depression of the 1930s were planted in the war years 1914-18. They sprouted in August 1921. That was when country banks were ordered by the Federal Reserve Board not to renew their notes from ranchmen and farmers, but to collect them, full and at once…. The sudden contraction of credit…… pulled the bottom out from under prices of grain and hay, eggs and milk and cotton, and no farmer escaped. (18)

McMillen then went on to describe how discussions of agricultural “overproduction” and “farm surpluses” became widespread, and how such discussion prompted an insight on his part. According to McMillen, he came to see the logic of using agricultural surpluses for non-food purposes when he attended a lecture in Chicago in 1924. The then-president of the United States Chamber of Commerce, Jules Barnes, made a speech at the annual convention
of the American Farm Bureau Federation, where he said, “the world will buy and eat only so
much wheat…... Unfortunately, the human stomach isn’t elastic.” (20) From that point on,
McMillen made it his mission to learn more about how agriculture could develop new, non-
food uses for its surpluses and, in doing so, develop new markets. In doggedly pursuing his
self-appointed course, McMillen himself became an agent in the chemurgy drama. In the
story of chemurgy that he tells in his book, he is seen aligning himself with other such
powerful agents as organic chemist William Hale, world-renowned automobile industrialist
Henry Ford, and politicians such as Theodore Bilbo and even then-president Herbert Hoover.
Ironically, it was McMillen, an outsider to science, who was able to push the chemurgic
agenda along in a way that eluded organic chemists such as William Hale. What separated
him from the other chemurgy proponents of his day was his sense of agency, his sense of
what, given the appropriate tools, means and instruments, was possible in the way of social,
economic and cultural transformation. And, unlike Hale, he was well aware of the futility of
the lone agent mentality. Although he respected the genius of organic chemists and other
scientists immensely, he also recognized the wisdom of dissolving and not strengthening the
boundaries that existed between farmers, academics, industrialists and government officials.
It was undoubtedly this awareness that motivated him to create, with the help of Henry Ford,
the National Farm Chemurgic Council, an organization with many similarities to the
contemporary Bioeconomy Institute. In 1935, McMillen persuaded Ford to host a large
gathering of influential politicians, industrialists, railroad development officials, newspaper
editors, and agricultural leaders at his Dearborn, Michigan estate. (Finlay, 34) The National
Farm Chemurgic Council (NFCC) was pivotal in advancing the chemurgy movement.

Early on in McMillen’s investigation of new uses for agricultural products, McMillen
discovered that chemurgy was not a new concept for scientists. In the tradition of George
Washington Carver and others, chemurgic research had been underway for decades. In the
mid-1920s, McMillen met with scientists at the Department of Agriculture who were aware
of the fact that paper, for example, could be made from cornstalks and straw, but who felt
powerless in pursuing markets for such bio-based products. (McMillen, 22) McMillen came
to realize that the true obstacle to a viable chemurgic marketplace wasn’t a dearth of
scientific data, but instead a lack of consensus among the interdependent groups of farmers, scientists, corporations, etc. that such products could be made inexpensively and embraced by the American public. With his faith in the agency of science and technology, McMillen sensed the kairotic opportunity to push forward the chemurgic solution. Of his own conviction in the movement, he writes:

…I was fully convinced that science could develop markets still undreamed of and unimagined for the output of the farms. No one could put me off by mentioning some little effort that had been tried and failed. No one could any longer tell me that there was nothing to try. Everything, almost, was yet to be tried! The imaginations of men had not ever been stirred to begin to ask the elementary questions. (24)

In his historical exploration of the chemurgy movement, Mark Finlay addresses the inherent complexities of bringing together the disparate interests necessary to make chemurgic ideals a reality. He writes:

Chemurgists of the past encountered political barriers and the inertia of entrenched agricultural and economic systems. Fundamental tensions arose among individual, corporate, academic, and governmental interests over the power to meaningfully lead research in the realm of biobased feedstocks. The chemurgists’ goal of reducing American dependence on foreign raw materials directly challenged others who embraced the increasingly internationalist economy or promoted petrochemicals and other nonagricultural sources for industrial raw materials. Also, the chemurgists’ nationalist agenda threatened the political interests of farmers who produced goods for international trade and markets……….For good reason, chemurgy never received much real support from practicing farmers; many rightly suspected that industrialists would be the true beneficiaries. (43)

Given his journalistic credentials and subsequent access to the various groups involved in agriculture, McMillen was able, to a limited degree, to disrupt some of the “inertia of entrenched agricultural and economic systems.” In examining McMillen’s rhetorical strategies in New Riches from the Soil, one cannot help but reflect upon Grossberg’s assertions regarding agency. According to Grossberg, agency is not, “merely a matter of the individual’s power to act.” (123) Grossberg argues that one must also consider how effective that individual’s actions are from an historical point of view, and that cannot be viewed in the vacuum of an individual subject’s position. Grossberg defines agency as the “active forces struggling in and over history,” and he distinguishes agency from agent-hood,
which he defines as “actors operating, whether knowingly or unknowingly, on behalf of particular agencies.” (123) While Grossberg rejects the confining notion of interpellation that straightjackets individuals into subject positions, he doesn’t think that individuals are ever able, through their rhetorical gifts alone, to effect significant changes to the structure of society. He states:

History is not merely a matter of human whim and creativity. People are never free to produce any articulation imaginable…. For if human beings make history, it is always under conditions that they do not control. (124)

McMillen’s chemurgic career is a case study in the kind of agency espoused by Grossberg. On the one hand, McMillen was able to use his rhetorical skills to persuade agricultural, industrial and political leaders to embrace, albeit briefly, biobased products. Yet, McMillen’s “agent-hood” was ultimately no match for the historical forces that quieted the chemurgic movement. Like McMillen, BEI director Robert Brown is an undeniable agent in the renewable energy drama that is currently unfolding in the 21st century. Also like McMillen, Brown is attempting to exercise rhetorical agency by uniting seemingly incongruous groups under the banner of a future bioeconomy. Evidence of this can be seen in the brief description of BEI’s annual Growing the Bioeconomy: Biobased Industry Outlook conference that appeared in the 2007 conference registration brochure:

As bioenergy and biorenewables generate increasing interest throughout the United States and the world, the Biobased Industry Outlook conference is quickly becoming “the event” for leaders from industry, government, academia, and the non-profit sector who want to share information about producing and handling biomass feedstocks, and processing, manufacturing, and marketing biobased chemicals, fuels, and energy.

Despite his rhetorical savvy, Brown has no more control over the historical conditions influencing the ultimate fate of the biorenewables movement than did McMillen nearly a century ago. Perhaps it isn’t surprising that the BEI rhetors have the most in common rhetorically with the chemurgic rhetor who is not a scientist, but who is instead a journalist given the changes that have occurred over the last two decades regarding the material
realities of “doing science” (as Fuller would say) in a MODE 2 environment. These changes in funding sources (discussed in the first chapter) have pulled senior scientists away from the laboratory bench, where they could enjoy invisibility and autonomy, and into the world of press releases, conference presentations, and grant writing; in essence, into the world of overt and highly visible persuasion.

In the next chapter, we will take a look at the impact that MODE 2 science has had on scientific ethos and the relationship that exists between ethos and rhetorical agency.
CHAPTER THREE. RHETORICAL AGENCY AND SCIENTIFIC ETHOS IN A MODE 2 WORLD

To have ethos is to manifest the virtues most valued by the culture to and for which one speaks…….

-Michael Halloran (“Aristotle’s Concept” 60)

In the scientific community, ethos is often granted to scientists engaged in basic or fundamental research that is generally seen as being more “pure” than applied science. Calhoun argues against this tendency of scientists to confer greater value and esteem upon fundamental research. He does this by elaborating upon the relationship that exists between fundamental and applied research and how the false image of a dichotomy between the two belies important complex processes that facilitate scientific discovery:

More “applied” research may be helpful, but the opposition of applied to pure is itself part of the problem. It distracts attention from the fundamental issues of quality and originality and misguides as to how both usefulness and scientific advances are achieved. Sometimes work undertaken mainly out of intellectual curiosity or to solve a theoretical problem may prove practically useful. At least as often, research taking up a practical problem or public issue tests the adequacy of scientific knowledge, challenges commonplace generalizations, and pushes forward the creation of new, fundamental knowledge. (3)

Kuhn is similarly concerned with the relationship between what he describes as “normal” science and the scientific revolutions that tend to generate a lot of public discourse. In describing the meaning of a scientific revolution, Kuhn draws parallels between revolutions that occur in the political arena and developmental scientific revolutions. His metaphor conjoins two seemingly disparate environments i.e. the political and the nonpolitical, the rhetorical and the a-rhetorical, the partial and biased with the impartial and objective, or, as Haraway might say, the corporeal and visible with the modestly invisible:

Political revolutions are inaugurated by a growing sense, often restricted to a segment of the political community, that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created. In much the same way, scientific revolutions are inaugurated by a growing sense, again often
restricted to a narrow subdivision of the scientific community, that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way. In both political and scientific development the sense of malfunction that can lead to crises is prerequisite to revolution. (92)

In more than one instance, BEI director Robert Brown has used the word “revolutionary” to describe burgeoning biorenewables technologies. This word has significant connotations for it is generally used in connection with violent political uprisings that forcefully push the old regime out of the way to make room for radical visionary new leadership. These images seem to be worlds apart from images of pristine laboratories and sober and deliberate scientific researchers engaged in what Kuhn refers to as “normal” research, which slowly and incrementally builds upon a broad base of disciplinary knowledge. Following his somewhat dramatic description of a scientific revolution, Kuhn then goes on to elaborate on the nature of the relationship between normal research and revolutions:

Normal research, which is cumulative, owes its success to the ability of scientists regularly to select problems that can be solved with conceptual and instrumental techniques close to those already in existence……. The man who is striving to solve a problem defined by existing knowledge and technique is not, however, just looking around. He knows what he wants to achieve, and he designs his instrument and directs his thoughts accordingly. Unanticipated novelty, the new discovery, can emerge only to the extent that his anticipations about nature and his instruments prove wrong. (96)

Paradigm-busting revolutions then are wholly dependent upon the basic or normal research that precedes them; a fact that Brown and other BEI scientists understand quite well. Brown’s own interest in biofuels was sparked after years of studying the fluidized bed combustion of coal. A course on climate change prompted him to see if wood and then switchgrass could be used in place of coal and converted into a fuel gas. In addition to understanding the potential ramifications for the fluidized bed gasification technology he was investigating, Brown also sensed that other technologies that dealt with the conversion of biomass into commercial products could radically alter Iowa’s agricultural landscape. In the case of the BEI, the “normal” science or basic scientific research that has precluded the
biorenewables movement can be found in numerous disciplines. By looking at the “problem” of fuel conversion technologies through a new disciplinary lens, Brown suddenly found that the tools and instruments that he had been using were no longer sufficient. It was this “sense of malfunction,” to use Kuhn’s words, which enabled Brown to rhetorically introduce (technically reintroduce) the practice of converting agricultural materials into fuel gas. Like the chemurgy movement, which also applied organic chemistry, engineering and other disciplines to agricultural industry, the biorenewables movement has kairotic appeal based on the political and economic crises facing the United States. Rhetorically speaking, what differentiates the earlier movement, however, from the current movement is the fact that scientists engaged in biorenewables research are operating in a MODE 2 environment. As such, they are expected and, in many cases, required to work cross disciplinarily on applied science projects and to communicate with nonscientific audiences using genres previously unfamiliar to most senior scientists i.e. the press release, the corporate funding proposal, newsletters, Web sites, etc. Despite this shift from MODE 1 to MODE 2 science and its subsequent expansion of rhetorical demands, modern scientists are still keenly aware of the importance of basic science and of how their ethos as scientists of merit is largely determined by their contributions to normal scientific research within their respective disciplines. This chapter will look at the strategies that BEI rhetors have used to safeguard their scientific ethos from a MODE 1 perspective while attempting to exercise rhetorical agency in a MODE 2 world. In this section, I’ve attempted to address first the third research question -- what kind of ethos does the BEI project to outside audiences?

The Bioeconomy Institute

During my 21-month tenure at the Bioeconomy Institute, I saw an abundance of changes take place. First of all, there were the physical changes, which included a relocation of the organization from the second floor of a nondescript building on the edge of campus to the newly renovated, fourth floor suite of offices that overlook the central campus. There was also the changing of the name of the organization from the Office of Biorenewables
Programs (OBP) to the Bioeconomy Institute, and the speedy addition of over 100 research affiliates who were eager to align themselves with “the” campus organization that was rapidly coming to symbolize the university’s push to expand research into all things biorenewable. That the organization’s profile and stature on campus quickly ascended during the time that I was there is an understatement. In fact, only a few short months after I began working at the BEI (then the OBP), the president of the university held a university-wide town hall meeting, encouraging faculty from every discipline to come and learn more about the university’s plans to support biorenewables. His stated mission was to “grow the bioeconomy” in an effort to raise the university’s reputation as a leader in the field, and to increase state, federal and corporate sponsorship. In fact, one of the first tasks that I was assigned as the organization’s communications specialist was to produce a publication that would make a significant impression upon very important oil industry executives. I will discuss the creation and impact of this document, which was entitled “An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems,” in more depth both later in this chapter and in the next chapter. Before I do that, however, I want to discuss my rationale for the organization of these next two chapters, as well as, my role as a participant-observer at my site.

One of the benefits of being a participant-observer in my study is that when it came time to decide which texts to select for analysis in the following chapters, I have, in some instances, witnessed the exigency of the circumstances that lead to their creation. I, therefore, don’t have to perform an exegesis on these texts the way that an outside observer would who wasn’t present during the unfolding events that influenced and ultimately characterized what Bitzer would call their rhetorical situations. That being said, it is important to note that I was not the “author” of any of these texts either. While I may have helped to coordinate their production by editing them, collecting photographs, suggesting (only rarely) visual schema and communicating with the graphics and printing professionals on campus, I didn’t do any of the actual writing of these texts. I, therefore, have been able to retain a relatively “fresh” perspective on the texts despite the fact that, in some instances, I was closely involved with their production. Since the thrust of my analysis will be on the rhetorical choices embedded
in the language of these texts, my involvement shouldn’t compromise my findings. In this chapter, I will look at two texts: the “An Integrated Approach….” document (heretofore referred to as the Integrated Approach document), and the New Century Farm proposal. I will outline my involvement with the first text; however, I had no involvement whatsoever in the creation of the New Century Farm document.

Assuming that there is an optimal kairotic time for rhetorical agency to occur, how do rhetors “read” the opportunities that present themselves and position themselves rhetorically to effect change or become agents of change? I will address my first question using a textual analysis that is grounded in my ethnographic experiences at the BEI. I will also address my third research question -- what kind of ethos does the BEI project to outside audiences? I will draw upon Fuller’s MODE 1 and MODE 2 science theories and terminology (discussed in the first chapter of this study) to get at the heart of this question. I want to learn more about how modern scientists, many of whom no longer have the luxury of their MODE 1 predecessors to focus solely on fundamental research, project their ethos as scientists while arguing in these texts that their applied research is worthy of fiduciary support.

In the next chapter, I will look at several BEI documents that were rhetorically constructed to give audiences the impression that biorenewables research at ISU is cohesive and comprehensive. Chapter four will look at the how the BEI rhetorically presents itself as the singular voice of biorenewables research at the University.

It should be noted that the topics addressed in chapters three and four hardly fall into neat, discreet categories. In organizing these two chapters, I realized that there is more than a little overlap among the rhetorical situations that called some of these texts into being. In fact, both of the texts that I look at in this chapter will also be analyzed in the next. That is because both of the texts were written with dual purposes and with dual audiences in mind. First of all, both texts are concerned with conveying the technical and scientific merit of biorenewables research to the larger scientific community. And secondly, the texts are concerned with impressing both internal (disciplinary) and external audiences i.e. potential corporate partners, and state and federal funding organizations that biorenewables research at
Iowa State is a highly coordinated affair. In order to analyze how the BEI attempts to exercise rhetorical agency and project and protect its scientific ethos, I will look at the following texts in this chapter:

- The proposal submitted to the Iowa Department of Economic Development to create the New Century Farm and Research Park Incubator; and
- A document entitled, “An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems” that was prepared specifically to entice representatives from a huge petroleum company to invest millions of dollars into biorenewables research at the university.

**Locating a New Scientific Ethos**

In her discussion of ethos and risk analysis, Carolyn Miller focuses on the way that expertise is used in the Atomic Energy Commission’s 1975 Reactor Safety Study (RSS), which proved to be an influential risk analysis document. (168) She explains that risk analysis, which is “usually considered to be a technical methodology,” can actually be seen as a discourse i.e. “a way of conceptualizing and communicating about a range of issues at the interface of science, technology, public policy, and social values.” (166) I was drawn to Miller’s look at the role of ethos in risk analysis and communication because biofuels discourse is in many ways a risk analysis discourse. According to Miller, the RSS was an important document because it used expert opinion for the first time in public arguments about atomic energy risk. Miller explains the significance of this development in this way:

The Rasmussen [RSS] report’s reliance on expert opinion is particularly interesting in view of the traditional rejection by science of the argument from authority, and it acquires even more significance in view of the change in American public values in the 1970s, which began to reject the long-standing presumption in favor of science and technology……. Risk analysis became a discourse of experts, in which the assumptions, interests, values, and beliefs of experts are deployed to answer public questions about new technologies, government policies, and human behavior. These responses involve transformations of ethos – transformations that conflate ethos with
logos and at the same time narrow the scope of ethos considerably from the original Aristotelian conception. (169)

According to Miller, the newly transformed scientific ethos is one that largely discounts public conceptions of risk, while greatly expanding the credibility of claims based on the authority of scientific and technological experts. Miller argues that for Aristotle, ethos is the most important rhetorical appeal when logos is insufficient or unavailable, and that people put their trust in those who have good sense (phronesis), good moral values (arête) and good will towards us (eunoia) (II i.5-67). As Miller and other scholars have explained, historically science has tended to rhetorically deemphasize the ethos-based argument from authority, leaving those kinds of arguments to be made by individuals without logos i.e. nonscientists. Instead, scientists have traditionally chosen to persuade audiences of the veracity of scientific statements by downplaying ethos:

…the rhetorical style of impersonality, the denial of ethos, is itself an argument that universalizes results originating in particularity: the scientist must seem fungible, so that her results could have been – and might be – achieved by anyone. Ideally, the facts speak for themselves and do not need an advocate; ethos should be unnecessary. However, if we understand this style of reasoning as itself a rhetorical choice that helps make an argument credible, we see that it constructs its own ethos, an ethos that denies the importance of ethos. The technical ethos – impartial, authoritative, self-effacing – is all the more powerful for its self-denial. So not only is ethos transformed into logos, but the favoring of logos becomes its own ethos. [Miller, 185]

In a similar vein, Harraway discusses the power of the “modest witness” in traditional Western discourse. She describes how the effacement of the personal, the historically situated and socially constructed enhances the narrative authority of the technoscientific witness.

This self-invisibility is the specifically modern, European, masculine, scientific form of the virtue of modesty… This is the form of modesty that pays off its practitioners in the coin of epistemological and social power…. This is the virtue that guarantees that the modest witness is the legitimate and authorized ventriloquist for the object world, adding nothing from his mere opinions, from his biasing embodiment. And so he is endowed with the remarkable power to establish the facts. He bears witness: he is objective; he guarantees the clarity and purity of objects. (24)
All of this modesty culminates in what Haraway terms the “culture of no culture” where scientific narratives have been created to bolster scientific credibility. In this narrative of transparency, science is characterized as disinterested and impartial and, therefore, trustworthy. Like the “ethos that denies the importance of ethos” in Miller’s analysis, Haraway’s paradox describes a cultural and rhetorical formation that is self-effacing, denying its own rhetoricity. According to Haraway, the figure of the modest witness, established so successfully during the Scientific Revolution, “set up a narrative about ‘objectivity’ that continues to get in the way of a more adequate, self-critical technoscience committed to situated knowledges. The important practice of credible witnessing is still at stake.” (33)

The shift in the rhetorical emphasis on ethos that Miller alludes to in her discussion of the RSS Atomic Energy report happens to correspond roughly to the shift from MODE 1 science to MODE 2 science. While MODE 1 scientists were loath to reveal themselves to the public and immodestly share their opinions, changing social and political mores have demanded that they do so by questioning and challenging the de-contextualized, invisible authority of technological and scientific discourse. The scientific “culture of no culture” that Haraway describes was allowed to flourish in what Fuller terms the old guard, MODE 1 scientific environment. This chapter, however, will look at the activities of MODE 2 modern scientists who spend more time involved in what Fuller describes as, “incessant grant writing, the day-to-day-management and coordination of a non-trivial number of specialized researchers, not to mention conference presentations to potential funders, as well as colleagues.” According to Fuller, “these are no longer seen as regrettable-but-necessary means to a nobler end, such as a Nobel-prize winning discovery. Rather, the perpetuation of the research program…has become an end in itself.” (Fuller 70) The scientists who make up the Bioeconomy Institute cannot afford to isolate themselves in ivory towers far from Latour’s noisy [nonscientific] hordes. Instead the “messy” material realities of making sure that biorenewables research doesn’t go the way of chemurgy keeps the BEI scientists very busy and, as this dissertation project will demonstrate, keenly aware of the importance of the ancient rhetorical concepts of kairos and ethos as they relate to rhetorical agency. This chapter will explore what scientific ethos and authority look like in modern MODE 2
settings. Unlike the scientists in the past that Haraway describes, modern-day scientists who must devote so much of their energy to securing support and funding for their work don’t rely solely on the appeal of logos to bolster their scientific ethos. As we shall see, modern scientists operating in a MODE 2 fashion are much more forthright about highlighting their authority than their more traditional counterparts. They are also astutely aware of the kairotic opportunities at their disposal to exercise rhetorical agency and garner resources for biorenewables research. Nonetheless, MODE 2 scientists are still concerned about their scientific ethos, integrity and standing within their respective disciplines.

At a fall 2007 meeting of the BEI’s Science and Engineering Board (SEB), there was a lively discussion about how best to organize BEI’s research program areas. One board member suggested an approach to the organization and subsequent marketing of the program areas that involved strategically identifying the funding opportunities that were already known to be available. At the same meeting, plans were discussed to hire a full-time federal/industry liaison officer, whose primary job would be to find funding opportunities. Several board members felt that the person to fill the position should be someone with a lot of public policy experience who could help the BEI to optimize their research efforts, and by extension their rhetorical efforts. While none of the SEB members used the terms kairos or rhetorical agency (I would have been shocked if they had), there was a keen awareness among them of the importance of capitalizing on all of the current attention on biofuels, yet there was also a concern about placing too much emphasis on only the areas of research that were perceived to be “marketable.” One member was particularly concerned that the university’s image convey the strength of the institution’s basic and foundational research. He was also concerned that the research agenda reflect the university’s commitment to environmental sustainability and felt that in order to promote ISU’s reputation as an interdisciplinary institution, research areas and initiatives should be organized in such a way as to represent the entire biorenewables life cycle. This board member’s comments engendered a discussion of the levels of funding necessary to continue some of the larger scale biorenewables projects, the high cost of which some board members found surprising.
The discussion concluded with a general consensus that hiring a full-time BEI employee devoted to finding funding sources and strategically supportive allies was a top priority.

The SEB members touched upon a tension in their discussion that lies at the heart of the biorenewables movement. On the one hand, scientists must confront the material reality of what it costs to sustain a biorenewable research agenda in the face of shrinking federal and state budgets. On the other hand, scientists must maintain their scientific ethos and garner support for the basic scientific research serves as the foundation for applied science projects with commercial potential. This tension will be explored further in this chapter.

**Shifting Ethos**

The shift from a Mode 1 approach to science to a Mode 2 approach is one that is still occurring and far from complete. I would argue, however, that although we are probably still somewhere on the cusp of the continuum between MODE 1 and MODE 2 science that we are closer to MODE 2 science than many scientists perhaps realize. The rhetorical shift that Miller referred to in her article was one that was beginning to take shape in the mid-1970s. This, of course, was a time of great social upheaval where citizens were beginning to challenge numerous cultural institutions. As Fuller explains, the end of the Cold War signaled the end of unlimited federal spending on scientific research. These political and economic changes brought with them an intensification of the corresponding changes in the scientific ethos that Miller refers to in her study of public discourse surrounding nuclear energy. Although funds from industry sources only make up about three percent of the external funding that the BEI receives annually, there are strong indications that the private funding of university research, which has steadily been on the rise over the last two decades, will only increase in the coming years. According to Adam Jaffe at the Department of Economics at Brandeis University, by the mid-1990s, privately funded basic research had tripled since the early 1980s to a total of about $8 billion per year (Jaffe 1996). If we take a strictly structurally determined view of the cultural transformation that is taking place in science in terms of what is shaping the material realities of how science is conducted and the
shift in MODE 1 sensibilities to MODE 2 sensibilities, then there would be little room for theorizing about the existence of rhetorical agency since it would seem that the corporations that are pouring more money into university research will have all of the agency. In the case of biorenewables research, however, there is a conscious rhetorical rejection of this determinist vision. That is not to say that there is no anxiety about how best to preserve scientific integrity in the midst of corporate largesse. Many of the scientists that I spoke with about the “Integrated Approach…..” document (created to impress oil industry executives) heard rumors that the institution would be referred to as “(Name of the Corporation) University,” if the BEI’s proposal seeking hundreds of millions of dollars in research funding had been accepted. However, in my discussions with BEI director Robert Brown, he has indicated that he thinks that because the Bioeconomy Initiative brings together professors in the hard sciences with professors in the humanities, and Iowa farmers with environmentalists, that such “across the aisle” collaboration will lead to progressive technologies that will allow these groups to exercise an unprecedented amount of agency. Whether or not this is in fact true remains to be seen, but this argument seems to inform many of the BEI’s rhetorical choices. Instead of seeing itself as a helpless academic institution that must wait around until corporate giants come along to save the day, the BEI presents itself in most of its publications and proposals as an already powerful agent ready to broker change and unleash its potential on a world desperately in need of its technical expertise and scientific knowledge. In numerous SEB meetings, there have been discussions about the fact that SEB members feel that a veritable “perfect storm” of kairotic circumstances have aligned themselves in favor of the biorenewables movement. They perceive that these fortuitous circumstances have given them some leverage when communicating with corporations and that kairos has allowed them to exercise rhetorical agency.

While MODE 1 scientists regard managing the material realities of science as a peripheral, if necessary, task, MODE 2 scientists spend the bulk of their time quite concerned with “the perpetuation of the research program,” which, “…has become an end in itself.” (Fuller, 70) Despite the distance of time that separates the academic scientists in the chemurgic movement (Christensen et al.) from the BEI scientists, both groups share a
perspective on science that makes them less likely to adopt the “culture of no culture” scientific ethos in their writing and more likely to emphasize how material and cultural realities shape how science is practiced. In all likelihood, the fact that both groups of scientists share the cultural experience of conducting research at a land-grant university is probably what gives them their shared perspectives and appreciation for the potential agency in their work. However, the MODE 2 environment that BEI scientists operate in allow them more latitude to develop arguments from authority, as we will see in the following chapter discussion.

An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems:

This document was created literally in about 48 hours as a way to appeal to a group of oil industry executives who had announced their intention of investing hundreds of millions of dollars in a consortium of universities engaged in biofuels research. BEI director Robert Brown wanted to pull together a document that could be distributed to the executives who were planning a visit to the campus within a week’s time. He wanted the document to convey the university’s dynamic, integrated, multidisciplinary approach to biofuels research. He wanted very much to impress upon the executives that, unlike other universities, ISU understood corporate culture and had devised an almost industrial approach to learning more about how best to bring biofuels technologies online. Although Robert Brown did all of the writing for this text, I had to stay up all night long in order to collect all of the images and photos that were needed to visually accomplish the document’s rhetorical goals. Despite my best efforts and Brown’s inspired writing, the document had many critics. In fact, it ironically created a wedge between several affiliated center directors who didn’t think that their centers were featured prominently enough. Some of them even tried to elicit a promise from BEI director Brown to destroy any remaining copies. Despite its controversy, the document proved to be a remarkably effective document in that it manages to compress an astounding breadth of information about all of the biofuels research being conducted on campus at that time in a very concise and digestible manner.
As one peruses the 17-page document, it isn’t difficult to discern that its primary, intended audience is a corporate one. The document is full of corporate terminology that would appeal to an audience concerned with the commercialization of innovative biorenewables technologies. For example, in the “Overview” section, there is a paragraph that discusses the value of research platforms for “transforming specific feedstocks into desired products.” (2) And later in the same passage, an understanding of the “culture of market-driven companies” is listed as one of the educational advantages of having students work in platform research teams. (2) Instead of beginning the document with a discussion of the economic feasibility and commercial viability of biorenewables research, however, BEI director Robert Brown chose to begin with a statement that, on its face, would seem to be antithetical to the rhetorical goal of securing funding from oil industry representatives. After explaining that the Bioeconomy Initiative was launched in 2002 to “investigate the use of biorenewables sources,” Brown wrote:

The bioeconomy is nothing less than a revolution in the way society will supply itself with essential sources of carbon and energy, in the process of moving beyond our current dependence on petroleum. (1)

The use of the word “revolution” is quite telling in this passage for it demonstrates Brown’s belief in biorenewables’ potential for agency in the larger society, as well as, his willingness to exercise rhetorical agency when discussing the importance of supporting biorenewables research. This language is clearly aimed at moving the reader from a neutral or indifferent view of the bioeconomy to one that embraces the bioeconomy as a positive cultural catalyst. That oil companies have become interested in supporting research into biofuels is evident in the number of universities that have entered into public/private “partnerships” or alliances with these companies over the last few years. In addition to BP’s partnership with the University of California Berkeley and ISU’s partnership with ConocoPhilips, Chevron has partnered with the Texas A&M University and ExxonMobil has pledged $100 million to Stanford University. How genuinely interested the big oil companies are in reducing greenhouse gases and “moving beyond our dependence on petroleum” is difficult to gauge. Marketing campaigns such as BP’s where they changed the logo of their
company from British Petroleum to Beyond Petroleum were very savvy from a marketing perspective and certainly didn’t hurt their public image. Regardless of the oil companies’ ultimate motives, however, the rhetoric of the BEI scientists conveys a firm belief that the bioeconomy will play a vital role in moving society forward towards better land stewardship. In fact, Brown’s “revolution” statement in the beginning of this document encapsulates the spirit of the rhetorical agency found at the heart of the biorenewables movement. No less than their chemurgic predecessors, do the BEI scientists believe that replacing petroleum-derived products with bio-based products will improve the nation’s future. As we shall see, however, the BEI scientists have chosen different rhetorical strategies to convey that message based on their understanding of kairos. Whereas the chemurgists were convinced that their pathos and logos-driven appeals to the nation’s collective conscious would endear them to the American public, biorenewables proponents have more shrewdly calculated how to project their ethos. The chemurgists presented themselves as the moral and ethical saviors of poor, disenfranchised, struggling farmers. Biorenewables advocates, on the other hand, have presented themselves as technical experts who can help the average American in an anxious, post 9-11 world save a dollar at the gas pump while shoring up the nation’s security. This rhetorical shift from a pathos based appeal to an ethos appeal might be accredited to a shift in perceptions of American farming practices and farmers from one that involved family based farms in the 1930s and 1940s to an image of the huge industrial farms of today. In the third paragraph of the “Overview,” Brown outlines the benefits of the bioeconomy. The first benefit he mentions is that biorenewables will “reduce our dependence on resources from unstable regions of the world.” (1) In addition to not having to depend on countries that don’t particularly like the U.S. for oil, one of the attractive potential underlying consequences of not having to import oil from overseas would presumably be a reduction in oil prices. Brown then goes on to mention the fact that biobased products will “improve environmental quality by reducing pollutant emissions associated with fossil fuel usage, especially sulfur, heavy metals, and greenhouse gases.” (1) Again, Brown aligns the biorenewables movement with an issue that has captured the nation’s attention i.e. environmental conservation and global climate change. Lastly, Brown mentions that a bioeconomy would “transform rural development by introducing new crops and new markets.” However, even here, this benefit
isn’t worded in a way that highlights the plight of the American farmer as much as the chemurgic rhetoric did. Instead, Brown states, “the development of biorenewable resources, like the development of petroleum resources over a century ago, will offer rich rewards for those with the knowledge, creativity and organization to turn this vision into reality.” (1) If one looks back at the chemurgy movement, one can see that it enjoyed its most popular phase during World War II when the nation’s attention turned to aiding the war effort by any means necessary. Fortunately for chemurgy proponents, biobased products were the most expedient and inexpensive means available for the manufacture of many wartime products. However, once the war concluded, the plight of struggling farmers just didn’t rank highly enough on Americans’ list of priorities to sustain the movement. It is, therefore, not surprising that even in discussing the seemingly altruistic topic of improving rural economic development, Brown chose language that would appeal to an investor’s instincts to capitalize on promising, burgeoning technology.

In addition to successfully analyzing the significance of kairos in order to position the bioeconomy “revolution” as an attractive alternative to present societal challenges, the BEI researchers have also displayed their rhetorical prowess over their chemurgic predecessors in the way that they establish the credibility of their own research programs and institutional agenda. Right after letting his audience know that he believes that biorenewables technologies have the power to change the status quo, Brown begins establishing the ethos of both the state of Iowa as the best in the country to locate a biobased business, and ISU as the best-equipped institution to conduct biorenewables research. He uses an eloquent metaphor to promote ISU, specifically, and Iowa, in general, as ground zero for biorenewables research. To make his point, Brown forgoes the aloof, impersonal, “universalizing” tone that, as Miller notes, characterizes a good deal of “scientific” discourse, and instead adopts a decidedly MODE 2 approach.

Instead of deemphasizing ISU’s authority and neutralizing his perspective, Brown not only highlights the strengths of the university and its researchers, but also argues that the university’s location and environment is a great boon to the coming bioeconomy. Brown takes advantage of the nonscientific genre that characterizes the “Integrated Approach”
marketing pamphlet and eschews language here that is normally associated with science, language that is abstract or generalizable. Instead, he uses language that is very specific and grounded in the Iowa landscape. The message here in this opening passage is one that proudly locates the biorenewables movement in the heart of Iowa with its rich tradition of agricultural activity:

> Just as petroleum refiners have been inextricably linked to places and cultures where oil was deposited in the earth, biorefiners will be inextricably linked to agriculture and forestry. However, unlike petroleum drilling, biorenewable feedstocks are produced from an ecosystem that needs to be conserved and renewed in order to ensure future production capacity. Therefore, the bioeconomy will require tight linkages between plant breeding, soil fertility, sustainable crop production, biomass transportation and logistics, rural communities, bioprocessing, distribution, and marketing services. (1)

This passage attempts to organically tie Iowa’s landscape to the revolutionary bioeconomy. Although Iowa isn’t specifically named, this passage argues that biorefineries will operate seamlessly in places such as Iowa where soil fertility, rural communities and plant breeding can co-exist. On the same page, Brown draws readers’ attention to how Iowa State’s land-grant status confers credibility in the biorenewables arena. He points out that unlike other universities who have begun conducting biorenewables research in recent years as a response to the public’s interest, Iowa State, given its land-grant history, “has been engaged for many years in both fundamental and applied research projects related to biorenewable resources and biobased products.” (1) Even among land-grant institutions, however, Brown argues that Iowa State is ahead of the curve when it comes to bringing the promise of biorenewables technologies to fruition:

> What distinguishes ISU is its early recognition that single objective, single investigator approaches to problems in this field have stymied progress toward commercialization of biobased technologies. (1)

Up until this point in the document’s introduction, Brown has relied on ISU’s enviable location in the heart of Iowa, its land-grant traditions and commitment to seeing the bioeconomy become a reality to persuade readers of its institutional ethos. This sentence,
however, marks a shift in rhetorical strategy. It is from this point on that those readers with a MODE 1 scientific sensibility may become a bit uncomfortable. What follows on the next page of the Overview section and throughout the rest of the document is an explicit discussion of just how prepared ISU researchers are to transform their fundamental research into commercially viable applications. Brown explains that in order to move the commercialization process along, ISU has organized their researchers into “platform” research teams that, much like their corporate counterparts, take an integrated, “systems-oriented” approach to research. He describes the platform teams in this way:

Platforms are defined as the convergence of enabling technologies into highly integrated systems for transforming specific feedstocks into desired products. The ideal platform team integrates research across disciplines to address major barriers to the entry of a biobased product into the market. Thus, in addition to technical barriers in the areas of plant science, production, processing, and utilization, economic and social issues, such as market limitations, policy designs, rural development, and environmental benefits, are included as appropriate. This platform team approach is essential to rapid and robust developments in biobased technologies. (2)

Although the word “market” is used a couple of times in this passage along with the word “product,” it is perhaps in the final sentence of this passage where we see one of the biggest tensions between a MODE 1 and a MODE 2 approach to science. It is here that we can see a sharp contrast between the speedy, commercially-driven application of technical knowledge and the generally slow, cautious pace of fundamental scientific research. Given that the goals of applied scientific research and basic or pure scientific research are inherently divergent, I found myself constantly asking the question of what kind of scientific ethos does Brown manage to present in this document? From a structurally determinist point of view, it would seem that he is merely cataloguing research projects that promise to make money, but don’t necessarily have any greater scientific or social value beyond their marketability. As I thought about it further, however, I realized that that was too simple and narrow a lens to view this document through. Instead of dichotomizing pure, fundamental science and applied science, I realized that Brown was actually making a strong case for the value of both throughout the document. For example, on page three, he describes a project entitled the “Genomic
Transformation of Soybeans for Improved Fuels and Lubricants.” He states, “In this project, fundamental research in plant sciences and molecular biology provides the information to transform normal soybean oil into high performance lubricants and more economical fuels.” I also realized that there was nothing inherently incongruent or unusual about a land-grant institution engaging in the kind of research that Brown describes. By their very definition, land-grant institutions are involved in the extension and application of research, which generally necessitates some cross-disciplinary interaction. While some institutions with huge private endowments may find such interdisciplinary collaboration unusual, land grant institutions are used to communicating about the practical value of their research projects to external funding agencies. The difference with this document, of course, is that the audience is a powerful corporation and not a federal or state agency. As unseemly as some academic scientists with a MODE 1 sensibility may find the document (as some certainly did on ISU’s campus), this document seems primarily to rhetorically attempt to present the biorenewables research, which in some form or fashion had been going on at ISU for decades, in a light most favorable to private, corporate interests. What is most interesting to me as a student of rhetoric is what this document, as a well as the other one that will be examined in this chapter, say about agency and reveal about the ideological orientation of the research scientists at this land-grant university.

In this section, I’ve attempted to address the question of what kind of ethos does the BEI project to outside audiences? Effective strategies in this document include using language that mirrors corporate language and presenting the work of the BEI in a way that would convince potential corporate sponsors that ISU researchers are highly efficient, industrious and cognizant of the issues involved in commercialization. Despite this decidedly pragmatic approach, however, the document still manages to convey Brown’s sense of agency, his sense that corporate sponsors won’t be the primary beneficiaries of the biorenewables movement, his sense that biorenewables technologies hold significant promise for rural communities and the global environment. Although this document seems less concerned with protecting the BEI’s scientific ethos in a MODE 1
sense than the New Century Farm proposal (the next document to be analyzed), Brown’s approach stops short of relinquishing BEI’s rhetorical agency to the highest bidder. Instead, the sense of ethos that he conveys in this document is one that, as Miller discusses in her work, is an expanded sense of ethos that, in a MODE 2 fashion, concerns itself with matters beyond the laboratory door. This expanded sense of ethos seems to broaden scientific discourse in a way that encourages scientists to become more comfortable addressing “issues at the interface of science, technology, public policy, and social values.” (Miller 166)

**New Century Farm and Research Park Incubator**

On August 21, 2007, the BEI submitted a proposal to the Iowa Department of Economic Development to expand upon a previous $3.3 million grant that was originally awarded for the construction of a Biologics Facility and Incubator. The BEI was seeking assistance with a $19 million research and development project entitled the New Century Farm.

Like the corporate audience for the “Integrated Approach” document, the Iowa Department of Economic Development (IDED) is concerned with the commercial viability of ISU’s biorenewables research. IDED, however, is more concerned with the long-term growth and development of Iowa’s economy than are individual corporate entities. Given the differing interests of these two audiences, the rhetorical emphases of these two documents are decidedly different. On the one hand, both documents reveal an awareness of kairos as an important component of rhetorical agency, and display an expanded appeal to ethos that reflects MODE 2 sensibilities. This New Century Farm proposal, however, is more pronounced in its emphasis on the BEI’s MODE 1 scientific ethos and priorities, and its independence from corporate sponsorship than the “Integrated Approach” document. The New Century Farm (NCF) proposal does this by arguing that the NCF will help researchers understand more about the impact of biomass production on the environment, potentially even improving soil and water quality. Ultimately, however, the rhetorical thrust of the NCF
proposition emphasizes how the demonstration site will serve as a catalyst to bringing new industry and by extension economic prosperity to Iowa’s rural landscape.

Reading Kairos

According to the project history outlined in the NCF proposal, the original 2002 plans called for the creation of an affordable, pilot-scale, limited production plant. This plant had been designed for the extraction and purification of plant-based proteins, which were deemed integral to the development of a plant-based biotech industry in Iowa. The original small-scale biologics facility would have focused on producing pharmaceuticals, nutraceuticals and industrial enzymes. It was originally conceived that the plant would help companies overcome the production hurdles that were blocking the industry's evolution. The facility was expected to accommodate multiple companies that would benefit from being so close to ISU’s scientific experts at the Plant Sciences Institute, Experiment Station and the Center for Crops Utilization Research. After raising $7 million in state and federal funds over the course of a two-year period, the ISU faculty members who spearheaded the project had to significantly scale down its scope due to financial limitations. Budgetary constraints, however, weren’t the only challenges to the project. Negative media attention over contaminated pharmaceutical crops gave rise to growing public concerns over safety. According to the proposal, “interest waned in developing a plant-based pharmaceutical industry as opportunities dwindled to commercialize products. The net result was a drying up of resources for companies limiting or eliminating funds for research and development work envisioned by the Biologics Facility concept plan.” (3) Naturally, this was bad news for many plant scientists and others engaged in plant-based biopharmaceutical projects. It proved to be manna, however, for those involved in biofuels research, and the kairotic opportunity that presented itself was not lost on those at the helm of the BEI, which was then still referred to as the Office of Biorenewables Programs (OBP). The New Century Farm proposal explained the unfolding kairotic events in this way:

By August 2006, the project reached a point where decisions needed to be finalized on design specifications. Because of continued concerns about the future of plant-
made pharmaceuticals, and about the limited size and functionality of the proposed facility, the university began to review alternatives for ensuring value of the facility to the research and business communities. (1)

This passage in the proposal caused me to reflect upon the various definitions, meanings and interpretations of kairos that I discovered in doing research for this project. I thought about the “right timing” definition of kairos and the wonderful weaving analogy that describes kairos as “the moment in which the shuttle could be passed through the threads of the loom.” (Stephenson, 4) I also thought of the “due measure” definition of kairos that can be traced back to archery where, “kairos denotes the moment in which an arrow may be fired with sufficient force to penetrate the target.” (4) I then reflected on the third, less commonly associated meaning of kairos that has spatial connotations and refers to “a concrete location i.e. the archer’s target or the space between the warp threads [in the craft of weaving].” (4) From my observation, a truly successful rhetor must not view kairos solely in its most popular, one-dimensional “right timing” context. For example, knowing that the time was right to drum up support for biofuels research after support for plant-based pharmaceuticals dried up was only half of the battle for BEI director Robert Brown. He then had to calibrate the appropriate response to the kairotic opportunity, and locate specific sites to maximize rhetorical agency and take advantage of the kairotic opportunity that had presented itself. For just knowing that the time is right to speak does not guarantee that the rhetor’s speech will be appreciated, understood or accepted. If one doesn’t consider the “due measure” kairotic aspect of one’s speech or the appropriate location of kairos, then one’s chance of “hitting one’s intended target,” so to speak, can be seriously compromised and the opportunity to exercise rhetorical agency squandered.

In the case of biofuels research, BEI director Robert Brown and his affiliates realized that they needed to convince IDED that their newly proposed biorenewables research facility was worthy of the state’s investment over the long haul, in a manner that the originally proposed facility was not. BEI crafted a proposal that respectfully dissects the flaws of the originally proposed facility, while outlining the benefits of a New Century Farm and
Research Park Incubator. The proposal, which is strong and positive without being too effusive in its tone, describes the New Century project in this way:

The New Century Farm will be the first integrated, sustainable biofuel feedstock demonstration and research farm in the United States and will serve as a model for American biorenewable energy and bio-products production made possible by the transformation of agriculture to “feedstock-ready.” It will serve as a laboratory for landscape-scale feedstock production studies, serving as a living laboratory for developing and testing sustainable biomass systems through rigorous integration of agronomic, environmental and socio-economic research. (3)

When it comes to kairos, Stephenson states that it is a tool that is neither completely out of the influence of rhetors nor completely manipulated by rhetors either. He argues that kairos helps rhetors shape their speech in order to “satisfy” their audience. (19) According to Stephenson, “kairos exists independently of the rhetor but lacks independent volition. In other words, the rhetor must understand or “read” kairos in order for it to be useful in the production of texts.” (19) In exploring the epistemological dimensions of kairos, Kinneavy argues that there is a “common thread” that connects the various meanings and interpretations of kairos. According to Kinneavy, kairos is what “brings timeless ideas down into the human situations of historical time.” (88) It is in this understanding of kairos as the intersection between “timeless ideas” and the temporal, physical world that the concept of agency takes precedence. Kinneavy argues that kairos, while grounded in the historical situation or context, also provides the rhetor the freedom to flesh out a “dynamic idea” that can be brought to bear in the right circumstances. According to Kinneavy, kairos offers a way to subvert the structural determinist theories of history that obliterate any possibility of agency. He argues that, “[Kairos] is closely related to Walter Benjamin’s notion of ‘now-time,’ the revolutionary possibilities inherent in the moment, the ‘state of emergency’ in which we live, the potentials for change inherent in the historical situation” (90)

In viewing the New Century Farm proposal in light of Benjamin’s interpretation of the relationship between kairos and agency, there are several instances throughout the document where biorenewables research is characterized as an inevitable solution to a problem that the world is experiencing at this time in history. What better way to position
one’s movement than to attach it to an external, historical mandate? Consider the following statement regarding the project:

The New Century Farm responds to needs identified by Iowa farmers, industry and ISU faculty and will be a model for American biorenewable fuels and bioproducts development. (6)

By describing the proposed NCF as filling a gap in academia, agriculture and corporate America, the BEI is highlighting the exigent, historical circumstances that call for applying scientific technologies to societal issues. I see this characterization of the project as a bid for agency in that once an audience perceives an action to be necessary, its revolutionary momentum gains force. In a later passage, the document lists a number of companies including Archer Daniels Midland, Cargill, Chevron, ConocoPhillips, ICM, VeraSun, John Deere, Poet and Vermeer that have been clamoring for biorefinery demonstration sites. According to the proposal, these companies “have strongly and consistently expressed the need to see the linkage between plant sciences, production, processing and utilization. ‘Farm-to-kitchen (biorefinery)’ has become a slogan that has commanded considerable attention.”(8) The proposal, however, is careful not to paint the NCF as merely a research and development site for corporations to enhance their profitability. Instead, the proposal aligns itself with federal and state mandates to improve and vitalize the rural economy in Iowa and other Midwestern states. In asserting that the NCF and Research Incubator would comply with federal goals and aspirations for a robust bioeconomy, the proposal references a U.S. Department of Energy document entitled “The Technology Roadmap for Plant/Crop-based Renewable Resources 2020.” According to the Technology Roadmap, the Department of Energy has “clearly articulated such a vision and is making major research investments focused on integrated systems for biofuels and biobased products.”(8) This strategy of hitching its goals and objectives to that of the D.O.E. allows the BEI to not only exercise rhetorical agency, but to also expand its ethos (in a MODE 2 fashion) from the scientific arena to the sphere of corporate and federal influence. In the following statement, the BEI rhetors go beyond linking the NCF project to the academic success of the university, they also link it to Iowa’s future economic development and even to the world’s technological progress:
In fall 2006, ISU had stepped up its efforts to develop its bioeconomy program, primarily in response to significant external funding opportunities. It was also a time when there was growing awareness that the emerging bioeconomy with its emphasis on renewable fuels produced from plants has the potential to transform rural America by creating jobs and economic opportunities in rural communities where biomass crops are grown and processed. For Iowa to take advantage of these opportunities it will have to become the leader in developing advanced biorenewables technologies. Through technological innovation, Iowa can not only attract advanced biofuels companies to Iowa and produce biofuels at competitive prices, but supply biochemical (including biofuels and biorenewables) technologies to the rest of the world. (3)

In outlining the project’s promise to create new industry in the state, the document manages to both exercise rhetorical agency on behalf of biorenewables research and establish ethos for the biorenewables movement. In the passage below, biorenewables researchers aren’t portrayed as powerless and dependent on corporations to come along and fund projects of their choosing. The proposal emphasizes the innovation of ISU’s faculty and the anticipated industrial products that will be based on the fruits of their fundamental scientific research:

The New Century Farm will result in the development of new intellectual property and the opportunity to create new businesses......... In some cases, scientists working within the New Century Farm may determine they wish to commercialize their discoveries within a start up, in other cases fledgling companies may want to utilize the capabilities of the New Century Farm. In either case, young companies will require scalable space where they can quickly and easily access a wide range of support services as well as maintain control over their own space. (8)

**Demonstrating Ethos: Linking the Bioeconomy to a Fundamental Research Agenda**

Throughout most of the NCF proposal, the rhetors focus on the positive economic impact that a bioeconomy would have on the state of Iowa. Yet, there are several instances in the proposal where the BEI rhetors try to enhance, in a MODE 1 fashion, the scientific ethos of its affiliated faculty members by highlighting the symbiotic relationship that will exist between the NCF and the university’s basic research efforts:

It [the NCF] will be directly linked to molecular and traditional plant sciences as well as to advanced processing research. Basic and applied research will be conducted to
achieve short-term and long-term advances in biorenewable fuels and biobased products. (3)

The language chosen in this passage is revealing when one ponders the definition of kairos that is concerned with “due measure” where, “kairos denotes the moment [in archery] in which an arrow may be fired with sufficient force to penetrate the target.” Despite the fact that it was the “traditional plant sciences” discipline that had taken a hit prior to the NCF proposal and had thus paved the way, kairotically speaking, for the NCF project to flourish, it was a wise choice on the part of the BEI rhetors not to offend those in the plant sciences community. The architects of the NCF proposal undoubtedly realized that it would be necessary to work with members of that community to launch the New Century Farm project. They also must have realized that while applied research would be the focus of the demonstration farm site that a mention of the fact that the facility would also foster basic research that looked at “long-term advances” would reassure state funding organizations that the facility wouldn’t quickly grow outdated after a few new technologies had been refined. From IDED’s perspective, funding a demonstration site dedicated to studying the best biorenewables farming practices and technologies seems to serve two functions. On the one hand, the state stands to benefit from the NCF’s ability to attract companies, large and small, to Iowa, and give birth to new start-up companies via the proposed research incubator. On the other hand, the “long-term advances” that the NCF promises via its fundamental research seem to guard against promising technologies that either don’t pan out or that become unpopular i.e. the nutraceuticals that became unpalatable to investors following the incidents of contaminated corn. The basic research to be conducted at the NCF bolsters the overall value of the facility to the state and enhances the reputation of the university. To use Kuhn’s language, it is the normal scientific research that serves as the foundation upon which revolutionary scientific discoveries are erected. In the following passage, the BEI rhetors explain how vital a role fundamental research will play in the NCF:

……… far more research is required to increase our understanding of the fundamentals of the key mechanisms of biomass conversion and address the critical technical challenges that need to be overcome for biofuels and biochemical industrial products to become economically viable and cost-effective. Significant investments will be required
to foster the development of the next generation of advanced technologies, promote innovation in the biomass processing area, and enable their commercialization by mitigating the risk that private investors would encounter. (3)

One of the most effective ethos-building strategies employed in the proposal can be found in passages where the New Century Farm’s commitment to environmental sustainability is discussed. These passages serve to remind readers that the commercial goals and aspirations of the ISU biorenewables researchers aren’t incompatible with the fundamental research goals of the larger academic, scientific community. Technically, research into environmental impact and sustainability issues could be described as falling under the heading of applied science since they involve applying scientific and technical knowledge to addressing societal issues. Sustainability is a decidedly pragmatic area of study and wouldn’t necessarily be described as the pursuit of “science for science’s sake.” However, sustainability and environmental studies have no immediate commercial application and are of growing concern to various disciplines within the academy, both in the sciences and the humanities.

It is interesting to note that the word “sustainable” is used several times early in the proposal to describe the NCF project. In fact, in a passage on the third page, the NCF is referred to as a “sustainable biofuel feedstock demonstration and research farm” that promises to develop and test “sustainable biomass systems.” Shortly after this passage describing the NCF as “sustainable,” the proposal states that one of the goals of the NCF will be to investigate the potential benefits of biomass production on the environmental landscape. The proposal specifically states that the NCF plans to “bring together scientific expertise to address........ the logistics of biomass supply and positive environmental effects such as recycling nutrients back to the land.” (4) This is an interesting statement to read in light of the fact that ironically it was biofuels production that took beating in the media over the last year regarding its allegedly detrimental impact on the environment. In fact, Robert Brown touched on the topic in his director’s letter in the 2008 BEI annual report:

……. legitimate concerns are sometimes distorted into predictions of worse-case scenarios and calls for moratoria on new technology until its impact on society are
fully understood. Such is the case for the bioeconomy….. concerns have been raised about biofuels diverting crops away from food production and encouraging the destruction of natural ecosystems in the developing world. These concerns have escalated into charges that biofuels are both a “crime against nature” and an “environmental disaster.” (Bioeconomy Institute Annual Report 2008, 3)

At the time the proposal was written, however, these criticisms hadn’t been widely reported in the mainstream media, and the BEI is careful to present the NCF project as one that is environmentally responsible. In describing the extension component of the New Century Farm, the proposal states that it will “demonstrate the economic, social and environmental viability of biorenewable energy and bioproducts production………….” (5) Furthermore, according to the proposal, one of the key questions driving the NCF research centers is the environmental impact of the bioeconomy. One of the primary purposes for the NCF is to identify and investigate the agricultural practices that help ensure that producing and harvesting biomass will not compromise natural resources. (5) In addition to the proposed biomass processing facility, the New Century Farm plans to build “additional structures” that will allow researchers to measure water runoff and soil quality, two issues that threaten environmental stability. The proposal states, “It is paramount that we develop production systems that are sustainable and potentially even improve soil and water qualities.“ (6)

In analyzing this NCF proposal, I have attempted to address both my first and third research questions. Throughout the proposal, we see how the BEI rhetors have read kairos and exercised rhetorical agency in very sophisticated ways. While the New Century Farm project had a lot going for it in terms of ingenuity, and purpose, some of the success of the proposal undoubtedly had to do with timing. IDED was already interested in supporting ISU research that would yield economic results for the state. However, it was poised to invest in plant biotechnology before the media backlash made that research less attractive. This set of circumstances created a kairotic space for the BEI to step in and shoot their rhetorical arrow so to speak. The BEI proposal, however, had to measure their rhetorical efforts to ensure that in their bid for rhetorical agency, they didn’t alienate any affiliated researchers in the plant sciences institute whose fundamental research provides the foundation upon which potential
new biorenewables technological discoveries would be based.

As for guarding their scientific ethos in this document, the BEI rhetors are much more direct and forthright in discussing the ways that fundamental science and applied science are inextricably linked than they were in the “Integrated Approach” document. The scientific ethos was implied in that document, whereas the BEI is very deliberate in spelling out the role that fundamental research will play in the NCF.

While the proposal takes pains to protect the MODE 1, boundary-conscious, scientific ethos of the ISU researchers, the BEI rhetors ultimately reveal through this document that they are aware of the porous walls that divide science from industry and politics. Instead of drawing a line around themselves to demarcate the scientists from the non-scientists and pure, fundamental scientific research from applied, commercially promising research, the BEI rhetors dive into the material realities that they face as researchers at a public university and mine the kairotic opportunities at hand in order to exercise rhetorical agency.
CHAPTER FOUR. FROM MANY VOICES, ONE VOICE

In looking at the potential agency of professional writing researchers to shape public policy through activist research, Jeffrey Grabill argues that all institutions are essentially rhetorical creations:

According to this view of institutions, an institution is a well-established, rhetorically constructed design, a bureaucratic and organizational site. Institutions are fundamentally constructed out of the discourses that make them possible. (e.g. legislation, grants, business plans, contracts) and the discourses by which they operate (e.g. policies, procedures, regulations, curricula, lesson plans, assessments). As systems of decision making – as rhetorical systems – institutions can be changed by altering (rhetorically) their processes.

This chapter will look not only at how rhetorical practices create and mold institutions, but also at how rhetorical practices mold public perceptions of institutions. In Brent Faber’s *Community Action and Organizational Change*, he discusses the significance of what he calls “image-power” as it relates to rhetorical agency. In Faber’s book, he takes a critical look at the limitations of traditional rhetorical approaches to affect the kind of structural changes characteristic of agency. He posits that in order for rhetoric to successfully challenge entrenched cultural systems, rhetors must first invest time and energy into constructing an image of their institutions, organizations or, in the case of his fieldwork, political candidates that conveys a sense of agency. He states that, “in the same way that narratives compete for legitimacy within an organization, images compete for legitimacy outside the organization.” (123) In order to create images that resonate with audiences already familiar with the existing images and narratives employed by those in power, Faber argues that successful rhetors read the power dynamics of the situations they find themselves in (an exercise I see as being synonymous with reading kairos) and then cast themselves in the roles of powerful agents. By positioning images in a larger public context, rhetors are better able to exercise agency. The structural changes that rhetors seek seem less intimidating.
and more palatable when they are pre-packaged for their audiences through contextualization. Faber explains his theory in this way:

A powerful organization is able to manufacture an external image that will stick in the minds of consumers, competitors and other stakeholders within their industry. Powerful people are able to control how they are perceived by other people. Image-power is not constant, but situational and highly dependent on context. Image-power can be fleeting and always operates in strategic accordance within and against existing structures. Image-power, like the organization’s narrative is a discursive product. It is created strategically using specialized discourse.

The image that the BEI has cultivated is that of an institution that is fully integrated and comprised of comprehensive research units, whose partners seamlessly collaborate their efforts. Although it is true that the scientists affiliated with the Bioeconomy Institute do work in a multidisciplinary fashion on their biorenewables projects, the BEI derives a great deal of its image-power from the perception that all of its research units are harmonious and complimentary. This image is a decidedly constructed one that implies an organic synchronicity and “natural” symbiosis among the research disciplines that doesn’t actually exist. Despite the fact that the BEI researchers do enjoy very genial and cordial relationships with one another, there are numerous disciplinary divides and obstacles to coordination that are belied in BEI’s discourse about its integrated nature. In his discussion of the characteristics of power, Faber alludes to Giddens’ “reconstructed theory of power,” which claims that, “power is created and reinforced when activities, routines and belief systems are replicated in other times and places.” Faber goes on to explain that, “by replicating itself in different places, power quietly gains acceptance as something natural or normal. People simply accept these relations as if they have always been there.”

This chapter will examine several BEI documents that strategically use both narratives and images to convey the idea that Iowa State’s land grant status and history makes BEI researchers inherently i.e. naturally more adept at working inter-disciplinarily than their scientific counterparts at other universities. Furthermore, I will look at how this image of “inter-disciplinarity” and integration are rhetorically linked to greater efficiency, which is highly valued among business leaders and those interested in regional economic growth. By building an argument that ISU researchers are efficient, these documents attempt to persuade audiences that
supporting research at ISU is a “good investment.” Whether or not BEI’s rhetorical claims are, in fact, true will not be the focus of this chapter. Instead, I will look at how BEI rhetorically attempts to persuade audiences that these claims are true and thereby attempts to increase its image-power.

**BEI’s Rhetorical Approach**

The two research questions I will address here are how do rhetors “read” kairotic opportunities and position themselves rhetorically to effect change or become agents of change, and what specific rhetorical strategies do the BEI scientists employ to capitalize on the popularity of the biorenewables movement? I will be using a textual analysis that is grounded in my ethnographic experiences at the BEI. Using the concept of kairos as developed in the first chapter to drive my analysis, I will discuss the kairotic circumstances that lead to the creation of several BEI documents that give audiences the impression that biorenewables research at ISU is cohesive and comprehensive. This chapter will look at how the BEI presents itself as the singular voice of biorenewables research at the University. I will argue that as one of BEI’s most consistent rhetorical strategies, the presentation of the research institute as being comprised of coherent, integrated research units or research platforms allows the affiliated scientists to exercise a certain measure of agency. In analyzing the documents chosen for discussion in this chapter, one is left with the impression that the scientists affiliated with the BEI want to dispel any MODE 1 stereotypes that readers might have about scientific researchers. Instead, they seem concerned with convincing the public that their research will address issues such as global warming that have captured the public’s attention, and with how their research can fuel the burgeoning bioeconomy. The term “bioeconomy” itself can be seen as a narrative construction that attempts to marry two seemingly dichotomous worlds: the world of academic scientific research, and the corporate world of high finance.

Taking its cue from the excitement generated by the political arena, BEI’s rhetoric stresses its ability to bring together disparate disciplines to address broad, complex social issues. The theme of “working across the aisle” and of bipartisan efforts trumping narrow
self-interest is popular in the contemporary political arena. In the 2008 election campaign, the presidential candidates presented themselves as being bridge builders who could put aside their ideological differences to rally people together to get results. The ability to step outside of one’s sphere of specialization in order to tackle multi-faceted, contentious issues that impact a large number of people i.e. the environment, is increasingly seen as a positive attribute outside of the academy. Throughout the documents examined in this chapter, the BEI casts the ISU scientists in this “bi-partisan” light, if you will, and portrays them as working cohesively together towards the fulfillment of inspired biorenewables technologies that will invigorate the renewable energy movement. BEI director Robert Brown has often said that his ultimate goal for the BEI is that it be seen as the “front door” for biorenewables research at ISU. He is keenly aware of the fact that being seen as a university where researchers work together in multidisciplinary teams or “research platforms” to develop technologies that can be easily transferred to the marketplace is a strong “selling” point for those interested in supporting university research.

To support the concept of “natural,” seamless, integration, the BEI rhetors highlight their systems-oriented research approach that brings together technology, the economy, and the ecosystem. This kind of systems approach, which allows researchers to conduct broad scale analyses of the bioeconomy, is one that requires a MODE 2 scientific orientation. Systems-level research threatens some of the MODE 1 autonomy and disciplinarity of previous research paradigms. In fact, there are several instances in BEI’s documents where a retreat from a restrictive “bricks and mortar bound approach” to research is recommended. Alternatively, these documents promote a movement towards a more flexible, MODE 2, “idea-oriented” approach that favors applied scientific projects. Nonetheless, we also see, in other instances, how the BEI attempts to protect the collective scientific ethos of their researchers and negotiate some MODE 1 autonomy on their behalf. [This was discussed in more detail in chapter three.] As we shall see here in this chapter, Brown is particularly adept at this nuanced rhetorical performance. Not only does he attempt to convince his MODE 1 contemporaries that the politically charged, noisy and messy modern MODE 2 environment that he inhabits isn’t the threat to pure, fundamental science that they may fear that it is, but
he also argues that it is, in fact, a stimulating catalyst for scientific revolution. In addition to this, Brown requests that his audience practice epoche and refrain from any hasty, partisan rush to judgment of the merit of biorenewables research. He instead implores them to indulge his cadre of scientists in a MODE 1 fashion by granting them the autonomy and freedom to experiment with new biorenewables technologies until the most sound and promising technologies are discovered.

Below is a list of the documents that will be analyzed in this chapter:

- The proposal to establish the Bioeconomy Institute from its previous incarnation – the Office of Biorenewables Programs (OBP);
- The document entitled, “An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems” that was prepared specifically to entice representatives from a huge petroleum company to invest millions of dollars into biorenewables research at the university;
- And the proposal submitted to the Iowa Department of Economic Development to create the New Century Farm and Research Park Incubator.

**Change Agent Provocateur: Robert Brown’s Rhetorical Performance**

Before looking at the BEI documents that simultaneously helped to create the institution and shape its image with outside audiences, I will discuss how BEI’s director has taken advantage of kairos to raise the profile of biorenewables research at ISU and enhance the institution’s agentive authority. In his discussion of image-power, Faber explains that image-power is self conscious and self reflective in that “powerful people know they are constructing an image…..” This self-reflectivity, Faber argues, is what allows for human agency because it takes for granted that people will be able to “recognize social, economic and political structures.” By extension, he asserts, they will also be able to locate themselves and their organizations within those structures and be able to “reproduce, alter, create, or otherwise influence the way that other people perceive images.” (123)
Brown’s sensitivity to kairos and ability to respond to historical circumstances with confident and astute rhetorical performances have allowed him to significantly influence public perceptions of biorenewables technologies, and exercise a substantial measure of agency. In addition to conducting biorenewables research himself and teaching biorenewables courses, Brown has created (along with the BEI) the Center for Sustainable Environmental Technologies (CSET), testified numerous times in front of the state legislature and Congress, developed the annual “Growing the Bioeconomy” conference, and helped bring in millions of dollars in federal and private funding for biorenewables research. Using language that is full of imagery, Brown has successfully appealed to broad audiences, convincing them that biorenewables research is of paramount importance for the university, the state, the entire Midwest region, the nation and the world. Considering the veritable whirlwind of biorenewables activity that Brown is responsible for initiating, it is tempting to see him as a dynamic, one-man agent of change. But before we can award that label to him, we must first examine the nuances of agency and agent-hood. According to Grossebrg, agency is “the active forces struggling within and over history,” and agent-hood describes “actors operating, whether knowingly or unknowingly, on behalf of particular agencies.” (122) Brown seems to fit Grossberg’s definition of an agent in that he is quite consciously operating on behalf of the biorenewables movement. Grossberg, however, doesn’t think that individuals are ever able, through their rhetorical gifts alone, to effect significant changes to the structure of society. He states: “History is not merely a matter of human whim and creativity. People are never free to produce any articulation imaginable…. For if human beings make history, it is always under conditions that they do not control.” (114) Instead of focusing on an individual’s conscious actions and their intentions, Grossberg urges students of agency to consider how effective that individual’s actions are from an historical point of view.

As we learned from our study of the chemurgy movement of the 1930s and 1940’s, there is nothing new about ISU researchers, particularly in the College of Agriculture, working together on multidisciplinary projects. What is new, however, are the particular material and historical circumstances that have brought together such a broad coalition of
ISU researchers to address global environmental and economic concerns that weren’t even on the world’s radar 60 or 70 years ago. From global climate change to unstable oil prices, ubiquitous technological advances and the takeover of agriculture by big business, biorenewables research has a kairotic urgency that has benefited the BEI’s bid for agency. Efforts in the field of biorenewables research have intensified in recent years thanks to the 2002 launching of the Bioeconomy Initiative. The Office of Biorenewables Programs (OBP), which preceded the BEI, came into being as the result of the presidential initiative, which called on researchers to work together on "big impact" research projects that, in the words of university president Gregory Geoffroy, would “respond to and anticipate critical needs in Iowa and the country, and enhance Iowa State's stature among peer land-grant schools.” BEI director Robert Brown, who himself has a background in two disciplines (i.e. mechanical engineering and chemical engineering), spearheaded the creation of the OBP. He early on recognized the kairotic opportunity that presented itself in 2002 to establish an organization that would serve as a nexus for researchers where all things biorenewables could thrive.

In an interview Brown conducted with a writer at a Des Moines public relations firm in the summer of 2006, he explained why he is motivated to take a leadership role in the area of biorenewables:

……I soon began to appreciate the advantages biomass offered for reducing dependence on imported petroleum, mitigating greenhouse gas emissions, and revitalizing rural economies. Not too many people were working in this field at the time, so it wasn’t difficult to stand out as “the guy pushing biomass.” I keep pushing because I sense that we are on the verge of a transforming event in the history of agriculture and energy utilization.

Here Brown describes just the sort of historic tendential forces Grossberg refers to. In that same interview, Brown gives us a glimpse of the kind of historical change he is attempting to engender with his actions. He discusses his belief in the potential of biorenewables to completely alter Iowa’s social and economic landscape:

……Like Silicon Valley technology companies, many biorenewables entrepreneurs will set up shop in close proximity to universities specializing in the intellectual
knowledge and skills that can advance the bioeconomy and provide it a skilled workforce. I hope that a “Biorenewables Prairie” emerges in Iowa as an engine of long-term economic growth with impact stretching well beyond its borders.

When one thinks of the enormous wealth and power that resides in Northern California throughout the Silicon Valley region, Iowa and the surrounding Midwestern states don’t generally come to mind as corollaries. The rural and agricultural communities that make up Iowa and her neighbors would seem to have little in common with the sophisticated environs surrounding San Francisco and San Jose. Yet here we see Brown envisioning a future “Biorenewables Prairie” that could potentially transform the social, economic and political landscape of Iowa. The use of this metaphor of a “biorenewables prairie” is an example of Brown’s attempt to garner image-power for the Bioeconomy Institute. Here Brown is using the established image of Silicon Valley as a place where technological innovation is developed and successfully nurtured to give his audience a frame of reference for his proposed prairie. By aligning a future entrepreneurial biorenewables prairie with the already successful Silicon Valley, Brown is, as Faber explains, locating his organization within an existing powerful structure in order to “reproduce, alter, create, or otherwise influence the way that other people perceive images.” (123)

Brown’s prairie image is every bit as sweeping and bold of a play for power as anything that his chemurgist predecessor William Hale articulated 60 years ago. Like Hale, Brown is not afraid of provocative language or of tweaking the sensibilities of the powers that be. In the 2005-2006 Office of Biorenewables Programs annual report, Brown stated in his “director’s letter” that he “found it hard not to be provocative” given all of the attention that renewable fuels had received over the course of that academic year. He stated that he knew that some of the public statements he made that year would be considered controversial, but he felt compelled to make them. Some of these included the fact that he would be delighted to see gas go up to $3 a gallon; that he agreed during an Iowa State Legislature joint session that you get less energy out of ethanol than you put into producing it, but that doing so was still a good idea and not an “outrageous waste of energy” as one legislator had asserted; that it was a “bad idea” to use coal to produce ethanol; and finally,
that the notion that making ethanol is tantamount to taking food out of the mouths of babes is “wrongheaded.” The overall argument that Brown developed in the director’s letter was that with a field as dynamic as biorenewables, rushing to judgment is misguided. Such an assessment seems to be very close to the rhetorical concepts of invention and stasis, which urge the rhetor to take the time to figure out what the real issues at stake are and how best to communicate about those issues before speaking. Brown put it this way:

It would appear that I am prepared to alienate both boosters and critics of the renewable fuels industry (at least I have little chance of making either camp happy). In fact, the issues of renewable fuels and the emerging bioeconomy are complex and multi-dimensional and are bound to get one in trouble during public discourse…….. it is too soon yet to pick winners and losers among the technology options. The ISU Bioeconomy Initiative is investigating many of these options… and working with industry to advance their commercialization. Meanwhile, it is okay to be provocative.

In this statement, we see Brown displaying a MODE 1 sensibility that I see as an attempt to reinforce his scientific ethos and create some autonomy for the fundamental research which fuels the biorenewables movement. In the midst of his engagement in public discourse, Brown calls for his audience to grant the biorenewables movement some distance and leeway while they tinker away in the laboratory. This is a call for epoche, Aristotle’s notion of a suspension of belief in one direction or another in order to exercise a healthy dose of skepticism. Although many of the rhetorical practices of the BEI are aimed at describing how biorenewables research is commercially viable and aligned with the public’s interests, there is also a theme that runs throughout the documents analyzed in this chapter of reverence for independent, pure and fundamental scientific inquiry. In these documents, we see the BEI presenting itself as a research collective open to exploring multiple potential technologies without the structural disciplinary limitations of a MODE 1 research approach hindering its progress. In this way, the BEI is able assuage any fears that multidisciplinary, applied scientific projects are somehow scientifically dubious or tainted by public interference. This strategy implies that Brown, who wrote two of the three documents examined in this chapter, is self conscious and self-reflective (to use Faber’s terms) in his attempt to increase the BEI’s image-power .(123)
Although Brown’s speech in the 2005-06 annual report is reminiscent of Hale’s in its blunt, tenacious and independent tone, Brown differs from Hale in his sensitivity to kairos. While Hale’s MODE 1 influenced philosophy identified the scientific discoveries and technological advances of scientists and engineers as the keys to the success of the chemurgic movement, Brown is much more focused on how outside factors have the power to determine the fate of the biorenewables movement. For example, by saying that he “looked forward” to gasoline prices climbing over $3 a gallon, Brown demonstrated his understanding of the complex set of material circumstances that have to come into play for audiences to be truly receptive to progressive dialogue about renewable energy.

Grossberg explains the complicated relationship between kairos and agency in the statement below:

Agency is never merely a matter of the individual’s power to act. The individual (whether as a biographical or corporate individual, or as a social group) as an actor on the historical scene also exists in relation to nonepistemological and nonideological relations of power, and it is here that we might begin to locate questions of historical (whether economic, political or cultural) agency. ……Hence there can be no universal theory of agency; agency can only be described in its contextual enactments. Agency is never transcendent; it always exists in the differential and competing relations among the historical forces at play. (123)

In order to maximize the opportune time for speech to be truly effective (and allow one to exercise agency), a good rhetor employs strategies designed to appeal to his/her audience. Sensing that the time is fortuitous for rhetorical agency, the scientists, extension specialists, administrators and designers affiliated with the BEI have strategically developed the theme of integration to increase their appeal. As we will see in the rest of this chapter, they have carefully constructed an image of biorenewables at ISU as being highly coordinated and systematic as a way of convincing their audience that ISU is a leader in the renewable energy field and worthy of support.
Integration Equals Efficiency

Integration is a popular strategy in the business world. Depending on their commercial interests, large firms practice either vertical or horizontal integration, and sometimes both in their quest to maximize their profits. Media conglomerates, for example, tend toward horizontal integration. They acquire multiple media outlets i.e. television stations, radio stations, newspapers and Web sites, where they can keep their costs down by spreading their product – the media content -- “horizontally” to their various outlets. (Thorburn and Jenkins, 283) Oil companies, on the other hand, often adhere to a vertically integrated structure. They own everything along the petroleum/gasoline supply chain and are involved in every part of the process of getting their fuel to market. They start by drilling for crude oil deposits and extracting the oil they find. They then move it to their refineries where it becomes the gasoline product we consumers purchase after being distributed to their gasoline stations. Vertical or horizontal, the driving philosophy behind integration as a business model is that it improves a company’s efficiency, making it more profitable. Taking a cue from the business entities that have shown an interest in biorenewables technologies, the Bioeconomy Institute consistently emphasizes in its documents the integrated and multidisciplinary nature of research at ISU. By doing this, potential supporters are left with the impression that any grants, federal funds or corporate gifts that are bestowed upon the researchers affiliated with the BEI will be put to good use and lead, ultimately, to commercially viable technologies. In order for a “Biorenewables Prairie” to emerge from Iowa and other states in the Midwest, those at the helm of the BEI realize that university researchers cannot afford to work in isolation from each other or in isolation from farmers, entrepreneurs, environmentalists, politicians or transportation experts. In much the same way that businesses continually seek to expand their base of operations and their horizontal and vertical networks, the BEI seeks to evolve. As we shall see in the documents analyzed in this chapter, the Office of Biorenewables Programs grew rapidly to become the Bioeconomy Institute, which is now seeking to bring together all of the research components of the Bioeconomy Initiative under one roof in a roughly 12,000 square-foot biorenewables facility. In the spring of 2007, the Iowa legislature approved $32 million for the construction of a
biorenewables laboratory building on campus that is expected to house the BEI and affiliated research centers, the Sloan Center for the Biobased Products Industry and an NSF Engineering Research Center for Biorenewable Chemicals. The theme of integration, and the implied promise of progress and efficiency is one that the BEI is careful to highlight and one that can be found in all of the following documents.

**The Proposal Requesting to Establish the Bioeconomy Institute**

In the 1977 movie Annie Hall, director and actor Woody Allen delivered the following lines to Diane Keaton, who was playing the title role. At the end of their love affair, he says, “a relationship, I think, is like a shark, you know? It has to constantly move forward or it dies. And I think what we got on our hands is a dead shark.”

Inevitably, relationships, romantic and otherwise, do move forward, and, with any luck, they grow and evolve, becoming more fruitful and productive for the parties involved. In order to avoid a “dead shark” scenario, it is important for organizations, which are made up of interlocking and interdependent professional relationships, to move forward and strengthen their influence or at least to rhetorically appear as if they are. In the case of the Office of Biorenewables Programs, this progressive movement manifested itself in the evolution from an “office” to an “institute,” with all of the gravitas and academic prestige that that word implies. At the time that the proposal requesting the change in status was prepared and submitted to the Iowa Board of Regents, the ranks of ISU faculty affiliating themselves with the OBP had swelled significantly in a very short time. In fact, over the course of one year (roughly May 2006 to May 2007), the number of OBP affiliated faculty members rose from about 50 to about 130. During this period, several high profile events raised the visibility of the Office of Biorenewables Programs, as well as, substantial media coverage of all things biorenewables. These events included a “town hall” meeting convened by university president Geoffroy to inform the faculty of what was going on with the Bioeconomy Initiative and engender excitement about biorenewables research opportunities. The president also held a biorenewables summit to encourage faculty participation from all of the university’s academic departments. As these events indicate, the push to integrate and
consolidate the university’s research efforts in the field of biorenewables was one that was strongly endorsed by the top levels of the university administration. According to information posted on the Office of the Vice President for Research and Economic Development’s Web site, president Geoffroy began looking for research projects back in 2002 that would have a "big impact." He was looking for projects that would address “critical needs” in Iowa and in the country, and would “enhance Iowa State's stature.” He ultimately decided on six presidential academic initiatives, the Bioeconomy Initiative chief among them. It was in 2002 that Robert Brown correctly surmised the significant appeal that a campus-wide biorenewables research agenda would hold for president Geoffroy. Although there were other potential leaders of the Bioeconomy Initiative (namely several of the directors of some of the already established research centers), Brown was the only one who seized the kairotic opportunity that was at hand and proposed the formal development of the network of alliances that existed on campus into the Office of Biorenewables Programs. Once established, the OBP attracted several highly publicized grants from oil and agricultural companies that were awarded around the same time that the president held his biorenewables summit. The timing then seemed ripe to make the case for the growth of the OBP into the Bioeconomy Institute.

The proposal that we are examining here arguing in favor of the elevation of the Office of Biorenewables Programs into the Bioeconomy Initiative is really then a second response to a kairotic opportunity that Brown recognized. This proposal would fall into Grabill’s category of a discourse that makes institutions possible in that without the arguments developed in this document, there would be little impetus for those with decision-making power at the university to upgrade the organization’s status. Brown realized that this evolution from an “office” to an “institution” was crucial to his organization’s survival for this increase in stature would thus confer upon the OBP its own broadened capacity for making decisions, as well as, the increased ability to alter outsiders’ perceptions of it as an important and powerful organization. This kind of discourse then can be seen as one that attempts to exercise agency by first observing the kairotic opportunities in play.
The “big impact” research projects alluded to on the Vice President for Research and Economic Development’s Web site, are described as being ideas that were chosen for Geoffroy’s presidential initiative because they are “highly collaborative” and “involve many researchers from across campus. They build on Iowa State’s strengths and fit the university's land-grant mission. They also generate significant amounts of external financial support as they progress." Throughout all three of the BEI documents in this chapter, we see Brown constructing an image of the BEI that supports a “collaborative” and “multidisciplinary” narrative that is in sync with the presidential initiative mandate. We also see Brown explicitly stating how his organization can further the larger goals of the university and the state of Iowa. For example, in the proposal to establish an institute, Brown credits ISU’s multidisciplinary approach as being a key factor in maintaining and improving upon the state’s reputation for success in the field of biorenewables. It is clear that Brown understands what rhetorical appeals will resonate with his Iowa Board of Regents audience. His argument throughout the proposal is based almost exclusively on ethos; it is based on the Board of Regents’ approval of ISU’s reputation and track record of achievement in the area of biorenewables. The logic behind Brown’s argument is essentially that if the Board of Regents thinks that ISU has done a good job coordinating biorenewables research thus far, then it only makes sense to grant the Office of Biorenewables Programs, which was at the epicenter of the biorenewables thrust, the right to expand and extend its influence by becoming an institute. Caroline Miller would describe his argument as an argument from authority; it is an argument that a scientist still ensconced in a MODE 1 perspective of science would be loath to employ. The passage below provides a description of the proposed Institute, emphasizing ISU’s reputation by using the word “prominence” twice:

We propose the establishment of a Bioeconomy Institute at Iowa State University to advance the use of biorenewable resources for the production of chemicals, fuels, and energy. ......... The Institute will build upon a five-year initiative at ISU that has brought us to national prominence in the field of biofuels and bioenergy. The establishment of the Institute will help assure ISU’s continued prominence in this rapidly advancing field. (1)
In addition to the strong appeal to ethos at the heart of the proposal, there is also a recognition of the material circumstances surrounding the propagation of a biorenewables research agenda. It is no secret that it takes a lot of money to run a university, nor is it a secret that the state’s coffers aren’t exactly flush. There is always the matter of financing to be considered, which a MODE 2 approach to scientific research addresses forthrightly. Supporting burgeoning biorenewables technologies that attract commercial investors to the state makes sound financial sense. Perhaps this is why in describing the activities of the Institute, Brown states, “the Institute will expand Iowa’s role in the emerging bioeconomy…..” (2) Brown elaborates on this point in his description of the proposed Institute:

Instead of fossil sources of carbon and energy, the bioeconomy will use biomass (including lignocellulose, starches, oils and proteins) as a renewable resource to sustain economic growth and prosperity. Agriculture will supply renewable energy and carbon to the bioeconomy while engineering will transform these resources into transportation fuels, commodity chemicals, and electric power. (1)

After describing the importance of the Institute in “growing” Iowa’s bioeconomy, Brown describes the Institute’s goals and objectives. In doing so, he highlights the importance of bringing together researchers from multiple disciplines:

The activities of the Institute include creating, sharing, and applying knowledge relevant to both producing biomass feedstocks and converting them to various products. These activities will be implicitly multi-disciplinary in order to address systems-level problems in biorenewables. (2)

The ability to approach “systems-level” problems is touted as a primary advantage of ISU’s interdisciplinary team approach throughout both the proposal to grant the OBP institutional status and throughout the “Integration” document, which will be analyzed in the next section. By using the term “systems-level,” Brown is implying that research that takes place in isolation without being fully integrated with related complimentary research efforts is operating at a lower level than research that takes whole systems into account. In other words, researchers who don’t take a bird’s eye view of problems, taking note of their interconnectedness, can’t hope to be a part of the solution of large problems with big societal
impact. This argument essentially inverts the traditional, MODE 1 hierarchal view of science that places a higher value on pure or fundamental science than on interdisciplinary and applied science.

Brown’s choice of the word “system” can again be seen (like the use of the word “integration”) as an attempt to appeal to a broad audience with members both inside and outside of the academic community. Engineers who work in industry and other business strategists use the term systems-level analysis to refer to a work process that encourages extensive planning and simulation of potential problems before the actual manufacturing processes begin. Correspondingly, within the academy, environmental and agricultural engineering professors refer to agroecosystem analysis as a way to examine the complexity of agricultural environments, and to identify the best solutions to various problems. Although agroecosystem analysis is often used to determine the most sustainable agricultural practices, agroecosystem analysis can also be used to simply identify the most economically attractive farming options, as indeed, the systems-level approach in business has become popular in recent years due to its perception as being cost effective.

In order to effectively address all of the issues related to biorenewables research, Brown explains in the proposal that research efforts must not be rigid, and limited by traditionally narrow disciplinary boundaries. Below, Brown describes the benefits of a “programmatic” or systems-level approach to research that the proposed Institute would adopt:

The Institute will be constituted of thematic programs that build upon the research platforms employed by the Institute’s predecessor organization, the Office of Biorenewables Programs (OBP). The advantage of organizing around programs rather than “bricks-and-mortar” centers is that existing centers and institutes on campus can be engaged in the Bioeconomy Institute and resources can be more readily shifted to the most promising opportunities in biorenewables as they emerge. We expect these programs will develop fluid and flexible leadership that draws from among the many talented junior and senior faculty and staff affiliated with the Bioeconomy Institute. This organizational structure will enable and enhance diverse academic units and centers across campus to become engaged in the programs of the Institute, allowing new research teams to assemble as new opportunities emerge. (2)
In this passage, Brown is taking a page from the playbook of those who have pioneered online businesses. Internet retailers have successfully applied the term “bricks-and-mortar” to business establishments (sometimes their own) to denigrate what they describe as an outdated approach to commerce. Here, we see Brown applying the term “bricks-and-mortar” to existing research centers on campus. This description serves as a perfect negative counterpoint to the more positive “fluid and flexible” nature of the programs he envisions will be spawned by BEI’s innovative and decidedly MODE 2 approach to research. Readers are left with the impression that ISU researchers who cling to a MODE 1, “brick-and-mortars” approach will be left behind, while more modern, MODE 2 oriented researchers who affiliate themselves with the BEI will be ready at a moment’s notice to drop what they are doing and galvanize their intellectual resources towards solving whatever challenges stand in the way of realizing the goals of the bioeconomy. As anyone who has ever worked at a university knows, especially in the sciences, the pace of research can sometimes be glacial. As an academic scientist, Brown knows this. So what should we make of his rhetorical strategy in this passage? Is he trying to delude the Board of Regents into believing that ISU researchers will be forming, dissolving and reforming opportunistic alliances with one another in a manner befitting a Survivor-type reality show? No. I think what Brown is doing is here is letting the Board of Regents know that the Institute will encourage a less isolated and more responsive approach to research that takes into consideration such material factors as the ability to attract outside funding sources. He is also attempting to get the Board of Regents to see that the Institute will not suffer from a Latour-like “mind-in-the-vat” dichotomous perception of scientific research and discovery. He is letting his audience know that the Institute will be paying attention to (if not directly responding to) what that the “noisy” masses of non-scientists are saying about biorenewables research. Brown is letting the regents know that while he and other researchers would never let business leaders, politicians or concerned lay people set ISU’s biorenewables research agenda, that he is aware of kairotic circumstances and able to discern when certain lines of scientific inquiry could prove beneficial to university, specifically, and to the state if Iowa, in general.
The passage below illustrates Brown’s insightful, kairotic MODE 2 approach to rhetorical agency:

………the Office of Biorenewables Programs is essentially an ad-hoc effort without sufficient financial resources to assure its continued national leadership or to maintain the high regard of our international colleagues. It is time for the Office of Biorenewables Programs to be superseded by an Institute designation, with a mission, organizational structure, and operating budget appropriate to the challenge of becoming a world leader in advancing the bioeconomy.

In a discussion I had with Brown regarding his earliest involvements with biorenewables research, he went into extensive detail about the evolution of the Office of Biorenewables Programs. The one thing that struck me during that conversation was how long Brown had been thinking about all of the various components and moving pieces of the biorenewables puzzle. With an engineer’s instincts, he had literally been experimenting with the model of an institutional biorenewables apparatus in his mind for nearly a decade before Geoffroy’s 2002 call to arms had even been issued. He had seen other research initiatives come and go and was well aware of the importance of kairos although he referred to kairos as “timing and opportunity.” While he had an enormous amount of respect for all of the researchers who were working on various biorenewables-related projects, he also possessed a shrewd understanding of what it would take to keep their various biorenewables efforts functioning well into the new century. He understood that scientific discovery alone was not going to keep research programs alive nor would the kind of isolated, disciplinary approach that once thrived during the Cold War. The economically challenging, politically charged, globally-linked world of the early 21st century demanded a radically different rhetorical approach to the biorenewables movement and Brown, unlike many of his colleagues, understood this well. As a participant observer in my study, there is one incident (among many similar incidents) that stands out in my mind as an example of this kind of prescience. I was asked to put together a series of posters that explained to a broad audience made up of scientists from various disciplines and lay people what some of the key biorenewables projects entailed. Most of the researchers sent me very detailed, and highly technical explanations of their research even after I explained to them who the audience was for the posters. Drawing on my experiences as a journalist, I had to conduct follow-up interviews
with the researchers after painstakingly wading through all of the minute scientific details they’d initially given me in order to extract the vital information I needed to satisfy our audience. All of the researchers were obliging and understood my needs except one. He resolutely refused to “dumb down” his description of his research. In fact, he went so far as attempting to pull his poster from the line up at the last minute. When Brown learned of his attempt, he got on the phone with him and reminded him of how beneficial his affiliation with the BEI had been to his ability to secure the funding necessary to do his research, and that what was being asked of him was essentially a minor concession in the larger scheme of things. Humbled, this researcher reluctantly agreed to present his research to our intended audience without all of the technical minutiae that he’d felt was so important. Although I initially read this researcher’s actions as being hostile and stubborn, I later realized that his recalcitrance stemmed from the fact that he was more concerned with appearing to lack scientific credibility to a jury of his disciplinary peers than he was with communicating with a broader audience, despite the fact that the broader audience had the potential power to enable his research to flourish. His perception was so focused on entrenched, MODE 1 scientific structural relations and alliances that he devalued the increasing power of a MODE 2, multidisciplinary organization such as the BEI.

I will close this section of this chapter by sharing an email message that was sent by a BEI administrator to a magazine reporter in the fall of 2007, shortly after the Board of Regents granted institutional status to the organization. The email letter was written by one of Brown’s staff members who helped to write and edit many of BEI’s proposals. I chose to include this letter because of its strident rhetorical tone in identifying the newly minted Institute as the unifying biorenewables force on campus. The language chosen here is clearly designed to focus the reporter’s attention on the Institution’s mission by discouraging a scattershot approach to covering the topic of biorenewables research at ISU:

Hello Michael,*

As discussed some time ago, we would urge that this “-----“ article feature prominently the Bioeconomy Institute (BEI). As you know, the Board of Regents approved establishment of the Institute in its October meeting. One important aspect
of the Institute's mission is to serve as the "front door" for biorenewables at Iowa State University. So while the breadth of faculty involvement is certainly impressive and will surely be of interest to your readers, we don't want to deliver the erroneous message that there are numerous, disparate groups out there conducting research in the area. Rather, we would like readers to know that the BEI is bringing cohesion to biorenewables-related research at ISU by organizing all these diverse faculty into focused, multi-disciplinary teams that will address the challenges and issues arising from the transition to a biobased economy…….. Thanks for considering our request and understanding our desire to convey the "right" message.

Best regards,

Blair *

Note: * These names have been changed and the original message has been edited to include only information relevant my doctoral project.

It is interesting to read this letter in light of Faber’s theory of image-power. In the second sentence, the writer uses the Board of Regent’s approval of its institutional status to bolster the BEI’s ethos and authenticate its role as ISU’s biorenewables “front door” organization. The image of a front door is a very powerful one that serves to solidify in readers’ minds the fact that the BEI is the official repository of biorenewables knowledge. Being the “front door” not only elevates the status of the institute to the position of unquestioned biorenewables authority, it also assigns for the institute the self appointed role of gatekeeper. This letter is essentially a bid for agency given the fact that an image of the BEI as comprising all of ISU’s biorenewables expertise would encourage the readers of this proposed article to view the organization as powerful and to treat it as such.

If the strategy of the BEI is to make sure that it is seen as the front door for biorenewables research, then the New Century Farm, as we shall see in the last section of this chapter, is the living room, dining room and kitchen as far as biorenewables research is concerned.
An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems

Since I have already discussed at length the genesis and rhetorical role of this document in the last chapter, I will merely summarize its origins here. Robert Brown’s intentions with this 17-page booklet were to convince a group of oil industry executives who were interested in investing hundreds of millions of dollars in biofuels research that ISU was the university best prepared to realize all of the bioeconomy’s potential. Although Brown wrote the content, I had only 48 hours to gather information from sources all over campus, coordinate with the graphic designer to convey the “unity” and “integration” message visually and negotiate a quick turn-around production schedule with the printer so that the half dozen oil industry executives visiting the campus could have copies to peruse. Brown very much wanted to impress upon the visiting executives that, unlike other universities, ISU understood corporate culture and had devised an almost industrial approach to learning more about how best to bring biofuels technologies online. From the minute it came off of the presses, the document was criticized. One the most contentious aspects of the document, on which I will elaborate upon further, concerned the way it portrayed affiliated research centers and units. Ironically, some of the directors of these centers didn’t think that their centers were featured prominently enough. So much for cooperative collaboration among the many biorenewables research components at ISU. These directors undoubtedly sensed that their autonomy and influence over their “bricks-and-mortar” centers would be eroded by the kinds of interdisciplinary affiliations that the BEI (then the OBP), with encouragement from the university president, was trying to promote. Despite the behind-the-scenes controversy, however, the document proved to be a vital one that helped to ease the pains engendered by the phenomenal growth spurt that the BEI was experiencing at that time. From a kairotic point of view, Brown realized that the organization was, in many ways, located at the bull’s eye of historical forces that had the potential to link Iowa’s destiny with that of a global bioeconomy. In the 21 months that I worked at the BEI, I came to see the “Integration” booklet as a crucial part of the BEI’s success with audiences outside of the university who needed to learn more about the astounding breadth of biofuels research at ISU in order to become convinced that Iowa State really had the capacity to lead in the biofuels field.
Consequently, the booklet was distributed widely to industry representatives, legislators, scientists at other universities, small business owners and federal agents.

Early on in the “Overview” or introductory section of the document, Brown describes the difficulty he faced in coordinating all of the scattered biorenewables research efforts that were underway in various parts of the campus in this way:

Upon launching the Bioeconomy Initiative in 2002, the challenge was not convincing faculty to work on problems relevant to the initiative; indeed, a large number of faculty and research centers have long studied biorenewable resources and biobased processes. The challenge was providing cohesion among existing efforts and establishing multidisciplinary teams to tackle integrated research approaches. (1)

Brown then goes on to explain the purpose of the Office of Biorenewables Programs. He states, “The OBP was established to provide cohesion among the diverse efforts in biorenewable resources on campus and to encourage collaboration among departments, colleges, and research units.” Whether consciously or unconsciously, Brown used the word “cohesion” twice in this passage. Having witnessed the fallout from the publication of this document, specifically the anger and hostility of some of the directors of the “affiliated research centers” who felt that their organizations weren’t highlighted sufficiently, I can say with authority that at the historical moment that the document was created, the cohesion that Brown alluded to was only partially realized. The fact that Brown emphatically used the word “cohesion” not just once, but twice, however, is an example of the kind of rhetorical agency he was attempting to exercise with this document. I would argue, too, that his attempts were largely successful. Although the oil industry executives that the document was created to impress ultimately awarded their multi-million dollar grant to another university, the OBP went on to procure another multi-million dollar gift from another oil company, entertain numerous overtures from multiple potential industrial partners, and garner significant state funding for its researchers. I would also argue that this document was instrumental in the move of the organization’s headquarters from the fringes of campus to a renovated suite in the center of campus, which occurred around the same time that the organization was granted institutional status from the Board of Regents.
Shortly after the passage in the “Overview” section where Brown explains the purpose of the Office of Biorenewables Programs and the need to coordinate biorenewables research efforts at ISU, he goes on to explain exactly how this coordination is achieved. He informs readers that, “much of the research in the Bioeconomy Initiative has been organized into platform teams to encourage interdisciplinary research and systems-oriented projects.”

On the opposite side of the page, under the heading “Research,” readers are informed that there are five research platforms at ISU. These include: oleochemicals, carbohydrates, natural fibers, thermochemical technologies and cross-cutting technologies. The research taking place among the various platform teams are described on the pages that follow the Overview section. On these “Platform” pages, the concepts of cohesion, unity and integration are conveyed not only through the text, but also visually. (see chapter appendix A). As you can see from this page, which describes the oleochemicals research platform and highlights a project entitled, “Genomic Transformation of Soybeans for Improved Fuels and Lubricants,” all of the researchers are visually corralled together via a dotted line that almost resembles a lasso or rope. Under the heading “ISU Collaborators,” researchers from such diverse disciplines as mechanical engineering, molecular biology, food science and economics are presented as a cohesive research team with the use of this dotted-line visual device. In the last paragraph of the copy describing the research project, the researchers are actually referred to as a “team.” In the following passage, team members’ roles are described in relation to the project’s goals:

Team members include molecular biologists to alter the types of oils soybeans produce; experts in seed processing to develop extraction technologies suitable for the new plants and oils; chemists who characterize chemical and physical properties of fuels and lubricants; engineers who test the friction, combustion, and engine performance; and economists who verify the market potential for products and applications envisioned. (3)

This paragraph on the oleochemicals “Platform” page stands out from the other platform project descriptions in that it uniquely details the specific roles that the researchers from multiple disciplines perform in order to accomplish the project’s desired end result. This project, which contains the largest number of researchers representing the broadest array of diverse disciplines and several research center directors, was singled out by Brown as one
to highlight. In fact, my contemporaneous research notes document that Robert Brown was adamant about including this research project in the oleochemical platform project given that it demonstrates the inordinate amount of cross-disciplinary cooperation necessary to conduct biorenewables research. Brown knew how important it was to spell out in the very first platform section how crucial interdisciplinary coordination is when undertaking projects of this magnitude.

Although the initial primary audience for the “Integration” booklet was a corporate one, the booklet was then used to showcase ISU research to numerous audiences including state legislators, biorenewables experts at other universities, federal agents and entrepreneurs. It is for this reason, as I discuss in the next chapter, that Brown not only chose to emphasize the commercial value of biorenewables research, but also biorenewables’ social impact and fundamental scientific value. On page four of the booklet, we get an explanation of how ISU’s integrated approach to research is important not only for the “rapid and robust development of biobased technologies” that will “transform specific feedstocks into desired products,” (2) but also for the long-term improvement of the environment. In describing the goals of the carbohydrates platform project entitled, “Integrated Feedstock Supply Systems for Corn Stover Biomass,” Brown includes project goals beyond the scope of commercialization. In fact, he states that the overarching objective of the project is to “develop productive, efficient, and sustainable strategies for corn stover biomass........, while significantly improving the rural agro-industrial economy.”(4) Brown then goes on to state that the carbohydrates research team plans to “evaluate and optimize these systems for efficiency as well as economic and environmental stability.” And, in the final sentence of the project description, he states that, “system integration goals include increased overall biomass productivity, efficient use of nutrients and energy, improved soil quality, and enhanced rural and economic development.” (4) By reminding readers that the OPB’s/BEI’s focus is on the whole agroecosystem, Brown is able to further emphasize that an integration of effort and greater efficiency are natural byproducts of the OBP’s approach. The carbohydrates platform project description isn’t the only one that emphasizes the importance of protecting the environment. In fact, the description of the “Nutrient Cycling Between
Emerging demands for biofuels and bioenergy derived from crop biomass are creating new opportunities for redesigning agricultural systems for improved ecological function and energy-use efficiency – making possible significant reductions in the environmental impacts of current annual-based agriculture at local, regional and global scales. To address these opportunities, a multidisciplinary team has been assembled to investigate nutrient recovery and recycling in combination with alternative cropping systems. These systems can be used to generate large amounts of biomass while better protecting environmental quality. (1)

What we see in this passage is Brown using the word “system” and the concept of integration to appeal to two very different audiences. For the internal audience interested in issues related to environmental sustainability, we see him promising that a systems-level analytical approach will be able to help researchers discover ways to improve energy efficiency and reduce harm to the environment. For external audiences interested in the commercial viability of biorenewables technologies, Brown assures that researchers will be looking for opportunities to generate large amounts of biomass for potential markets. In this way, Brown is able to rhetorically satisfy two masters or kill two birds with one stone, so to speak, depending on which cliché you prefer.

While the “Platform” section of the booklet makes a strong argument, both textually and visually, that ISU’s biorenewables research efforts are coherent and highly coordinated, the “Affiliated Centers” section that follows it is decidedly less convincing. (see chapter appendix B) Readers learn on the second page of the booklet that there are numerous research centers and units associated with the Bioeconomy Initiative. Some of the 13 that are listed there include the Center for Agricultural and Rural Development (CARD), the Center for Industrial Research and Service (CIRAS), the Center for Crops Utilization Research, the Institute for Science and Society, the Center for Plant Genomics and the Iowa Energy Center. Below the list of centers is a statement that reads, “the missions of these centers range from agricultural policy to plant science to thermochemical technologies.”(2) There is no further mention of the centers again until page eight of the booklet where there is a statement
accompanying the pictures and descriptions of the various centers that reads, “Iowa State University’s Bioeconomy Initiative is organized as a confederation of autonomous research centers on campus.” (8) As I mentioned in the previous section examining the proposal to create the BEI, this description of the Bioeconomy Initiative and its affiliated “autonomous” centers and units is out of sync with Brown’s vision for the Bioeconomy Institute. Instead of trying to coax various centers and research units to work together on predetermined projects, Brown preferred to showcase the more organic and dynamic biorenewables research projects taking place at the university. This rhetorical approach, however, seemed somewhat threatening to some of the directors of these centers, leaving too many of their individual biorenewables efforts unacknowledged. This is one of the reasons why the “Affiliated Centers” section of the “Integration” booklet seems much less integrated and cohesive than the other sections. Instead of being able to specifically discuss the ways in which each center worked collaboratively with other entities on campus to realize the goals of the larger Bioeconomy Initiative, each center had to be appeased with a photo of their director and a general description of their mission. Once the booklet was published, however, there was a fair amount of consternation among some of the center leaders about not having been listed on a certain page or not having enough of a chance to review the copy that accompanied their photo. Perusing the four pages that make up this section of the booklet, there is little trace of the team camaraderie that was evidenced in the previous “Platform” section.

As Faber explains in his discussion of image-power, one of the ways that power is amassed is by “replicating itself in different places.” According to Faber, agents who are able to replicate belief systems or as Giddens would say “structures of domination” are able to exercise power. Faber states that, “power quietly gains acceptance as something natural or normal. People accept these relations as if they have always been there.” (120) Faber explains that those in positions of power are able to maintain their power as long as they are able to “create conditions for acceptance.” He goes on to explain, however, that if “currently powerful agents are unable to maintain the conditions by which their power is naturalized, their status will erode and fade as new agents replace the old order with their own social infrastructures.” (120) What we see in the case of the BEI’s “Integration” document, is a
document that launches a rhetorical missive upon the status quo or “old order” (to borrow Faber’s terms). Brown’s rhetorical performance here was aimed at convincing his audience that cohesive, collaborative research at ISU, and BEI’s role as the “front-door” for that research was a fait accompli as opposed to a work in progress. By replicating both corporate structures and structures rooted in a MODE 1 orientation to scientific research, Brown is able to give his audience the impression that BEI relations to innovative biorenewables research are both “natural and normal.” Given the fact that the rhetorical potency of the document was reinforced by the discourse generated from the university president’s office, it is not surprising that the power balance between the upstart OBP and the already well established, entrenched research centers on campus began to shift. Given those circumstances, it is also not terribly surprising that the research center directors were not pleased with the document, nor that the section devoted to highlighting the existing centers was the least compelling part of the document. The image-power that Brown was able to garner for the BEI via this document was made possible by the authority that was granted to him by the president’s institutional discourse. In Grabill’s terms, this document was able to influence the trajectory of the biorenewables movement (on ISU’s campus at least) by rhetorically altering the university’s processes and constructing an image of a new research institution within the larger university institution that would function as a new, improved system of decision-making.

New Century Farm Proposal

The New Century Farm proposal builds a powerful argument for the continued growth of ISU’s Bioeconomy Initiative. The document does this by positioning the university as the agent for change in the state of Iowa that will help the state be seen as a leader in the anticipated social and economic biorenewables revolution. In this regard, the New Century Farm proposal displays more rhetorical agency than either the “Integration” document or the Bioeconomy Institute proposal in that it attempts to persuade readers that significant changes to the agricultural industrial economy is no mere pipe dream, but instead will yield tangible results. At the heart of the New Century Farm proposal’s argument is the claim -- popular among business professionals -- that collaboration and consolidation of resources leads to
concrete profits. It also carries the scientific claim that a system level analysis that integrates feedstock production with fuel processing and recycles materials and resources, is a sustainable technology that integrates all elements of the agroecosystem: industrial production, technology, environmental concerns. Throughout the proposal, one finds logos-based appeals to readers who may be skeptical about whether or not all of ISU’s biorenewables research efforts will come to fruition in a fiscally sound manner. Just as businesses integrate to improve their bottom line, the predominant theme found in the New Century Farm proposal is that responsible and, as we shall see, responsive biorenewables coordination is the key to ushering in a new era in agriculture.

Construction on the 23,000 square foot biomass processing facility began in the fall of 2008. The proposal was submitted to the Iowa Department of Economic Development in August of 2007. As discussed in chapter three, the facility was originally slated to house “an affordable, pilot-scale, limited production plant for the extraction and purification of plant-based proteins.” (2) However, kairotic winds of gale force proportions flattened those plans as public sentiment towards the plant-based pharmaceutical industry turned abruptly negative after the media publicized instances of “lapses in regulatory field trials” that raised “public concerns on the safety and value of pharmaceutical crops.” (2) The proposal describes the New Century Farm facility as “the first integrated, sustainable biofuel feedstock demonstration and research farm in the United States.” (3) The proposal also states that the facility will “serve as a model for American biorenewable energy and bio-products production made possible by the transformation of agriculture to ‘feedstock-ready.’” (3) According to the proposal, this transformation will be made possible by integrating basic and fundamental research with “advanced processing research” to “achieve short-term and long-term advances in biorenewable fuels and biobased products.” (3) Like any good proposal that wishes to illustrate that a project has merit and the capacity to meet its stated goals, the proposal uses specific examples in the passage below to explain how ISU’s integrated, multidisciplinary approach will be able to deliver the highly desired results:

The New Century Farm biomass processing facility is designed to support three basic technologies: bioprocessing, biochemical and thermochemical. It will be
important to integrate all three of these basic technologies into a single strategy in order to handle biomass feedstocks efficiently. For cellulosics as an example, both cellulose and hemicellulose might be converted to fermentable sugars while lignin might be gasified or pyrolyzed to bio-oils, and there may be opportunities to extract high-value nutraceuticals before either means of conversion. (5)

According to the proposal, advances in the discovery of biobased products and biofuels will not be achieved by pursuing integration in a narrow, linear manner. Instead, the proposal argues that collaboration must be pursued not only among the collective of researchers who will use the New Century Farm, but also by outside companies eager to use the new technologies. The proposal states that the New Century Farm will “provide the flexibility and the capacity for industry and the university to work in collaboration.” (4) The proposal also informs readers that, “there will be a suite of offices and four laboratories for both ISU faculty and industrial clients and research partners to carry out on-site analyses as well as a meeting room for companies and ISU researchers to interact.” (6) While industry/university collaboration, in general, is important, Brown and the other authors of the proposal know that it will take a strong logos-based argument based on specific, technical details to convince readers that ISU truly has the ability to bring about revolutionary changes in the way agriculture is practiced. In the next passage, we see how the authors attempt to address any logistical questions:

Many operations in the biomass processing facility will be about 1/1000 of commercial scale. This facility will allow ISU researchers and industry partners to test technologies. For many technical advances, the final step of precommercial testing, optimizing and demonstrating biorefinery processes will likely need larger scale equipment, up to 5 tons per day, provided at the BECON facility located near Nevada, IA. Thus, Iowa companies and researchers will have a full suite of tools and facilities to research, develop, compare, optimize and demonstrate new technologies, thereby reducing the risk of commercialization to the private sector while facilitating deployment of new biomass systems. (6)

The next move that our biorenewables rhetors make is to create a Swales gap or niche for the New Century Farm, distinguishing it from other biorenewables processing and manufacturing facilities. (you’ll need to explain this short hand reference) The proposal informs readers that there are two other pilot-plant facilities in Iowa, namely the Iowa Energy Center’s Biomass Energy Conversion Center (BECON), and the College of Agriculture and
Life Science’s Center for Crops Utilization Research (CCUR) on ISU’s campus. Like the New Century Farm, both BECON and CCUR are dedicated to the advancement of technologies that process “agricultural feedstocks into biofuels, bioenergy, biobased materials and industrial chemicals.” (6) Nonetheless, the rhetors argue that there is a strong need for the New Century Farm. The proposal again calls into play the overarching theme of the superiority of systems-level analysis and agroecosystem integration that appeals to scientific environmental researchers, stating that the farm will be “much more than a processing facility; the New Century Farm will integrate plant sciences, production, processing and utilization at one location achieving close interaction between plant scientists, agronomists, biologists and engineers.” (7)

In addition to mounting the argument that collaboration among plant scientists, agronomists, biologists and engineers is the best way to commercialize biorenewables research, the proposal also makes the claim that the New Century Farm’s multidisciplinary, multi-facility, academic/industrial coordination of efforts will also be good for the environment. Under the heading of “Visions and Goals,” one of the goals of the farm’s research efforts is listed as being able to address the “logistics of biomass supply and positive environmental effects such as recycling nutrients back to the land.” (4) On the next page, readers find the following statement:

ISU will be creating the first integrated and sustainable biochemical (biofuel and bioproducts) feedstock production system of its kind in the world on the New Century Farm in Boone county. This facility will serve as a living laboratory for developing and testing sustainable biomass systems by integrating agronomic, environmental and socio-economic research. (5)

Although the authors of the proposal spend much more time convincing readers of the commercial viability of the farm than they spend touting its benefit to the environment, it is important to note that they felt that it was important to make what can be argued is an ethical appeal in the midst of their logos-based appeal. I would argue that this is due to their finely honed sense of kairotic opportunity given that one of the reasons that the biorenewables movement has been able to garner so much attention in the last several years is due to the fact
that environmental issues such as global warming have become a part of the public’s consciousness.

Another way that the authors of the proposal display their sophisticated sense of kairos is in the way that they frame their motivation for proposing that the complex and ambitious New Century Farm demonstration site be developed. On the sixth page of the proposal, the authors state that the farm “responds to needs identified by Iowa farmers, industry and ISU faculty and will be a model for American biorenewable fuels and bioproducts development.” By stating that their proposed farm is merely responding to a need that already exists “out there,” undoubtedly among some of the readers of the proposal, the authors are rhetorically creating an exigency that bolsters their agency. We see this rhetorical strategy being used again on the next page in the passage below along with the “systems approach” as the topoi of development that integrates technology, economy, ecosystem:

Industry continually tells us that it is critical to the future of biorefineries in Iowa that we make Iowa “feedstock-ready”. This requires an integrated and total systems approach, which is not being taken at either BECON or CCUR or even at other institutions. (7)

I would argue that this passage illustrates what I would define as a “call-and-response” strategy that claims in essence that the proposed action that readers are being asked to support is not only of great importance, but will fulfill a timely i.e. kairotic need. In increasingly skillful and subtle ways, the proposal’s authors use kairos to strengthen their argument that the New Century Farm will be the perfect vehicle to drive the bioeconomy to its rhetorical destination.
CHAPTER FIVE. CONCLUSIONS

At the start of my inquiry into the relationship between kairos and agency, I realized that I wasn’t going to get very far without learning more about ethos, in general, and scientific ethos, specifically. Throughout this project, I have juxtaposed the role that ethos has traditionally played in exercising agency in a MODE 1 environment to a newly evolving scientific ethos. The appeal of ethos has generally been disguised and downplayed in such familiar genres as the scientific report and the scientific article, where scientists primarily talk to other scientists in their own disciplines. The traditional claim to ethos has been characterized by the perceived objectivity of the scientist, whose knowledge is presumably based on the scientific method and not on any personal bias or opinion. Historically, this objectivity has allowed the scientist to wield a significant amount of authority, and, by extension, agency, while remaining modestly invisible. Part of the rhetorical potency of this strategy is that it persuades those outside of the scientific community that if they cannot understand the argument that the scientist is making that the fault lies with their outsider status and inability to grasp the logos of the report/article. While the traditional model of scientific ethos bestows agency upon the scientific rhetor, it does little to foster public engagement. As I have discussed throughout my project, whether the scientific community is excited about it or not, scientists in many disciplines are now being required to engage with numerous publics at various levels thanks to changes in the way that science is funded. These changes have made a study of the interplay between kairos and rhetorical agency that much more cogent for scholars interested in scientific rhetoric. Although kairos has undoubtedly always been a consideration for scientists, even when their primary audience was made up solely of their disciplinary peers, a grasp of kairos is now essential for scientists who engage in public discourse.

At the intersection of ethos, kairos and agency are issues that I have attempted to explore in this project. For example, is it possible to use kairos to exercise rhetorical agency to influence audiences beyond one’s disciplinary boundaries of expertise and still retain
scientific ethos and credibility? In light of the changes that have taken place over the last several decades in the way that science is funded, scientists no longer have the luxury of ignoring kairos. As Fuller discusses in his description of the material realities of “doing” science, modern scientists must spend a substantial amount of time engaged in activities that pull them away from the laboratory and out into the public domain. In exploring the impact that these funding shifts have had on scientific rhetoric, I have found that ethos and rhetorical agency are inextricably linked to one another in that questions of ethos inevitably arise when quantifying agency. Agency, at its core, is really about power i.e. what kinds of arguments are powerful enough to challenge entrenched, hegemonic cultural structures? Agency then implicitly asks what knowledge is considered valuable enough to shape such arguments, and, by extension, who possesses that knowledge? Kairos serves as a bridge that helps rhetors connect their own specialized knowledge and expertise to the ever shifting, infinitely variable arena of public discourse. Rhetorical scholarship can play a leading role in opening up and, in a sense, democratizing scientific discourse. In the passage below, sociologist Craig Calhoun does a good job of articulating the importance of rhetoric to public engagement:

The rhetorical tradition has been a sort of subordinated “other” to the dominant traditions in modern philosophy (indeed, since the ancient quarrels of philosophers and orators). Its significance lies not in the technical analysis of rhetoric elaborated in the ancient world or Middle Ages, but in the importance of locating knowledge in argument. This again stresses the plurality of perspectives – and indeed the importance of perspective itself. It also locates knowledge in particular settings, making clear its limits and it emphasizes the extent to which knowledge is embedded in efforts to work out particular problems. (14)

Overview of Findings

With an eye towards understanding the rhetorical implications of scientific public engagement and how rhetorical scholars can become more involved in the social studies of science, I developed three broad research questions at the start of my inquiry. They are listed below:
1) Assuming that there is an optimal kairotic time that is right for rhetorical agency to occur, how do rhetors “read” the opportunities that present themselves and position themselves rhetorically to effect change or become agents of change?

2) How do the rhetorical strategies employed by the BEI scientists capitalize on the kairotic popularity of the biorenewables movement?

3) What kind of ethos does the BEI project to outside audiences? Is this ethos static or does it change depending on the interests of the audience?

In the fourth chapter entitled “From Many Voices, One Voice,” I address issues related to my first and third research questions. Early on in my investigation, I discovered that one of the most effective strategies that the BEI rhetors employed to take advantage of kairotic circumstances was that they, in a seemingly reflexive manner, aligned themselves with already powerful agencies. This was in keeping with Faber’s theory of image power that asserts that successful rhetors read the power dynamics of the kairotic situations they find themselves in and then cast themselves in the roles of powerful agents. For example, in response to the growing public concern over global warming and dependence on oil from abroad, the BEI has rhetorically aligned itself with both the larger “green” movement and the national security movement. In fact, the theme of the BEI’s 2006 “Growing the Bioeconomy” conference was “Re-imagining Agriculture for National Energy Security.” By positioning their image in a larger public context, Faber would argue that the BEI rhetors are helping those outside of their organization to view them as powerful. This kind of contextualization theoretically leads to an increase in agency for external audiences will see the structural changes that the BEI rhetors are seeking seem less like a radical and potentially threatening (to the status quo) shifting of power and more like a natural, organic progression of pre-existing circumstances. Faber explains his theory in this way:

Powerful people are able to control how they are perceived by other people….. Image-power is not constant, but situational and highly dependent on context…. Image-power can be fleeting and always operates in strategic accordance within and against existing structures….. Image-power, like the
organization’s narrative is a discursive product. It is created strategically using specialized discourse…. (122)

Another effective strategy that the BEI has employed has been to use the concepts of integration, consolidation and cohesion to enhance their image with external audiences. According to Faber, “a powerful organization is able to manufacture an external image that will stick in the minds of consumers, competitors and other stakeholders within their industry.” (122) A quick glance at the BEI’s earliest rhetorical artifacts (i.e. brochures, conference Web sites) reveals that the organization touted their ability to coral all of the various moving parts involved in a dynamic bioeconomy to appeal to funding sources interested in commercial application of biorenewables research. As I discuss in chapter four, integration is a well-known business strategy. Depending on their commercial interests, many large firms practice either vertical or horizontal integration, and sometimes both in their quest to maximize their profits. The driving philosophy behind integration as a business model is that it improves a company’s efficiency, thereby making it more profitable. Taking a cue from the business entities that have shown an interest in biorenewables technologies, the Bioeconomy Institute consistently emphasizes in its documents the integrated and multidisciplinary nature of biorenewables research at ISU. By doing this, potential supporters are left with the impression that any grants, federal funds or corporate gifts that are given to BEI affiliated researchers will be put to good use and lead, ultimately, to commercially viable technologies. In an effort to raise the BEI’s profile and strengthen its image with external audiences, Robert Brown has referred to the BEI as the “front door” to biorenewables research at ISU. By manipulating its “front door” image, the BEI has attempted to place the organization in a position to reap the benefits of an anticipated bioeconomy.

In order for a “Biorenewables Prairie” to emerge from Iowa and other states in the Midwest, those at the helm of the BEI realize that university researchers cannot afford to work in isolation from each other or in isolation from farmers, entrepreneurs, environmentalists, politicians or transportation experts. In much the same way that businesses continually seek to expand their base of operations and their horizontal and vertical networks, the BEI seeks to evolve. Therefore, in addition to positioning itself as
the big biorenewables organization to contend with on ISU’s campus, the BEI, through its annual “Growing the Bioeconomy” conference has also sought to extend its influence by broadening its network of strategic allies and partners. There is no denying the rhetorical success of these annual conferences as they have grown steadily in attendance and prestige over the years. The highly attended annual “Growing the Bioeconomy” conference is described in marketing materials as attracting leaders from industry, government, academia and the non-profit sector. At both the 2006 and 2007 conferences that I helped to publicize, attendees ranged from small farmers to venture capitalists to chemical engineers. The BEI was always networking with varied groups that shared interlocking interests, building bridges between them to realize their vision of a bioeconomy. I found that it was those strategic alliances that really bolstered the BEI’s rhetorical agency for they helped the BEI rhetors understand what their constituents/stakeholders/audiences found most valuable and compelling about the bioeconomy, in general, and about biorenewables research, specifically.

By keenly understanding its external audiences and the importance of kairos, the BEI rhetors have been able to contextualize their arguments from authority and, in doing so, develop a new scientific ethos that appeals to modern audiences. As Miller explains in her discussion of ethos and risk analysis, the newly transformed scientific ethos makes much broader use of the authority of scientific and technological experts than traditional scientific rhetoric. Miller argues that historically scientists have tended to deemphasize the ethos-based “argument from authority,” leaving those kinds of arguments to be made by individuals without logos i.e. nonscientists. (169) However, the agency of scientific neutrality and objectivity has been challenged since the end of the Cold War and scientists are no longer able to tuck their ethos away behind logos, claiming that they are completely unbiased and impartial observers of the natural world. Unlike the chemurgic rhetors who, in a MODE 1 fashion, were reluctant to make arguments from authority or, in the case of Hale, developed ethos-based arguments that highlighted scientific authority in such a way that alienated nonscientists and undermined public discourse, the BEI rhetors have taken kairotic forces into account to hone their arguments from authority in an attempt wield rhetorical agency. An example of this can be seen in the BEI’s decision to use sustainability as a theme for both
the 2008 and 2009 “Growing the Bioeconomy” conferences. In the title for the 2008 conference “From Foundational Science to Sustainable Practice,” we see the BEI carefully protecting its traditional scientific ethos and credibility, while aligning itself with the popular sustainability movement that calls for the conservation of our natural resources and good environmental stewardship. This constitutes a definitive rhetorical shift in tone from the 2006 conference that had the words “national security” in its title. From a kairotic perspective, this makes perfect sense in that over the last several years, the country has gone from being lead by an administration that made national security its overriding concern to one that has used the prospect of a “green” economy based on green jobs and technology to inspire hope. The 2008 conference title, along with language found in the New Century Farm proposal (analyzed in chapter three), suggests that the BEI rhetors sometimes combine rhetorical strategies for maximum impact and agency. In these instances, they are attempting to communicate to external audiences that Iowa State’s research efforts are highly coordinated (the focus of chapter four), while also communicating to internal audiences of academic scientists that BEI’s research is based on sound, fundamental science (the focus of chapter three).

The BEI’s attempt to appeal to both internal and external audiences is a topic related to my second research question concerning the importance of scientific ethos in public engagement. In chapter three, I explore the historical dichotomy between fundamental science and applied science that is largely rhetorically constructed. I would argue that this false dichotomy belies the close symbiotic relationship between scientific investigation at its most disciplinarily concentrated and esoteric level, and science at its most interdisciplinary and public level. Many of the BEI’s rhetorical efforts have been aimed at severing this perceived dichotomy and presenting the work of the BEI researchers in a seamless and integrated way. This rhetorical task, which I think is the key to the development of a new scientific ethos based on public engagement, is a challenging one for perceptions of the dichotomy of fundamental and applied science are culturally entrenched.
According to Calhoun, the fundamental/applied dichotomy gained traction after World War II. The following passage describes the rhetorical evolution of the dichotomy concept. Although Calhoun initially focuses his description on the social sciences, he quickly turns his attention to scientific research, in general:

Public social science is not simply the “application” of previously accumulated knowledge. It is part of the process of forming, testing, and improving knowledge. This is obscured by the dichotomy of pure vs applied, especially as recast in the post-WWII context. The distinction became part of the sales pitch for the value of basic science that had no immediate payoff: sooner or later, science advocates suggested, such “blue sky” research would eventually yield truths that could be applied in more practical efforts. This was sometimes true – as famously space research yielded the capacity to make non-stick cooking surfaces – but also misleading. It implies a temporal and intellectual order of discovery-then-application that is often not how knowledge develops in the real world.……… And thinking otherwise encourages a hierarchical structure of scientific knowledge in which allegedly “pure” research is seen as more “basic” than “applied research”. This sort of hierarchy is especially pernicious for activist research. (3)

In the documents that were analyzed in chapter three, the BEI rhetors demonstrated their scientific ethos in interesting ways. Instead of relying on the “modest witness” approach to rhetorical agency, the BEI developed a sense of ethos that emphasizes the authority of its experts and features a sophisticated use of kairos. While the modest witnessing approach can be quite effective in such scientific genres as reports and articles where scientists are generally addressing disciplinary peers, such a rhetorical device is much less effective when used to address more public audiences who need contextualization. In the BEI document entitled “An Integrated Approach to Development of Large-Scale Bioenergy and Biobased Products Systems,” Robert Brown adroitly uses kairos in the introduction of the document to convey how biorenewables technologies can mitigate global warming and stimulate rural economies. Brown is able to build a bridge between the fundamental (or foundational) research that is underway at Iowa State and the application of that research to contemporary issues. Although the descriptions of the various research projects found within the body of the document are important, Brown’s understanding of kairos and the varied interests of his audience allow him to contextualize the research in the introduction in a way that develops a truly persuasive argument from authority. Brown has been successful in raising Iowa State’s
profile in the field of biorenewables and attracting support for its biorenewables research programs by making sure that the BEI joins in the public biorenewables conversation.

**Chemurgy and the Bioeconomy: A Comparative Look at Rhetorical Agency**

Considerations of scientific ethos have been a continuous theme in relation to rhetorical agency from the early days of chemurgy. One of the key differences in the rhetorical approach of the chemurgy scientists and the biorenewables scientists centers around their use (or lack) of ethos. Although the scientific rhetors of the chemurgy movement discussed in chapter two had vastly different rhetorical styles, they shared a MODE 1 sensibility when it came to scientific ethos. On the one hand, there was Christiansen et al., who largely adhered to a traditional “objective,” modest rhetorical style that downplayed their scientific ethos or authority. On the other hand, there was Hale, who proudly displayed his authority as a chemist throughout his writings on chemurgy and in spoken testimony before Congress. Despite their radically different rhetorical styles, however, both Christiansen et al. and Hale shared a MODE 1 confidence in scientific method and “objectivity” to persuade audiences. Much like Foucault’s universal intellectual, who was perceived as operating as the conscience of society, giving voice to the “universal” concerns of that society, MODE 1 scientists were able to operate in a world that was less critical of the motivations of scientists, and more willing to grant them the ability to pursue lofty scientific endeavors without nearly the level of public, political scrutiny that MODE 2 experience today. Christensen et al.’s reliance on logos-as-ethos argumentation and Hale’s propensity to elevate the authority of scientists over nonscientists clouded these rhetors’ ability to use kairos to their full strategic advantage. While in an effort to capitalize on kairos and exercise agency the chemurgists’ contemporary biorenewables counterparts have adroitly manipulated their image as publicly engaged and even publicly subservient scientists who are developing technologies that are currently being demanded by the public, the chemurgic scientists tended to ignore the importance of ethos. Instead, they overemphasized the appeals of logos and pathos, and seemed to think that as long as audiences were made aware of the value of
chemurgy to alleviate rural poverty, help the war effort and strengthen U.S. economic autonomy that the public would reject the oil companies’ aggressive marketing techniques. This rhetorical miscalculation proved to be costly for the chemurgy movement.

A Populist Movement Runs Out of Gas

The chemurgy movement was a lot like the month of March. It came on strong like a roaring lion and bleated out like a diminutive lamb. This, however, was not for any lack of kairotic opportunities for chemurgic rhetors. In fact, both the Depression and then World War II proved to be galvanizing kairotic forces that propelled the chemurgy movement forward. Throughout the 1930s, proponents of chemurgy touted it as the solution to the nation’s economic problems. Unlike the “green” movement to promote the adoption of biofuels, the rhetorical thrust of the “farm chemurgy” movement was economic farm relief and agricultural prosperity. In an extensive article published in the spring 1998 edition of the Automotive History Review, Radford University media studies professor Bill Kovarik describes the chemurgy movement as “a populist Republican alternative to Democratic President Franklin Delano Roosevelt's agricultural policies.” In the article, entitled “Henry Ford, Charles Kettering and the ‘Fuel of the Future,’” Kovarik explains Ford’s motivation for supporting chemurgy this way, “A dedicated agrarian, Ford thought new markets for fuel feedstocks would help create a rural renaissance. Henry Ford backed the idea by sponsoring a conference at Dearborn, Mich. in 1935.” (26) While the chemurgic rhetors used the kairotic circumstances of the economic Depression somewhat successfully to garner support for their cause, the Second World War proved even more beneficial for chemurgy thanks to the demand for increased production of power alcohol. In fact, massive quantities of ethyl alcohol were produced during the war for synthetic "Buna-S" rubber and for aviation fuel. Production soared from a pre-war peak of 100 million gallons of alcohol per year to over 600 million gallons. The alcohol eventually provided three quarters of the raw materials for the total synthetic rubber demand, which before the war was only one third of the demand. (U.S. Tariff Commission)

The chemurgy rhetors discussed in chapter two were all quite adept at recognizing the
significance of kairotic opportunities presented by both the Depression and the Second World War, and they all mounted powerful arguments for the adoption of power alcohol. Yet, due to a mixture of political naivete and rhetorical miscalculation, the chemurgy movement was overtaken by the oil industry. With chemurgy, you had a movement whose fate was decided not by the supremacy of a competing technology, but instead by the force of a highly coordinated and vicious big oil rhetorical machine.

In 1936, the Chemical Foundation published Christensen et al.’s pamphlet *Power Alcohol and Farm Relief*. Despite the fact that *Power Alcohol* was well researched and featured extensive scientific evidence that ethyl alcohol was an excellent fuel for all internal-combustion engines, the authors refrained from addressing some of the political motives of chemurgy’s opponents. It was no secret that many of chemurgy’s supporters such as Hale were critical of Roosevelt’s agricultural policies. Christensen et al., however, were reluctant to engage in the public discourse of the time, instead they chose to employ logos-based arguments that reflected their MODE 1 sensibilities. This resulted in a pamphlet that was quite rational in its defense of chemurgy, but one that was not necessarily very effective with audiences that didn’t already have an interest in the topic. Left to the university scientists, there may have been little to no momentum to the chemurgy movement. Their habitus as university scientists probably inhibited their ability to view themselves as catalysts and agents of sweeping political and social change.

Hale, on the other hand, had no reservations about going straight for the jugular of chemurgy’s opponents. He spoke out candidly about what he saw as their greed and materialistic motivations for undermining the chemurgy movement, and he derided what he viewed as their politically underhanded tactics. Like Christensen et al., Hale was influenced by the traditional, MODE 1 scientific approach. This perspective, however, didn’t manifest itself in the modest witness objectivity adopted by his scientific peers in the academy. Instead of solely relying on the public’s ability to appreciate the superior rationality of his logos-based arguments, he also assumed that due to traditional perceptions of scientific ethos that the public would be willing to believe in the ability of science, and by extension scientists, to objectively solve society’s problems without any real substantial contribution from the
scientifically unenlightened public. Hale made no pretense of engaging with those outside of the scientific community unless they were one hundred percent supportive of a chemurgic agenda. In both of his books and in his congressional testimony, Hale pulled no punches in lambasting his political opponents, nor was he shy about hailing the lofty virtues of scientists. As I discussed in chapter two, his decision to “argue from authority” was perhaps the result of his move away from the university and toward industry. Like outspoken pro-chemurgy industrialist Henry Ford, Hale probably came to embody an entrepreneurial habitus that lent itself to bold statements and independence. Unfortunately, his bold rhetorical style had a distancing effect on anyone in his audience who wasn’t already a chemurgy proponent. Despite the fact that I found his arguments for chemurgy compelling, it was distracting to read about his low opinion of nonscientists and how he felt the nation would be a better place if all important decisions were left to superior, ultra-rational, scientifically trained minds.

Hale’s failure, rhetorically speaking, was in ignoring the various constituencies (to borrow Calhoun’s term) that would have benefited from chemurgy. Hale’s emphasis on the elevated stature of chemists, and the moral corruption of the oil industry representatives and politicians of his day was a rhetorical miscalculation. Unlike agricultural journalist Wheeler McMillan, Hale didn’t understand the importance of coalition and consensus building. Both Christensen et al. and Hale left agency on the table, so to speak, thanks to their limited approach to rhetorical strategy. McMillen, on the other hand, exercised significant rhetorical agency because he understood the diverse and sometimes competing interests of various chemurgic constituencies. Like his modern-day counterparts at the BEI, McMillen saw the wisdom of bringing together multi-faceted groups under one large umbrella. Although Hale is probably rolling over in his grave at the thought of the BEI scientists consorting with the likes of oil industry executives, the BEI rhetors share with McMillen an appreciation for coalition building. They understand how important it is for the bioeconomy not to be perceived as an isolated endeavor that will only matter to a handful of farmers in the Midwest, but instead that it be seen as a solution to global problems. Both the BEI rhetors and McMillen have strategically engaged in public discourse and appealed to broad audiences in order to garner the support that they need (both financial and political) to accomplish their rhetorical goals. As I mentioned in chapter two, McMillen’s background as a journalist exposed him to a diverse group of people. Interacting with Henry Ford and other
agents involved in chemurgy research and agriculture is probably what gave McMillen his sense of agency. This ability to exchange information with various sources and insightfully grasp chemurgy’s transformative potential would be described by Collins and Evans as interactional expertise. (254) As I will discuss further in the next section, this interactional expertise is something that McMillen shares with contemporary rhetoricians such as those at the BEI.

**Looking Ahead**

In my role as a participant-observer at the Bioeconomy Institute, I was able to witness in real time the difference that rhetoric made in the activities of this growing organization. This research site was an exciting one for me because I was able to learn more about the vital role that rhetoricians can play in professional communication. Instead of being limited to writing practices that emphasized the cannon of style, I was called upon to invent topics, and, in some cases, develop arguments and lines of inquiry regarding certain organizational goals. In fact, almost all of the decisions regarding BEI’s activities were imbued with rhetorical considerations. As the director of the BEI, Robert Brown didn’t view rhetoric as something that could be divorced from logic or reasoning. Instead, for him, rhetorical strategy was an intrinsic aspect of not only his organization’s survival, but also of the survival of any fundamental scientific research program whose budget is threatened. Having had the opportunity to observe a site where rhetoric is so well integrated into organizational practices, I began to think about other professional and activist spheres where rhetoric’s unique gifts would be appreciated. From my perspective, these gifts include enhanced coalition and consensus building, clarity of argumentation, heightened awareness of image, and, ultimately, agency.

In Richard Hughes’ article, “The Contemporaneity of Classical Rhetoric,” Hughes describes rhetoric as “an art of moving an idea from embryo to reality …… an art which rests not at the end of the intellectual process, but an art that lies within the process.” (157) Because of issues related to expertise, authority and ethos, rhetorical inquiries into scientific
matters can be problematic. For example, in Collins and Evans’ article “The Third Wave of Science Studies: Studies of Expertise and Experience,” the authors discuss the role of expertise and experience in scientific and technical decision-making. They categorize specific areas of expertise that range from the esoteric contributory expertise of core groups of scientists to the ability of the general public to use discrimination and judgment where science is concerned. The authors argue that somewhere in the middle of this continuum, there is a place for a group of experts whom they call “translators.” The translators interact with core groups of scientists who are highly trained and certified to contribute scientific knowledge in their disciplinary fields and with other groups of individuals who possess a lot of experiential knowledge, but not necessarily formal training or certification in a scientific field. The authors use Brian Wynne’s study of Cumbrian sheep farmers to illustrate the difficulties that can arise when groups perceived to inhabit asymmetrical positions of power fail to share knowledge and coalesce around an issue of public concern. The authors argue that following the Chernobyl disaster, scientists involved in measuring the radioactive fallout and contamination could have benefited from the experiential knowledge of local sheep farmers at the Cumbrian fells. According to Collins and Evans, what was needed in this case was what they refer to as the interactional expertise of the translator:

Wynne found that the sheep farmers knew a great deal about the ecology of sheep, and about their behaviour (and that of rain rainwater) on the fells, that was as relevant to the discussion of how the sheep (and the fells) should be treated so as to minimize the impact of the contamination …… The farmers have all the characteristics of core-group experts in terms of experience in the ecology of hill sheep on (mildly radioactive) grassland, even though they had no for formal qualifications. In our terms, the farmer had contributory expertise, which in some respects exceeded that of scientists working for the relevant government department. The scientists, however, were reluctant to take any advice from the farmers. …….. Should the situation have been symmetrical, it might have been an arbitrary matter whether the farmers’ expertise was absorbed by the scientists or the scientists’ expertise was absorbed by the farmers, but it was not symmetrical. To produce the optimum outcome, the scientists needed to have the interactional expertise to absorb the expertise of the farmers. (255)

Although Collins and Evans never use the word rhetoric in their article, the definition that they provide for interactional expertise i.e. expertise that enables one to interact
interestingly with participants and carry out a sociological analysis, resonates with the kind of expertise that rhetoricians possess. In *Roots for a New Rhetoric*, Daniel Fogarty defined rhetoric as “ways of arriving at mutual understanding among people working toward patterns of cooperative action.” (4) Collins and Evans emphasize the need for those with interactional expertise i.e. rhetoricians to become involved in technical and scientific decision making in a more substantial way than such experts have traditionally been encouraged to. According to the authors, when making technical and scientific decisions in the public domain, decisions must be made according to a timetable established within the political sphere, not the technical or scientific sphere.” Because decisions of public interest must be made at a pace that is faster than consensus is generally arrived at in the scientific sphere, the authors argue that political decision-makers are, therefore, continually forced to define classes of experts before the dust has settled – before the judgments of history have been made……What we are arguing is that sociologists of scientific knowledge, per se, might also have a duty to make history as well as reflect on it; they have a role to play in making history in virtue of their area of expertise ---‘knowledge.’(241) In future projects, I plan to explore ways that rhetoricians can influence scientific and technical decision-making, creating new kinds of knowledge about such timely and important issues as global warming, genetic cloning and artificial intelligence.

At the start of my project, I had two objectives: to learn enough about how kairos and agency function at my chosen site to be able to join in the theoretical discussion involving rhetorical agency; and to be able to generate some new knowledge based on my insights that I can share with my study participants. Like McKenzie Stevens, who also worked as a writer among a group of scientific experts, I have attempted to confront some of my own biases regarding scientific authority and questioned my own ethos regarding my ability to produce knowledge valuable to the community of scientists I worked with and observed for 22 months. (158) Also like McKenzie Stevens, I have been guided by Haraway’s theory of diffraction, which posits that writing shouldn’t merely attempt to “reflect” its subject matter, but instead should “diffract” new, situated knowledges onto the world in the same way that patterns of light are diffracted when they pass from one medium to another. As McKenzie
Stevens states, “Writers are not mirrors, not reflectors, but creators ….. writers’ creativity gives their knowledge the ability to be a new invention, something different, but nonetheless connected to other meanings through a complex web of relationships.” (169) One of the challenges for rhetoricians like myself interested in activist participatory research is to find sites that allow for the kind of diffractory writing and participation that Harraway describes. While I would love to say that I think that I have thoroughly achieved my lofty objectives, saying that would be a misleading overstatement. What I will say is that I think I have made some initial progress. I now have a better understanding of how rhetorical expertise, which implies the ability to read kairos, can inform rhetorical strategy and impact agency.
SPOILIGHT

GENOMIC TRANSFORMATION OF SOYBEANS FOR IMPROVED FUELS AND LUBRICANTS

In this project fundamental research in plant sciences and molecular biology provides the information to transform normal soybean oil into high-performance lubricants and more economical fuels. Goals of the project include improving cold-weather performance of biodiesel, reducing the operating costs of soybean refineries, and increasing the oil content of soybeans without diminishing protein content of the meal byproduct.

Cold-weather performance of biodiesel is being improved by inserting into soybeans the genes of microorganisms that express branched-chain fatty acids instead of the normal straight-chain fatty acids. Branched-chain fatty acids have lower crystallization temperatures and are more stable to high-temperature oxidation. Operating costs of soybean refineries can be reduced by inserting genes into soybeans from other plants that produce monoenes instead of triglycerides, in the process eliminating the transesterification process currently required to obtain high-quality biodiesel from vegetable oil. Oil content of soybeans will be improved by redirecting photosynthetic, which normally synthesizes indigestible carbohydrate, to produce oil. This would increase the supply of soybean oil without sacrificing the valuable protein of soybeans.

Team members include molecular biologists to alter the types of oils soybeans produce; experts in seed processing to develop extraction technologies suitable for the new plants and oils; chemists who characterize chemical and physical properties of fuels and lubricants; engineers who test the friction, combustion, and engine performance; and economists who verify the market potential for products and applications envisioned.
APPENDIX B

AFFILIATED CENTERS

Iowa State University's Bioeconomy Initiative is organized as a confederation of autonomous research centers on campus. These are briefly described on the following pages; the names and photos of center directors are included, as well.

AMES LABORATORY'S BIORENEWABLE RESOURCES CONSORTIUM

The Biorenewable Resources Consortium (BRC) is dedicated to the development and utilization of agriculturally derived alternatives to petrochemicals and other nonrenewable fossil resources. The BRC will help redress the problem of our national dependence on nonrenewable resources as a primary source for energy. Partnerships are critical to the ultimate success of the BRC.

We welcome connections with industry, commodity groups, cooperatives, and groups engaged in rural revitalization. The BRC has connections with the National Corn Growers Association, the Iowa Corn Growers Association, and the Iowa Industries of the Future program. ISU's research community is a recognized leader in agriculture, the physical sciences, and engineering. It has an impressive faculty of world-renowned scientists and young researchers.

GEORGE KRAUS

CENTER FOR AGRICULTURAL AND RURAL DEVELOPMENT

The Center for Agricultural and Rural Development (CARD) conducts innovative public policy and economic research on agricultural, environmental, and food issues. CARD uniquely combines academic excellence with engagement and anticipatory thinking to inform and benefit society. CARD researchers develop and apply economic theory, quantitative methods, and interdisciplinary approaches to create relevant knowledge.

Communication efforts target state and federal policymakers; the research community; agricultural, food, and environmental groups; individual decision makers; and international audiences. CARD conducts interdisciplinary research on the impacts of policy alternatives for trade and agricultural policy, resource and environmental policy, food and nutrition policy, agricultural risk management policy, and science and technology policy. The Center for Agricultural and Rural Development has been conducting policy research and providing graduate training and outreach activities since its founding in 1958.

BRUCE BARCOCK

CENTER FOR CROPS UTILIZATION RESEARCH

The Center for Crops Utilization Research conducts mission-oriented research (both basic and applied) to find new uses for Midwestern crops and to identify uses for crops that might be grown in this region if a market developed. Activities include developing technologies for producing food, feed, biofuels, and biobased industrial products from agricultural materials, developing agricultural substitutes for petrochemicals, and exploring and modifying the functional properties of crop-derived materials through applied biotechnology. Interdisciplinary teams develop more efficient, cost-effective processing techniques and apply biotechnological advances to modify and improve traditional and new crops. The center encourages successful technology transfer to industry by utilizing state-of-the-art pilot plant facilities designed to demonstrate “proof-of-concept” by upscaling laboratory studies into commercially viable processes and products. The center takes advantage of partnerships with government and the private sector, as well as the strong research programs and developing technologies within the Plant Sciences Institute and elsewhere in the university.

LARRY JOHNSON
REFERENCES CITED


Faber, Brenton D. Community Action and Organizational Change: Image, Narrative, Identity, Carbondale, IL.; Southern Illinois UP; 2002


Geisler, Cheryl. “How Ought We Understand the Concept of Rhetorical Agency?: Report From the ARS.” *Rhetoric Society Quarterly*, 34.3 (Summer 2004): 9-17.


Kinneavy, James L. *Kairos: A Neglected Concept on Classical Rhetoric*. (Finish citation)


