DIFFERENCE AND SCIENCE AT WORK: THE OCCUPATIONAL IDENTITY OF ANALYTICAL CHEMISTS

by

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and by Charles A. Wight, Dean of The Graduate School.
ABSTRACT

In this dissertation, I provide an examination of the relationship between difference (as it relates to national origin and gender) and the occupational identity of analytical chemists working in the United States. This project explores the ways in which aspects of worker difference play a role in the performance and understanding of occupational tasks, responsibilities, membership, and acceptance. Four research problems motivate this project: First, literature regarding foreign-born workers has focused primarily on the individual as the site of difference and has yet to engage how systemic aspects of difference affect organizing. Second, domestic discourses of difference or nation are the most regularly engaged in studies of work, but these areas are rarely examined together, which has stunted our ability to consider questions of global diversity in organizing. Third, research on science and technical work has yet to directly address the foreign-born worker, thereby ignoring a significant population performing scientific work. Fourth, intersectional research on difference is still scarce in work scholarship, which has limited our ability to consider how discourses of difference interact in the occupation.

I took a mixed methodological approach using surveys and in-depth interviews to address these research problems. I used the communicative construct of occupational identity to bridge epistemological and methodological difficulties associated with using multiple methods in order to answer the following research question: In what way, if any
are discourses of difference and socially coded characteristics experienced and understood as part of the occupational identity of the analytical chemist?

The consequent analysis considers the ways that difference impacts analytical chemistry work and the worker. I argue that difference plays a defining role in occupational identity—specifically, conceptions of “good science” conceived through occupational decisional premises and conceptions of the “good scientist” developed through discourses of intersectional difference. I assert that the construction of difference in science is created and maintained through the invocation and reliance on epistemologically varied definitions of difference.

This study adds to contemporary scholarship through an examination of how aspects of difference (conceptualized as discourses and socially coded characteristics) contribute in diffuse ways to the development and understanding of the occupation.
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CHAPTER I

INTRODUCTION TO THE PROJECT

This research project is an attempt to understand a relatively simple question: How are the work experiences of highly skilled, scientifically trained, foreign-born workers in the U.S. shaped by domestic understandings of difference—specifically, nation, gender, and race? In order to answer this question, I sought to examine how work systems and practices related to these intersections of difference.

There is widespread agreement in academic and public spheres that the labor force within scientific and technical markets has changed dramatically over the past 20 years, leading to an influx of highly educated and skilled foreign-born workers\(^1\) (Committee, 2006; Florida, 2004). Scholars from fields such as social anthropology, education, and public administration have focused on foreign-born workers in a number of recent studies in response to this shift. The aim of these projects has been to understand foreign-born workers' experiences of racism, hostility, and acculturation in the U.S. (Alkhazraji, Garnder, Martin, & Paolillo, 1997; Chakravartty, 2006; England &

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\(^1\) In this research, the term *foreign-born worker* will be used to denote individuals born outside of the U.S. who have since entered the U.S. and obtained legal rights to labor. Foreign-born workers may be either immigrant or nonimmigrant workers, meaning that they may be permanent residents actively engaged in obtaining permanent residency, or temporary workers legally working with U.S. visas. For the purposes of this research, individuals born in the U.S., the Virgin Islands, Puerto Rico, or Guam, or any persons born in a foreign country with at least one U.S. citizen as a parent, will not be studied as foreign-born (Mosisa, 2002).
Stiell, 1997; Ibrahim, 2005; Kamat, Mir, & Mathew, 2004; Subramanian, 2000) and the endpoint effects for international workers in U.S. settings, such as differentials in pay rates or promotions (Duleep & Sanders, 1992; Goyette & Xie, 1996; Varma, 2002).

While these studies have contributed significantly to the understanding of experiences of foreign-born workers in the U.S., they have not focused on how these experiences can be understood through the lens of work itself; in other words, they have not considered occupational and organizational factors. In this introduction, my strategy for initiating the case for such a focus is threefold: First, I will make a case for creating a “bridge” between postpositivist and critical traditions in order to appropriately tailor the design of this project to the multiple ways of knowing that inform this topic of study. Second, by way of enacting this “bridge work,” I will review how the intersections and mergers between the literatures regularly invoked when discussing this topic of study suggest several “blind spots” in this area of theorizing. In doing so, I will preview my argument regarding how to address these blind spots in a way to further organizational and difference literatures. Last, I will offer some of the contributions I believe this research may bring to scholarly fields and the communities of practice which I study.

In this project, I studied analytical chemists in the United States. I selected this scientific group because the field of analytical chemistry tends be comprised of a relatively diverse workforce (in terms of nation, race, and gender). While there is virtually no organizational research on this occupation, the increasing focus on scientific and high-tech work as a key factor in U.S. economic success (Committee, 2006) and the argument that scientific work is an “ideal typical occupation” (Barley & Kunda, 2001, p. 83) suggest that scientific fields such as analytical chemistry will become more relevant
in globally concerned academic research—specifically, research which aims to explore how issues of difference are understood and experienced in work and organizing.

Extant literature surrounding foreign-born workers and science and technical work is happening in roughly four separate spheres: a) foreign-born workers, b) scientific and technical work, c) difference at work, and d) occupational segregation. These spheres have developed in limited contact with one another partly due to discursive reasons (i.e., language, ways of understanding, and jargon limit and isolate contact between fields) and also partly due to epistemological and methodological differences (i.e., several areas of literature function out of critical traditions while others function out of largely postpositivist traditions). As a result, the applicable literature for this project varies dramatically in focus and design. I suggest that these differences have produced “silo effects” in the study of foreign-born workers and have made it substantially difficult to engage in a thoughtful and detailed inquiry of this population. I aimed to bridge these differences in two ways in this project: a) I focused on how the divergent literatures related to and intersected with each other rather than continuing to study them in isolation from one another, and b) engaged in multiple epistemologies and methodologies in order to bridge and connect these ways of knowing.

The primary way I created this bridge was through invoking the communicative concept of occupational identity (OCI) (as theorized by Ashcraft, in press) as a key construct. Occupational identity is defined as a “social construction process and outcome” (Ashcraft, in press, p. 1) that addresses the work of which an occupation is comprised as well as the incumbents performing the work. This construct provided productive routes for this project’s research focus, design, and rationale.
In her research, Ashcraft conceptualized OCI as a mechanism that organizes work across multiple sites: the material realm (i.e., the institutional, economic, and physical factors of work) and the symbolic realm (i.e., the shared representations, understandings, and meanings of work). As such, OCI can be used when studying professional groups of workers, such as analytical chemists, to understand how symbolic images of analytical chemistry and foreign-born workers come together in the performance of work. This conception of OCI highlights the notion that beliefs, stereotypes, assumptions, etc., are carried through time and space to different organizations and associations and even into decision-making in personal and interpersonal contexts. OCI allowed this project to thus capture the relatively slippery ways in which work systems and practices rooted in images of occupations may become constructed, enduring phenomena. In this way, OCI offered a bridge to study how the symbolic organization of work affects the material organization of work.

Because OCI showcases the work and typical incumbent, it also allowed for the exploration of the body-work link. This link is conceptualized as the relationship between the body performing tasks and the features of the tasks being performed. The body-work link was of utmost importance in this study for several reasons. First, it allowed for the development of questions aimed at understanding how certain tasks are directed toward certain workers. Second, it allowed for an interrogation of those practices in order to appreciate their effects. Questions regarding the body-work relationship also attended to intersectionality, or the ways that multiple aspects of difference came together in particular contexts to shape the experiences and understandings of self and other. OCI is a useful construct to use in studies of
intersectionality since it allows for the simultaneous study of multiple aspects of difference (both socially coded characteristics and discourses of difference\(^2\)) in social contexts without immediately assuming primacy of one over the others. This is necessary since humans do not view bodies as individually showcasing discrete characteristics. Instead, those characteristics that are often readily identified by self and others (such as race, nation, gender, etc.) are knotted together in ways that secure particular and encompassing concepts of identity into place (West & Fenstermaker, 1995). The concept of intersectionality also creates a theoretical space that “avoids essentialism and enables the significance of context to be explored” (Adib & Guerrier, 2003, p. 416) in order to analyze the interlocking of political categories. While OCI does not suggest “interlocking” as the mechanism by which aspects of difference come to be experienced, it does treat the body as a site where material and symbolic factors gain significance.

In these ways, occupational identity provided a discursive bridge (i.e., a linguistic and epistemic link) which aided in the examination of foreign-born workers in U.S. domestic settings across systems of understanding. However, as mentioned earlier, there were additional divergences that had to be addressed when studying foreign-born workers in organization, specifically, the different traditions (postpositivist and critical) in which the literatures had developed. Thus, the second way I created this bridge was through the use of multiple methods within the structure and design of this project. This project sought to invoke postpositivist traditions (traditions with a focus on verifiable and repeatable data) in the service of critical traditions (traditions with a focus on power and

\(^2\) In this project, I will be using different versions of terms relating to the concept of difference (e.g., *socially coded characteristics* and *discourses of difference*). I do not see these as interchangeable. These shifts and efforts in vocabulary are part of the hybrid metatheory work I will be attempting to enact in this project. A description of this aspect of the project along with specific definitions of these concepts can be found on page 66.
political influence within social interaction). In doing so, I aimed to create a thoughtful, tension-bound relationship that recognized the complexities of difference within organization and the consequences of that difference for foreign-born workers in science and technical work, such as divisions and hierarchies of labor. This epistemological and methodological relationship provided value by accepting that while knowledge is not "truth-based," or based in an objective reality, its continual reproduction produces a "truth-like" effect for organizational members (Barinaga, 2007). This means that, while clearly socially constructed within systems of power, knowledge can create effects that are "deeply rooted, everywhere prevalent, with consequences that are often too ‘real’ to bear" (Ailon-Souday & Kunda, 2003, p. 1075).

In this project, I used several methods to investigate how difference is associated with the occupational identity of analytical chemists. I engaged in two phases of research in an effort to pay tribute to the enduring presence of material factors emanating from surrounding social, cultural, linguistic, and economic practices as well as to wage a sustained effort toward highlighting knowledge as a politically motivated and bound process. First, I used survey data to develop an understanding of whether and how occupational identity was shaped by socially coded characteristics (i.e., the relatively stable, identity-based features that have been objectified in society to have material and symbolic import—such as race, gender and nation).

With initial data and associated literature, I developed interview questions that provided the opportunity to further engage participants regarding discourses of difference (i.e., the social, cultural, and linguistic representations and performances that shape our understanding of constructed human categories) and occupational identity; how they
believed that identity functions in the workplace; and how they saw the body-work link operating in the occupation.

Because OCI was explicitly designed to function across diverse methods and levels of analysis, it allowed me to offer empirical research on social constructions that appear to have a material existence. Through the advancement of mixed methodological studies, I argue that this type of research may expand and develop understandings of difference in a way that may eventually enable more democratic forms of organizing.

In the next section, I review how the intersections and mergers of literatures in this topic of study have produced four blind spots that need to be addressed and I will preview how this project has served in that endeavor.

**Argument**

This introduction provides a preview to the arguments to be developed in Chapter II which point to four major blind spots in the current literature. First, in literature regarding the foreign-born, there is an overwhelming focus on the ways in which the foreign-born worker as an individual is different, in effect labeling the foreign-born worker as the “problem.” This focus on the individual as the site of difference has subsumed any inquiry into how systems of work organize tasks through difference. Literature regarding foreign-born workers needs to begin to address the systemic aspects of difference related to work systems, specifically organizational and occupational systems, in order to better explore how race, gender, and nation all operate at work.

Second, science and technical work literature, which arguably examines a work population that includes a large number of foreign-born workers, does not address this
form of nation-based diversity within the confines of its research. In fact, science and technical work research rarely acknowledges difference at all. Because science and technical work in the U.S. has been and continues to be a significant draw for individuals from countries outside of the U.S., research must begin to examine this relevant population at work.

Third, the literatures focusing on difference have a tendency to spotlight either nation or domestic difference but do not study them together. More specifically, organizational difference literature has primarily examined domestic discourses of difference that are seen as meaningful in the U.S. for U.S. citizens. This is not overly surprising given the sordid and devastating histories of race and gender in the U.S. since the colonization of North America. However, because of this focus in domestic studies on race and gender from a U.S. perspective, the bulk of U.S. research has yet to take into account the substantial role that national origin has had and will have in organizations in the U.S. In addition, the difference literature that has examined nation (literature focused on foreign-born workers) has primarily done so by focusing on the “different individual” rather than considering domestic difference discourses. Literature regarding foreign-born workers in U.S. domestic settings is in need of studies that examine how domestic understandings of difference have formulated the foundation for measuring and managing foreign-born workers in the workplace.

Fourth, when issues of difference have surfaced in organizational and occupational difference literatures, the difference being examined is most often gender. While this has provided organizational and occupational studies with solid empirical research regarding how gender shapes organization communicatively, its spotlight has
obscured the study of other types of difference at work. Importantly, even when researchers have attempted to study other aspects of difference (such as nation), few studies have taken a sustained look at them intersectionally; meaning few have studied how race, nation, and gender operate together. Literature regarding foreign-born workers in U.S. domestic settings is in need of research that looks at how intersectionality plays into organizing in the workplace.

Overall, these blind spots only become evident through a review of the intersections between the literatures. Using OCI as a primary construct while moving/intersecting between literatures, epistemologies, and methodologies, I address what has not been directly examined before: a) how science and technical work should be studied through the lens of difference and b) how difference should be studied through the lens of science/technical work.

### Potential Contributions

This research stands to contribute at three levels: theoretically, metathecetically, and practically. Theoretically, this project serves to add to current understandings of occupational identity within scientific and technical work research. Current organizational research has stressed issues of organizational identity (Alvesson, Ashcraft, & Thomas, 2008; Cheney & Christensen, 2001) but has not yet focused similar interest on occupational matters (see Ashcraft, 2007, Faulkner, 2000a). This project will build theory demonstrating the necessity and importance of studying work and power through an occupational lens. Additionally, while research on scientific and technical work has provided substantial information regarding what occupational identity looks like in the
workplace (Barley, 1996; Barley & Bechky, 1994), there has been a lack of focus on how
difference intersects with that identity. This project will serve to develop this area in
need of focus.

In addition, this project will contribute to organizational communication research
on difference. Scholars in organizing have recently been calling to expand our research
to address more global and practical concerns (Broadfoot & Munshi, 2007; Monge,
1998). However, the scarcity of discussion in organizational literatures on nation-based
difference has left us unprepared to speak to and engage contemporary issues of
organizing in science and technology. In addition, it has positioned organizational
scholars as unable to engage scholarly conversation regarding the increasingly
transnational labor pool within our current domestic setting. This leaves our fields of
research prone to appearing outdated or, worse, disinterested in non-Western people
living and laboring in the U.S. In this research endeavor, I take seriously the call that we
expand our research and interest to the non-Western worker in an effort to engage and
question the fluid boundaries that make up our current global economy and workforce

From a metatheoretical perspective, this research offers a way to use multiple
methods in critical communication research. This project suggests that critical and
postpositivist traditions can be used within a single study to develop and abstract
understandings of difference. Scholars in organizational communication have yet to
engage this particular type of research due to the admittedly significant epistemological
and methodological disjunctions between the two traditions. In response, this project
offers a metatheoretical roadmap to the conceptual and practical tensions associated with
such a study and attempts to address (not reconcile) those tensions directly and productively. It is suggested through this work that new ways to engage and look at critical empirical research may emerge.

From a practical perspective, this research has the potential to provide mechanisms to identify and understand more nuanced forms of oppression beyond pay rate differentials or promotion rates for foreign-born workers. This research project will engage the notion that international workers may experience a type of occupational segregation that has the capacity to alter everything from day-to-day tasks, to supervisory decisions, to basic communicative interactions. In turn, these practices may pave the way for ethnocentrist segregation practices in recruitment, job organization, advancement, and termination to develop and become reified in U.S. science and high-tech markets. By studying how identity aspects function to affect one’s work, we will be better suited to acknowledge and address discrimination in the workplace.

The chapters of this dissertation will follow the same framework as this introduction. As previewed above, in Chapter II, I will review the relevant literature in order to substantiate my claims regarding the project’s argument. In Chapter III, I will make a case for the mixed methodological approach in this project and in doing so will address the epistemological, ontological, and methodological tensions in such a case. In Chapters IV, V, and VI, I will describe, from three different perspectives, how difference is experienced and understood as part of the occupational identity of analytical chemists. Specifically, in Chapter IV, I will demonstrate how difference, as socially coded characteristics, is linked to the work and experience of analytical chemists. In doing so, I
will cover statistical findings indicating the inequality faced by workers of diverse backgrounds in terms of both the performance and understanding of their work.

In Chapter V, I will explain how discourses of difference (i.e., locally achieved, talk, and embodied performance) inform the occupational identity of analytical chemists. In particular, I will illustrate how occupational decisional premises based in beliefs, values, and expectations rooted in occupational identity are used to rationalize differing treatment and behavior associated with difference.

In Chapter VI, I will describe how Discourses of difference (i.e., broad social narratives that serve as “powerful ordering force[s]” in society) (Alvesson & Karreman, 2000, p.1127) construct diverse employees in ways that shape their experiences of occupational identity. In accomplishing this, I will offer findings that suggest that the Discourses regarding particular intersections of difference dictate the types, levels, and amounts of work appropriate for particular workers.

In the final chapter, I will bring the findings from these three chapters together to assert that the occupational identity of analytical chemists is shaped through conceptions of good science and the good scientist. I will contend that the physically-manifested and discursive components that contribute to these conceptions are core components of the social construction process of difference in science. In addition, I will discuss contributions made by this study and will offer recommendations regarding the findings in this research in order to assist organizational professionals in improving work experiences for diverse employees.
CHAPTER II

“BRIDGE WORK” FRAME: LITERATURE REVIEW

As discussed earlier, this project aims to understand whether and how difference shapes the work systems and practices of foreign-born workers in analytical chemistry. Thus, this review navigates the intersections and mergers between literature on foreign-born workers, scientific and technical work, difference at work, and occupational segregation. This review is not meant to be exhaustive, but rather is designed to point to the ways in which the identified literatures intersect and merge with one another to offer key areas in need of theoretical and empirical development.

Foreign-born Workers

Keenly aware of the social tensions that exist regarding migration and immigration in the U.S., social scientific scholars across disciplines have chosen to study two different aspects of the highly skilled, foreign-born worker experience. Specifically, they have aimed to determine the economic and experiential consequences of foreign-born workers laboring on U.S. soil. In both aspects of these studies, the literature has focused on the actual worker, but has not seriously engaged their work.
The Economic

There has been much debate about the economic effect that legal foreign-born workers have had on the U.S. economy. Consequently, the bulk of research on legal, highly skilled, foreign-born workers has, at two distinct levels, addressed how these individuals either help or hinder city, state, and/or national economic status. First, it has been suggested that, by entering the U.S. workforce, highly skilled, foreign-born workers have the capacity to impact U.S. worker labor wages and housing prices in the areas in which they settle (Greenwood & Hunt, 1995; Mosisa, 2002; Sum et al., 2002). While previous research had indicated that immigration results in negative effects for U.S. worker wages (Borjas, 2003, 2006), additional studies have offered that immigration is positively associated with said wages and housing prices (Ottaviano & Peri, 2005, 2006; Peri, 2010). Positive higher-order effects such as state and national economic stimulus, which have resulted from highly skilled, foreign-born workers’ scientific and technical discovery, have also been demonstrated through numerous studies (Florida, 2004; Levin & Stephan, 1999; Libaers, 2007; Saxenian, 2002; Stephan & Levin, 2001). In fact, Wadhwa, Saxenian, Rissing, & Gereffi (2007) found that between 1995 and 2005, 7,000 U.S. companies were immigrant-founded, representing over $52 billion dollars in 2005 sales alone and accounting for more than 450,000 jobs in the U.S.

Economic labor research has also indicated that the U.S. economy faces significant threat without a continued presence of foreign-born workers. Economic forecasters have determined that a skilled worker gap in the U.S. is imminent due primarily to a) the U.S. education system failing to produce steady, significant numbers of native science and technical workers, and b) baby boomers, who currently make up
approximately 60% of the workforce, increasingly reaching retirement (Florida, 2004; Gates, 2007). U.S. government and academic scholars across disciplines have therefore begun to call for more lenient immigration policies for highly skilled, foreign-born workers (Committee on Prospering in the Global Economy of the 21st Century, 2006; West & Bogumil, 2000), which has resulted in a “theoretical” acceptance of this population. This conceptual acceptance, however, has not addressed the social and cultural problems faced by these workers when entering U.S. organizations. In many high-tech and scientific organizations, domestic populations are anxious about their own economic well-being in the increasingly tumultuous environment (Sherman, 2009; Winter, 2009). Researchers interested in furthering their inquiry beyond the statistical realm have thus employed a critically focused lens in their research to explore the ambivalent and often hostile experiences foreign-born workers face in the United States.

The Experiential

Hostility aimed at foreign-born workers in the U.S. labor market has been apparent for some time. Identified as “threatening the sanctity of both national security and ‘good’ American jobs” (Chakravartty, 2006, p. 39), foreign-born workers face immediate obstacles to being accepted into American workplace culture, as evidenced by this sentiment expressed by one antiforeign labor group:

We are America’s best and brightest and we are being systematically replaced by cheap foreign labor….Are these the types of jobs you would like foreigners to have? Who have no family, no devotion to our way of life and our country? (quoted through Chakravartty, 2006, p. 46)

Communication of this sort, which uses national origin as a method of segregation (Burke, 1969), paints the foreign-born as the enemy. Successful efforts at vilifying this
population create social and linguistic schisms between foreign-born and U.S.-born workers. These efforts, along with cultural markers such as language skill and outward appearance, likely position many foreign-born individuals as social outsiders within the workplace (Alberts & Hazen, 2005; Kamat et al., 2004; Subramanian, 2000). Scholars have noted that language skill and accent are often used as a method to display dominance over a specific group by equating nonnative language fluency to intelligence (England & Steill, 1997). In addition, nation-based socially and behaviorally constructed differences (e.g., deference and modesty) often serve as a liability for foreign-born workers in the context of U.S. organizing, thus preventing them from moving up the corporate ladder (Varma, 2002, 2010).

Overall, the current research on foreign-born workers across disciplines focuses on the ways in which foreign-born workers are constituted as “different” people (whether their difference results in economic or experiential shifts has been noted as dependent on the literature reviewed). This blind spot, which is evidenced through a continual focus on the individual worker instead of the work, has begun to normalize a view of the nonwestern body as problematic and to (inadvertently) naturalize race and nation hierarchies (Munshi, 2005). Gender research in organizational studies has, for some time, accepted that, by looking at the gendered individual in organizations, the gendered organizational and occupational systems themselves become obscured and more difficult to address (Acker, 1990). I am making a parallel argument here: Rather than studying difference in occupation, we need to understand how occupations are organized through and around difference. Accordingly, I turn toward literature that most directly relates to
the occupations in which most highly-skilled foreign-born workers are employed—science and technical work.

**Science and Technical Work**

While researchers studying foreign-born workers have emphasized the *worker* within their research, science and technical work researchers have entirely focused on the *work*. Even though organizational scholars are well-situated to investigate this population, research on science and technical work that attends specifically to being foreign-born in a U.S. workplace has not been regularly performed. This is not to say that foreign-born workers have not been part of populations studied in science and technical work; instead, what has been missing is a study of foreign-born workers as foreign-born in particular occupations. I therefore suggest a shift toward the foreign-born *worker* in science and technical work research in order to develop an understanding of how conceptions of national culture come together in organization and occupation. While scientific and technical research has not contributed in this aspect, it should be noted that several important lessons from historical and contemporary studies of scientific and technical work inform this project.

As Barley (2005) lays out in his review of science and technical work research, early studies regarding scientists and technicians in the workplace focused primarily on theoretical understandings of said occupations without engaging in significant study of the actual activities in which individuals within these professions were involved. This resulted in research that did not accurately reflect the lived labors of engineers and scientists. As Barley points out, three scholars from Columbia University changed this in
the mid-80s when they began engaging inquiry on the practices and activities of engineers in the U.S., Britain, and France (Crawford, 1989; Whalley, 1986; Zussman, 1985). The culmination of their efforts was the conceptualization of three major claims about the ways in which technical work should be researched. First, they asserted that historical and national contexts are linked to engineering status and thus must be explored and understood. This assertion was developed as they found that the field of engineering had been constructed differently depending on each national context (e.g., in Britain, engineers are regular folk that work in the shop versus in France and the U.S. where engineers are educated elites who labor mentally more than physically). The researchers found that the diverse historical and national contexts resulted in significantly different practices and ideologies regarding the work. The researchers’ second claim was that all aspects of engineering (e.g., roles, duties, experiences, and organization) are dependent on “product markets, labor markets, technologies and the pace of technological change” (Barley, 2005, p. 387), meaning that in order to understand the occupation, you must understand the context of operation for the occupation. Because engineering has vast applicability, engineering labor differs substantially based on the product of the organization and the organization’s level of technological advancement. The final claim of the Columbia researchers was that engineering itself looked different when examined across occupation and function. The Columbia researchers asserted that an understanding of how the occupation fits into the organization and the responsibilities expected of said occupation is critically important. This claim suggested that not only does the field look different based on context, but that the actual practice of work is organized and performed differently based on the occupation and responsibilities. The
information that the Columbia researchers contributed to the field of science and technical work was tremendously important. It evidenced that research on work must be grounded in and developed through studies of work and labor. In addition to the Columbia researchers’ focus on engineers, Pelz and Andrews’s (1966) research on scientists demonstrated similarly that an understanding of the actual job duties, occupational functions and levels, and contexts is pivotal to theorizing about a given occupation.

Recent research on science and technical work has taken its cue from these researchers’ studies and has endeavored to actively engage the study of work. Barley and colleagues have stood out in their commitment to this perspective and methodology by detailing (Barley & Kunda, 2001) and enacting their rationale regarding the importance of studying labor in occupational research (Barley, 1996; Barley & Bechky, 1994; Kunda, Barley, & Evans, 2002; Nersessian, 2006; Zabusky & Barley, 1997). Barley and colleagues have argued that science and technical work research should come from scholars with at least a basic understanding of the scientific and/or technical fields they are studying. Nersessian (2006) gives a strong example of this type of research in her study of interdisciplinary biomedical engineering laboratories. She offers that, while cognitive components of science research are clearly important to understanding said work, comprehending the social and material practices provides the grounding to uncover even the most basic insights. Thus, her strong background in physics in addition to organization studies provided her both the skill and knowledge to research this aspect of work.
Another contribution of recent science and technical scholars is the demonstration of the importance of *occupation-specific studies*. Marks and Scholarios (2007) showed how studying occupational sectors can provide more nuanced information about work and workers. They offered that while computer software workers have been generally lumped into the category of “knowledge workers,” survey and interview data regarding this assumption reveal it to be problematic. This finding evidenced that software workers are not significantly different from technical workers except for the way in which they view their occupational and organizational identities. They found that software workers with formal IT educations had strong occupational identities while software workers without formal IT educations had strong organizational identities.

Historical and contemporary studies have thus demonstrated that science and technical work research must be grounded geographically, historically, and materially in order to accurately explore the markets, products, and pressures within an occupational field. It has also been offered that research must be done with a rudimentary understanding of the field being studied in addition to the concrete activities associated with said work. Through the implementation of these practices, contemporary science and technical work research has produced findings that complicate conceptions of work as well as conceptions of power within organizations. In Barley and Bechky’s (1994) research on technicians in scientific labs, for example, they found that “contextual understanding[s] of materials, instruments, and techniques [and a blend of formal and informal knowledge were] grounded in hands-on experience” (p. 116) were vital aspects of the scientific process. However, these invaluable scientific skills were consistently undervalued both in status recognition and compensation due to the lower hierarchical
status of those who held these skills. These findings offer that power relationships in science and technical work not only develop through linear progression of one’s education or organizational tenure, but also are grounded in discursive (i.e., socially and culturally created) and symbolic understandings that indicate that the body doing the job marks the value of said job (regardless of the work or incumbent’s functional contribution toward organizational goals).

As evidenced above, science and technical organizational scholarship has developed over the past 50 years, moving beyond concern with job requirements, education, and hierarchy (Barley, 2005; Gorz, 1976; Mallet, 1975; Miller, 1967; Ritti, 1968) to interest in how actual labor performed impacts the understanding of occupations (Barley, 1996; Barley & Bechky, 1994; Barley & Kunda, 2001). However, as hinted to earlier in this section, while these scholars have developed their field substantially as it relates to activities of work, the blind spot that emerges is their failure to include the worker in their analysis. They have overlooked several opportunities by failing to account for the worker. First, they have yet to study how being constituted as foreign-born in the U.S. shapes workplace interaction and experience. Second, there has not been an examination of how systems of organizing promote or preclude action based on one’s status as foreign-born. As a result of these two issues, I argue for a shift toward studying the embodied subject within studies of science and technical work in order to elucidate how being foreign-born impacts scientific and technical work practices. Because few, if any, science and technical work scholars have engaged studies of difference at work, this project requires moving into a third group of literature—difference at work research.
Difference at Work

In general, researchers studying difference at work have examined relationships between work and dimensions such as gender, race, nation, class, and sexuality. These groups are regularly studied because they are also the groups with which humans tend to align and identify. By examining groups associated with social identity we gain insight into the social behaviors and beliefs surrounding them (Tajfel, 1981, 1982).

It could be said that, in general, gender has been the most studied aspect of difference in organizational literature. Race has been somewhat less studied, although it is becoming a key area of inquiry in critical studies of organization, while nation has just recently entered the scene. The following discussions will provide the key contributions offered by each of these areas of research and will also further the call of many scholars to increase and improve intersectional studies. I argue specifically that nation must be more explicitly included in intersectional studies of work. Because the concept of intersectionality has been offered up several times thus far but has yet received focused attention, it is prudent to explain how intersectionality is being conceptualized within this study and what it brings to the discussion.

Intersectionality

Intersectionality has been broadly understood as the way in which multiple aspects of identity come together to shape the experiences and understandings of self and other (Alvesson, 2008; Crenshaw, 1994, Kondo, 1990, Verloo, 2006). Intersectionality has been used to explain the ways oppression is “compounded” structurally and politically when individuals characterized as belonging to multiple marginalized groups

Two excellent studies that have focused on intersectionality of race, gender, and conceptions of ethnicity/national identity offer a glimpse into some of the ways in which intersectionality research can continue to expand our conceptions of how identity enables and constrains behavior. First, Adib and Guerrier (2003) offered that the organization of labor is a far more nuanced process than simple segregation by sex or race. Rather, it involves complicated negotiations of sex, race, ethnicity, and nationality that shift based on identity markers within a given workplace. Second, Tienari, Søderburg, Holgersson, and Vaara (2005) found that intersectional understandings of nation and gender can play crucial roles in organizing. If Tiernari et al. had chosen just to examine gender, they would have missed that some of the primary ways executives made sense of and rationalized decisions regarding women in management came specifically through nation-based conceptions of gender (in)equality. Both studies offer that the importance of intersectionality in organizational and occupational research is that it allows the researcher to watch how differences function simultaneously in ways that enable and constrain work, social processes, and interaction. This project aims to add depth to intersectionality research by considering how intersectionality informs the material organization of work. This contrasts with much of the difference at work research to be reviewed below, which focuses on broad social narratives of specific difference (e.g.,
gender or race or nation) in an attempt to understand how they impact organizational and occupational matters.

Gender

It has been gender scholars who have most actively taken up inquiry regarding difference at organizational and occupational levels. Early gender scholars’ initial work in organizational research focused primarily on the differences between the experiences of men and the experiences of women within organizations. Kanter’s (1977) review of the organizational and occupational roles of women, in particular, demonstrated that women within the U.S. workplace were faced with structurally based difficulties in job acquisition, mobility, and respect that men did not experience. Shortly after Kanter’s groundbreaking work, Ferguson (1984) provided a similarly compelling account of women’s disenfranchisement within bureaucratic organizations and offered that because of the innate structure of bureaucracy, women would routinely struggle (and likely fail) to be considered equal members of said organizations.

These and other studies encouraged gender and organization scholars to endeavor to more deeply understand the relationship between gender and organizational structure. Resulting from this effort was Acker’s (1990) assertion that gender is an organizing dimension of the organization itself, suggesting that “advantage and disadvantage, exploitation and control, action and emotion, meaning and identity, are patterned through and in terms of a distinction between male and female, masculine and feminine” (p. 146). By proposing that organizations are gendered through communicative and behavioral symbols and images, Acker opened the door for organizational communication scholars to see organizations as gendered irrespective of the physical sex and/or gender
characteristics of the employee. She offered that it is the actual hierarchies and jobs within organizations that are themselves gendered, and thus, she highlighted the structural and cultural functions of gender and power inherent in the workplace.

Gender and power are linked structurally, in men’s overall greater representation in jobs with higher pay, more status and more formal organizational, political and institutional power. Second, they are linked culturally, in the social practices that construct tasks, positions, and traits as gendered, such as in the juxtaposition of men/masculinity as powerful and women/femininity as compliant, which supports a gender system favoring men. (Ely & Padavic, 2007, p. 1130)

Acker argued that jobs have been implicitly structured around a body who does not have to handle the routine responsibilities of a private life (i.e., males), but that these jobs have been “advertised” as possible and available for any person. Thus, while it appears the job is for the “universal” worker, its structure and design was set up for the female-enabled abilities of a man. As a result, divisions of labor are reified, thereby allowing for some organizational positions to be known as “women’s work” (e.g., secretarial, assistant-focused work) and other positions to be considered “men’s work” (e.g., management, executive-level work). These gendered job roles, although discussed as gender-neutral organizationally, consequently maintain and, in some ways, justify interactional patterns of domination and submission (Pringle, 1989). It is the actual structure of the organization, then, that can covertly enable women and men to experience their work in ways that mirror traditional models of female and male power dynamics.

The policies and procedures of an organization are also often seen as processes that readily control gender at work. The display of sexuality is frequently a worry in organizations (arguably due to legal concerns) and, thus, bureaucratic effort to suppress sexuality is primarily focused on the ways that women’s bodies can be perceived and
experienced. While both men and women must go through anti-sexual-harassment training, the focus of these trainings is generally to educate men to overlook or ignore women’s bodies (thus reinstating the myth of the “negative” or “dangerous” sexual power a woman holds over a man) and to educate women to control and/or hide their sexuality appropriately, thus implying to women that their physical bodies are so concerning that they should be hidden and/or effectively managed out of sight (Acker, 1990).

Gender experiences in the workplace are not all focused directly on sexuality. They are also often marked by a focus on what the female body has the possibility of producing. Many women’s personal experiences with pregnancy and childbirth lead their bodies to be targets of organizational discussion and policy creation (Ashcraft, 1999). Organizational efforts to manage maternity (compared to other types of short-term leaves that can be taken by men and women) can work to unfairly mark women as the workplace outsiders by denoting their bodies as significantly different from their male counterparts’ (Martin, 1990).

Out of these studies of gender at work, two blind spots have become evident: First, by highlighting gender, other aspects of difference are excluded and minimized in ways which reproduce the notion that things such as race, nation, context, and power relations have little to no bearing on organizational and social interaction. By taking an intersectional perspective, this view could instead be complicated to suggest that difference constantly shifts and transforms given the surrounding contextual and political dynamics. Second, most of these studies use domestic (Eurocentric or Western) views of masculinity and femininity. By critically questioning the domestic gaze of and on
gender, I suggest that more global views of gender could destabilize discussions of
gender in contemporary organizational theorizing in exciting ways. Gender researchers
could begin to take issues of nation and culture more directly into account by considering
not only how masculinity and femininity are understood from a U.S. perspective, but, just
as importantly, how those domestic views have obscured more global and intersectional
views of gender in our research.

Overall, it has been found that at an organizational level, gender functions
structurally and culturally. Structurally, gender acts as a dimension of organizing, linking
symbolic and discursive representations of gender to components of work. Culturally,
gender at work is reified through day-to-day language, policy, and procedure. In these
ways, gender has the capacity to inform what types of work women and men do within
organizations. These findings have led a number of gender scholars to investigate how
specific types of work and occupations are perceived and limited symbolically,
discursively, and materially (Alvesson, 1998; Ashcraft, 2005; Ashcraft & Mumby, 2004;

Of note for this project, research on gender within scientific and technical
occupations has proved a vital field of interest for many sociology, management, and
communication scholars (Bailyn, 1987; Bergvall, 1996; Cockburn, 1985; Dryburgh,
1999; Eisenhart & Finkel, 1998; Evetts, 1996; Frehill, 1997; Hacker, 1990; Kvande,
1999; Morgan, 2000). Faulkner’s (2000a/2000b) research on female engineers offers that
images of scientific and high-tech positions may not always adequately represent
occupational role responsibilities in day-to-day practice. She argues that, as a result,
gender segregation in occupations may occur not because of role requirements but
because prevalent gender segregation stereotypes invite actors to follow image proscriptions. Faulkner’s work provides examples of the ways in which images of workers within certain occupations can play a strategic role in how work comes to be organized. Jorgensen’s (2002) communication study adds an interesting view by highlighting that incumbents may attempt to push back on occupational stereotypes and images (for instance, the notion that women are not accepted in engineering occupations) even when personal experience demonstrates otherwise. Jorgensen offers that even when participants’ “gender-neutral” conceptions were directly challenged by their own interview data, they communicatively shifted the orientation of the discussion by reframing the stated bias through a lens of motherhood. This reframing allowed them to keep personal conceptions of gender and occupation unaffected by minimizing the link between motherhood and women.

Organizational gender research has provided nuanced and critically developed conceptions of gender at work. Occupational literature on gender, specifically within scientific and technical fields, has offered that symbolic and discursive representations of gender play a role in one’s conception and performance of occupation. But as mentioned above, by failing to take into account other aspects of difference that contribute to the image and performance of work, valuable information is likely lost. Consequently, it is vital to review another key aspect of difference related to this research—race.

Race

Through race and ethnicity organizational studies (Allen, 2001, 2002, 2004; Ashcraft & Allen, 2003; Cox & Nkomo, 1990; Grimes, 2002; Nkomo, 1992) and
significant research on race in cultural studies, critical rhetoric, and Whiteness literature (Delgado, 1998; Flores & Moon, 2002; Nakayama & Martin, 1999; Olson & Worsham, 1999; Ono & Sloop, 1995; Simpson, 2008), race has been conceptualized as an “enduring, contested phenomenon with important implications for communication studies, and for transforming society” (Allen, 2007, p. 259). As such, race is a lived and experienced construction that has the capacity to determine where one will live, what work one will perform, and with whom one will regularly associate.

Organizational studies of race have found that, for the most part, racial stereotypes and assumptions regarding individuals of differing racial and ethnic backgrounds often played a noteworthy role in subjects’ opinions and understandings of one another within the organization (Feagin, 1992; Leonard & Locke, 1993). For instance, race scholars have noted that race and ethnicity can substantially impact one’s ability to be listened to and treated ethically in the workplace (Meares, Oetzel, Torres, Derkacs, & Ginossar, 2004). Researchers have suggested that only when the dominant group is willing and open to sharing power with all cultural members is the workplace a supportive and productive climate (Limaye, 1994; Zak, 1994).

In addition, race is often used as a “key” to broader social maps providing information about how people will speak, behave, and interact with each other (Grimes & Richard, 2003; Orbe, 1994, 1998). Grimes and Richard (2003) and Orbe (1998) have demonstrated how organizations can be affected by race ideologies that position diversity, and thus workers from diverse backgrounds, as issues and populations that must be “dealt with.” In an effort to provide intervention strategies, these authors detail communication styles, processes, and effects resulting from White privilege and power in
the workplace. By highlighting these acts, the authors aim to demonstrate how race
pervades interaction at every level. In addition, as Allen (2001) points out in her chapter
on gender, race, and communication in professional environments:

> Members of all groups may use gender/racial stereotypes to interact with one
another. Or, persons of color or white women may expect others to discriminate
against them. White males may feel threatened and intimidated by the influx of
minorities and women…and may feel uncomfortable about interacting with
newcomers for fear of being perceived as racist, sexist, insensitive or patronizing.
(p. 213)

Allen thus makes it clear that issues of race and gender can come together in
multitudinous ways in the workplace to create a potential space for conflict,
misunderstanding, and tension.

Studies of organization and race have demonstrated that discourses of race have
the capacity to impact both symbolic and material experiences of self and other. While
gender researchers have pushed to understand gender’s impact on specific types of
occupations, race scholars have focused studies primarily on hierarchical levels within
organizations, particularly management (see Davidson & Friedman, 1998; Greenhaus,
Parasuraman, & Wormley 1990; Jones, 1986; Nkomo & Cox, 1989; Parker, 2001; Parker
& ogilvie, 1996), rather than on occupational fields per se (the majority of counter
examples—such as McKay, 2006—use gender and/or nation rather than race for a basis
of discussion). In addition, while race has been noted as a “fundamental and
consequential aspect of identity” (Allen, 2007, p. 259) and research in this area has
grown somewhat in scope and breadth over the last 15 years (Hendrix, 2005; Hopson &
Orbe, 2007; Nakayama & Martin, 1999), its blind spot has been the way a primarily
domestic conception of race has been invoked. For instance, the terms *Black* and *White*
are often used without significant consideration of the ways in which these terms are
complicated by nation or ethnicity. For example, within a U.S.-based organization, a
White man born in Slovenia will likely have a significantly different experience from a
White man born in Sweden and both may have different experiences from a White man
born in the U.S. Overall, organizational race research has done exceptional work
building an understanding of what race means in the U.S. but has yet to study how those
understandings become complicated in their application to foreign-born workers. It is
research on nation that has come closest to discussions of the foreign-born.

Nation

Scholarship on nation and culture is relatively new to the field of organizational
studies. As Munshi (2005) writes in his powerful chapter on diversity, “despite the
decreasing population ratio of the west, the subject of diversity remains, more often than
not, constructed through western eyes” (p. 51). In addition, Broadfoot and Munshi
(2007) demonstrate that the overwhelming Euro-American, Western focus in
organizational communication has worked to not only ignore present-day globalized
organizing but also to silence those outside of the Western mainstream orientation. U.S.
organizational scholars interested in research surrounding nation and transnational
experiences are still relatively few. Those few have been working to address these
silences and have begun to amass a body of research on the relationship of nation to
organization (Bochner & Hesketh, 1994; Dempsey, 2007; Essec & Brannen, 2000;
Nelson & Gopalan, 2003; Saka, 2004; Segalla, 1998). In particular, researchers have
demonstrated that national and cultural identity may serve as a resource for
organizational members to rely upon both in the organization (Alkhazraji et al., 1997;
Essers & Benschop, 2009) and within the larger context of globalization (Ailon-Souday & Kunda, 2003). Contrastingly, researchers have argued that minority national identity may also be used by those in majority status to alienate individuals in both organizational and social contexts (Chakravartty, 2006), leading to conflicts between national and organizational identity that have been negatively associated with job performance and burnout (Das, Dharwadkar, & Brandes, 2008). In addition to the benefits and consequences of national culture and cultural diversity in the workplace, Barinaga (2007) provides that discourses regarding national culture also provide group members the opportunity to “define individual worth and establish interdependency among group members” (p. 337). In general, this research offers that nation plays a key role in organizational and social experiences.

Nation has also been examined at an occupational level with several important findings. First, national origin appears to have a particularly loaded status within scientific and high-tech occupations. Because of virulent public arguments regarding H1B visa employment and outsourcing (FAIR, 2009; Washtech, 2009; Zazona, 2009), national origin is often used as a marker to denote whether an individual has “earned” a job or “stolen” it. For instance, Chakravartty’s (2006) research on Asian nonimmigrant computer programmers pointed to the nationalist narratives surfacing on the internet and other media outlets such as The National Review, often equating nonimmigrant work in the U.S. to outsourcing in India. Describing Asian computer programmers as “infecting the American workplace” while offering images of the White male American worker “often depicted as [an] individual—in stark contrast to the masses of young brown women with earpieces staring blankly at a sea of computer screens” (p. 44) promotes an
understanding of national origin as a menacing signal of doom for U.S. citizens with privilege within the scientific and technology occupational sector. Chakravartty also quotes anti-immigration groups suggesting that “time is running out [because] America has already lost many of its best jobs to foreigners” (p. 45). In the scientific and high-tech sector, national origin influences social beliefs and practices regarding occupation.

Second, while debates over job stealing often occur outside of the organization proper, additional (albeit limited) research is being done to study how nation comes to affect actual work. Varma’s (2002) research on Asian immigrants provided insight into the ways in which Asian scientists and engineers face discrimination and lack of advancement within their occupations because of their national origin. Particularly relevant for this project, stereotypes regarding Asian immigrants as only able to handle “routine, programmed decisions” (p. 355) have created a view of them as “mimetic rather than original… [and thus] suited for carrying out other people’s orders and ideas” (p. 355). In addition, concerns regarding language skills are often used as a justification for relegating Asian immigrants to lower positions on the occupational ladder than their White counterparts, although the only language-based difference between many Asian immigrants and their U.S. peers is an accent. Varma’s work is a strong example of how occupation and nation are entwined with one another.

Organizational scholars studying issues of nation and national culture have produced research regarding the impact of national culture on organizing (Bochner & Hesketh, 1994; Nelson & Gopalan, 2003; Saka, 2004). However, the bulk of these studies still focus primarily on the individual as the site of difference and fail to critically consider how U.S. domestic conceptions of difference are used to measure the worth of
national cultures both individually and organizationally. As such, this project asserts that further research regarding how discourses of national culture inform work systems and practices must be done.

Difference at work literature has examined discourses of differences to differing degrees depending on the specific area being studied. However, because of the common methodological practice of focusing on a single topic, difference at work literature lacks a sustained focus on intersectionality. The reliance on either domestic conceptions of difference or nation at the individual level has produced literature that takes a U.S.-centered view of difference. I suggest that an engagement of these blind spots can provide an intersectional and more globally relevant view of difference at work.

In addition, this literature has offered a primarily critical standpoint on the consequences of difference at work. This project suggests that it is also advantageous to examine the same phenomenon through different epistemological traditions in order to gain complementary knowledge. The field of occupational segregation also studies consequences of difference at work but does so from a primarily postpositivist perspective. With this orientation in mind, I shift to the final section of review.

**Occupational Segregation**

Organizational studies have historically given very little attention to the study of occupational segregation. However, it is occupational segregation research that has most clearly been attentive to the material aspects of difference at work. That being said, occupational segregation studies have focused primarily on domesticated global comparisons of occupations (i.e., comparisons among socially coded characteristics
considered broadly salient) in the U.S. There are two general types of studies: First, a
large majority of studies identify gender as a key marker that functions to segregate
workers into different types of occupations that have more or less potential for
advancement, earnings, and stability (Bielby, 1992; Blackburn, Browne, Brooks, &
Jarman, 2002; Charles & Grusky, 2004; Duleep & Sanders, 1992; Reskin & Cassirer,
1996; Tomaskovic-Devey, 1993). This research demonstrates the global inequity women
in general face at work, but does little to narrow down or specify what types of women
experience what types of segregation. The second type of study aims to address more
pointed questions, such as the ones above. In this effort, researchers analyze multiple
socially coded characteristics comparatively (Belliveau, 2005). For instance,
Tomaskovic-Devey (1993) examines both gender and race individually and then
demonstrates comparatively that as the number of men and women of color entering a job
increases, not only do compensation and status trend downward, but the actual status of
the job as a whole (across organizations) is devalued. This research shows the
importance of looking at multiple aspects of difference at work. However, these studies
examine difference comparatively rather than intersectionally. Through intersectional
research, scholars may be able to see how multiple characteristics simultaneously affect
organization.

Some international research (see Altonji & Blank, 1999; Åslund & Rooth, 2005;
Bevelander & Scott, 1996; Chiswick & Miller, 1995 for examples) on occupational
segregation has worked to push beyond domestic discourses of difference to understand
the role of national origin in job attainment, advancement, and pay rates. Le Grand and
Szulkin (2002) found that sex, country of origin, and length of stay within the host
country significantly impacted pay rates for workers. Specifically, immigrants from countries such as “Africa, Asia and Latin America faced substantial obstacles to earnings progress when entering the Swedish labor market” (p. 59) compared to immigrants from Western countries that faced little issue with labor market integration. This research brings up globally significant questions of national hierarchy and race within domestically situated occupations. Particularly, it suggests that domestic context and associated discourses related to national origin can affect how immigrants and nonimmigrants experience their occupations.

While U.S. research has engaged occupational segregation at national and international levels (Brinton, 2001; Charles & Grusky, 2004), it has yet to begin a sustained discussion, as its European counterparts have done, of foreign-born worker occupational segregation within the U.S. domestic context. One particular piece of research counter to this trend may provide useful insight. Goyette and Xie (1999) examined a U.S. census sample from 1990 to better understand how immigrant scientists fared in the U.S. marketplace. They found that gender did impact employment of immigrant scientists and that, more specifically, immigrant women’s family responsibilities may play a role in their lower employment rate, offering that female immigrants are more likely to be married with children than their male immigrant counterparts (for additional study of immigrant gender identity and work, see Pessar, 1999). These findings offer that gender, nation, and race inform organizational segregation for women and men at multiple levels and in multiple ways.

In sum, much occupational segregation research has focused primarily on sex segregation, suggesting that gender role ideologies play a substantial role in the choices
men and women make about their own work (Bielby, 1992). In addition, researchers have also pushed to comparatively understand how additional socially coded markers (such as race and ethnicity) also affect segregation within occupations. However, occupational segregation literature shares blind spots with several of the literatures already discussed. First, it tends to focus on the individual as the site of difference rather than the systemic aspects of organization that promote segregation. Second, while it often looks at multiple socially coded characteristics within studies of segregation, it comparatively examines them as semidiscrete variables that function individually rather than in combination/relation to one another. Last, as already noted, much occupational segregation literature focuses on domesticated global comparisons rather than looking at the ways in which discourses of difference may operate differently based on context. In combination, these areas in need of development suggest the need for more nuanced accounts of how foreign-born workers’ experiences are compartmentalized and researched within domestic understandings of difference.

**Literature Review Summary**

This literature review has covered the intersections and mergers of several fields of inquiry related to foreign-born workers in scientific and technical work. The study of these intersections and mergers has produced four blind spots that should ideally be addressed. First, the focus on the individual as the site of difference has produced research that fails to examine systemic aspects of how difference affects organizing. Second, studies that highlight domestic discourses of difference or nation, but rarely look at them in conjunction, fail to allow more contemporary and global questions of
organizing to surface. Third, the failure of science and technical work research to address the foreign-born worker at any level has instantiated the notion that scientific and technical work are not affected by discourses of difference. And fourth, literatures that have examined difference have not regularly done so intersectionally, which has stunted our ability to theorize how discourses interact and converge in the context of work.

In order to address these blind spots, a construct that can address both symbolic and material factors regularly invoked across the four distinct literatures needs to be used. The following explores how OCI effectively serves in this capacity.

**Occupational Identity as a Bridging Construct**

As defined earlier, OCI is a “social construction process and outcome” (Ashcraft, in press, p. 1) that addresses the work an occupation is comprised of as well as the incumbents performing the work. In the introduction to this project, I offered that OCI provides a discursive bridge to the examination of foreign-born workers in U.S. domestic settings. However, what has yet to be completely fleshed out is how OCI created a productive bridge between the relevant but divergent literatures surrounding this study.

The literatures invoked in this study suggested the necessity of a construct that can a) link difference (manifested as discourse and constructed categories) to science and technical work, b) explicate how intersectionality functions at work and, c) explore how difference affects the material organization of work. OCI has been designed explicitly to handle diverse inquiries of these types in order to understand how the “identity of work is central to the work people do” (Ashcraft, in press, p. 32).
Difference and Science and Technical Work

The literature on foreign-born workers and science and technical work evidenced that the former focused primarily on the worker while the latter examined the work. Using two aspects of the OCI, image and performance (Ashcraft, in press) to access data from participants, I provide the mechanism to bring these literatures together in order to study the worker and the work. To clarify,

...image refers to evolving but fairly stable or persistent narratives in cultural circulation, which represent the ‘essence’ of an occupation. Performance captures the situated, lively, embodied process of practicing and reflecting on an occupation. While image makes the identity of work accessible in a more coherent, distilled, and global fashion, performance negotiates the local limits, tensions, and variability of image.” (p. 21)

This view of image provides an entry point for discussion of the narratives that abound regarding foreign-born workers in the U.S. and of their positions within scientific and high-tech organizations; for example, references were made previously to Asian men and women as technically brilliant but lacking in creativity. By asking participants what images they considered relevant to analytical chemistry workers, this project offered understandings of how symbolic and discursive representations of national culture informed work.

Performance provides another way to link discussions of the worker and work. In occupational identity, performances are the ways that work gets accomplished and understood by workers. By uncovering what particular performances are common in analytical chemistry, I may be able to better account for how the work itself plays a role in perpetuating discourses regarding nation-specific workers. By capitalizing on these aspects of OCI, the literatures on foreign-born workers and scientific and technical work are drawn together.
Intersectionality and the Body-Work Relationship

With joint consideration now being given to the worker and the work, it is advantageous to more deeply explore the ways in which the workers’ bodies are related to the work. Occupational segregation research has noted the importance of socially coded characteristics as they relate to work, but it has not examined them intersectionally nor have they considered these characteristics anything more than manifested traits (as opposed to constructed representations of subjects). Difference at work research and some research on foreign-born workers have attempted, at differing levels, to take the body into account but have done so at primarily individual and organizational rather than occupational levels. Via the body-work link, OCI can bring these concepts and practices regarding difference and the body together in order to examine the intersectionality of nation and gender\(^3\) and their relationship to the construction of work. This project suggests that socially coded characteristics provide organizational members with a mental catalog of representations and consequent roles and performances appropriate for said body. Thus, the use of OCI’s focus on the body-work link may come closer to drawing out how formations of politically charged discourses are actively constructed to provide socially coded roadmaps to behavior, which consequently function to objectify and reify larger narratives and/or representations of subjects.

OCI then brings together all four literatures to understand the ways in which the intersectionality of difference shapes the images of the scientific worker and the

\(^3\) This project will emphasize the body-work relationship—seeing the body as a site where the intersection of difference takes place. Nation and gender have been chosen because they tend to be aspects that are directly referenced within work systems. For instance, while one may be hesitant to address a peer’s sexuality in the context of a scientific workplace, nation often is something that is discussed openly.
performance of scientific work. The last way in which OCI sustains this bridge is through an engagement of the material organization of work.

OCI and the Material Organization of Work

Difference at work literature and research on occupational segregation have hinted at the ways that difference affects the material organization of work. However, the epistemological and methodological differences between these two literatures have resulted in a failure to pointedly offer the ways in which this material organization happens. For instance, occupational segregation researchers will routinely point out that the variables which they study have a discursive quality and thus, could potentially be changed through discourse. However, this quality is never deeply explained, nor are potential means of intervention. Investigation of discourse and possible interventions, however, are where difference at work scholars have developed a stronghold. Critical organizational scholars focusing on difference can clearly discuss it as a discourse and even demonstrate the ways in which these discourses are institutionalized, objectified, and reified. Unfortunately, their methods do not allow them to demonstrate how these discourses have a material affect beyond individual studies.

OCI offers a bridge at this disjuncture; it suggests that difference is a constructed phenomenon while also offering the opportunity to measure the ways that it materially impacts the organization of work. Specifically, the design of OCI as a construct that can be used with mixed methods opens up the door for occupational segregation and difference at work studies to be used to generalizably describe the ways that discourse affects the material organization of work while also interrogating those discourses.
In an effort to draw this discussion of OCI as a bridge across literatures to a close, I offer an example from my own experience to demonstrate how the power of occupational identity informs aspects of organizing often buried in day-to-day work.

In my experience as a human resources director and recruiter at a biotechnology organization, I made decisions with hiring managers about recruitment. Through the invocation of images of science and national culture, as well as nation-specific socially coded characteristics, it was within our ability to make organizational decisions based on perceptions of how people of a particular national origin performed certain types of scientific labor (invoking stereotypes such as the idea that individuals from mainland China are strong analytical chemists or that individuals from India tend to be great medicinal chemists). Thus, both the foreign-born workers’ own conceptions and the decision-makers’ beliefs about occupational identity were key to creating and perpetuating systems that invited and compelled certain people to do certain labor. When workers excelled in their work, their success served to validate race- and nation-infused occupational identity (e.g., Asians sure are meticulous when it comes to analysis). When they failed, their failures had the capacity to call into question both their skill and their national heritage (e.g., I thought Russians were supposed to be creative chemists!). Thus, neither outcome dismantled nation-infused conceptions of occupational identity but instead normalized cultural images of science and technical work without explicitly addressing how they are then linked to decisions about work.

Within this section, I have demonstrated the applicability and benefits of using occupational identity as a discursive bridge within this project. Through the construct of occupational identity as well as a review of the literature surrounding this topic of study, I
argue that a) science and technical work should be studied through the lens of difference and that b) difference should be studied through the lens of science/technical work. To accomplish these tasks, the following research question was constructed.

**Research Question**

1. *In what way, if any, are discourses of difference and socially coded characteristics experienced and understood as part of the occupational identity of the analytical chemist?*

I contend that, in order to answer this question, both postpositivist and critical lenses are necessary to bridge the discursive, epistemological, and methodological differences within these fields of inquiry. As such, in the following chapter, I engage a metatheoretical discussion regarding postpositivist and critical traditions and ways to bridge the tensions that necessarily exist between the two. While it is assumed that these epistemological stances and their resulting methodologies are based on competing, and often contradictory, assumptions, the following section will engage these contradictions in order to compel the reader to not only see the tensions present within an endeavor of this sort (some that can be reconciled, some that cannot), but to consider the possibilities that open up to communication scholars by cautiously holding together multiple “ways of knowing” in order to actively engage the communities and individuals that we study in their vernacular of comfort.
As noted earlier, the literatures reviewed for this project reflect different and arguably conflicting epistemologies. In order to address these arguments and to begin to create a case for a joint relationship between metatheories, I will first briefly characterize both postpositivist and critical traditions. Second, I will discuss the tensions between them and offer alternative ways to view them productively. Third, I will explain how I see a hybrid epistemology enabling a constructive conversation to begin and exist across these tensions.

**Postpositivist Traditions**

Epistemologically, postpositivists within the field of communication suggest that “the search for knowledge remains centered on causal explanations for regularities observed in the social world” (Miller, 2000, p. 60). In other words, knowledge is developed by identifying contributory relationships between phenomena. That being said, postpositivists are aware that the ability to adequately and objectively judge relationships within the social world is not actually possible (Miller, 2005) because regardless of whether there is a reality beyond human existence, humans do not have the ability to access it through any other means than their own lenses of reality. As a result,
most postpositivists have accepted the axiological position that human values are an integral part of understanding the social world, and thus do not attempt to remove them altogether from the process of inquiry. Instead, postpositivists use the process of emergent objectivity to search for knowledge through systems of “organized skepticism” (Corman, 2005, p. 29) in order to ensure said knowledge is sound and reasonable given the standards within a particular field. This means that postpositivists choose to analyze and judge knowledge claims through rigorous systems of inquiry prior to accepting them as reasonable and legitimate.

Ontologically, postpositivists can favor realist positions, believing that phenomena exist outside of humans’ perceptions (Miller, 2000). Or, many postpositivists take a social constructionist perspective and argue that while phenomena in the world are socially constructed, they are also “regularly reified and treated as objective by actors in the social world” (Miller, 2005, p. 29). As a result, studying their relationship with the world is a necessary component of the postpositivist tradition. This ontological position allows postpositivists to make the important claim that there can be multiple realties and truths surrounding a given phenomenon. This does not conflict with postpositivist epistemology because postpositivists would argue that “truth” can be conceptualized differently based on a particular group’s position within the world (Corman, 2005), or simply the “tendency for some unpredictability to be present in any situation” (Allen, Titsworth, & Hunt, 2009, p. 8).

While postpositivism is often discussed in communicative circles primarily as a perspective associated with quantitative methods (Miller, 2000), this is not necessarily the case. Postpositivist qualitative methods are quite common in the social sciences and
humanities (Prasad, 2005). In the literatures reviewed, much of the research on science and technical work takes a postpositivist qualitative perspective and seeks to provide knowledge within specific communities of practice (for instance: Barley, 1996; Marks & Scholarios, 2007; and Nersessian, 2006). These literatures suggest that a focus on emergent objectivity and etic concepts within research should be regarded as ideal because they provide the researchers the opportunity to identify comparative theories of organizing across multiple types of work (Barley & Kunda, 2001).

In addition to qualitative work, quantitative research makes up a large portion of postpositivist studies. Particularly relevant here are the literatures on occupational segregation and much of the economically-driven research on foreign-born workers (for example: Borjas, 2003; Goyette & Xie, 1999; Reskin & Cassirer, 1996; Saxenian, 2002; and Wadhwa et al., 2007). This research, which focuses on statistical analyses as the main method of knowledge acquisition, attempts to provide repeatable and generalizable knowledge about the phenomenon in order to make a case for inequality in organizations and social environments. The way in which many studies in occupational segregation research and much research on foreign-born workers do this is to use socially accepted variables—such as gender, age, race, and salary—to measure aspects of segregation and acculturation in the workplace and society. These measures demonstrate statistically significant relationships between diversity and organizational and social acceptance. But the postpositivist tradition is by no means the only tradition that has been used to study foreign-born worker’s experiences in U.S. organizations. Critical traditions have also provided valuable insight into this field of study.
Critical Traditions

From an epistemological perspective, critical traditions differ significantly from postpositivist orientations, suggesting that knowledge cannot be found through straightforward examinations of interactions. Instead, relationships of power and politics with regard to any phenomenon must be studied in order to develop understanding of any interaction in the social world. Because of this primary focus on power and politics in everyday life, critical theorists are intimately concerned with the ways that “human interests, values and possibilities [are shaped] at the most mundane levels” (Mumby, 2000, p. 70) and with how those features connect to larger institutional factors such as political and/or economic systems. Importantly, this view of knowledge is undergirded by the notion that no knowledge exists in value-free environments. Thus, axiologically, critical theorists believe that all knowledge must be thoughtfully examined to highlight the often hidden assumptions regarding the social world (Deetz, 2005). Overall, the epistemological focus in critical traditions is “understanding, explicated and critiquing the various ways in which political and ideological limits are placed on social actors’ abilities to fully realize their identities as active participants in meaningful dialogue communities” (Mumby, 2000, p. 72).

As with postpositivists, the ontological commitments of critical scholars vary depending on the particular theoretical focus of their individual work. For instance, those who function through a Marxist perspective that contends societal structures are the defining feature of subjugation (e.g., late versus early Marxist work) would likely lean toward a more realist position, seeing social structure as real as it relates to the alienation and subjugation of workers. However, most would agree that the bulk of scholars
operating out of the critical tradition today see reality as a product of social construction. One example of a way that some critical scholars ontologically maneuver discursive and material realities is Giddens’s (1976) duality of structure. This concept suggests that a dialectical relationship between humans and structures exists, both enabling and constraining agency and the production and reproduction of structures.

The majority of contemporary critical research in organization studies is accomplished through qualitative methods. In this way, critical researchers have been able to develop knowledge claims regarding the nuanced and often extremely subtle ways that power shapes interests and beliefs (see Alvesson & Deetz, 2000; Barker, 1993; Clair, 1993). Within this specific project, literature from several of the groups hails from a critical tradition and uses qualitative methodology. For instance, several of the studies of foreign-born workers (Chakravartty, 2006; Ibrahim, 2005; Subramanian, 2000) have qualitatively focused on the ways that political and power-based systems have developed beliefs and assumptions regarding foreign-born workers. In addition, the vast majority of literature on difference at work comes from a critical-qualitative perspective. The research reviewed on gender, race, and nation has primarily developed through qualitative studies aimed at interrogating how difference functions to subjugate workers (for example: Acker, 1990; Meares et al., 2004; Pringle, 1989; Reitman, 2006). Importantly, while many of these studies hail from a primarily critical epistemology, a number of them also draw on an interpretive focus of understanding (see Adib & Guerrier, 2003; Ashcraft, 2005; England & Stiell, 1997). As a result, the use of quantitative measures has been particularly uncommon given their general purpose of explanation and prediction versus understanding.
As indicated, each of the four groups of literature relevant to this project tends to be dominated by certain epistemological and methodological stances. One stance that is absent from this review is research examining critical questions with quantitative methodology. This is likely because it is assumed that quantitative research often takes a somewhat positivistic stance (i.e., there is a real, immutable world beyond the human interpretation of it, and through a systematic, scientific processes, we can access that world objectively), which is at odds with the critical understanding of social realities as inevitably political. If a positivist stance such as this is taken when determining commensurability between quantitative and critical work, then it is completely reasonable that these methods will not connect with this tradition. However, I take a particular kind of postpositivist (rather than positivist) view of quantitative methods, one that allows me to see patterns in order to access and abstract views of difference through a critical work lens. As such, I argue that quantitative methods can be appropriate when working in the service of critical epistemologies. In order to substantiate this claim, I will first discuss the ways to bridge broad epistemological tensions and then I will narrow the focus to discuss directly how this can be accomplished in my project.

Understanding and Bridging Epistemological Tensions

Corman (2005) argued that postpositivist research relies on five basic tenets: falsification, naturalism, realism, transformational models, and emergent objectivity. In discussing these tenets, I will attempt to point the reader toward a number of the assumed tensions between postpositivist and critical research. Additionally, I will address how these tensions may be thoughtfully managed in ways that produce valuable research.
Postpositivists believe in the falsification process. Namely, they argue that, while all knowledge is interpreted (again, postpositivists have moved away from positivist ontologies of the “discovering reality”), that interpretation must be criticized in order for it to be considered valid. Critical theorists would reasonably question the assumptions embedded in the term “valid,” suggesting that the word implies not only that there are “truths” regarding the phenomenon of study that can be authenticated but, additionally, that the many systems set in place to validate knowledge (namely statistics) were designed to erase nuanced forms of oppression through reducing complicated social relationships down to often simple distinctions. In addressing the first point, I would argue that the concern regarding validity is actually a struggle of translation.

Postpositivist and critical researchers are both extremely concerned with the ways in which knowledge claims come to exist, and both believe it is the responsibility of the researcher and his associated communities of practice to systematically challenge, test, and be skeptical of those claims (Corman, 2005). What differs between these perspectives beyond translation is the actual process of validation. This difference will be addressed in the following section, but it is first necessary to develop a broader discussion of connection between both perspectives.

The second and third tenets, naturalism and realism, appear on the surface to be clearly opposed to critical views of knowledge. Many postpositivists use the term naturalism to explain that, because humans interact and relate in the physical and social world, there should be rigorous ways in which to examine those interactions and relationships. In addition, the definition of realism provides that there is a “real” world independent of our perception. While on the surface these terms may feel fraught with
inconsistencies as related to critical epistemologies, I suggest that “as experts in organizational communication, we should be particularly adept at dealing with issues of symbolic translation and understanding” (Miller, 2000, p. 64) and thus be open to considering the ways in which conceptions of naturalism and realism are capable of fitting into critical traditions.

First, as mentioned in the ontological discussions of both traditions, researchers in both the postpositivist and critical areas are scattered across the spectrum in their views of the “real” and/or “constructed” world. There are postpositivists who function as social constructionists and thus use the terms naturalism and realism fluidly to mean “constructed in ways which appear and feel real.” In addition, there are critical scholars who maintain relatively stable realist positions. For instance, historical materialists have been quite clear that, while relationships of power that alienate workers from their own labor are constructed, the effects of those constructions exist in a world that is real and relatively immutable (Prasad, 2005). As a result, historical materialists are “less averse to using quantitative techniques and collecting statistical data, provided that both are done in keeping with the overall goals of the…project” (Prasad, 2005, p. 113). In addition, I would argue that there are few critical scholars engaged in research today that would suggest that the effects of power relationships are not materially evident in the world through economic, institutional, and political factors. Thus, while the terms naturalism and realism are problematic due to their definitions, which presume relationships in the world are natural and self-evident, I would suggest that, in the spirit of translation, organizational scholars see the driving focus of these postpositivist tenets as aiming to clarify the ways in which symbolic and structural formations have the capacity to mark
human existence in powerful ways. Importantly, while it could be assumed that these
tenets suggest singular types of truths and realities, this would not be reflective of a
postpositivist stance. A more reasonable description of this stance would be that there
are always multiple truths regarding a given phenomenon since knowledge is context-
specific (Corman, 2005; Miller, 2005). However, if adequately researched and studied,
all should stand up to sustained criticism and inquiry from the appropriate communities
of practice.

The process of researching “truths” is, by all accounts, difficult work. As a result,
both traditions aim to find creative and productive ways to uncover hidden knowledge.
Postpositivists refer to this process as researching through transformational models. They
define this process as creating models and methods that access information, which
previously has remained obscured from human understanding (Corman, 2005). While
critical researchers do not refer to their own practices as models, they have, for some
time, designed theories that access knowledge in innovative ways. In fact, critical
researchers and theorists have developed theories and ways of knowing such as
Giddens’s duality of structure (Giddens, 1976), Gramsci’s hegemony (Gramsci, 1971),
and Barker and Cheney’s concertive control (Barker & Cheney, 1994), all of which could
be identified as parallel to transformational models within the postpositivist perspective.

The final tenet to postpositivism is emergent objectivity. Because no one can be
truly objective, emergent objectivity is used as an aim for postpositivist researchers. As a
process, emergent objectivity aims to ensure that claims are rigorously created and
informed by approaching the knowledge process with “organized skepticism.”
Postpositivists and critical researchers have this process in common (Corman, 2005),
even though the term *emergent objectivity* is off-putting to critical scholars due to its implied tilt toward an idealistic view of knowledge acquisition. Both traditions understand that good research is not hampered by skeptical, critical views from appropriate communities of practice (e.g., critical communication research should be reviewed by critical communication scholars, not positivist physicists) (Wenger, 1998). In fact, research from either tradition should arguably only be bolstered by skeptical critique. However, this discussion leads us back to where we left off during the review of the first tenet of postpositivism: How can we engage in methodological critique that bridges epistemologies? Specifically, how can statistical forms of knowledge validation be commensurable with critical views of knowledge?

**Bridging Methodologies**

Statistics are generally invoked in traditions which contend both epistemologically and ontologically that there are relatively straightforward ways to study and know phenomenon. As such, it would be difficult to suggest that critical traditions could easily accept statistics as *the* suitable and/or appropriate method of inquiry in a critical study. However, critical scholars do not suggest that institutional and economic factors within the social world are not relevant to studies of power. It is possible in critical studies of work to then include statistical methods that identify inequality through institutional and economic effects. For example, as referenced above, literature on foreign-born workers has spanned both postpositivist and critical traditions. Each research area has conceptualized this group differently, focusing on discrete markers of the group’s significance. While these lenses carry distinct epistemological and
ontological assumptions, both provide valuable and unique information about this population. Postpositivist studies have primarily focused on the readily observable, generalizable, and repeatable data—within this particular context, the economics of foreign-born worker labor. This data has been crucial in research regarding this population because while it suggests socially coded characteristics as static or fixed, it sheds light on the tangible and material consequences of being foreign-born and working in the U.S. that should be more broadly recognized. Historically, it was this type of data that provided rationale for government bodies to step into private industry in order to moderate effects of discrimination (Anderson, 2004). However, while empirical research of this sort has demonstrated inequities for foreign-born workers, it has not labored to understand how and why these inequities exist. It has been critically focused research that has examined these tensions and differences in power by highlighting the ways ideologies stemming from cultural and historical frames function to shape conceptions of reality. This research has been equally important, uncovering the power of discourse to persuade people to believe and behave in certain proscribed ways (Clair, 1993; Danner & Walson, 1999; Wendt, 1994).

Both forms of knowing develop and extend from different theories of what counts as “knowledge.” In collaboration with one another, they work to create a valuable picture of the historically and culturally bound and materially experienced environment in which foreign-born workers work. I argue that instead of having to span literatures to utilize this picture, both forms of knowledge can be used within a single project in an effort to contextualize and extend understandings of foreign-born workers in the U.S. Specifically, I suggest that, as Prasad (in press) does in her study of immigrant
discrimination in Sweden, statistical measures be used to highlight institutional and economic dimensions of inequality in order to further study them critically through additional methodological measures (e.g., interviews, etc.).

A great way to illustrate the utility of this argument is to relate it to the phenomenon of most interest within this project—difference. The literature surrounding this topic of study has demonstrated that the distinct ways in which postpositivist and critical researchers understand difference produces some significant tensions. One way to begin abstracting these tensions in order to communicate across them is through using the literature as a basis. For instance, Adib and Guerrier’s (2003) critical study of nationality, race, ethnicity, and class in hotel work offered that discourses of difference are constructed and institutionalized through politicized systems of power that promote or prevent certain courses of action by certain organizational members. Importantly, difference is conceptualized as an accomplishment in this and similar critical studies of difference; meaning that we perform or “do” difference through our interactions (West & Fenstermaker, 1995). Because difference is a process that is performed and maintained through communication, the importance of political context should not be understated. As Adib and Guerrier demonstrate, due to their performative nature, discourses of difference shift and function differently depending on the specific politics functioning in a given setting. In essence and key to this project, critical scholars see difference as constituted through communication.

In contrast, Saxienian’s (2002) postpositivist research on immigrant entrepreneurs defines difference as the relatively straightforward variables of a person’s physical or social makeup. This allows researchers to statistically measure ways that immigrants
have contributed to state and local economies. As a result, this study engages difference as a characteristic that is easily distinguished, stable, and not driven by context. This view is of race, gender, and nation as measurable, individual trait variables that can be analyzed in order to create statistically based truth claims regarding difference. In sum, postpositivists see difference as an innate property that exists before and beyond communication. It is something that we posses rather than perform.

It should be obvious that the implications of these two differing conceptions are substantial. One says difference exists regardless of the ways we talk about it; it is a property of our human makeup. The other says difference is made meaningful and real through our continual efforts to constitute it as such. The question then becomes, how can a mixed methods study reconcile these two theories of difference, which, at their core, assume contradictory positions? First and foremost, this conceptual difference cannot be simply reconciled. After all, the metatheoretical traditions from which they were developed have been created, criticized, and reformulated over many years. It would be simplistic, and, to be honest, glib to assume differently. That being said, I do believe that there are ways to address this issue without seeing reconciliation as a requirement.

In this project, it is a critical sensibility that promotes and drives the research question; however, I do not claim to conduct critical methods per se. This project assumes that discourses of power operate at organizational and occupational levels in ways that affect how occupational identity is constituted for foreign-born workers. Thus, a critical conception of difference is the driving factor in this project and is understood as a process that functions through and in language. It is this process that fundamentally
shapes the development and creation of occupational identity. In this project, I will draw upon interpretivist traditions of understanding in order to build a coherent explanation of participant data. While I consider this a crucial part of this research because it allows me to draw insight directly from participant’s reflections, my desire in this project to move past understanding toward social change based in insights regarding power in the workplace differentiates it from a primarily interpretivist study. Therefore, I follow the precedent of past critical organizational communication scholars who utilize interpretivist methods and employ critique throughout analysis (see Barker, 1993; Papa, Auwal, & Singhal, 1995; Tretheway, 2001).

In this project, I also take seriously the consequential material aspects of organizing that result from discourses of difference. It is postpositivist measures of difference that can most directly acknowledge those material aspects in a way which recognizes the “realness” of them. The capability of marking inequality through repeatable measures is of clear value for critical work in that it allows researchers to pinpoint direct areas that could benefit from intervention. This does not mean that this study subscribes to the notion that difference is a stable property of the human body. It instead suggests that in order to move past that conception of difference—to abstract from that understanding of difference—we must bring it to the surface and acknowledge the ways in which it informs our understanding of inequity. We can then use it to question the communicative practices that enable marginalization.

I believe that the critical tradition is capable of handling research processes that are complex, nuanced, and even ironic. This project required the critical tradition to be suspicious of its own rigorous metatheoretical boundaries and question whether those
boundaries were performing policing functions beyond their necessary scope. For instance, these boundaries have benefited the quality of research within traditions by producing extremely well-developed and thorough studies. They have also, however, provided the mechanism for scholars and researchers to assert dominance within particular fields of inquiry without having to substantially account for complimentary literatures and research in epistemologically different and/or competing traditions. As a result, it is possible for an academic to become supremely trained and recognized within relatively small areas of study and know relatively little about the same topic in a different field. In addition, beyond the effects of stringent metatheoretical boundaries on individuals, there are also effects on studies of phenomena. The literature surrounding this project is a strong example of this. The four literatures reviewed in this document produced very little referencing or acknowledgement of one another even though each provides the other with valuable insight. As offered in the literature review, this has resulted in a number of gaps in academic understanding of these phenomena.

This mixed methods project also capitalized on the critical tradition’s long-standing reliance on irony within research. By being able to seek out and highlight the paradoxes of social interaction and communication in organizing, critical projects have often provided insight that would have been otherwise overlooked (Pringle, 1989; Sotirin & Gottfried, 1999; Stohl & Cheney, 2001). The ironic, but strategic, use of postpositivist methods and epistemologies in the service of critical work provided valuable results.

As I have suggested, although not minimizing the significant difference between the views of these traditions, the conceptual problems stemming from the differences in perspectives does not need to be fully mediated in order to engage in a mixed methods
study. Beyond the theoretical mechanisms to manage the substantial differences, I also must address the practical tensions that may develop. In the following sections, I discuss tensions of vocabulary, reification, and method/technique in order to offer my ideas of management.

The first tension evident is vocabulary. These studies of difference demonstrate fundamental definitional distinctions being made by each perspective. Difference is understood from a critical perspective as a discourse that is institutionalized, in flux, and a site of constant contestation. From a postpositivist perspective, on the other hand, difference is defined as a characteristic that is relatively stable, immutable, and resistant to change. These meaning shifts indicate that a key responsibility in mixed projects is the ability to identify and be consciously aware of the ways in which terms flex and function across epistemological traditions. The goal in a mixed study is not to reconcile these differences, since it is the differences that are desired. However, clarity among terms and their relationship to one another is vital for a project’s success. That said, the first way communication across tensions was accomplished through the conscious process of code-switching. For instance, when referring to “discourses of difference,” I refer to either locally-achieved social, cultural, and linguistic representations and performances of difference or the broader social narratives that shape our understanding of constructed human categories. When I referred to “socially coded characteristics,” I implied the relatively stable, identity-based features that have been objectified in society to have material and symbolic import (e.g., race, nation, and gender). Code-switching required

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4 In Chapters V-VII, I indicate which definition of discourse I am drawing upon as is appropriate within the analyses.
constant vigilance; however, it allowed for different meanings to be capitalized on and developed in this project.

The second tension surrounds reification. It is the concern of “stigmatization by statistical association” (Gastelaars, 2002, p. 8). The use of quantitative postpositivist conceptions of difference in a study that will also invoke critical conceptions of difference could inadvertently conflate the two terms. This could have resulted in a disastrous, quasi-critical study that reifies difference as truth-based. Not cool. There is no arguing that this is a possible consequence of the use of quantitative data. However, it should be noted that while critical qualitative scholars have made clear the risk of reifying discourses of difference through their invocation, I would suggest that reification still exists in critical research as well. Critical qualitative work has the potential to mask claims that lean toward more objective-based views of difference through the avoidance of statistical research and a focus on qualitative methods. For instance, some difference at work research nods quickly to race as a constructed phenomenon, yet treats it primarily as a stable and noncontingent reality in ethnographic and interview-based research. Plainly stated, we know that gender, race, nation, etc., are constructed through complicated social interaction and experience and thus could have conceivably been constructed in another way. However, in this particular space and time, gender, race, and nation and their associated discourses do exist as relevant constructs that everyday people use in everyday situations to mark difference in social, institutional, and economic ways. As a result, the risk of statistical associations reifying constructed discourses of difference as “real” is reasonable and justified. However, it is not substantially different in critical qualitative research.
In response to this risk, I developed a sustained use of reflexivity. Specifically, I was conscious of the issues of normalizing and naturalizing that were at stake. I was also thoughtful about the ways in which statistics and terms of difference were used. For instance, in this project, it was necessary to preface statistical results with a discussion about the constructed nature both of socially coded characteristics and of the ways in which discourses of difference are objectified and reified in the social world. In so doing, I hoped to demonstrate both the importance of the statistical findings of inequality and the necessity of holding these categories of study lightly.

The third tension abstracted from the literature is methodological. The conceptual problem of difference being understood as either a property or a performance yields clearly methodologically based issues. Methods are developed through their specific epistemological frames of knowing. More specifically, it is commonly accepted that because methodology is a “technique of knowledge production [it must] be driven by what counts as knowledge” (Anderson, 1996, p. 33). If this understanding is taken as “fact” (ironically, objective fact), then it is simply impossible to use methods that span epistemological traditions because their very premises are countered methodologically from the moment of initiation. It is clear in this example that difference as a performance cannot be measured in the same way as difference as a property. In a mixed methods study of this type, it was vital to understand that methods could not be paired with epistemologically competing concepts. As such, another practice to alleviate tensions was to ensure that methods and concepts were paired in ways that allowed for research to be metatheoretically logical (e.g., difference as a property is measured statistically; difference as a performance is measured communicatively).
In addition, I do not suggest that both perspectives can equally “cooperate” in a single study due to their immediately competing epistemological standings. I argue that instead of seeing method as strictly “a technique of knowledge production, driven by what counts as knowledge” (Anderson, 1996, p. 33), we see method as a technique in the service of what counts as knowledge. This shift, and what I consider the final way to address mixed methods tensions, allows for the use of methods stemming from postpositivistic perspectives to inform and develop critical questions of work and organizing without asserting its epistemological traditions as primary. Thus, statistical methods can be engaged not to demonstrate fact, but instead to capture the sense of “realness” regarding phenomena in order to abstract them in more critical and thought-provoking ways. In doing so, researchers will be in a better position to study phenomena in depth and from a perspective aware of both the material and symbolic aspects of the social world in which we operate. In the case of difference, quantitative measurements of difference as a property allowed relationships of power to become evident.

The use of statistical data in the service of critical studies of difference provides the opportunity to demonstrate inequality in U.S. domestic contexts in an interesting, insightful, and ironic way, which, coupled with critical-qualitative interviews, may produce opportunities for change within organizational contexts. In order to detail how this will happen at a practical level, discussions of each set of methods and methodological processes will be discussed separately in Chapter IV and Chapter V. Chapter IV will detail the specific methods and procedures undertaken in the development of hypotheses and survey instruments, review the distribution and analysis of the surveys, and will discuss analysis results. Chapter V will detail the specific
methods and procedures undertaken in the creation of interview questions and actual interviews, describe the data analysis procedures, and will discuss findings. Chapter VI will cover an additional theme developed from the in-depth interviews but will not repeat methods and practices. While this set-up is unconventional, because most dissertations are completed as single-method studies, it is the clearest way to associate methods and findings in this mixed methods project.
Studying occupational identity requires examining both the worker and the work in a given occupation. Because of the overt focus on difference in this study (as defined as socially coded characteristics), I wanted to look specifically at the ways, if any, that difference linked the body and work. In other words, because socially coded characteristics of the body are regularly treated as “real” properties in everyday social interaction and communication, it was valuable to study if and in what way practitioners see those characteristics as having a “real” impact on work. In this chapter, I sought to answer how socially coded characteristics are experienced and understood as part of the occupational identity of analytical chemists through a set of 18 hypotheses regarding difference and the occupation. Additionally, I sought to identify raw data or statistical results regarding any socially coded characteristics or communication related to said characteristics that could be enhanced and/or complicated through further qualitative methods. This process, as well as a similar effort throughout the qualitative phase of analysis, allowed me to develop and build my findings through an active interplay between methods. The plan for this chapter is as follows: I will first review the rationale for the 18 developed hypotheses studied in this project. Second, I will undertake a
detailed examination of the survey and instruments used to investigate these hypotheses.

I will then report the results of the hypotheses and discuss them in greater detail.

Before moving forward, I want to clarify that although I phrased survey hypotheses in a way which may have implied that I conceptualized difference as an innate property, which, in and of itself, caused work effects, this was not the case. Hypotheses were phrased as was methodologically appropriate for a statistical study. I took the perspective in data analysis, however, that socially coded characteristics in the hypotheses functioned discursively to affect work due to their perceived symbolic and material import by occupational practitioners.

**Hypotheses**

**Occupational Identity Hypotheses**

Two important ways in which occupational practitioners experience their work are the performance of job tasks and the performance of supervisory responsibilities. Researchers have argued that diverse employees are given job and supervisory responsibilities that are different from those not considered diverse (Duleep & Sanders, 1992; Gurcak, Espenshade, Sparrow, & Paskoff, 2001; Lusis & Bauder, 2009; McKay, 2006; Varma 2002). In the literature review, differences such as gender, ethnicity, and national origin were all found to be relevant in the workplace. What these studies have not examined in-depth is how the tasks and supervisory responsibilities within an occupation are organized through and around difference. The first two hypotheses aim to investigate this aspect of difference and work:

*H1: Aspects of difference will affect job makeup for analytical chemists.*
**H2: Aspects of difference will affect supervisory responsibilities.**

While a significant amount of research has demonstrated that socially coded characteristics are related to the assignment of employee tasks and responsibilities, as well as organizational structure (Acker, 1990; Ferguson, 1984; Meares et al., 2004; Reitman, 2006), we do not know as much about how diverse workers in U.S. organizational settings actually perceive and experience their own socially coded characteristics as affecting how they do their work. Socially coded characteristics that mark an individual as different or diverse are often believed to play a role in many aspects of living (e.g., what you wear, what you eat, how you speak). Thus, it is not unreasonable for people (e.g., self, other, or both) to believe these markers of diversity also affect aspects of working. Those who function as part of the mainstream on the other hand, are rarely called upon by themselves or others to acknowledge the potential relevance of their own socially coded characteristics (Nakayama & Krizek, 1995; Reitman, 2006), and as a result are likely not to see their background as affecting how they do their work. These understandings prompted my creation of the four hypotheses below:

**H3: Foreign-born analytical chemists will report a higher relevance of socially coded characteristics in doing their own work than U.S.-born analytical chemists will report.**

**H4: Female analytical chemists will report a higher relevance of socially coded characteristics in doing their own work than male analytical chemists will report.**
H5: Foreign-born analytical chemists will report their perception that others see socially coded characteristics as relevant to doing work at a higher rate than U.S.-born analytical chemists will report.

H6: Female analytical chemists will report their perception that others see socially coded characteristics as relevant to doing work at a higher rate than male analytical chemists will report.

Socially coded characteristics can be conceptualized as affecting work for a variety of reasons. The concept of “foreign-ness” can often precipitate negative discussions about national origin and work in the U.S., such as the issue of “job stealing” or abusing governmental resources (Chakravarty, 2006; Committee, 2006). Studies have routinely noted that gender, too, plays a role in the understanding of one’s work (Ashcraft & Mumby, 2004; Eagly & Johannesen-Schmidt, 2001). In addition, common beliefs regarding particular groups being particularly adept at certain types of work (e.g., women make the best secretaries) also feed into conceptions that socially coded characteristics matter in work. These prevalent social narratives make it reasonable for foreign-born and female analytical chemists to perceive that their own cultural backgrounds are considered salient to their work, whereas those whose privilege obscures the link between work and the body will likely not see their characteristics as considered relevant to their work.

Accordingly, hypotheses 7–8 assert that foreign-born and female employees will perceive that their own backgrounds are more relevant to their work than U.S.-born or male employees, respectively.
H7: Foreign-born analytical chemists will report that their own socially coded characteristics are deemed relevant to their work at higher rates than U.S.-born analytical chemists will report.

H8: Female analytical chemists will report that their own socially coded characteristics are deemed relevant to their work at higher rates than male analytical chemists will report.

Because research has demonstrated that people often link markers of difference to work, it is not surprising that studies have also shown that differences in background affect work group inclusion (Elsass & Graves, 1997; Larkey, 1996; Milliken & Martins, 1996). Aspects of group inclusion have been demonstrated across various business settings but have not been seriously studied in science. Hypotheses 9–10 aim to determine whether group inclusion is impacted by socially coded characteristics in the analytical chemistry occupation.

H9: Foreign-born analytical chemists will report that one’s ability to be included as a full group member is affected more by socially coded characteristics than U.S.-born analytical chemists will report.

H10: Female analytical chemists will report that one’s ability to be included as a full group member is affected more by socially coded characteristics than male analytical chemists will report.

Inclusion as a full group member has been shown to come about when individuals see strong value and belief links between themselves and their coworkers (Harrison, Price, & Bell, 1998). Hofstede (1997) asserted that differences in values that often stem
from differences in cultural frameworks can lead to issues within the organization. In his study of IBM subsidiaries, he found that differences stemming from individualistic versus collectivistic values could cause issues within the workplace. One way to determine whether cultural frameworks differ among participants was to ask for their rationale for entering the analytical chemist occupation. For instance, it is reasonable to assume that those who used cultural and family rationale for choosing their career likely ascribe to a more collectivist framework compared to those who did not.

\[ H11: \text{Foreign-born analytical chemists will report different rationales for entering the field than U.S.-born analytical chemists will report.} \]

As mentioned briefly in the literature review, stereotypes often develop as a result of differences in social identity related to social and cultural frameworks (Nakayama & Martin, 2004; Tajfel, 1982). They can also make it difficult to be attentive to individual qualifications over outwardly observable characteristics. Stereotypes surrounding outward appearance have been shown to affect beliefs about intelligence and competence (England & Steill, 1997; Kurien, 2003; Morrison & Von Glinow, 1990; Subramanian, 2000; Wood, 1999), but for the most part, researchers have not studied these stereotypes directly within scientific occupations. These arguments led to the following hypothesis, which asserts that stereotypical occupational identity images will affect one’s occupation:

\[ H12: \text{Stereotypical images of analytical chemists will affect participants’ perceived occupational status.} \]

\[ A. \text{Those who do not fit the stereotypical image of the analytical chemist will report being hurt by this stereotype.} \]
B. Those who do fit the stereotypical image of an analytical chemist will report being helped by the stereotype.

These first 12 hypotheses have postulated questions about the body-work link; specifically, how aspects of physically manifested socially coded characteristics play a role in and develop the work and experience of work for the analytical chemist. The following six hypotheses will expand on that link to better determine how conceptions of socially coded characteristics are perceived by occupational practitioners to affect work (e.g., day-to-day experiences at work and satisfaction with the job).

Workforce Diversity Questionnaire Hypotheses

The Workforce Diversity Questionnaire (WDQ) gathers information about participants’ perceptions of how employees from various cultural and demographic backgrounds are accepted in the workplace. The questionnaire focuses on four aspects of acceptance in the workplace: inclusion/exclusion; varied/conforming ideation; understanding/misunderstanding; and positive/negative evaluations. These questions assess the perceived effects of socially coded characteristics on work experience.

Questions of inclusion/exclusion assess the participants’ perceptions of the level at which they or their coworkers are included or excluded in work groups. Research has suggested that foreign-born workers and women experience exclusion from formal and informal work group communicative interactions due to differences in culture, appearance, and custom (Alberts & Hazen, 2005; Chakravartty, 2006, Ferguson, 1984; Kamat et al., 2004; Subramanian, 2000, Wells, in progress). These differences may cause foreign-born workers to be isolated from communicative interactions that happen
informally in the workplace, and they may also be excluded from formal interactions through mechanisms such as silencing or disconfirmation (Wells, in progress). Others have suggested that women’s historically limited presence in the U.S. workforce, due to cultural and legal limitations, has caused the exclusion of women from certain types of formal and informal interactions, due to jargon and behaviors that have become institutionalized in organizational structures (Wood, 2001).

**H13: National origin and gender will positively impact levels of perceived exclusion.**

A. **Foreign-born analytical chemists will report higher levels of exclusion in workplace interactions than U.S.-born analytical chemists will report.**

B. **Female analytical chemists will report higher levels of exclusion in the workplace than male analytical chemists will report.**

The second component of the WDQ is varied ideation/conforming ideation. This aspect asks participants to indicate whether they feel that they or others need to conform to dominant modes of operation and/or communication in order to be listened to and valued as part of a team. Past research indicates that, due to differences in cultural norms, diverse workers may feel it necessary to conform to the dominant form of discourse in the workplace (Henley, 1977; Orbe, 1998) in order to succeed in the organization. For instance, foreign-born workers may indicate the need to follow U.S. norms of organizational operation, such as direct and/or assertive communication, in order to be heard and taken seriously, even if those norms are counter to their cultural
background (Alkhazraji et al., 1997). Women may feel obligated to adapt to communicative styles most typically assumed male in order to be accepted in the workplace (Cava, 1988; Hinze, 1999; Mills & Chiaramonte, 1991).

**H14: National origin and gender will positively impact levels of perceived conforming ideation.**

A. Foreign-born analytical chemists will report higher levels of conforming ideation in the workplace than U.S.-born analytical chemists will report.

B. Female analytical chemists will report higher levels of conforming ideation in the workplace than male analytical chemists will report.

The understanding/misunderstanding aspect of the WDQ asks participants to indicate whether or not they see diversity as a factor in understanding their coworkers and/or whether diversity affects others’ understanding of them. Misunderstanding, particularly as it relates to a lack of fluency in a dominant language (both written and spoken), can seriously impede worker success and group understanding (England & Steill, 1997; Hassink, 2007; Lan, 2003). As a result, it is possible that foreign-born workers speaking English as a second language may feel misunderstood in the workplace. In addition, native English speakers may indicate that misunderstanding is more prevalent when communicating with speakers for whom English is a second language than with other native English speakers. Misunderstanding can come not only from variations in language ability but also from cultural and gender differences (Martin
& Nakayama, 2004; Tannen, 1990; Ting-Toomey, 1994), and it can be extremely difficult to manage and address due to differences in social perspectives.

**H15:** National origin and gender will positively impact levels of perceived misunderstanding.

* A. Foreign-born analytical chemists will report higher levels of misunderstanding in the workplace than U.S.-born analytical chemists will report.

* B. Female analytical chemists will report higher levels of misunderstanding in the workplace than male analytical chemists will report.

The final aspect examined in the WDQ is positive/negative evaluation. This portion of the WDQ assesses the ways in which participants perceive diversity as affecting their value/status within an organization. For example, it is possible that domestic workers may see diversity issues for foreign workers as not important or salient for success in the workplace because of prevalent U.S. discourses of individualism and self-determination, in addition to the “bootstrap mentality” in U.S. culture (Cloud, 1996). Consequently, U.S.-born workers may attribute diverse employees’ difficulties in the workplace to negative personal traits/attributes rather than to differences in culture or background (Ilgen & Youtz, 1986; Thomas & Alderfer, 1989). Gender-specific biases and stereotypes also affect evaluations at work (Rosen & Jerdee, 1973). For instance, research has indicated that women are often promoted into highly volatile leadership roles in organizations in which organizational problems already exist. When leaders in
positions such as this fail, failures are linked to gender more than to the declining state of the organization (Ryan & Haslam, 2007).

\[ \textbf{H16: National origin and gender will positively impact levels of perceived negative evaluations.} \]

\[ A. \quad \text{Foreign-born analytical chemists will report higher levels of negative evaluations in the workplace than U.S.-born analytical chemists will report.} \]

\[ B. \quad \text{Female analytical chemists will report higher levels of negative evaluations in the workplace than U.S.- and foreign-born male analytical chemists will report.} \]

\[ \text{Job Satisfaction Hypotheses} \]

One of the final hypotheses of this project is that, because foreign-born analytical chemists will experience higher levels of exclusion, conforming ideation, misunderstanding, and negative evaluations than their U.S. counterparts, foreign-born analytical chemists will have lower evaluations of job satisfaction in the workplace.

\[ \text{H17: Foreign-born analytical chemists will report lower levels of job satisfaction in the workplace than U.S.-born analytical chemists will report.} \]

Counter to this hypothesis, previous research has demonstrated that women trend higher in job satisfaction than men despite evidence that they should be less satisfied at work (Clark, 1997; Hodson, 1989). I follow previous research and postulate that there will be no difference in job satisfaction between genders because female participants will
weigh the costs and benefits resulting from their occupation rather than using only one aspect of their experience to measure their satisfaction (Clark, 1997; Wharton & Baron, 1991). Consequently, while the hypotheses in this project suggest that women will experience higher levels of exclusion, conforming ideation, misunderstanding, and negative evaluations than their male counterparts, it does not necessarily follow that women will differ from male analytical chemists in job satisfaction.

**H18: Female analytical chemists will report similar job satisfaction in the workplace as male analytical chemists will report.**

The following section will detail the methods undertaken to evaluate the hypotheses outlined above.

**Phase I Surveys**

While survey data do not always provide the in-depth information that interviews can yield, research has shown that participants are initially more apt to offer sensitive and personal information on a survey than in an interview (Sudman & Bradburn, 1974). As such, this project capitalized on both survey and interview data to gain as much information as possible about the individuals being studied. Because the survey was administered prior to the initiation of interviews, participants were allowed to choose, after completing their survey, whether they would like to be interviewed to discuss their answers and related information in further detail. I invoked an active interplay between the data gathered from both the surveys and interviews in order to capitalize on the variety and depth of information available. However, in order to maintain a sense of
coherency in this document, the methods for the in-depth interviews as well as the results from those interviews are discussed in Chapters 5 and 6.

Participants were asked to complete a survey (Appendix A) in this first phase, which included basic questions about socially coded characteristics, their Analytical Chemistry Job Makeup (ACJM), their images of the occupation, and their opinions on diversity climate (WDQ) and job satisfaction (JSS).

Procedures

After obtaining an exemption from the University of Utah Institutional Review Board (personal communication, 10/1/09), I contacted the presiding chairperson of the Analytical Chemistry Division of the American Chemical Society (ACS) to request permission to distribute my survey to their members. The chairperson agreed to discuss my request with the executive committee of the division (personal communication, 8/13/09). Two months after the initial request, the chairperson informed me that the committee had denied permission to distribute the survey to its member population (personal communication, 10/13/09). As a result, I used a snowball sample technique to locate participants in industry and academia across the United States. Personal contacts in the biotechnology community provided the opportunity to send electronically a cover letter and link to the survey to approximately 37 members of the analytical chemistry community. I asked interested parties to send the survey to friends and colleagues who may have had an interest in participating in the research. I took additional steps to increase the participant pool by contacting authors from domestic organizations and universities whose names I gleaned from a review of the past 5 years’ worth of journal
articles in *Analytical Chemistry, Analytical and Bioanalytical Chemistry*, and *Journal of the American Society for Mass Spectrometry*. This led to the distribution of the same cover letter and survey link to approximately 298 authors.

Those individuals who accessed the survey electronically were informed on the survey home page of: 1) the purpose of the study, 2) the time commitments for participating, 3) the voluntary and confidential nature of the survey results, 4) the contact information for questions and/or concerns, and 5) my appreciation for their participation.

Due to the purposive sampling procedures used to obtain the data in this survey, the data should not be used to generalize across the broader scientific field. In addition, due to the limited number of participants in the study, it was not possible to run all tests for interaction effects (e.g., gender and national origin versus gender or national origin). The second phase of the research program used the information acquired from the tests that were run in an effort to better understand any existing themes of intersectionality.

**Participants**

Analytical chemists are individuals who generate and communicate information about such topics as the identity, strength, purity, composition, and stability of matter. Specifically, analytical chemists:

- perform qualitative and quantitative analysis; use the science of sampling, defining, isolating, concentrating, and preserving samples; set error limits; validate and verify results through calibration and standardization; perform separations based on differential chemical properties; create new ways to make measurements; interpret data in proper context; and communicate results. They use their knowledge of chemistry, instrumentation, computers, and statistics to solve problems in almost all areas of chemistry. For example, their measurements are used to assure compliance with environmental and other regulations; to assure the safety and quality of food, pharmaceuticals, and water; to support the legal
process; to help physicians diagnose disease; and to provide chemical measurements essential to trade and commerce. Analytical chemists are employed in all aspects of chemical research in industry, academia, and government. They do basic laboratory research, develop processes and products, design instruments used in analytical analysis, teach, and work in marketing and law. (ACS, 2009)

According to the most recent Chemcensus (2005) taken by the American Chemical Society, approximately 5,121 (16.5%) of ACS member chemists employed in classic chemistry (i.e., analytical, inorganic, organic, physical, and theoretical) are analytical chemists.

Survey Instruments

Socially Coded Characteristics Data

The first section of the survey contains questions about socially coded characteristics (e.g., age, gender, country of origin, race, languages spoken, etc.). As stated earlier, socially coded characteristics are often assumed to be meaningful because they are invoked with regularity in social and professional environments to denote difference. In addition, organizational members often use socially coded characteristics to pinpoint and address differences in treatment and experience in the workplace. The answers generated from the survey questions were used to determine 1) the prevalent socially coded characteristics of analytical chemists and 2) whether a relationship exists between these characteristics and work.

The critical orientation of this project made it crucial to allow participants the option of not disclosing aspects of their cultural background, despite the value that knowing the socially coded characteristics of participants brings to this research. Thus, socially coded characteristics data were not required in order to complete the survey.
This resulted in an approximate 90% completion rate per question related to socially coded characteristics.

The survey was completed by 141 individuals currently or previously employed as analytical chemists. Table 1 provides an overall view of the socially coded characteristics of the surveyed population. The percentage of female participants (35%) is slightly higher than the overall percentage of women in the broad field of chemistry, which is noted as 25% in the 2005 Chemcensus. Additionally, the percentage of participants who identified as being born in countries outside of the U.S. was 28%, which is also slightly higher than the overall industry percentage, identified as approximately 21% (Chemcensus, 2005). In sum, the characteristics of the group suggest a diverse group of analytical chemists in terms of age, gender, national origin, education, languages spoken in the home, occupational tenure, and current state of residence.

Of note to this project is that survey data did not enable the development of “race” as a category separate from “national origin.” Only 1 participant in the Phase I survey identified as Black, while the remainder of participants identified as either White or their national origin. The percentage of Black chemists in this survey (.7%) is lower than the overall percentage of Black chemists in the field, which is identified as 1.9% (Chemcensus, 2005). Both Chemcensus data and this survey data reveal a need for substantial research regarding the social and educational systems potentially promoting racial inequity in the U.S.-based chemistry-related sciences.
Table 1: Demographic Data of Analytical Chemistry Survey

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<th>B: Gender</th>
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<tr>
<td>Female</td>
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<tr>
<td>European Countries</td>
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<tr>
<td>English only</td>
<td>98</td>
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<td>Several languages</td>
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<tr>
<td>Master’s</td>
<td>23</td>
<td>16.3%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>70</td>
<td>49.6%</td>
</tr>
<tr>
<td>MD</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td>JD</td>
<td>3</td>
<td>2.1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>13</td>
<td>9.2%</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Analytical Chemistry Job Makeup (ACJM)

The second section of the survey queried participants about the key aspects of their occupation as analytical chemists. I designed the analytical chemistry job makeup questions in an effort to learn more about the performance of job duties and tasks assigned to participants. With my experience working with and recruiting analytical chemists, I have become familiar and comfortable with the types of labor consistently assigned to those working in this occupation. Questions about the makeup of the respondent’s job were designed using analytical chemistry job descriptions gathered from publicly available job postings.

The first question asks participants how much time they spend performing specific job duties associated with the analytical chemist occupation. Variability across job duties is typical and to be considered normal due to divergent organizational requirements. Analysis of this question focused on associations among divisions of job duties and socially coded characteristics and aimed to uncover if and how socially coded characteristics correlated to the division and hierarchy of job duties in analytical chemistry. For instance, as Varma (2002) points out, Asian scientists often perform work rooted primarily in the technical due to the assumption that Asian women and men lack creativity but are technically and mechanically skilled. The questions on the ACJM were designed to gather more in-depth information about Varma’s findings, and respondents’ answers assisted in the development of data regarding the performance of analytical chemistry job duties.
A total of 13 items were submitted to a principal component factor analysis using a varimax rotation with Kaiser normalization. Four factors were extracted in the analysis (eigenvalues >1) and tested for Chronbach’s alpha reliability (see Table 2).

The first factor, which focused on supervisory responsibilities in the occupation, included four items: 1) “supervise direct reports,” 2) “supervise nondirect reports (e.g., cross-functional team members),” 3) “supervise lab space and equipment,” and 4) “work with scientists and technicians across fields to complete project or organizational goals.” Items 2, 3, and 4 all loaded purely on factor 1 at .68, .72, and .71, respectively, using the criterion of primary loading \( \geq .60 \) and secondary loading \( \leq .40 \). Item 1 loaded on factor 1 at .69 and on factor 2 at .44, thus slightly violating the 60/40 rule. However, due to the level of loading on factor 1 and the supervisory content, I chose to retain it in the supervisory factor.

The second factor focused on aspects of chemistry labor within the analytical field. It included three items: 1) “develop new analytical chemistry assays based on existing methodologies,” 2) “develop new methodologies to develop assays,” and 3) “develop, institute, and validate testing methodology used to control raw materials, production intermediates, and final products.” Items loaded purely on factor 2 at .76, .72, and .67, respectively.

The third factor focused on the participants’ responsibilities of reporting data to teams and senior groups. It included two items: 1) “report your findings to a project or department team” and 2) “report your findings to senior management team.” Items loaded purely on factor 3 at .85 and .88, respectively.

The fourth and final factor focused on the primarily technical aspects of analytical
### Table 2

**Analytical Chemistry Job Makeup Factors**

<table>
<thead>
<tr>
<th>Question</th>
<th>Factor 1 - Supervisory Responsibility</th>
<th>Factor 2 - Chemistry Labor</th>
<th>Factor 3 - Data Reporting</th>
<th>Factor 4 - Technical / Mechanical Labor</th>
<th>MEAN (SD) +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop new analytical chemistry assays based on existing methodologies</td>
<td>.13</td>
<td>.76</td>
<td>.13</td>
<td>.25</td>
<td>3.22 (1.11)</td>
</tr>
<tr>
<td>Develop new methodologies to develop assays</td>
<td>.35</td>
<td>.72</td>
<td>-.05</td>
<td>.07</td>
<td>3.20 (1.16)</td>
</tr>
<tr>
<td>Develop, institute and validate testing methodology used to control raw materials, production intermediates, and final products</td>
<td>-.12</td>
<td>.67</td>
<td>.24</td>
<td>.14</td>
<td>4.02 (1.22)</td>
</tr>
<tr>
<td>Establish, institute and document new or existing compound identification methods</td>
<td>.05</td>
<td>.43</td>
<td>-.06</td>
<td>.48</td>
<td>3.86 (1.17)</td>
</tr>
<tr>
<td>Analyze and/or characterize drugs and drug-like compounds</td>
<td>-.20</td>
<td>.17</td>
<td>.19</td>
<td>.65</td>
<td>3.27 (1.46)</td>
</tr>
<tr>
<td>Interpret data</td>
<td>.15</td>
<td>.31</td>
<td>.29</td>
<td>.56</td>
<td>2.25 (0.90)</td>
</tr>
<tr>
<td>Maintain lab equipment</td>
<td>.18</td>
<td>-.00</td>
<td>-.01</td>
<td>.86</td>
<td>3.20 (1.29)</td>
</tr>
<tr>
<td>Report your findings to a project or department team</td>
<td>.04</td>
<td>.07</td>
<td>.85</td>
<td>.21</td>
<td>3.02 (1.26)</td>
</tr>
<tr>
<td>Report your findings to senior management team</td>
<td>.07</td>
<td>.14</td>
<td>.88</td>
<td>.01</td>
<td>3.42 (1.28)</td>
</tr>
<tr>
<td>Supervise direct reports</td>
<td>.70</td>
<td>.44</td>
<td>-.18</td>
<td>-.19</td>
<td>3.18 (1.43)</td>
</tr>
<tr>
<td>Supervise nondirect reports (e.g., cross-functional team members)</td>
<td>.68</td>
<td>.22</td>
<td>.35</td>
<td>-.06</td>
<td>3.80 (1.13)</td>
</tr>
<tr>
<td>Supervise lab space and equipment</td>
<td>.72</td>
<td>.13</td>
<td>-.32</td>
<td>.38</td>
<td>3.09 (1.33)</td>
</tr>
<tr>
<td>Work with scientists and technicians across fields to complete project or organizational goals</td>
<td>.70</td>
<td>-.23</td>
<td>.35</td>
<td>.14</td>
<td>2.52 (1.07)</td>
</tr>
</tbody>
</table>

+ Means: 1= nearly all of my job and 5=none of my job.
work, the maintenance of laboratory equipment, and the routine and mechanized portion of analysis. This factor contained two items: 1) “analyze and/or characterize drugs and drug-like compounds and 2) “maintain lab equipment.” Items 1 and 2 loaded purely onto factor 4 at .65 and .86, respectively. The remaining two items, “establish, institute, and document new or existing compound identification methods” and “interpret data” failed to load at acceptable levels on any of the four factors and were analyzed separately.

Further analyses found Cronbach’s alpha scores for factors 1, 2, and 3 to be acceptable. “Supervisory Responsibility” yielded an alpha of .72. “Chemistry Labor” yielded an alpha of .67. “Data Reporting” yielded an alpha of .85. The fourth factor, “Technical and Mechanical Labor,” did not yield an acceptable alpha score (.54) and thus, item 1, “analyze and/or characterize drugs and drug-like compounds,” and item 2, “maintain lab equipment,” from the fourth factor were analyzed separately.

Analytical Chemistry Supervisory Responsibilities

The third section of the survey asked participants about their supervisory responsibilities as analytical chemists. These questions were designed to uncover the supervisory responsibilities participants have in their workgroups and organizations. In scientific fields, supervision manifests in different ways (e.g., direct supervision of employees, supervision of technical space(s), and/or supervision of scientific project(s)). Each of these levels of supervision requires different kinds of managerial responsibility (e.g., space and equipment versus personnel management) and interaction with senior management. Answers to these questions allowed for the analyses of associations between socially coded characteristics and the level and kind of supervisory
responsibilities. Results led to an understanding of the ways in which performance is impacted by socially coded characteristics. Previous research has offered that supervisory roles in the U.S. tend to reflect majority (e.g., White, male) characteristics more so than any others (Duleep & Sanders, 1992; Varma, 2002). This research added to these findings. Supervisory responsibilities were not analyzed as factors and thus were tested independently.

Rationale for Analytical Chemistry Occupation Choice

The fourth section of the survey asked participants about their rationale for entering the analytical chemistry occupation. These questions provided an understanding of how participants saw socially coded characteristics as personally affecting their work choice as analytical chemists.

A total of six items were submitted to a principal component factor analysis using a varimax rotation with Kaiser normalization. Two factors were extracted in the analysis and also tested for reliability (see Table 3).

The first factor focused on culture and family rationale for entering the field of analytical chemistry. This factor had 2 items: 1) “cultural expectation to work in the scientific field” and 2) “family expectation to work in the scientific field.” These items loaded purely at .87 and .91, respectively.

The second factor focused on issues of personal motivation outside of or beyond the individual’s heritage and/or lineage, such as economic and social status and personal interest. This factor had two items that loaded purely and an additional two that did not. Item 1, “perceived economic status of the occupation,” and item 2, “perceived social
status of the occupation,” loaded purely at .79 and .78, respectively. Item 3, “interest in analytical chemistry,” loaded at .59 while also loading on factor 1 at -.35. Item 4, “to show people that you could do it,” loaded at .58 while also loading on factor 1 at -.04. An interitem correlation matrix demonstrated that familial and cultural rationale for entering the field were highly correlated ($r > .70$), as were social and economic status rationale (see Table 4).

### Workforce Diversity Questionnaire (WDQ)

Larkey (1996) developed the Workforce Diversity Questionnaire (WDQ) to measure how organizational members perceive diverse colleagues. This project used this questionnaire to understand if and how the socially coded characteristics of the worker impact experiences of and at work.

<table>
<thead>
<tr>
<th>Question</th>
<th>Factor 1 - Family/Cultural</th>
<th>Factor 1 - Personal Motivation</th>
<th>MEAN (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural expectation to work in a scientific field</td>
<td>.87</td>
<td>.06</td>
<td>4.30 (1.24)</td>
</tr>
<tr>
<td>Family expectation to work in a scientific field</td>
<td>.91</td>
<td>.08</td>
<td>4.25 (1.25)</td>
</tr>
<tr>
<td>Interest in analytical chemistry</td>
<td>-.35</td>
<td>.59</td>
<td>1.92 (1.21)</td>
</tr>
<tr>
<td>Perceived economic status of the occupation</td>
<td>.38</td>
<td>.79</td>
<td>3.46 (1.19)</td>
</tr>
<tr>
<td>Perceived social status of the occupation</td>
<td>.38</td>
<td>.78</td>
<td>3.76 (1.29)</td>
</tr>
<tr>
<td>To show people you could do it</td>
<td>-.04</td>
<td>.58</td>
<td>3.95 (1.27)</td>
</tr>
</tbody>
</table>

*Means: 1= very important and 5= not important*
Table 4
Interitem Correlation on Rationale for Entering Analytical Chemistry Occupation

<table>
<thead>
<tr>
<th></th>
<th>Culture</th>
<th>Family</th>
<th>Interest</th>
<th>Economic Status</th>
<th>Social Status</th>
<th>Show Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>.715(**)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>.057</td>
<td>.186</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Status</td>
<td>.303</td>
<td>.344</td>
<td>.219</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Status</td>
<td>.293</td>
<td>.346</td>
<td>.206</td>
<td>.719(**)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Show Others</td>
<td>.022</td>
<td>.077</td>
<td>.085</td>
<td>.296</td>
<td>.278</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed)

I chose the WDQ after reviewing the following diversity questionnaires: the Workplace Prejudice/Discrimination Inventory (James, Lovato, & Cropanzano, 1994), the Attitudes Toward Diversity Scale (Montei, Adams, & Eggers, 1996), the Organizational Diversity Inventory (Hegarty & Dalton, 1995), and the Perceived Occupational Opportunity Scale-Form B and Perceived Occupational Discrimination Scale-Form B (Chung & Harmon, 1999). While each of these measures could have provided valuable data in a project focused on diversity, I determined that the WDQ’s focus on communicative interaction and resulting diversity climate was most appropriate for this study. Of note is that while Chung and Harmon’s scales of occupational opportunity and discrimination appears particularly relevant to this project, the scales were designed specifically for an African-American population, thus diminishing its usefulness in this particular capacity.
The questionnaire consists of 15 scale items and assesses interactions in diverse workgroups. Specifically, the questionnaire was designed to examine issues of 1) inclusion/exclusion, meaning the ways in which participants feel included or excluded in work groups (e.g., “It seems that the real reason people are denied promotions or raises is that they are seen as not fitting in.”); 2) varied ideation/conforming ideation, meaning the ways in which participants feel they need to conform to the dominant mode of communication in order to be listened to and valued as part of the team (e.g., “People are reluctant to get involved in a project that requires them to balance ideas from different gender and racial points of view.”); 3) understanding/misunderstanding, meaning the ways in which participants perceive diversity as affecting one’s ability to understand another person (e.g., “Women and people of color are interpreted differently than White males, even when they say the same thing.”); and 4) treatment, meaning the ways participants perceive diversity as affecting one’s value/status within the organization (e.g. “Some people in our group are ‘talked down to’ because they are different.”).

Reliability

The reported Cronbach alpha scores for the four subscales within the WDQ were Inclusion (.75), Ideation (.75), Understanding (.64), and Treatment (.74) (p. 317). The reliability on the Understanding subscale was somewhat lower than what is generally deemed acceptable. After reviewing the items within this subscale, it seemed likely that this lower alpha score is due to a shift from third person to first person language in one of the items. In particular, this item asks participants to recall a time when they personally confronted a peer because they felt that the peer was discriminating and had the peer
deny the existence or significance of their behavior. Because this question requires a particular type of extended experience that may be relatively rare, and because the alpha scores for the remaining two items were also not particularly high, it is reasonable to believe that this alpha score (.54) reduced the total strength of the subscale significantly.

Validity

The WDQ was designed to measure organizational climate as perceived by members. At face value, all four aspects of workforce diversity climate (inclusion, ideation, understanding, and treatment) provide a coherent understanding of the total workforce climate. While all measures were tested and found to be unidimensional, they also had a common underlying factor defined as “diversity climate” (Larkey, 1996, p. 320). This measure was significant across the scale, providing strong evidence that the WDQ reasonably assesses organizational cultural patterns, attitudes, and “situational factors governing the perception and reactions to those who are different” (p. 320). Larkey did not report construct- or criterion-related validity for the WDQ.

Instrument Applicability in the Current Project

Larkey’s (1996) four key factors in the survey (inclusion, ideation, understanding, and treatment) were used in this study due to the limited number of participants responses to the WDQ survey questions in this project (approximately 70% response rate, N=98). The current study yielded slightly higher and more acceptable reliabilities than Larkey’s initial study. “Inclusion” yielded an alpha of .77 (N=96, M=3.32, SD=.92); “ideation” yielded an alpha of .86 (N=96, M=3.49, SD=.90); “understanding” yielded an alpha of
.70 \( (N=91, M=3.31, SD=1.02) \); and “treatment” yielded an alpha of .77 \( (N=93, M=3.32, SD=.84) \). In order to achieve an acceptable reliability score for the “Understanding” scale, item CE62 (“When people who are culturally different or are of different genders work together in our group, there is always some amount of miscommunication.”) was removed from the factor and was analyzed separately. It is assumed that because of the double-barreled nature of this question, participants struggled regarding how to answer identically for both populations. It is recommended that further studies separate this question into two.

Job Satisfaction Survey (JSS) Data Description

The Warr Job Satisfaction Scale (JSS) is one scale out of eight created by Warr, Cook, and Wall (1979) in their larger work attitudes questionnaire. Because the WDQ focuses primarily on diversity aspects in workplace interaction, the JSS was included within this survey to provide participants the opportunity to evaluate their broader job experience, allowing them to contextualize their experiences of diversity in the larger frame of their work.

After reviewing the Occupational Stress Indicator (Cooper, Sloan, & Williams, 1988), the Minnesota Satisfaction Questionnaire (Weiss, Dawis, & England, 1967), and the Job Diagnostic Survey (Hackman & Oldham, 1975), the Warr Job Satisfaction Scale was identified as the most appropriate survey for this project because of its simple assessment of key job factors. This 15-item Likert-type scale allows respondents to indicate how satisfied or dissatisfied they feel with key aspects of their job (e.g., the
amount of responsibility they are given, relationships with coworkers, pay rates, etc.). It measures intrinsic and extrinsic job satisfaction.

Reliability

In the research of Warr et al., the total job satisfaction Cronbach’s alpha score varied between .85 and .88 (p. 135). It was thus reasonably expected that the reliability would be sufficient for this study.

Validity

This scale seeks to measure how satisfied or dissatisfied participants are with various aspects of their jobs. All 15 questions in the JSS had strong factor loadings, demonstrating that they measured the aspects of job satisfaction which they suggest. Additionally, the JSS scale correlates with the subscale as expected. Numerous studies have employed the JSS and found it to be reliable and valid (Balloch, Pahl, & McLean, 1998; Cooper, Rout, & Faragher, 1989; Schnake, Cochran, & Dumler, 1995). Warr et al. did not report construct- or criterion-related validity for the JSS.

Instrument Applicability in the Current Project

Warr’s (1979) two key factors in the survey (intrinsic and extrinsic job satisfaction) were used in this study due to the limited response to the JSS survey questions (approximately 70% response rate, N=98). The current study yielded slightly lower but acceptable reliabilities as compared to Warr’s research: “Intrinsic job satisfaction” yielded an alpha of .79 (N=98, M=2.54, SD=.86). “Extrinsic job
satisfaction” yielded an alpha of .85 \((N=96, M=3.06, SD=.81)\). In both scales, 1 indicated the participant was extremely satisfied and 5 indicated that they were extremely dissatisfied.

Results

Occupational Identity Results

Dr. Sally Planalp and I conducted a series of tests (including ANOVA, Mann-Whitney U tests, \(t\)-tests, and chi-squares) to test hypotheses 1–12. The tests revealed complete support for H1, H2, H7, H11a, H12a, and H12b and partial support for H4, H6, H9, and H11b and did not support H3, H5, H8, and H10. A discussion regarding these results will follow.

Hypothesis 1 stated that aspects of difference would affect job makeup. We performed a two-way ANOVA analyzing gender and foreign/domestic status for the three normally distributed factors (Supervision, Chemistry Labor, or Data Reporting). These tests yielded no significance. The remaining items (“Maintain lab equipment,” “Analyze and/or characterize drugs and drug-like compounds,” “Establish, institute, and document new or existing compound identification methods,” and “Interpret data”) were not normally distributed and could not be adequately transformed. Thus, we ran a median split and chi-square with gender and foreign/domestic status for each item. Taking into account experiment-wise error, we divided the .05 significance level by the eight tests in order to determine a .006 significance level for each of the tests. The .05 level was also deemed marginally significant. Of those tests, one was significant and another was marginally significant. The significant test examined foreign/domestic status and the task
of “Maintaining lab equipment” $\chi^2(1)=8.37, p=.005, \epsilon=.06$, with foreign-born participants reporting that maintaining lab equipment was a larger portion of their job than their U.S.-born counterparts reported. The test that yielded marginal significance examined foreign/domestic status and the task of “Analyzing and/or characterizing drugs and drug-like compounds” $\chi^2(1)=5.28, p=.03, \epsilon=.03$, with foreign-born participants reporting that analyzing and/or characterizing drugs and drug-like compounds was a larger portion of their job than their U.S.-born counterparts reported.

Hypothesis 2 asserted that aspects of difference would affect supervisory responsibilities in analytical chemistry. We tested this through a series of 14 chi-square tests. Taking experiment-wise error into account, we divided the .05 significance level by the 14 tests in order to determine a .004 significance level for each of the tests. The .05 level was also deemed marginally significant. The results of these tests indicated that the majority of supervisory responsibilities are significantly related to gender. The tests did not indicate that foreign/domestic status had a relationship to supervisory responsibilities (see Table 5).

Post-hoc analysis of the responses of female participants was done to determine whether national origin affected supervisory responsibilities within gender. While mean differences were not statistically significant between foreign-born and U.S.-born women, data indicated that foreign-born female participants in this study reported supervising lab equipment, lab space, and lab personnel at a higher rate than U.S.-born women (FB Women: $N=17, M=1.46$ / US Women: $N=24, M=1.62$). Mean data also indicated that U.S.-born female participants reported supervising projects, project personnel, and having the ability to hire, fire, and promote at a higher rate than foreign-born women (FB
Women: \( N=17, M=1.75 \) / US Women: \( N=24, M=1.69 \). In both instances, means of 1 indicated that they did supervise in the given area and capacity and means of 2 indicated that they did not supervise in the given area and capacity. These findings, while not statistically significant, are consistent with the theory that foreign-born workers tend to have job responsibility over the technical and analytically-related aspects of analytical chemistry.
chemistry. Because of the small population in these tests (Foreign-born=17; U.S.-born=24), it is not possible to determine if the lack of significance here is related to a lack of power in the study or due to an absence of a statistically-significant relationship in the analytical chemistry occupation.

Hypothesis 3 proposed that foreign-born analytical chemists would report a higher relevance of socially coded characteristics in their own work than would be reported by U.S.-born analytical chemists. This hypothesis was not supported. A Mann-Whitney U test determined that there was not a significant difference between the degree to which foreign-born and U.S.-born participants reported that national origin, gender, race, or age affected how they do their own work (see Table 6).

Hypothesis 4 proposed that women would report a higher relevance of socially coded characteristics in their own work than men would report. This hypothesis was partially supported. A Mann-Whitney U test determined that there was a significant difference between the degree to which women and men reported that gender affected their own work, but there was not a significant difference between the degree to which women and men reported that national origin, race, or age affected their own work (see Table 7).

Hypothesis 5 proposed that foreign-born analytical chemists would report that others considered their socially coded characteristics relevant to work at a higher rate than U.S.-born analytical chemists would report. This hypothesis was not supported. A Mann-Whitney U test determined that there was not a significant difference between the degree to which foreign-born and U.S.-born participants reported relevance of difference in doing one’s work (see Table 8).
Table 6

Self-perception of Relevance of SCC for Work

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Origin</td>
<td>Foreign-born</td>
<td>36</td>
<td>46.44</td>
<td>1006.00</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>U.S.-born</td>
<td>66</td>
<td>54.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Foreign-born</td>
<td>36</td>
<td>47.00</td>
<td>1026.00</td>
<td>0.237</td>
</tr>
<tr>
<td></td>
<td>U.S.-born</td>
<td>66</td>
<td>53.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Foreign-born</td>
<td>36</td>
<td>48.82</td>
<td>1091.00</td>
<td>0.472</td>
</tr>
<tr>
<td></td>
<td>U.S.-born</td>
<td>66</td>
<td>52.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Foreign-born</td>
<td>36</td>
<td>53.69</td>
<td>1109.00</td>
<td>0.562</td>
</tr>
<tr>
<td></td>
<td>U.S.-born</td>
<td>66</td>
<td>50.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7

Self-perception of Relevance of SCC for Work

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Origin</td>
<td>Women</td>
<td>44</td>
<td>50.83</td>
<td>1246.50</td>
<td>0.833</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>58</td>
<td>52.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Women</td>
<td>44</td>
<td>40.22</td>
<td>779.50</td>
<td><strong>0.000</strong></td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>58</td>
<td>60.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Women</td>
<td>44</td>
<td>53.91</td>
<td>1170.00</td>
<td>0.445</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>58</td>
<td>49.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Women</td>
<td>44</td>
<td>49.98</td>
<td>1209.00</td>
<td>0.635</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>58</td>
<td>52.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis 6 proposed that women would report that others considered their socially coded characteristics relevant to work at a higher rate than men would report. This hypothesis was partially supported. A Mann-Whitney U test determined that there was a significant difference between the degree to which women and men reported gender affecting others’ perceptions of their work, and a marginally significant difference between the degree to which women and men reported age as affecting others’ perceptions of their work, but there was no significant difference between the degree to which women and men reported relevance of national origin and race in doing one’s work (see Table 9).

Hypothesis 7 proposed that foreign-born analytical chemists would report that their own socially coded characteristics were deemed relevant to their work by others at higher rates than U.S.-born analytical chemists. This hypothesis was supported. A Mann-Whitney U test determined that foreign-born analytical chemists reported that their
Table 9

Perception of Relevance for Others of SCC for Work

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Origin</td>
<td>Women</td>
<td>44</td>
<td>48.17</td>
<td>1129.50</td>
<td>0.297</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>58</td>
<td>54.03</td>
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</tr>
<tr>
<td>Gender</td>
<td>Women</td>
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<td>38.68</td>
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<td>0.000</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>58</td>
<td>61.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Women</td>
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<td>47.90</td>
<td>1117.50</td>
<td>0.244</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>58</td>
<td>54.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Women</td>
<td>44</td>
<td>44.17</td>
<td>953.50</td>
<td>0.023</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>58</td>
<td>57.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

demographic background was deemed relevant to their work at a significantly higher rate than U.S.-born analytical chemists reported that their own background was deemed as relevant to their work (see Table 10).

Hypothesis 8 proposed that women would report that their own socially coded characteristics are deemed relevant to their work by others at higher rates than men. This hypothesis was not supported. A Mann-Whitney U test determined that women did not report their demographic background as relevant to their work at a higher rate than men (see Table 11).

Hypothesis 9 proposed that foreign-born analytical chemists would report that one’s ability to be included as a full group member is affected by socially coded characteristics more than U.S.-born analytical chemists would report. This hypothesis was partially supported. A Mann-Whitney U test revealed that foreign-born analytical chemists report that language affects one’s ability to be included as a full group member at a significantly higher rate than U.S.-born analytical chemists. However, there was no
significant difference between foreign-born worker and U.S.-born worker reports regarding clothing, religion, and jargon as affecting full group member inclusion (see Table 12).

Hypothesis 10 proposed that women would report that one’s ability to be included as a full group member is affected by socially coded characteristics more than men would report. This hypothesis was not supported. A Mann-Whitney U test revealed that there was no significant difference between women’s and men’s reports regarding language, clothing, religion, and jargon as affecting full group member inclusion (see Table 13).

Hypothesis 11a proposed that foreign-born analytical chemists would report higher levels of familial and cultural expectation to work in the field than U.S.-born analytical chemists. This hypothesis was supported. A Mann-Whitney U Test

Table 10

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
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<tbody>
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<td>Demographic</td>
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<td></td>
<td>U.S.-born</td>
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Table 11

<table>
<thead>
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<th>Dep. Variable</th>
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<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
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<tr>
<td>Demographic</td>
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<td>Men</td>
<td>57</td>
<td>55.24</td>
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</table>
Table 12

Socially Coded and Cultural Characteristics’ Impact on Inclusion as Full Group Members

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
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<td>37.26</td>
<td>675.50</td>
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<td>U.S.-born</td>
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<tr>
<td></td>
<td>U.S.-born</td>
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<td>51.77</td>
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</tr>
<tr>
<td>Jargon</td>
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<td>46.69</td>
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Table 13

Socially Coded and Cultural Characteristics’ Impact on Inclusion as a Full Group Member

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
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</tr>
<tr>
<td></td>
<td>Men</td>
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<tr>
<td>Clothing</td>
<td>Women</td>
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<td>44.42</td>
<td>962.50</td>
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<td>Men</td>
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</tr>
<tr>
<td>Religion</td>
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<td>46.87</td>
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<td>Jargon</td>
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<td></td>
<td>Men</td>
<td>58</td>
<td>53.25</td>
<td></td>
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</tr>
</tbody>
</table>
demonstrated that foreign-born analytical chemists report family and cultural expectations to work in the scientific field at a higher rate than U.S.-born analytical chemists. Hypothesis 11b proposed that women would report social status and showing others that you can do it at a higher rate than men. This hypothesis was partially supported. Women did report social status as a rationale for entering the field more than men at a marginally significant level, but there was no significant difference between men and women for the rationale of showing others that you could do it (see Table 14).

Hypothesis 12a proposed that those participants who did not fit the stereotypical image of the analytical chemist would report being hurt by this stereotype in their work. This hypothesis was supported. Of those who indicated an effect, 41.7% stated they were hurt by the stereotype compared to 32.3% who stated they were helped. This test produced interesting results related to gender. Women that reported not fitting the stereotype did indicate at a significantly higher rate than men that this hurt them in their occupation. However, women that reported not fitting the stereotype also reported at a significantly higher rate than men that this stereotype helped them (see Table 15). I consider this finding more deeply in the discussion section.

Hypothesis 12b proposed that those who do fit the stereotypical image of an analytical chemist would report being helped by this stereotype in their work. This hypothesis was supported. Of those who indicated an effect, 41.2% stated they were helped by the stereotype compared to 24.1% who stated they were hurt. There were no significant differences between the populations studied related to this question (see Table 15).
Table 14

Rationale for Entering the Field

<table>
<thead>
<tr>
<th>Ind. Variable</th>
<th>Dep. Variable</th>
<th>N</th>
<th>Mean Rank</th>
<th>Mann-Whitney</th>
<th>Asymp. Sig (2-tailed)</th>
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<td>738.50</td>
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<tr>
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</tr>
<tr>
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<td><strong>To Show Others</strong></td>
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<td><strong>Interest</strong></td>
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<td>Men</td>
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<td><strong>Social Status</strong></td>
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<td><strong>Men</strong></td>
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<td><strong>To Show Others</strong></td>
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</tr>
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<td>Men</td>
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<td>52.77</td>
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</tr>
</tbody>
</table>
WDQ and Job Satisfaction Results

We ran an interitem correlation matrix to test correlations between the WDQ and job satisfaction items on the survey. The matrix demonstrated high correlations within each of the measures, and low, often negative, correlations between the measures (see Table 16).

As a result, we conducted MANOVA tests and between-subject effects follow-up tests using the WDQ and job satisfaction factors as dependent variables separately. The
The goal of these tests was to determine the relationship among the independent variables (e.g., gender, foreign-born status) and dependent variables (e.g., inclusion, ideation, understanding, treatment, and intrinsic and extrinsic job satisfaction).

The results for the MANOVAs and follow-up tests for between-subject effects regarding the Workforce Diversity Questionnaire and Job Satisfaction Survey revealed support for H13, H14, H15, H16, and H18. The MANOVA did not support H17.

A Box Test of Equality of Covariances revealed that the WDQ groups differed significantly in covariance ($p=.000$), and as a result Pillai's trace results were reported.
since they do not assume equality of covariance. We saw significant effects for foreign-born/domestic status \((p=.000)\) and gender \((p=.025)\). We then performed follow-up tests of between-subject effects to determine effects for the individual variables within the WDQ.

Hypothesis 13 proposed that foreign-born analytical chemists and women (U.S.- and foreign-born) would report higher levels of exclusion in workplace interactions than U.S.-born analytical chemists and men (U.S.- and foreign-born), respectively. This hypothesis was fully supported. The first test determined the relationship between gender and inclusion/exclusion. The test indicated that women report exclusion at a significantly higher rate than men. The second test determined the relationship between foreign-born status and inclusion/exclusion. The test indicated that foreign-born participants report exclusion at a significantly higher rate than U.S.-born participants (see Table 17).

Hypothesis 14 proposed that foreign-born analytical chemists and women (U.S.- and foreign-born) would report higher levels of conforming ideation in the workplace than U.S.-born analytical chemists and men (U.S.- and foreign-born), respectively. This hypothesis was supported. The first test determined the relationship between gender and varied/conforming ideation. The test indicated that women report the need for conforming ideation at significantly higher levels than men. The second test determined the relationship between foreign-born status and varied/conforming ideation. The test indicated that foreign-born analytical chemists report the need for conforming ideation at significantly higher levels than U.S.-born analytical chemists (see Table 18).

Hypothesis 15 proposed that foreign-born analytical chemists and women (U.S.- and foreign-born) would report higher levels of misunderstanding in the workplace than
U.S.-born analytical chemists and men (U.S.- and foreign-born). This hypothesis was fully supported. The first test determined the relationship between gender and understanding/misunderstanding. The test indicated that women report being misunderstood at significantly higher rates than men. The second test determined the relationship between foreign-born status and understanding/misunderstanding. The test indicated that the foreign-born participants report being misunderstood at significantly higher rates than U.S.-born analytical chemists (see Table 19).
Hypothesis 16 proposed that foreign-born analytical chemists and women (U.S.- and foreign-born) would report higher levels of negative evaluations in the workplace than U.S.-born analytical chemists and men (U.S.- and foreign-born). This hypothesis was fully supported. The first $t$-test determined the relationship between gender and positive/negative evaluation. The test indicated that women report negative evaluation at work at a higher rate than men. The second test determined the relationship between the foreign-born status and positive/negative evaluation. The test indicated that foreign-born analytical chemists report negative evaluation at work at a higher rate than U.S.-born analytical chemists (see Table 20).

Hypothesis 17 proposed that foreign-born analytical chemists would report lower levels of job satisfaction in the workplace than U.S.-born analytical chemists. This hypothesis was not supported. A Box Test of Equality of Covariances indicated that job satisfaction groups did not differ in covariance. Wilks’ Lambda test results indicated that the means of job satisfaction (whether intrinsic or extrinsic) did not differ significantly.
Hypothesis 18 proposed that women and men would not differ in their reports of job satisfaction. This hypothesis was supported. Wilks’ Lambda test results indicated that the means of intrinsic and extrinsic job satisfaction did not differ significantly based on gender ($p = .196$).

Discussion

In this chapter, I aimed to answer how socially coded characteristics are linked to the work and experience of analytical chemists. In this phase, I demonstrated that socially coded characteristics play a statistically significant role in the occupational identity of analytical chemists, specifically through performances of task and supervisory responsibilities and performances surrounding group membership and acceptance. In addition, I will point out quantitative findings that spurred qualitative inquiry in the next phase of this research endeavor.
Prior to discussing these findings, it is wise to restate the spirit and frame in which these analyses were completed. As mentioned earlier in this chapter, this project subscribes to the notion that in normal, day-to-day life, people see socially coded characteristics primarily as stable properties of human makeup. The properties are assigned “real” meaning by human actors through the ways that people discursively link them to other aspects of life. To be clear, it was not my intent to affirm socially coded characteristics as “real” or to suggest that, as properties, they “naturally” interact with the world resulting in measurable effects. Instead, I assert that socially coded characteristics are only real as they are perceived as such by human actors (in this case occupational practitioners) and that the effects associated with these characteristics, as discussed in this results section, are discursively rather than “factually” linked, but are felt and experienced as meaningful and real.

Job Makeup and Supervisory Responsibilities

At the outset of this project, my interest in studying the analytical chemistry occupation stemmed from the desire to better understand whether tasks in highly scientific occupations (i.e., job makeup and supervisory responsibilities) were affected in any way by conceptions regarding the socially coded characteristics of the worker. Survey results have offered that socially coded characteristics do play a role in task construction. Specifically, findings have indicated a link between national origin and certain aspects of job makeup. They have also shown a strong relationship between gender and supervisory responsibility.

The aspects of job makeup that were significantly different based on national
origin were maintaining lab equipment and analyzing or characterizing chemical compounds. These job tasks require substantial technical skill and precision. Varma (2002) argued in his research that labor requiring significant technical skill is regularly assigned to Asian workers due to cultural assumptions regarding detail orientation and mechanical prowess. This project’s results corroborated Varma’s assertions that technical work is performed by foreign-born workers at a higher rate than by U.S.-born workers. Surprisingly, this survey did not pick up differences among additional aspects of job makeup. While this could be due to power or design of the survey, it is also possible that foreign-born status does not significantly impact all aspects of scientific work in analytical chemistry.

Socially coded characteristics also appear to impact supervisory responsibilities. Previous organizational research has noted that supervisory responsibilities for diverse workers are different from those of workers considered part of the U.S. mainstream (Duleep & Sanders, 2002; Morrison & Von Glinow, 1990; Riggins, 2001). This project uncovered consistent and significant differences among supervisory responsibilities between women and men; however, it did not uncover differences between foreign-born and U.S.-born analytical chemists.

The sciences have historically and stereotypically been male-dominated fields and in this respect, the field of chemistry is no different. Women in analytical chemistry do not supervise as regularly as men. The 2005 Chemcensus showed that even when women do supervise, they more often supervise female workers. In fact, only 14.3% of male chemists surveyed reported being supervised by women, compared to 23.8% of female chemists.

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5 Because Varma focuses specifically on Asian employees, it is prudent to note that 54% of the foreign-born participants in this project reported Asian countries of birth.
chemists surveyed who reported being supervised by women. Data from this project indicate that women are less likely than men to supervise projects, lab space, and people. It was these data that signaled to me a potential value to considering, through qualitative methods, the ways intersections of gender, nation, and age impact the performance of work. As a result, through interview data, Chapter VI develops and supports these findings in order to build discussion regarding the complexity of intersectionality at work.

Group Membership

Reports of job makeup and supervisory responsibilities from the analytical chemist participants suggested that socially coded characteristics are considered relevant in the job and supervisory duties of the occupation. To broaden discussions of performance at work, the survey included additional questions aimed at understanding whether there were specific characteristics or identified markers or behaviors that affect acceptance as a full-group member in the occupation, such as language (particularly fluency and accent), clothing (particularly culturally specific garments, such as hijabs), religion (wearing religious symbols, listening to religious radio), or jargon (language that is associated with a certain age group, race, or culture).

Foreign-born participants reported at a significantly higher rate than U.S.-born participants that language (particularly fluency and accent) affected inclusion as a full-group member in their occupation. Language is routinely identified as a significant determinant of acceptance and organizational success for foreign-born individuals (Davila, Bohara, & Saenz, 1993; Gouveia & Rousseau, 1995; Kossoudji, 1988; Lang, 1986;
Pendakur & Pendakur, 2002; Vaillancourt, 1992). While women and men did not differ in their opinions about whether or not these markers and behaviors affect inclusion, means for these items did demonstrate that women and men believed that language impacted one’s ability to be accepted as a full group member *fairly often* (Women: \(N=43, M=2.30, SD=1.16\) / Men: \(N=58, M=2.59, SD=1.21\)). Foreign-born and U.S.-born men and women reported clothing, religion, and jargon as affecting full-member status only occasionally.

Speaking English as a second language while working in the United States sets foreign-born workers apart from their U.S.-born counterparts as soon as communicative interactions begin. The findings regarding language in this quantitative portion of the study were pivotal to this project in that they alerted me to a potential disconnect between what domestic and foreign-born participants said about the importance of English as a second language in analytical chemistry. Specifically, domestic participants saw language as a significantly less important to occupational membership and inclusion than foreign-born workers. Because of this notable difference in statistical data, I asked participants in qualitative interviews to discuss if and how the English language was relevant in the occupation. The findings from these interviews, which suggested that domestic workers have significant and serious concerns about language issues functioning as roadblocks to occupational membership and occupational success, contradicted the quantitative results in this study. Without the use of multiple methods in this study, it is possible that serious inquiry into the inconsistencies surrounding occupation and language would have gone overlooked. Instead, Chapter V is devoted to
investigating the impact of language in the scientific workplace and demonstrates the importance of active interaction between methods.

Survey questions also explored how socially coded characteristics, such as race, gender, national origin, and age, were seen as relevant to perceptions of work. This aspect of the project yielded interesting results. When participants were asked to rate a list of socially coded characteristics in accordance with how they believed or how they thought others believed each characteristic impacted their work, foreign-born participants did not differ significantly in their responses compared to U.S.-born participants. However, when foreign-born participants were asked how their own demographic background had affected their work, foreign-born analytical chemists reported at a significantly higher rate than U.S.-born participants that their background affected their work. This finding suggests that foreign-born analytical chemists may see the effects of their background as an individually based phenomenon rather than as an indication of a group-wide effect. This result mirrors research in the literature review which suggested that studies on foreign-born workers rhetorically position the foreign-born individual as the site of difference, which subsequently obscures focus on group-level effects of difference. Because information that positions the foreign-born worker as an individual could be argued as the most popularly available (Zeidner, 2009), it is possible that foreign-born analytical chemists are not as aware of group-wide issues impacting national origin at work compared to their own individual experiences. As a result, it is possible that they consider the issues that they face unique to them and thus either not worthy or too embarrassing to address in social or public settings.
These same questions surrounding experiences of difference also showed significance between genders. Reports showed that women saw gender as impacting perceptions of work at a significantly higher rate than men did. However, they did not show a significant difference when participants were asked about the impact of their own background at work. Major strides in equality that arose from the feminist movement as well as the Civil Rights Act of 1964 have allowed women to become steadily more aware of the gender-based structural and systemic barriers within organizational environments. Women in the survey likely reported that gender broadly affects perceptions of work because of their awareness that gender functions as an organizing principle. While there was a difference between genders as it related to the impact of personal background on work, this difference was on the border of significance \( (p=.051) \). This finding does not suggest that women do not experience marginalization and discrimination in the occupation, it simply offers that women’s own reports of their backgrounds affecting their work do not differ significantly from that of men’s reports in this instance.

**Stereotypes**

Because stereotypes play a substantial role in our understanding of social identities (Tajfel, 1982), I wanted to know if and how socially coded characteristics reported as impacting work were objectified by participants as stereotypical in the analytical chemistry occupation. In addition, I also was interested in knowing whether participants considered these potential stereotypes as helpful or hurtful in the occupation. Ninety-three participants responded when asked to describe the stereotypical analytical chemist. The most prevalent archetype was a male, most likely White in race, wearing a
white lab coat. The data also implied that this individual was U.S.-born\(^6\). Participants were asked whether fitting or not fitting the stereotype they had described had helped or hurt them in their occupation. Interestingly, women reported at significantly higher rates than men that not fitting the stereotypical image of an analytical chemist helped them but also hurt them. What these results demonstrated was that women in the survey were polarized regarding whether or not fitting the stereotypical image was beneficial or detrimental for their careers. Further review of the data revealed that, while statistically significant differences were not present, reports on this item varied based on whether women were foreign-born or U.S.-born. Means indicated that foreign-born women reported they were hurt by the stereotype more than they were helped. None of the individual foreign-born female participants scored that they were helped by not fitting the stereotype at a higher rate than they reported being hurt. This was not so for U.S.-born women. In fact, 7 of the 22 individual U.S.-born women participants scored that they were helped by not fitting the stereotype at a higher rate than being hurt by the stereotype. Overall, means indicated that U.S.-born women reported that they were helped by the stereotype more than they were hurt by it.

This difference in response could be linked to popular U.S. conceptions of tokenism (Murray, 1996; Williams, 1992) that suggest that being the outsider holds benefits and rewards not easily accessed by the mainstream. Qualitative interviews suggested that some U.S.-born women felt they were helped by not fitting the stereotype because they were a bit more extroverted and a bit less “nerdy” than the stereotypical

\(^6\) When participant’s purposely noted nation-status in this section, it was to clearly denote foreign-status. Because of this method of marking difference and because the survey was only conducted with practitioners working in the U.S., it was assumed that the absence of reference to nation-status implied U.S.-status.
analytical chemist (Qualitative Interviews, 2009). Depending on their tenure in the United States, it is possible that these conceptions of access and benefits likely do not hold as much social significance for foreign-born female analytical chemists due to additional complicating factors such as language skill and cultural difference that may limit full inclusion at work, even as a “token” employee.

Group Acceptance and Treatment

Beyond the effects of stereotypes in the workplace, the final area this research aimed to develop were the differences, if any, in treatment of and behavior toward diverse workers compared to workers considered mainstream in the analytical chemistry field. The results from the WDQ demonstrated that, across the board, foreign-born men and U.S.- and foreign-born women reported significantly higher levels of exclusion, misunderstanding, negative evaluations, and the need for higher levels of conforming ideation than U.S.-born workers and U.S.-born males, respectively. These findings suggest that socially coded characteristics do impact the occupational identity of analytical chemists, regardless of prevalent conceptions related to scientific fields which imply, through omission, that aspects of difference are not relevant to scientific work. These findings are particularly important given the lack of discussion about difference in scientific fields and occupations, and they point to a need for additional and varied research in this area. This quantitative data, which demonstrates statistically the difference in occupational experience between highly skilled and educated foreign-born workers and highly skilled and educated domestic workers, is extraordinarily valuable because it makes obvious that regardless of class and education, bias still functions in
these types of occupations. These data directed my qualitative inquiry in Chapters V and VI toward expanding and developing a communicative understanding into how this bias functions so effectively and consistently in the occupation.

Job Satisfaction

Given the results from the WDQ, it seemed reasonable to expect that foreign-born analytical chemists would report lower levels of intrinsic and extrinsic job satisfaction than U.S.-born populations. This, however, was not the case. Foreign-born workers showed no significant differences in reporting job satisfaction than their U.S.-born counterparts. Ang, Van Dyne, and Begley (2003) had similar findings in their research and found in postsurvey interviews that foreign-born employees measured their job satisfaction as compared to previous job satisfaction in their home countries. In addition, this study’s result may indicate a tendency to not readily link job satisfaction to difficult personnel interactions or organizational systems. Given the data obtained from quantitative survey comments and the qualitative phase of this project, I argue that individuals who choose to leave their home countries and move to a foreign environment where they have few social resources to rely upon possess personal views and characteristics (such as determination and ambition) that allow them to overlook U.S. measures of job satisfaction that may prove unpleasant for other workers. One foreign-born interview participant stated:

…I think what you also need to understand is that…the people who leave their country and they go, you know, to like a brand new country…they’re very ambitious. They’re extremely ambitious. They’re not the people who don’t have the ambition, you know, to do something. When they get [here], they have to make it work somehow.” (Qualitative Interview, 11201)
This comment makes it clear that foreign-born workers are likely to find ways to succeed in U.S. organizational settings regardless of the barriers or difficulties placed in their way.

Foreign-born workers in this study appeared to be satisfied in large part just to have the opportunity to work in the United States, where they claimed to have greater opportunities for growth and development than in other locations. When asked for any final comments, one survey participant reported, “I am very grateful for the opportunities given to me. It is a hard work job. My achievement can only be realized in this great country USA” (Survey Data, 2009). Another participant stated, “As an immigrated scientist, I can't ask more for what I have already got at the position of highest leadership for bioanalytical chemistry… I always feel grateful for the opportunities that were given to me by my bosses and companies” (Survey Data, 2009). These comments suggested that the opportunity for greater growth and development at work were more important to these participants than other measures of satisfaction such as acceptance.

In regard to job satisfaction, previous findings related to gender (Wharton & Baron, 1991) appear to align with findings of women’s job satisfaction in the analytical chemistry occupation. Wharton and Baron argued in their research that employees weigh the costs and benefits associated with a job in total when measuring their overall job satisfaction and thus do not measure satisfaction solely in terms of negative experiences in the occupation. In addition, they also assert that when women are a relative minority in an occupation (as they are in analytical chemistry), they often receive benefits of token status. This was evidenced in U.S.-born women’s comments in the survey which suggested that not fitting the stereotype was of benefit to them in their occupations.
Additional gender research salient for this project has suggested that gender-based differences in job satisfaction reporting would disappear for highly-educated, professional occupations (Clark, 1997), such as analytical chemistry.

Summary

This research offers a fairly in-depth view of the ways that socially coded characteristics are experienced and understood as part of the occupational identity of the analytical chemist. Findings supported that socially coded characteristics are considered relevant in job and supervisory responsibilities, the ability to be considered a full member of the work group, and overall the experiences of treatment within the occupation. The link between the body of the worker and the work the practitioner performed was particularly evident in questions regarding job and supervisory responsibilities. Questions regarding aspects of difference as related to the occupational practitioner also showed significant differences in the ways that individuals were perceived in the performance of their work. Issues surrounding language, national origin, and gender were key themes for participants in this research. This research also demonstrated that national origin and gender negatively impact acceptance at work as measured by inclusion, understanding, positive treatment, and varied ideation. Throughout this phase of the research, multiple strands of quantitative data were identified and pulled through the qualitative study to inform and strengthen my overall findings. Issues of gender, language, occupational bias, and intersectionality were identified as particularly salient in the survey and consequently were deeply explored in the qualitative phase. Chapters V and VI confirm the value of multiple methods within a study by developing the identified
aspects of data from the quantitative phase. In turn, the qualitative phase also provides corroborations to many of the quantitative findings in this chapter.

The next chapter will present the second phase of this project: in-depth qualitative interviews. It will review the methods and processes used to perform the interviews as well as discuss the first topic of the qualitative data—communicating good science.
CHAPTER V

COMMUNICATING GOOD SCIENCE

To review, this project's research question asks how, if at all, discourses of difference and socially coded characteristics are experienced and understood as part of the occupational identity of the analytical chemist. Chapter IV offered, from multiple perspectives, the ways that socially coded characteristics associated with analytical chemists are linked to the material organization and experience of work. Of import to the qualitative phase of this project, I demonstrated in Chapter IV that socially coded characteristics are seen by occupational practitioners as affecting occupational performance membership and acceptance in substantial ways. I suggest that these findings demonstrate that issues of difference require further examination in the fields of science. In this chapter, I aim to answer how discourses of difference (i.e., locally achieved everyday talk and embodied performances) inform decisions about work.

I have taken a mixed methods approach in this project in order to study difference in science from a perspective of statistically significant understandings and in-depth conceptions of how difference actually manifests through negotiations of power. To develop my understanding of these conceptions of difference, I centered the qualitative phase of the project around in-depth interviews with people in the analytical chemistry occupation. I took an unconventional approach in this study and presented my
quantitative methods along with my results in Chapter IV. I will now cover the qualitative methods for Chapters V and VI here in order to ensure that all methods and analyses are logically linked (within chapters) for review. My overall aim here is to provide a smooth transition in reading and reviewing the different phases of this project.

**Phase II Interviews**

In the interviews, I asked questions to access how participants saw difference affecting or not affecting their work. I aimed to have participants share their “stories, tales, gossip, anecdotes and parables” (Lindlof and Taylor, 2002, p. 179) regarding difference and analytical chemistry, and so I engaged in narrative interviewing. Lindlof and Taylor discuss personal and organizational narratives as separate threads of narrative interview study, and I believe that both were important and beneficial to my research. Specifically, a focus on personal narrative allowed me to learn about each participant’s experiences in relation to issues of difference, such as nation, “gender…and other politicized identities” (pp. 180-181) and better understand how they positioned their own occupational identity in the context of the United States. Another benefit of including organizational narrative questions was that they focus on how members “themselves are sources of stories that become embedded in, or problematic to, the minds and actions of the membership” (p. 181). I specifically set out to understand how participants perceived that their status as highly skilled foreign-born and U.S.-born workers affected organizational and occupational work systems and practices.
I interviewed participants using a mixture of structured and nonstructured interview questions. In the structured interview questions, I used a mixture of nondirective, directive, and closing questions. I asked nondirective questions that prompted participants to discuss why they chose analytical chemistry as a career, trace the history of said career, and describe their employment organization; these questions allowed the participants to become more comfortable in the interview setting. The directive questions I asked pressed participants to share issues surrounding their work status (e.g., the difficulty or ease in obtaining the right to work in the U.S.), their actual labor in analytical chemistry, and their experiences with supervisors, supervisees, and coworkers. My closing questions focused on OCI and difference. Through these questions, I encouraged participants to talk about their jobs as analytical chemists and how they saw difference (manifested as everyday talk, embodied performance, broad social narratives, etc.) affecting their occupational identity. I invited them to share narratives related to these topics. If participants had supervisory responsibility, I also asked them about the process by which they recruited and managed the performance of employees. The interviews allowed me to access how participants saw difference as affecting their occupational identities, how they participated in the construction process of the analytical chemist occupational identity, and how they functioned as a product of that construction.

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7 Interview guide is attached as Appendix B.
Procedures

At the conclusion of the Phase I survey, participants were asked if they were interested in a follow-up interview. I received 32 initial responses from survey participants about the interview process. An additional 4 participants contacted me to express interest in being interviewed for the project after speaking with colleagues that had also taken the survey. I contacted all participants within 1 week of their indication of interest in the interview process (many within 1 to 2 days). Immediately upon contact, participants were informed of 1) the purpose of the interview, 2) the time commitments of participating, 3) the voluntary and confidential nature of the interview data, 4) the contact information for questions and/or concerns, and 5) my appreciation for their willingness to consider participation. Following distribution of this detailed interview information, a total of 24 participants indicated their continued interest in the process. Two participants ended up cancelling their interviews on their scheduled dates due to scheduling conflicts, and they did not reschedule.

In total, I completed 22 in-depth interviews with analytical chemists from varied organizational backgrounds, cultures, genders, and national origins. Interviews were scheduled for 60 minutes and, after consent was given, they were recorded electronically. Recorded data yielded 371 single-spaced pages of transcripts.

Participants

Participants in the interview process were diverse in education and occupational tenure, and in background, age, national origin, and gender. Of the 22 participants, 36% identified as U.S.-born males, 23% identified as foreign-born males, 27% identified as
U.S.-born females, and 14% identified as foreign-born females. Participants identified their national origins as Australia, Bulgaria, China, Germany, Sweden, and the United States\(^8\). Their ages ranged from 34–64, and their occupational titles in the field ranged from Research Associate to Professor to Senior Vice President.

**Data Analysis**

In this section, I describe the methods I employed to analyze my qualitative interview data. Because I had already become familiar with the quantitative data in the project and thus could not reasonably suggest that I was purely inductively coding the qualitative data, it was inappropriate to invoke grounded theory (Glaser & Strauss, 1967) as a method of analysis. I also did not want to inadvertently limit the interview data by creating *a priori* codes prior to initiating the interviews. As a result, I chose the general accounting scheme coding method discussed by Miles and Huberman (1994) and invoked by both Lofland (1971) and Bogdan and Biklen (1992), which is considered a middle-ground between *grounded* and *a priori* options. This process allows for the creation of “a general accounting scheme for codes that is not content specific, but points to the general domains in which codes can be developed inductively” (Miles & Huberman, 1994, p. 61). This method allowed me to come to the data knowing the main categories that would likely be salient, while also providing me the opportunity to inductively develop codes within those categories. The general codes I created prior to initiating the interviews were: Good science prevents discrimination; Language skill and national origin as a

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\(^8\) Similar to data obtained in the Phase I survey, participants in the interviews identified only by national origin and did not discuss race as a separate discourse. This precluded the ability to theorize regarding discourses of race in the analytical chemistry occupation. Reflections on this aspect of the project are discussed in more detail in Chapter VII.
barrier to good science; Analytical chemistry as a marginalized field; Gender as relevant in science; and Intersectionality in analytical chemistry. While these codes remained relatively consistent throughout my analysis, data within these codes were inductively developed to create a more nuanced and rich understanding of discourses of difference in analytical chemistry.

I read all of the transcripts in their entirety several times in order to become comfortable and familiar with the data as well as to note initial themes. Next, I used the codes I had already developed to begin the initial process of coding, which I did by color coding relevant sections of data. I read and listened to the interviews during this process in an attempt to “re-enter” the interview environment and to identify the stories during which participants showed excitement, frustration, and engagement with the information they were sharing. I looked for contradictions and tensions between the language of their stories and the behaviors they described in the stories. I also looked for subtle statements and utterances outside of the defined stories that exemplified “taken-for-granted” beliefs that the participant may have shared, as well as off-the-cuff comments about the analytical chemistry field or the people working within that field.

After completing the initial coding of the transcripts, I separated the data so that I could focus on each broad theme individually. This allowed me to inductively code within the initial themes in order to develop codes that more deeply accessed information within the transcripts. At this point, I chose to reduce my data into a display in order to clearly read and understand the information that I had available. Because my data addressed the research question from multiple perspectives, I wanted a display that would allow me to note relationships among the data as well as to compare and contrast it. I
thus chose to create a conceptually clustered matrix (Miles & Huberman, 1994). This “matrix has its rows and columns arranged to bring together items that ‘belong together’” (p. 127), either conceptually or empirically. I began the categorization of items within the matrix with concepts from the initial codes I used to analyze the data. I labeled rows with discourses of difference regularly shared within stories, and I labeled columns with effects of discourses of difference that were referred to or implied. The intersections of these rows and columns showed nuanced relationships between aspects and effects of difference. The nuance was evident in the difficulty and ambivalence participants exhibited while explaining and making sense of their experiences of difference at work. I saw two coherent themes in the matrix, which I named 1) communication-difference enthymeme of science and 2) hierarchies of difference. I now turn to the first theme to demonstrate how the study of science through a lens of difference provides a view into subtle mechanisms that create tensions and limitations at work for diverse employees. I discuss the second theme, hierarchies of difference, in Chapter VI, and I take the converse approach to this chapter by examining difference through a lens of science. This perspective provides the opportunity to consider the ways in which discourses of intersectional difference become rationale for occupational tasks and standings at work.

Language and Communication in Science

The first theme in this research centers on the use of language and communication (which encompasses discursive representations of social, cultural, and linguistic performances) in the analytical chemistry occupation. Whether in a scientific environment, an accounting office, or just in the grocery store, most people accept that
language, and the ability to speak the majority language in a specific setting, is fundamental to social interaction. This is because a common understanding of language is that it is a key aspect of human capital (Lazear, 1999) that allows for the coordination of behavior, including the ability to access work or trade. Various arguments regarding language as capital have demonstrated that one’s social stability and economic success are closely tied to whether or not the native language one speaks is also the majority language in their work context (Davila et al., 1993; Gouveia & Rousseau, 2007; Kossoudji, 1988; Lazear, 1999). This is because language performance is not simply the correct and appropriate recitation of words; it is an ongoing and embodied performance and representation of cultural competence manifested in verbal, nonverbal, written, and kinesthetic communication. These performances trigger associated broad social narratives which suggest there are acceptable ranges of divergence in language performance. Those within range are able to “pass” as, or as similar to, dominant group members. Those outside of the range are generally unable to pass and are thus potentially marked as inferior. Markers that appear to activate social narratives regarding difference are competence in oral and written communication, noticeable variations in grammar, accent, cadence and emphasis, eye contact, the use of space, gesturing and posturing, the use of silence, and even the use of artifacts (Knapp, 1972; Lang, 1986; Wood, 1999). The embodied performance of language demonstrates difference and sameness to coworkers, and in doing so, it sets the stage for discriminatory behavior in the workplace.

Broadly speaking, these social narratives reflect that language is a representation of culture. It is not surprising then that language functions as a marker of economic, social, and symbolic power. Numerous studies have demonstrated economic differences
between those that speak the native language as primary versus secondary (Bloom & Grenier, 1992; Dustmann, 1994; Shapiro & Stelcner, 1996). Those that speak the native language as secondary routinely find difficulty in gaining stable employment at a living wage. Disturbingly, knowing the majority language in addition to a minority language does not appear to improve economic conditions for minority group members. Those who speak a nonnative language as primary but have learned the majority language actually often have lower wages than those who know only the majority language (Pendakur & Pendakur, 2002). These economic differences signal the power inherent in majority group social systems and hint at the insidious and pervasive mechanisms that function to segregate groups of people by culture, national origin, and race. When the majority language is secondary, bilingualism, because it denotes difference and the likelihood of minority status, is linked to economic instability, even though by all other accounts it should function as an economic benefit.

Differences in language performance also affect social and symbolic power in professional environments. Speaking the native language as primary but with a style, tone, or affect that is considered indicative of minority status can function as a social determiner of worth and value. Johnson and Buttmy’s (1982) study on perceptions of Black speakers indicated that people responded more negatively to speakers who “sounded Black” when discussing intellectual material than to speakers who “sounded White.” If employers use language as a tool for measuring intelligence, the performance of language can set the stage for organizational decisions about employee development, promotion, and retention. Fundamentally, language performance itself functions as symbolic power in that it has the ability to divide groups and assert representations upon
those groups that are either beneficial or detrimental materially and symbolically (Bourdieu, 1991).

These theories surrounding the effects of language at social and organizational levels appear to also hold true in the analytical chemistry occupation. The quantitative data in Chapter IV indicated that foreign-born participants felt that differences in language skill and fluency in the U.S. workplace affected one’s ability to be included as a full member of a group. U.S.-born participants, however, significantly differed in reports of this perception, suggesting that difference in language skill and fluency did not affect one’s ability to be included as a full member of a group as much as foreign-born participants reported. Because of the crucial role that language performance plays in experiences of difference, I tagged this statistical difference for further examination in the interview phase of this project. The interview responses in this second phase of the research indicated that both U.S.-born and foreign-born participants saw language as a key issue at work, and, interestingly, U.S.-born participants highlighted language issues in great detail. Through the mixed methods approach used in this project, a disjuncture between U.S.-born quantitative and qualitative responses became evident. U.S.-born quantitative responses demonstrated less concern over this issue (as measured by their survey responses suggesting that language ability occasionally affects occupational membership) than their qualitative responses (which detailed the substantial role of language in occupational membership). These differences in findings prompted me to inquire how shifts in participant communication allowed such inconsistencies to coincide.

To access these shifts, I reviewed participant responses to my questions about the occupation. I had asked specific questions about the skills necessary to function as a
“good analytical chemist,” whether participants believed issues of difference or diversity ever played a role in the analytical chemistry occupation, and, if so, what role those differences played. Throughout the course of their responses, many participants referred to language and communication as important aspects of the analytical chemistry occupation. Their answers demonstrated 1) a consistent message regarding the necessity for clear, direct communication in analytical chemistry occupations performed in U.S. scientific teams and 2) a concern that not all analytical chemists could adequately enact that type of communication. Multiple reviews and analyses of the interview data revealed a pattern in participants’ stories. Responses across participants demonstrated a “syllogistic decision-making process” (Tompkins & Cheney, 1985/2006, p. 189) regarding communication and difference in science.

This decision-making process is best explained in Tompkins and Cheney’s (1985/2006) discussion of organizational identification and control in the workplace. Here, they develop the concept of the enthymeme by dividing it into two subsets in order to explain the ways employers develop and maintain organizational identification. Enthymeme1 suggests that throughout primary socialization, individuals learn and internalize socially appropriate expectations and values. Later in life, employers will expect employees to apply these premises to their own decision making regarding work (e.g., Premise: hard work is a valuable trait / Conclusion: I want to work hard for my employer). However, because working individuals have to consider all aspects of their lives when making decisions, employers cannot always assume that employees will apply the premise that will most benefit the employer. As a result, enthymeme2 is “a syllogistic decision-making process, individual or collective, in which a conclusion is drawn from
premises (beliefs, values, expectations) inculcated in the decision maker(s) by the controlling members of the organization” (Tompkins & Cheney, 1985/2006, p. 168).

Tompkins and Cheney’s enthymeme is incredibly valuable for analyzing unobtrusive control in organizations. It allows researchers to pinpoint the ways that beliefs, whether accurate or inaccurate, can play legitimate roles in workplace decisions. In addition, I believe that their definition of the enthymeme provides an opportunity to extend theory on an additional type of control in the workplace—occupational control.

Occupational Control

Occupational control has been primarily conceptualized as “the collective capability of members of an occupation to preserve unique authority in the definition, conduct and evaluation of their work and also to determine the conditions of entry to and exit from practice within occupational parameters” (Child & Fulk, 1982, p.155). It is certain that occupational practitioners exercise occupational control to maintain the boundaries and definition of their work. I argue, however, that the current definition of occupational control overlooks the ways control is communicatively exercised. As such, I suggest that the definition of occupational control be extended to reflect how occupational decisional premises, which come from expectations, rules, and beliefs emanating from occupational identity, function to control the behavior of occupational practitioners.

Barker and Cheney (1994) take up discussions of unobtrusive control in their research that which develops the concept of concertive control (first coined by Tompkins & Cheney). The theory of concertive control suggests that while there are supervisors
present in organizations, the primary method of control in many types of organizations comes from the work group’s collective “agreement” to follow standards of practice. This agreement comes to exist through four processes. First, employees accept that they must “yield” to general organizational values, rules, etc. in order to function as part of the group. Second, through collaboration in the organization, employees create ways of knowing and operating that are effective and productive organizationally. The routine application of these standards of operation defines an expected structure of work and implies corresponding discipline necessary for maintaining that structure. Third, this discipline becomes part of normal everyday interaction among employees and is governed through self and peer monitoring. Fourth, these “disciplinary mechanisms” become powerful through their association with values by/in which employees are motivated/invested.

I suggest that occupational control functions similarly to concertive control but with a few small exceptions. First, occupational practitioners yield to rules and values of the occupation that they likely see as in line with their occupational identity. For analytical chemists, the development of this identity stems in part from the substantial training an analytical chemist receives to perform work: advanced educations including both the formal and informal inculcation into occupational practices, expectations, norms and beliefs, as well as occupational associations that center specifically on the occupation rather than the organization. Second, occupational practitioners create and follow standards and practices in the occupation itself that can be transferred across organizational settings and are assumed as appropriate and effective in the occupation. For example, analytical chemists follow standard validation practices in the occupation.
regardless of the organizationally-driven project on which they are working. These standards are not coercively controlled per se but are expected to be maintained and followed by individual practitioners in order to do “good science.” In this project, it is these standards of “good science” in the analytical chemistry occupation that are examined for their underlying premises regarding difference. The premises discussed in this project are shown to control practitioner decisions and behaviors about difference in the occupation. This control happens in indirect and diffuse ways, because as Barker and Cheney argue, expectations of conformity surrounding expected ways of knowing and working become part of everyday, normal interaction. Thus, decisions about difference appear normal and to be “just the way things are” at work.

In the occupation, disciplinary mechanisms associated with “good science” are extremely powerful not only because they are associated with occupational identity, in which the employee is invested, but also because of the substantial stake the employee has in the occupation itself. Highly skilled, scientific positions require (as mentioned earlier) significant undergraduate and often graduate training. While many employees are reasonably committed to their organizations, I would assert that in highly skilled positions, employees are equally committed to their occupations knowing that their “trade” is what enables them to gain work within organizations.

To be clear, this theory of occupational control is not, in any way, assumed to take the place of concertive control in the organization. I argue that these aspects of control work in parallel with one another. More specifically, I posit that occupational control begins functioning early on in a practitioner’s education with the development of occupational beliefs, norms, and expectations. In essence, this control develops along
with the occupational identity of the practitioner such that the practitioner’s identity is bound up in expected self-disciplinary behavior regarding the right and appropriate ways to perform work. The disciplinary mechanisms are extremely powerful in this work because effectively conforming to them implies occupational success. When the practitioner gains employment and begins the process of identification in specific organizations, concertive control becomes a parallel dimension in which the employee monitors self and peer for compliance with not only organizational standards but occupational standards as well.

The enthymeme developed in this project from participant reflections was not bound by or to particular organizations. Of the 22 interview participants, only 4 (2 in one organization and 2 in another) were associated with the same organization. As such, organizational identification and concertive control were not directly examined in this study. The responses from participants indicated a convergence of premises around the occupation—not the organization. Thus, this chapter aims to shed light on the ways that occupational premises of good science control the actions of occupational practitioners.

**The Communication-Difference Enthymeme of Science**

The premises that occupational practitioners relied on in their reflections of difference facilitated my development of the communication-difference enthymeme of science. This enthymeme is made up of three parts. It starts with a premise considered true⁹ by survey and interview participants: 1) Good science prevents discrimination. If the first premise is combined with another premise also considered true, in this case, 2)
Good science is impeded by communication problems related to difference, then the conclusion can also be considered true (Rieke, Sillars, & Peterson, 2009). Here, the conclusion is 3) Difference may prevent good science. As with all enthymemes, most participants omitted one premise or the conclusion from their discussions. For instance, some offered in a story that good science has nothing to do with difference. Yet later, in the same story or in an entirely new story, they detailed the ways in which behaviors and beliefs associated with difference impeded good scientific work or affected their decisions about scientists.

Many participants (both U.S.- and foreign-born) labored to demonstrate that they did not harbor specific biases against individuals of different cultures or national origins and appeared distinctly uncomfortable when faced with making sense of their occupational practices as related to diversity. Without exerting effort to complete the syllogism, individuals did not have to consider how discourses of difference are woven into science in the U.S. For example, one participant shared her experience of recruiting an analytical chemist for her organization. She prefaced her discussion by stating that she and her colleague did not ignore issues of difference such as national origin or gender, but that they were primarily interested in analytical skill; “we tend to focus much more on technical” skills (Interview 11231) when recruiting. As the discussion progressed, the participant characterized the applicants for the job: “one was a Chinese PhD and one was a woman.” After noting that neither of these candidates was hired, the interview participant stated that the job was reposted. The new applicants included “two Chinese…one Russian [and one U.S.-born White] …men.” The participant stated that demographics had nothing to do with their decision, but that, as “the elephant in the
corner,” demographics were hard to ignore. This comment suggested that the participant recognized demographic background as a salient and noticeable aspect of applicant identity but felt that she and her colleagues had done their best to “ignore” those identity aspects in their decision-making process. According to the participant, the final recruitment decision came down to the particular applicant’s skills in the occupation and their geographic proximity to the organization, but the participant also stated the chosen candidate was the one U.S.-born, White male. This story exemplifies the conflicted relationship that the analytical chemistry participants had with diversity. Plainly, participants wanted to demonstrate that difference did not affect work or considerations of work – that technical skills and ability were the tools for measurement. But the presence of difference was hard to ignore…the elephant in the corner.

As an occupational field, analytical chemistry is extremely diverse in terms of national origin (Chemcensus, 2005). Given the diversity of the occupation, it made sense that participants did not suggest national origin and culture as counter to good science. However, through the process of equating “good science” with clear and direct communication, it appeared that those who did not perform communication in the ways deemed appropriate by the majority in the analytical chemistry field in the U.S. were generally seen as impeding good science. In other words, it was not a surprise that, given the highly educated and diverse population interviewed, participants did not directly state that they discriminated by national origin or culture. Instead, the vast majority of participants (foreign- and U.S.-born) contributed at multiple levels to the communication-difference enthymeme of science, which implies difference can impede good science in the U.S. This finding, regarding issues of difference as they relate to scientific
occupations, indicates that even though social, cultural, and linguistic performances are rarely discussed directly in science, they still have a significant impact on worker experience. In addition, this finding provides insight into the Chapter IV quantitative responses by U.S.-born participants that did not rate language as highly in importance as their foreign-born peers in occupational membership and success. It is possible that because language discrimination is happening through moments of subtle occupational control, that U.S.-born participants did not recognize how ingrained occupational beliefs about language inform their day-to-day decisions about the occupation in ways which contradict their own personal beliefs about diversity. In other words, what they say and what they do may not always coincide.

Going forward, this chapter will demonstrate through the communication-difference enthymeme of science that language differences at work are more than just a point of cultural difference. Via the analysis of these premises and conclusion, I argue that language difference manifests as an issue of power and politics at work that results in privilege for those using dominant forms of communication and oppression for those that do not.

Good Science Prevents Discrimination

A commonly heard expression is that science itself is an international language (Benfield & Howard, 2000). This expression comes from the idea that science operates outside of, or beyond, the “normal” interactional parameters of communication (e.g., 2 hydrogen + 1 oxygen = H₂O). In contrast to critical theories which assume that all knowledge is based in power relationships and can consequently shift based on context,
the field of analytical chemistry assumes that accuracy and precision are immovable constructs that do not shift because of power but because of analytical, fact-based calculations. Analytical chemistry and similar scientific fields presume that the practice of positivist methods ensures good science. These conceptions of science were a common theme with interview participants. The majority of participants who spoke broadly about the field of science referred both directly and indirectly to this phenomenon, stating, “…science is more of… an international language” (Interview 1119) and that through a focus on scientific equations above all else, quality work in the field of analytical chemistry can be done. As one participant stated: “…we live in a world of equations and I do everything to promote that particular stereotype…I’d like to see more of the highly structured thinking that I think promotes quality work but it doesn’t always work that way” (Interview 1130).

Because participants saw science as an international language, as a way of communicating across differences, they suggested that issues of difference would not impact good analytical chemistry. This perception provides an explanation for the gap referred to in the literature regarding the absence of foreign-born workers in science research. The concept that good science transcends difference makes a case for treating all scientists as “bodyless” and consequently for not examining what role difference has in studies of scientific occupations. Therefore, there is an underlying theory in science that difference does not require examination due to its logical lack of place in the field. The implication of the first premise (Good science prevents discrimination) and the idea that science does not need to examine difference suggest that the occupation functions as a filter for discrimination. The invocation of the metaphor of a filter allows the
occupation to be examined as semiporous; it does not obviously exclude, but subtly limits what passes through. In this context, the analytical chemist is placed in the filter, which then allows those who do “good science” to pass through. This metaphor forefronts the concept “good science” and highlights it for critical consideration. Previous research would suggest that the occupation filters for the good scientist, leaving discrimination and other unrelated issues behind. I assert that the concept of “good science” is predicated on difference in such a way that when the occupation filters for the good scientist, it is a particular embodied subject that passes through along with unexamined conceptions of difference in science. The concept of good science is not just about the tasks and labor at work, but it is based, in part, on the identity of the embodied subject and his or her particular performance of the work. As a result, the concept of good science and the power active within it was taken up for further examination.

The concept of good science was expanded upon by participants in multiple interviews. From their reflections, it was clear that they believed scientific inquiry and scholarship consider human differences as immaterial to scientific pursuits. The scientific episteme has no place for consideration of things not objectively manifested in the research process and, as a result, participants were able to suggest that discrimination has no home in the quest for good science. The excerpts provided throughout this section typify references made by participants regarding good science and good scientists. “If you’re a good scientist [then] I think people will respect your opinions and whatnot regardless [of your background]” (Interview 11182). Participants used the fundamental goals of science (such as understanding a process, characterization, or result) as rationale for a lack of concern regarding difference.
…science is often more focused on [research] issues than appearance. So I would think overall, people have probably an easier way to doing science. …You have these people who focus so much on a specific theme [of research] that I can see that [diversity] probably doesn’t play such a big role. (Interview 1117)

The process of invoking scientific “tools of the trade” in discussions of difference provided a mechanism to refocus on the aspects of analytical chemistry that can be measured and quantified rather than experienced or felt. “What matters is how smart you are, how well you understand the techniques and how you apply…the techniques to what problems” (Interview 11202). When asked about the stereotypical image of an analytical chemist, one participant responded, “Don’t know, don’t care. The question is, are they a good analytical chemist?” (Survey Data, 2009). These responses, from both the survey and interview data, exemplify the paradoxical effects of employing the scientific episteme to human bodies. By ignoring differences above all else, participants are practicing what is often preached in discrimination prevention training courses: focus on behavior, not on background. It can be argued that relying on this epistemological approach to work will allow employees to function relatively free of organizational problems (at least from a legal standpoint) —they will not be charged with discrimination or harassment in the workplace. On the other hand, by ignoring the embodied subject, and reducing the human experience to a set of technical and analytical skills, participants may create an environment that provides little opportunity for the voicing of minority member opinions and standpoints.

In summary, participants suggested that discrimination is uncommon in the field of analytical chemistry because the practice of “good science” prevents discriminatory behavior. However, their method of measuring good science is unclear. By ignoring all aspects of background in order to retain the concept of good science, those who are
different become “veiled” occupational members. I suggest this is problematic because if diverse analytical chemists are not considered full members of the occupational group, it follows that the occupational group doing the measuring is likely not considering diversity when determining the measurement of good science. This concern led me to what became the second premise of the communication-difference enthymeme of science—good science is impeded by problems related to difference.

Good Science is Impeded by Problems Related to Difference

In 1996, Momsen and Simeral compiled research on the traits of analytical chemists in the U.S. As an analytical chemist himself, Simeral noted that the individuals engaged in the occupation appeared to have similar personality characteristics which allowed them to succeed in the field. He found that analytical chemists tended to be introverts skilled in “internal processing based on logical data gathering and decisions” (Momsen & Simeral, 1996; Simeral, 1999). Responses from participants in this project built on Simeral’s findings, offering that good science, and specifically, good analytical chemistry, could be measured by the ability to balance creative problem-solving with meticulous attention to process and documentation. Outside of many scientific fields, creativity and meticulous rule-based documentation generally are not seen as complementary. Analytical chemists appear to then function through “creative tensions” (Pelz & Andrews, 1966, p. 7) that invoke a continual push and pull between innovation and established method and protocol. This participant’s reflection about the occupation summarized concepts and beliefs shared by survey and interview participants when asked about the skills needed in the job:
You need to be creative to overcome challenges and very detail oriented, which is why they’re called “anal” chemists sometimes, in that you keep meticulous notes so that you can go back and discover where, if something failed, why it failed and overcome that challenge. If you don’t take the initiative to solve a problem, it’s probably not going to get solved. It’s just going to keep going and continue to have problems until it becomes catastrophic. (Interview 11232)

To be an analytical chemist, it is essential to be inventive and open to new ideas, but as the participant states, it is also crucial to be “anal” in your attention to detail. The bulk of survey and interview participants shared that their path to analytical chemistry was not straightforward, but rather was a process in which they eventually found or fell into this occupation that allowed them to use their creative thinking, mechanical aptitude, precision, and accuracy for a purpose.

I was always interested in answering the question as to why something is like the way it is. My mom tells me…that I was already ripping apart toasters because I wanted to see how they look inside. So I think I like to answer some basic questions on how are things driven, how are things being put together. So it's a very innate thing that I have been following essentially my passion. During my Ph.D., I started doing more and more analytical chemistry [and that] is how I got into that. (Interview 1117)

This participant describes how early in life, she was interested in technically investigating the things around her. During her advanced schooling, she began formally studying analytical chemistry because she saw her “passion,” or the technical work that she had engaged in for simple enjoyment as a younger person, as a core aspect of the occupation. The vast majority of participants described similar rationale for their occupation choice; they were drawn to the occupation by the process of the work.

It is not surprising then that the combination of skills participants reported possessing (e.g., technical precision and attention to detail) were also identified as promoting good science, and more specifically, promoting the practice of good analytical chemistry work. However, when pulling the whole picture of the analytical chemist
together, most participants added an important caveat to good work. “…A consistently good analytical work ethic and problem solving and then the ability to communicate that to people [is what makes a good analytical chemist]” (Interview, 1215, italics added).

The practice of good science is predicated on the expectation that it can be communicated well; the “ability to communicate best science is most important” (Survey Data, 2009). Here, I answer the question of what is the measure of good science. Good science appears to be as much a matter of language and communication skill as it is scientific and technical skill. Participants maintained that without the ability to communicate the results that one produces, one’s technical skills become irrelevant. This switch from fact-based calculations to discourses associated with the efficacy of linguistic and cultural performance is critical. Good science is measured not just through calculations but through communication, and those who have the capacity to do the measuring are those dominant in forms of communication, both language and culture, considered appropriate for science.

I asked participants to talk about their experiences with language and communication in the field. A number of participants shied away from the use of the word language when discussing interactional issues and more regularly referred to communication. Additionally, I found that if I asked about communication issues versus language issues, participants were more apt to discuss their experiences. It seemed that this slight twist of hand which initially drew the performance of communication to the forefront and pushed language (and consequently national origin) to the background allowed the initial theme of good science preventing discrimination to remain intact. Articulated as a deficiency in communication, the issue became not about English as a
second language, but an issue with individual skill sets; the deficient communicator as the site of difference.

A lady that works for me from [national origin] 10 has a great difficulty in writing, of putting prepositions in. And so you have a hard – it’s very disjointed. …So it probably depends on what school she went to or where they came from. …Yeah, [this is a problem] because what will happen is then pressure is on everybody and it may not be a prejudice. It’s if I have a, if I’m sitting here and somebody’s pressuring me [to] get this result in. I’ve got to get this out. And you say I’ve got to go where I can get it the fastest, and so I don’t want to go and talk to “so and so” because it’s going to take me fifteen minutes longer to understand what they’re saying. … There are people who will go to another person that works for me rather than to the [national origin] lady because they don’t want, I just don’t have time to wrestle with it. (Interview 1215)

The focus on time use as the key problem in this communication provided the participant the opportunity to assert that the issue was not about prejudice but about expediency in the workplace. The participant did not state directly that English as a second language was the central issue; however, this seemed evident in his story. Additional references to communication in the interviews illustrated the term was being used without inflammatory intent to broadly indicate performance and cultural awareness associated with native-U.S. status were missing.

An additional issue at play in these references to language and communication skill requires that we return to the first gap covered in the literature review: foreign-born workers as identified as the individual site of difference in research. Because of this leaning in the literature, discussions about foreign-born experiences at group or organizational levels are rarely undertaken. At work, issues of language proficiency generally get chalked up to individual skill because it is the individual with whom we

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10 In the process of maintaining a critical sensibility and in order to avoid stigmatization and the reproduction of stereotypes regarding discourses of difference, all interview data identifying specific national origins and/or cultures in this chapter were purposely removed and replaced with a broad reference to difference whenever they were not critical for comprehension.
interact. Individually, then, foreign-born workers that struggle with English language skills are limited in their opportunities for development at work due to perceived incompetence. Because this routinely occurs at the individual level, a group-/organization-wide effect soon occurs. Foreign-born workers as a group hit a “glass ceiling,” but do so under the guise of individually based problems. Focusing on the individual allows organizational and societal systems that generate hierarchical schemes of value based on national origin and associated language accent and fluency (Lan, 2003; Wells, in progress) to remain obscured, while the foreign-born individual is perceived as succeeding or failing solely on his or her own merits.

[People from countries where English is not the primary language] tend to have language communication problems. Not, I don’t know whether to call it of their own making or not, but it’s sometimes very difficult to understand what they’re saying. And so what do you do about that? You know they’re technically sound and, but I’m not quite sure they’ve communicated to me what the result is. So you’re thinking, “What do I do?” It’s, as a manager it’s not quite clear to me, frankly, to say that you need to go back to school and be able to talk more clearly. That will get you further in the company. Because they – everybody just needs to understand what you’re saying more clearly. So they struggle with that. (Interview 1215)

This participant pointed out that the technical skills of nonnative English speakers were not suspect, but rather that their ability to share the results emanating from those skills in a way that was effective and clear was problematic; the breakdown between technical and communicative ability was the issue. This supervisor believed that increased education would assist the employee, which it likely would. However, suggesting that the solution to the problem is for an individual to take up additional schooling on their own, while not

\[11\] The term *glass ceiling* generally refers to the phenomenon of minority group members having the ability to advance their occupational development only to a certain point (generally high level individual contributors), at which time it becomes difficult, if not impossible, for the individual to move beyond their current responsibilities. This ceiling is generally understood not to be a direct reflection of organizational policies but instead an unofficial but nonetheless real cap on minority member work experience.
valueless, will likely continue to perpetuate the notion that this is an issue to only be addressed individually. Solutions like this fail to address how U.S. perceptions of language skill are impacting the occupational development of highly intelligent and qualified groups of individuals from different nations. Here a participant shared another story of an employee struggling in the workplace:

…the previous chemist we had here…was a woman, a [national origin], and her language skills were poor and what it meant was she could do her work very well but there were aspects of it, she could do her technical work but going [to communicate it] she would have great difficulty. (Interview 11231)

These reports of success in the analytical field hinging on clear and direct communication invoked an image of a type of communicative sieve. With an effective sieve, technical and creative analytical skills poured neatly though, providing new ways to look at scientific problems and understand results. With an ineffective sieve, technical and creative analytical skills clumped together and were consequently left unused.

These types of participants’ stories suggested that communication affects science. This finding initially appeared to be counter to the claim that science is the international language. If the language of science really functions as “international,” then all analytical chemists (regardless of difference) should have the opportunity to contribute equally as long as intelligence, experience, and skill are comparable. This discord between participants’ claims highlighted a subtle gap in allusions to science as the international language. This gap has, for the most part, been ignored in the Western mainstream and has silenced a key but unstated narrative in the consideration of scientific occupations and difference. This is that science may be an international language, but the international language of science is English (Ammon, 2001; Benfield & Howard, 2000; van Leeuwen, Moed, Tijsse, Visser, & van Raan, 2001; Watson, 1986). Scientists
from non-English-speaking countries have known this for some time. Scientists who do
not speak English, or who speak English as a second language but choose not to publish
in English scientific journals, are rarely acknowledged or even known for their scientific
contributions in the U.S. and Europe (van Leeuwen et al., 2001). There is a material
consequence here for scientists who do not speak English, or who speak English as a
second language, given that the bulk of financial resources in scientific research are also
in the U.S. and Europe. Investing financial resources only into scientific projects clearly
communicated in English will ensure a global scientific future mired in Western thought
and Western biases. One foreign-born participant spoke about the impact of not being
able to communicate in English in scientific contexts:

I even think written English even worse [than spoken English is problematic]
because you have black on white. [You can] just see that the people are struggling
with the language and, of course, that has a huge impact. It has an impact on how
well you can publish; it has an impact on how well you can persuade people in
conversations. (Interview 1117)

This participant shares that difficulty communicating in English limits occupational and
scientific development. At the organizational and team levels, English operates as a
symbolic divider between those that have the ability to perform analytical chemistry tasks
and those who have the ability to communicate the results of those tasks. One U.S.-born
supervisor stated:

Sure, I mean, you know, the obvious [issue] that almost always comes up is
ability to communicate. And more time is spent for those people where it’s a
second language than not…I think that is a very real problem. The ability to
communicate what you’re thinking and to understand what somebody else is
thinking is the key to a group being successful. …I’ve run into the problem of not
being able to be understood [when traveling to a non-English speaking country]
and that’s difficult and I think as a consequence it lessens the impact of your
message. It lessens the, I think I guess not status as much but lessens how you’re
perceived. So not only is the message diminished by not being able to be
communicated but you’re somewhat diminished because you can’t communicate. (Interview 1123)

Employees who speak English as a second language, then, experience not only the risk of being marginalized and diminished for having difficulty with English as a second language, but also for being a person who cannot communicate effectively. This participant went on to suggest that, not surprisingly, this difficulty follows the employee throughout his or her career development:

… in my opinion…the more into the supervisory roles you go, the more verbal communication and written nonscientific communication become important. And so your ability to communicate effectively in whatever the major language is [is] essential to be successful and I think that people recognize that if you can’t do that, then you’re not ready to be moved into that advanced position and so you don’t get it. (Interview 1123)

This participant makes plain that without the ability to communicate in ways which are considered domestically-appropriate in the occupation, opportunities for development will be stunted.

Limitations due to communication were not only referenced by U.S.-born participants. Foreign-born participants also shared the concern that communication was a limiter for individuals from countries outside of the U.S. This concern stemmed not only from a concern about fluency in the language but also from a concern over the performances of cultural communication customs, such as interactional norms.

I think, you know, there’s some [foreign-born individuals that] are quite reserved, you know. They don’t talk a lot, yeah. Like in a meeting or when they are…very sure, then they speak out. You know. …I think… here in the U.S., you know, you have to talk a lot I mean. But if you don’t talk too much, then you have less chance to get promoted. But if actually, you know, if you let [foreign-born individuals] be in charge of a group, in charge of department, they can do a very good job. Yeah, but if you [as foreign-born] don’t talk much, you will not get attention and people think why you are not very good at this. (Interview 1217)
This participant points to one of the domestically appropriate behaviors that indicate scientific engagement in the U.S.—talking a lot. This participant shares that because this interactional behavior is domestically specific that even though foreign-born workers are not accustomed or comfortable with the practice, those who do not conform to it will not get opportunities for advancement even though they may possess the actual skills to perform higher level work. Speaking English, the assumed and practiced international language of science, and performing communication through U.S. cultural standards impacts not only how well one is received by one’s peers, but also the ability to be promoted, regardless of technical and analytical skills. The following example, while more severe than most shared, offers that effects of communication issues can be not only debilitating for occupational development but also humiliating:

When communication is difficult to understand, you are not taken seriously if the listener has to constantly interpret. We had many [national origin] scientists, and they rarely rose to even a middle level even if they had good scientific skills. The department director…called some of them "bob" just to not have to learn the foreign names. (Survey Data, 2009)

In this example, the participant points to a basic aspect of individual dignity that is socially stripped if one’s communication skills are not considered domestically-adequate; the individual is not taken seriously. As can be seen here, a result of not being considered a serious contributor in the organization can be that colleagues may take liberties beyond appropriate occupational parameters, for instance, foisting a simple “American” name on an individual. In that moment, I would suggest that any semblance of individuality that these individuals may have previously felt in the workplace was erased.
Invoking the English language as primary in the workplace provides privileges, particularly for those in supervisory positions. Supervisors have the capacity to limit the opportunity, direction, and rate of career development for those that do not perform cultural communication in ways that they deem appropriate. In addition, this example demonstrates that some supervisors may exempt themselves from modeling language performance that they require from all others. The irony is overwhelming; those with language privilege expect that language and accent fluency and neutrality be demonstrated by those speaking English as a second language in order to gain advantages in the workplace. These advantages can be as substantial as a promotion or as simple, yet vitally important, as recognition – such as being referred to by one’s own name. However, those supervisors who already have those advantages do not have to demonstrate comparable or even minimal skill in using or even attempting another language, even if this attempt is just trying to pronounce an employee’s name correctly.

In another disturbing example, supervisor language privilege severely impacted a participant’s occupational experience and development. When entering the United States, the participant did not speak English (his native language was Arabic and his second language was German). As a result, he drove taxis and delivered pizzas while taking English courses at night. Once he achieved acceptable English skill, he found employment as a glass washer in a lab and entered a U.S. graduate program. Over a period of 10 years, he achieved his PhD and gained employment as a lab director at a university. Even then, his continued difficulty with the English language and lack of tenure in his position ended up playing a significant role in his occupational experience.

It was very important for me to have help with the composition of words so people can understand what I mean. So [I have to] be dependent on someone. And
I was dependent for the past 10 years on my boss…to fix my English. And sometimes she was helpful and sometimes she took benefits from that. Sometimes she takes my idea and then says, ‘This is my idea.’ …She starts to say, ‘This is my lab, my money, my budget.’ This makes me ask, ‘So what I am doing here?’ She makes my life miserable. I was Principal Investigator for a big study. She says, ‘You cannot hire any people for that work’ [even though it was my study and funding]. …The dean comes to solve the problem and the Dean says, ‘She has tenure, you do not have tenure.’ (Interview 1124)

Despite making a notable scientific contribution in the field and receiving numerous accolades regarding this achievement, several months after this incident, the participant’s employment contract was not renewed. This employee’s inability to clearly make his case in persuasive English to the Dean and his dependence on his supervisor for communication assistance resulted in the abrupt ending of his career.

As evidenced in the above examples, foreign-born workers in U.S. settings are often impacted negatively due to their differences in performing domestically-appropriate communication. One foreign-born participant suggests that one’s fluency in English in the U.S. determines one’s occupation.

…let’s say somebody who English is your first language and you’re functioning in this American English speaking society. Very likely, you’re going to choose jobs that require good speaking skills and so naturally, you’ll see these people going into sales, they’ll be sort of settling or they’re not going to be looking for work in the lab. And I think that’s why you’re seeing so many people from other countries in the lab. Some of us don’t want to be there. We just don’t have a choice. That’s where we get opportunities. So the more lack of communication skills or you know the lower the level, the more you’re going to see the people staying in the lab longer. Because it’s a way to still make good money even though you may not have the perfect communication skills. (Interview 11201)

This participant believed that not speaking English in the way that Americans speak English was an occupational liability. Other participant accounts were similar.

Participants encountered difficulty at two levels. The first difficulty was that they felt they were not respected or taken seriously when communicating scientific results to peers
and supervisors. The second difficulty was their trouble with and sometimes inability to garner the support of management to move out of the lab and positions where more communication was required. One foreign-born participant shared that the way to overcome these barriers is for foreign-born workers to start their own businesses.

One thing [is that not many foreign-born people] get into the leadership position you know. Sometimes it’s more difficult to…get a job. … Yeah, I remember one thing, you know, is like a newspaper in San Diego…said when you see [national origin people as] a senior executive of a company, then that’s their own company. So if you [are a foreign-born person at] a big company and [if it is] not your own company [then] you have a glass ceiling. (Interview 1217)

This participant, who started his own analytical chemistry contract organization in order to have a say in what type of work the company performed and how they performed that work, shared his understanding that the primary way foreign-born workers become employed at high levels in scientific organizations is through starting their own companies. The high rate of entrepreneurship for foreign-born workers in the U.S. (Saxenian, 2002) may be indicative of a desire to push back against practices that limit them in the U.S.-centric workplace. Workers are disengaging from English-dominant organizations in order to resist these practices. This improves the working experience for those who leave these organizations, but it does nothing to help change the experience for those who do not have the capital, ability, or desire to start their own organizations.

Another way foreign-born workers may attempt to overcome barriers associated with difference is to adopt certain domestic culture, behavior, or dress in order to mitigate effects of difference. One participant explain that an employee in her group made an effort to reduce the noticeable cultural differences between her and her U.S. counterparts in order to “fit in” more effectively:
I mean I had, for instance, an Indian girl at one point in my lab, and she told me that she used to wear only the Indian traditional clothes and that when she came to the U.S. she totally switched to [U.S. clothes]. I think that she said that she wanted to, first of all, to have a sense of belonging and so she felt like when she wears her traditional clothing, she would not belong to a Western society. And I can see that you know, it also indicates a sense of being willing to adapt to a different societal standards. So I feel probably reinforced by her comments. Yes indeed, when you wear clothing that makes you look different from the rest, you might have a harder time... But I personally would also, I mean I don't want to say I would be reluctant to hire someone like that, but I would certainly think about it twice, does this person fit into my group and would that be a problem or not? (Interview 1117)

The employee referenced in this story appears to have recognized one of the key issues being forwarded in this project: that difference does matter in science. Changing the way that she dressed in order to fit into Western society was an attempt to show that she was a full member of the group in which she worked. The supervisor who shared this story also reflected that difference matters: “I don’t want to say I would be reluctant to hire someone like that [read: someone visibly different from other group members], but I would certainly think about it twice.”

The second premise of the communication-difference enthymeme of science has asserted that national origin and culture come to play a role in occupational identity through perceptions regarding one’s ability to communicate data (both linguistically and culturally) in clear and direct ways. Participants hesitated to point to the English language and/or U.S. culture as the mitigating factors in communication problems, but as stories unfolded, those individuals routinely identified as inhibiting analytical work were the individuals who came from countries and cultures where English was not the primary language and Western culture was not as commonplace. This premise leads to the syllogism conclusion—difference may prevent good science.
Difference May Prevent “Good Science”

Across the survey and in interview participant responses, a recurring theme was that clear and direct communication was desirable. U.S.-born scientists have been socialized to understand that accessing, analyzing, and utilizing information as expediently and effectively as possible is the ideal standard for work performance. However, outside of the U.S., cultures from all over the world generate, engage, and use information in completely different, but equally productive, ways. There are a number of cultures that view fastidious attention to time as it relates to working hours, meeting times, and socializing periods as unnecessary and often counterproductive (Hall, 1976; Wood, 1999). The U.S. values direct eye contact and direct communication, while other cultures and nations find both discourteous (Martin & Nakayama, 2004). These differences demonstrate that, within social and/or organizational frameworks, acceptable communicative behavior is bound by cultural and geographic norms. Once a person is immersed in the framework, that bounding has little flexibility.

Differences in communicative patterns due to national origin and culture can have two basic types of negative effects. The first type of effect is direct; for instance, one party is offended and the other confused/unaware/pleased. The second type of effect is indirect; for instance, both parties feel slighted or offended, but neither considers the offenses as justly linked to differences in cultural norms. Instead, both assume the other is insensitive, rude, or unpleasant. Erickson and Shultz (1982) note an example of this in their work on communicating across cultures. They found that African American students meeting with White American school counselors felt “talked down to” and marginalized in their discussions, and they consequently ignored counselor advice.
Counselors saw the students as disinterested and disengaged and felt they had to do additional work to provide the students necessary information. The authors postulated that the experiences of both parties were mediated by cultural differences between active listening cues. White counselors said they expected a verbal response to signal listening, while the African American students said they demonstrated listening through a slight nod. Because the counselors routinely missed students’ active listening cues, they would repeat information and alienate their students. More culturally competent and productive interactions would likely have occurred if the counselors, who in this instance had the power and authority in the organizational setting, had recognized the possible existence of differences in communicative responses.

In contrast to the Erickson and Shultz study, participants in this project did appear to recognize that the differences in communicative interactions and behaviors were likely linked to diverse national origins and cultures. The interesting part was that participants’ awareness did not appear to affect their perceptions of the employees in question. While participants generally did not directly state that national origin or culture prevented good science, a number of participants offered examples to this effect. To be clear, none of the participants interviewed appeared to show pleasure or satisfaction in relating their stories. What they did appear to reflect was the belief that issues related to the performance of culture and national origin adversely impact some aspects of scientific work—that this was regrettable, but also a factual matter. Of the supervisors interviewed, a common theme was the concern that they were not getting accurate or straightforward information from foreign-born employees. Supervisors made clear that they did not believe these difficulties stemmed from a desire to deceive or misdirect, rather that communication
across cultures did not allow for U.S. norms of scientific interaction to be followed, and this was seriously problematic in the workplace. In addition, the supervisors interviewed did not mention or suggest that perhaps they had a responsibility in helping to address these issues, for instance by providing access to language courses for free or reduced rates.

The [national origin] males, especially, will tell people in authority what they think they want to hear and they don’t regard it as lying. And in a technical situation like at [a large company] or where I might have a group leader developing a product…I would say, ‘How is the work going?’ And they’d tell me, ‘Oh great!’ [but] it wasn’t. And so what I would do to get around that is instead of having a meeting just with the [foreign-born] group leader, I included the entire group. So the group leader might say, ‘Oh the work experiment is going great.’ And one of the [U.S.-born] techs might say, ‘Yeah, but it is green and smells funny.’ And that was a depth of information that I really needed. So you know, if you’re willing to get around that, you can, but you have to be aware of the cultures and how they think. (Interview 11231)

This supervisor shared that she did not feel she could trust certain foreign-born employees to directly and openly communicate the status of research projects under her purview. To address this issue, she informally appointed U.S.-born employees at significantly lower organizational levels to “speak” for her foreign-born employees. This supervisor demonstrated in this example that “getting around” cultural issues meant avoiding them. The issue this supervisor faced was not based in language per se, but was instead rooted in cultural norms as they related to supervisory hierarchy and associated appropriate behavior. Communication is about more than just words spoken; it is also about the performance and rationale for performance at work.

In a previous study, I found similar behaviors being enacted in a scientific team. A foreign-born scientist that was male and the most senior in education and occupational tenure in his group was routinely silenced, spoken over, and spoken for by female, junior,
U.S.-born researchers (Wells, in progress). Here, we return to the third gap in the literature: primarily domestic measures of difference are problematic when studying globally diverse populations. U.S. analytical chemists in the study recognized that aspects of difference stemmed out of cultural background and English language skill. Their hesitancy to directly address these issues in the workplace with foreign-born workers and instead use U.S. employees as buffers demonstrated a strong desire to avoid discussions of difference at work. This management of difference has likely developed out of domestic conceptions of difference management.

The Civil Rights Act of 1964 provided legal incentive to improve living/working rights in the U.S. Blatant racism and discrimination as related to employment were made federally illegal, which paved the way toward employers judging potential and current employees based on skill and not demographic background. In the U.S., legal and social effort has been exerted to make clear that Black Americans cannot be treated differently than White Americans, that female Americans cannot be treated differently than male Americans. However, applying the same principles in whole that have been exercised domestically to foreign-born workers does not appear to work. Discourses relating to social, cultural, and linguistic differences of foreign-born workers’ performance do not comfortably mesh with parallel domestic discourses of difference. This makes it ineffective to apply the “treat everyone the same” model at work. Due to discomfort and very likely a concern about discrimination, U.S. employers and supervisors discuss the problems regarding foreign-born employees’ communication with U.S. peers and attempt to make organizational changes (such as having junior U.S.-born researchers present in meetings that are generally reserved for project leaders) instead of discussing the issues
with foreign-born employees directly. Diversity management programs often teach that diversity is good for business. What they do not teach is that “good for business” does not equate to “easy” or “comfortable” for all involved. Actually working in a diverse environment is hard work for all employees; if management, organizational trainers, and consultants do not acknowledge this up front, those employees with the privilege and associated ability to avoid that hard work will likely do so. One of the fascinating aspects of privilege is that it creates an expectation by those that have it that if something is difficult or uncomfortable, it is also probably wrong or inappropriate. Consequently, those with language privilege attempt to shut down or circumvent all that is difficult regardless of the consequences for others. In this way, privilege is maintained.

Participants with language privilege shared stories of foreign-born analytical chemists speaking in ways that are traditionally considered rude in the U.S. In 2 U.S.-born participants’ stories, they stated that they knew the foreign-born individual was not trying to be rude but that instead, the communication issue stemmed from differences in language structure and intonation. Regardless, these stories were shared, which likely suggests that while it was understood the individuals were not trying to be rude, their interaction was still considered inappropriate.

…one of my PhDs is a guy that grew up in [national origin] and my first exposure to this guy, he was taking a course from me and he walks into the office and he says, ‘I demand to turn in my problem set a day late.’ I looked up at him and I said, ‘Excuse me. I believe you meant, “I request to turn in my problem set a day late.”’ He said, ‘Yes, that’s what I meant.’ …And you can [see] where the stereotype comes from, in that particular case [it] is sloppy translation, and I mean if you say well somebody’s going to be arrogant or something, that’s one thing. If you say they’re using a limited vocabulary and they come across as being somewhat insolent, well that’s something else again. So again, if you’re sensitized to the problem, you can fix it pretty easily. (Interview 1130)
The supervisor recognized that the individual speaking with him did not yet have the nuances of English mastered and thus had difficulty performing politeness. He suggested that awareness could help address misunderstandings, but his suggested fix was to simply rephrase the employee’s sentence without an associated explanation. Without direct instruction, the employee could have just as easily assumed he had used incorrect grammar as opposed to having performed a cultural slight. Without being able to openly discuss differences in cultural or linguistic performance, we ensure that these types of issues will continue to adversely impact employees, supervisors, and the formation of broad social narratives of difference.

This second story regarding employee behavior also demonstrated how difference in the cultural performance of communication can have a negative effect on the scientific process and the associated employee:

…she will say to [her coworkers], “Why do you want this?” And do you see how that comes across? She doesn’t mean it that way, it’s just something about the [national origin] language and that tonality business that what she means is, “What is it that you want and when do you want me to get it to you?” But she doesn’t say it that way and she’s not a forceful person at all but it really comes across to everybody as kind of, you can just see everybody’s reaction is, ‘Whoa.’ (Interview 1215)

In this recollection, the supervisor related how a foreign-born employee communicated in ways that outcasted her from the rest of her workgroup. Regardless of this supervisor’s recognition that the faux pas was due to differences in national origin and cultural frameworks, he shared that people were offended by or uncomfortable with the interaction. In addition, he made no mention of attempting to help this employee with English assistance or communicating with his team to develop their understanding and interest in creating a cohesive workgroup.
These stories demonstrate that working with and as a foreign-born worker in the U.S. can be interpersonally challenging and can affect work product, outcome, and relationships. Additional participants took this concern a step further and discussed how cultural and nation-based differences actually impeded the process of scientific inquiry:

…there are very, there are some very strong cultural differences that I will find that I run [into]. I’m pretty, I’m open-minded and I like to have my guys call me on stuff and say, ‘You know, we shouldn’t do this because this is really stupid’ or whatever it is. But there’s a level of – [foreign-born employees] are unwilling to challenge me because it’s cultural that you don’t challenge the boss if you will. And I think they think of me as a boss as opposed to their leader. And as a result, I’m probably not doing the best thing because I’m basing [my scientific decisions] on my experience, and they might know—you know they have the hands on… experience, if you will, with whatever the problem might be. And I might be, you know, coming off, you know, kind of spouting at the mouth, if you will, trying to move things along without really understanding the whole problem that they might understand. And between not being able to communicate it clearly as well as the reluctance to call me on maybe being wrong, which I would encourage, but they wouldn’t accept that or feel comfortable with that. …So that’s a bigger issue for me then, because the culture, the style is different [so] that I’m not really getting an honest answer, [I’m getting] an evasive answer or something. (Interview 11301)

This supervisor described her frustration with not being able to access direct information about project status due to differences in cultural communication. She stated that as a result, she was aware that she may have made decisions that had impeded project success. She felt that good scientific inquiry required continual challenges and questions; however, she has not felt that she could get that scientific process to function as she felt was appropriate given her relationship with foreign-born employees.

Many of the supervisors who discussed issues with communication-based cultural tensions were U.S.-born; however, several foreign-born participants also provided insight into cultural issues while working in the U.S. This supervisor discussed the difficulty of working with an individual from his same home country but suggested that cultural
differences developed through different country-based education systems were equally
problematic in U.S. organizations too:

…there is one person, he [does not] report to me directly but report[s] to the
supervisor who reports to me. Now he’s a [national origin man] so there shouldn’t
be any language issue at all and he get his education in [another country] and
spend maybe a couple of years doing postdoctoral work [there], so he spent 6
years [there]. He drove me crazy every time he talked to me. He want, you know,
[to] discuss issues with me. Basically he would talk just like, it’s not to criticize
anyone, but I think it’s a cautious thing. I think [in the country he studied] they
tend to, you know,…they want to talk; it’s kind of impolite to go straight to the
point so you have to kind of talk [about] other things and try to review the case
then, you know, maybe 10 minutes later then talk to the main point. And it always
drives me crazy because you know he would come to my office and start to talk
[about] different things, and I say ‘What’s the point?’ you know, ‘What do you
want help with because I don’t have much time.’ And so I think it’s a cautious
thing… Maybe if I’m working in [country] then maybe that’s the way you should
do [it], but in the U.S., it’s different. You know we all say, you know, if you want
something just go to the point. We don’t feel offended. (Interview 1218)

This foreign-born supervisor points to a key issue evident in this research that “in the
U.S., it’s different.” This supervisor shared that he had been working and living in the
U.S. for 19 years and as such, had aligned himself with key communicative behaviors
that were necessary for success in the U.S. workplace. To be clear, his reference to the
U.S. having particular standards of scientific communication should not imply that other
countries do not operate with their own biases and expectations; in fact, this concept is
demonstrated in the preceding discussion of country of education versus country of work.
However, it does suggest that not adopting appropriate cultural performances in the U.S.
workplace is problematic for the worker and, in differing ways, for associated work
groups. The following story typified responses regarding the problems that are common
in cross-cultural communicative interactions:

[Individuals from a specific national origin] tend to shake the head when they
listen to you intensely. And that can be very disturbing because you know, you
interpret as, what the heck is she talking about? And I had several occasions,
because I was working with customers who came in and one of the girls I worked with, she would sit there and she shakes her head. And I explain something to her and I rephrase it and she shakes her head and then I realize you know, it was sort of unconsciously going on, but at that time when I realize it, so I had to stop my thought - I know what you're doing. It was really disturbing. And so I guess you know, there's a lot of those things that are going on between, interculturally that you interpret something differently than it is meant because it comes from a different context, but it makes it very difficult to have undisturbed communication. (Interview 1117)

In this story, the participant shared how the cultural norm of a colleague, shaking her head side-to-side (which is commonly understood in the U.S. to represent “no” or “I don’t understand,” but in her country of origin represented, “I’m listening”) actually stunted the participant’s ability to communicate with her effectively. The nonverbal signals indicating disagreement or confusion from a U.S. perspective were difficult for the participant to intellectually override in order to continue her discussion. While this example displays the symbolic difficulty to communicate across cultures, the consequences of clear and efficient communication in analytical chemistry can also be material. Communication that inhibits good science was discussed as cause not to hire. One survey participant shared that they were “uncomfortable hiring chemists that [they could not] understand due to the fact that English was their second language” (Survey, 2009) because errors due to miscommunication were costly for the department and costly for the organization. In addition, communication that inhibits “good science” was also offered as a cause to terminate employment.

And there is an issue because language becomes a barrier because the communication, when English is second language it’s also very hard to communicate and I have been in multiple situations in laboratories where there is a large [national origin] group where they’ll be communicating to each other and I’m totally not part of that communication because they’re communicating in their native language. So that does affect the workplace tremendously because then there’s a sense of them versus us sort of thing that gets set up. You’re not really sure, you know, what’s going on. Sometimes too I find that unfortunately…. I’ve
had to lay off people and fire people and thank goodness hire a lot more than I’ve fired and laid off, but several of the cases where I’ve had to fire people was related to the language issue because we never could get over the communication barrier and as a result, they never could demonstrate that they understood or were able to deliver what was needed to be delivered. And so I’ve had some uncomfortable situations because of that. So that’s, you know, been an issue for me. (Interview 11301)

This supervisor pointed to a feeling of alienation as the majority member being excluded from minority member discussion. He pinpointed an experience diverse employees have been talking about for a long time: Communicating in ways that isolate some members from full group participation affects the workplace tremendously. The difference in this case, however, is that as a supervisor, this participant had the power to punish/control those doing the exclusion through employment termination. In another example, a participant pointed to a similar experience of outsider status:

…it has been an issue sometimes, of either communicating to somebody [from] a different language and then they go and they might get other instructions from somebody else they know because they have the same language. You might tell them to do one thing and then they go talk to someone else and get something different because it’s their - the person that they know that this is their language [too]…even if they’re [in different] groups, they seem to, you know, you happen to see them talking together. You see them at lunch together, you happen to just see those groups more often together. … [Also], there has been times where you’ve or I’ve even sat down and you hear another language and it doesn’t necessarily stop because you sit down. So there’s that kind of that language barrier sometimes. (Interview 12151)

This supervisor shared his concern that foreign-employees not only relied on one other to make sense of occupational tasks (regardless of whether their colleagues have direct access to the pertinent information) but that they also communicated in ways which kept him segregated from their conversations. This narrative brings up important considerations of resistance to power at work. By speaking a language other than English at work, foreign-born workers resist dominant modes of communication and thus open up
a space to demonstrate (whether purposely or not) the experience of exclusion to English-only speakers. However, because English-only speakers function through language privilege, it is likely they will not see their exclusion as a method of resistance but rather a demonstration of a lack of English skill. “Those in power maintain the power consciously or subconsciously, by controlling the discourse and, as a result, controlling the meanings that are created” (Meares et al., 2004, p. 7). In resisting English in some work settings, foreign-born workers likely reproduce the hegemonic systems that oppress them. When those who have language privilege feel excluded, there are far greater risks to those doing the exclusion because their performances of exclusion can be used to demonstrate their inability to effectively work in a U.S.-based organization. As a result, material consequences such as termination or glass ceiling effects are possible.

Summary

The findings detailed in Chapter IV demonstrated that socially coded characteristics, understood as the relatively stable, identity-based constructs that have been objectified in society to have material and symbolic import (e.g., national origin and gender), play a significant role in the occupational identity of analytical chemists. This chapter switches perspectives to examine how discourses, which can, in part, enable the conceptions of characteristics discussed earlier, are used to inform occupational decisional premises about work.

The interview data relating to language, communication, and difference provided for the development of the communication-difference enthymeme of science, which suggests participants believe that conceptions of difference associated with national
origin and culture can impede the scientific process. The ability to communicate (linguistically, culturally, and socially) within U.S. norms of scientific conduct is a critical component of successful analytical chemistry work. From a theoretical perspective, this enthymeme highlights the relevance of the proposed theory of occupational control. Through occupational decisional premises (in this project: Good science prevents discrimination/Good science may be impeded by issues of difference/Difference may prevent good science), occupational practitioners can rationalize decisions that may feel personally suspect otherwise. The engaged use of occupational premises provides occupational practitioners the capability to call upon discourses of difference that demonstrate that those who most effectively assimilate and acculturate to U.S. conceptions of good science are good scientists. Those that do not “effectively” assimilate are associated with discourses of difference that are negatively viewed in scientific occupations: occupational members who are a burden to the group due to strained, inaccurate, or inappropriate language or communicative interaction. This control of the use and meanings of discourse provides the mechanism to shape the occupational identity of those who do not model U.S. conceptions of science (through negative reflections on image and performance) without having to account for concerns of discrimination or inequity (i.e., they just are not good scientists).

This use of occupational control demonstrates that communication is the process and product which performs and constructs power. Having language/communication privilege allows one full occupational membership status, which includes the ability to 1) have one’s opinions and ideas be legitimately considered, 2) be sought out for information and data directly related to one’s expertise, 3) be given equal opportunities to
present and publish data, 4) be considered for appropriate recruitment, retention, and promotion, and 5) shut down or direct communicative interactions with those of difference in ways that minimize one’s own social discomfort and difficulty regardless of the effects on others. These findings corroborate statistical findings in Chapter IV that indicated that foreign-born workers face more difficulty in being understood, having their ideas taken seriously, and being considered full and equal occupational members of a group.

Last, this analysis provided the opportunity to highlight an occupational metaphor for scientific occupations. Participant data provided a framework to see the occupation as a filter that subtly limits the types of individuals that get to pass as good scientists. This metaphor emphasizes the ways in which occupations are loaded with socially, culturally, and geographically relevant expectations. Metaphors are useful and meaningful in the process of creating organizational and occupational theory. “The use of metaphor implies a way of thinking and a way of seeing that pervade how we see our world generally.” (Morgan, 2006, p. 4)

I now turn to Chapter VI to continue discussions of difference and its role in the occupational identity of analytical chemists. In this chapter, I will consider how intersectionality reflects a hierarchy of national origin in the occupation.
The previous chapter extended the theory of occupational control and developed the communication-difference enthymeme of science, which explained that performances of linguistic and cultural difference trigger occupational decisional premises that provide rationale for differences in treatment (such as inclusion, recruitment, and opportunity for development). Participants offered that the ability to communicate clearly and directly in English was a skill that enabled success in social and organizational environments. Participants noted that without this skill, occupational success (measured with intrinsic criteria such as respect and extrinsic criteria such as promotions) was limited if not utterly stunted.

Throughout Chapter V, discussions regarding differences related to national origin and culture such as interactional norms and cultural expectations were also touched on. However, because the chapter focused on the premises used to explain and rationalize treatment of diverse occupational practitioners, the broader social narratives of difference at play in the occupational setting and their impact on the practitioner were not covered; this is the aim of Chapter VI. In this chapter, I shift my use of the word *discourse* from referencing situated embodied performances and everyday talk, which
were the primary focus of Chapter V, to Discourse meaning the “general and prevalent systems for the formation and articulation of ideas in a particular period of time” (Alvesson & Karreman, 2000, p.1126). By doing so, I aim to answer how Discourses of difference construct diverse employees in ways that shape their experience of occupational identity. I will also consider how these constructions of foreign-born workers discursively form a hierarchy of national origin in the occupation.

In the interviews, I asked participants questions about aspects of difference and diversity in the analytical chemistry occupation. Early on in the interviews, the participant responses made it clear that these areas were not particularly common discussion points for them. Even after detailed discussions of the research project and academic focus, which covered my interest in understanding the role diversity played in analytical chemistry work, several of the participants stated that they did not understand the relevance of the questions to the field or my purpose in asking them. As Chapter V suggests, this is likely because occupational practitioners and those who study scientific work have constructed scientific fields as being unaffected by difference, despite evidence to the contrary. While the majority of participants attempted to answer the questions as completely as possible, they seemed uncomfortable at times sharing personal opinions or beliefs for which they could not immediately provide evidence or directly prove. While this was not a surprise given that the strength of analytical chemists is their ability to trace, pinpoint, and prove every scientific claim they make, it did make it difficult to assess how participants perceived experiences of diversity or their opinions.

12 Throughout Chapters VI and VII, I will differentiate between the terms of discourse being invoked via the “little d” and “Big D” as per Alvesson and Karreman (2000). This will ensure clarity between terms used in the project.

13 Methods regarding said interviews were covered in Chapter V.
regarding intersectionality in the occupation. As a result, the data regarding intersectionality were limited. I argue that these data are particularly rich, however, given that the participant population who shared it was hesitant to discuss aspects of difference openly.

Participant accounts revealed that the constructions of foreign-born workers in the analytical chemistry occupation actively shift and flex according to the perceived effects of different economic and social conditions. In addition, participant stories implied that there are broad social narratives which constitute particular workers as (un)acceptable and useless(-ful) in U.S. scientific contexts, and that these narratives simultaneously construct value hierarchies of workers’ national origins. For instance, interview data showed that, in some cases, intersections of difference painted certain subjects as hard workers; as a result, those subjects were overworked, and positioned on the hierarchy of national origin according to their “work horse” value. Stories from the interviews substantiated previous research regarding the different perceptions and treatment of individuals depending on their national origin14 (Chiswick, 1978; Chiswick, Cohen, & Zach, 1997; Nekby, 2002; Rydgren, 2004) and provided a discursive explanation for that treatment.

In order to explain these findings in detail, Chapter VI progresses as follows:

First, I present a brief reminder regarding why and how intersectionality is taken up in this study. Second, I review the condition that discursively impact how foreign-born workers are perceived in the occupation. Last, I trace the ways in which Discourses of

14 Much of this research demonstrates that through significantly extended periods of stay within a host country (10–25 years), differences in unemployment and wage earnings improve for foreign-born individuals. In other words, as foreign-born workers either “Americanize” or align with culturally-specific discourses such as American behaviors and speaking skills, their economic stability increases. These studies (save Rydgren, 2004) do not examine social acceptance specifically.
intersectional difference construct diverse employees in ways which impact their occupational identity in the analytical chemistry field. This analysis will demonstrate how national origin (i.e., foreign-born identities and relations) is a heterogeneous social narrative rife with internal hierarchies that shift around occupation.

**Intersectionality in Science**

Previous chapters have demonstrated that socially coded characteristics and discourses of difference play meaningful roles in the creation of occupational identity. In this chapter, I contend that when Discourses surrounding particular intersections of difference are commonplace, they inform occupational action and decision making regarding occupational identity. The results of these decisions and actions are then used as texts to validate hierarchies of national origin at work.

This argument is based in a theory of intersectionality. Before moving forward, it is important to note that I am not suggesting that simply adding one characteristic to another allows us to ascertain the amount of marginalization or discrimination a particular person or group experiences. This practice would reflect a postpositivist epistemology appropriate for discussions of socially coded characteristics conceptualized as stable. This is because when studying identities as stable, it is possible to assume that they will not transform noticeably when combined with other entities. For instance, if women experience discrimination and foreign-born workers experience discrimination, then foreign-born women should experience double the discrimination. While this may hold true in some statistical analyses, this assumption does not hold true when examined against broad social narratives regarding differences. Intersectionality, as considered in
this project, assumes that combinations of discursive constructions create unique and
discrete understandings of people and groups. Each time these discursive intersections
occur, they produce particular meanings and stories and result in different types of
behaviors. For example, a few constructions of Black women in the United States have
been those of “welfare queens,” “mammies,” and “castrators” (as discussed by Parker,
2001). These constructions are dissimilar from constructions of Asian women in the
United States, some of which are “dragon ladies,” “china dolls,” and geisha girls. Even
though both sets of constructions consider similar axes of difference (gender and race)
and on the whole do so in primarily negative ways, the two sets do not reflect the same
understandings or embody the same feelings. As a result, the effects of these
constructions come to impact the individual in different ways: the Asian female is
infantilized and simultaneously sexualized, while the Black woman is stigmatized
particularly around notions of reproduction and is economically disenfranchised. Overall
in this project, it is the way that intersectional constructions as “meanings, metaphors,
representations, images, [and] stories” (Burr, 2004, p. 64) come together to form coherent
social narratives which symbolically and materially organize work that is crucial to
consider.

When examining intersections at play in this project, I tended to highlight one
discourse at the expense of another. This choice reflected the difficulty in researching
and writing about intersectionality. In order to appropriately explain one concept fully, I
set aside another for a short period. I suggest these moves mirror the ways in which
intersectionality functions in the social world. At one moment, gender may be the
intersection of primary interest, but even a few moments later, the discursive context may
have shifted, pushing national origin or class into the limelight. In these ways, I suggest that intersectionality is not consistent in how it functions, but that it does function consistently. It is my hope that as I and other researchers continue to work through the difficulties associated with research on intersectionality, we will find additional ways to reflect and discuss constructs in simultaneous play.

This chapter covers the discourses most drawn upon by participants. These discourses were made up of stereotypes, representations, and beliefs regarding aspects of gender, national origin, and, in a few instances, age in analytical chemistry. Class was an unspoken narrative threaded through participant reflections. Virtually all analytical chemists make a wage that places them in the middle-to-high income bracket in the United States for an individual\textsuperscript{15}. Class and education level are often associated with one another (e.g., the higher the income bracket, the higher the education level) as well. As mentioned in Chapter V, the prevalence of substantial education among the participants likely impacts the ways that participants discuss and engage aspects of diversity. As a matter of organizational membership, the majority of participants had experience with discrimination training and had been educated about the consequences for discriminatory behavior. Their cautious and carefully spoken comments regarding aspects of difference can be linked to both education and class-based aspects of identity.

Conditions of Relevance

As a way of explaining issues regarding diversity in analytical chemistry, a number of participants shared that the economic climate of the U.S. and the social climate of the organization were key factors in indicating how constructions of foreign-born

\textsuperscript{15} The median salary for an analytical chemist in 2005 was $75,300 (Chemcensus, 2005).
workers became more or less salient at work. After contextualizing their comments, participants’ discussions of the types of constructions most notable in analytical chemistry suggested that representations of difference imply a hierarchy of national origin in the analytical chemistry occupation.

The Economy

There is little argument that the U.S. economy is currently facing significant hardship. With a national unemployment rate of 9.9% as of April 2010 (BLS, 2010), employees across fields are anxious about the stability of their organizations and, in turn, their jobs. Because employees are already nervous, additional “threats” to their work such as equally skilled, foreign-born workers are generally not well received. The current economic conditions in the United States affect how differences are “read” and interpreted by U.S.-born workers. This foreign-born female participant reflected on how she believed the economy plays a discursive role in the view of foreign-born workers in the analytical chemistry occupation:

I would say that it all depends on how the economy is doing at the time. If the economy is doing great, usually there’s no problem and I mean currently, though in this economy, I’m finding that sometimes I’ll hear people, you know, make comments that make me realize that I’m definitely not as welcome. But it’s definitely … I understand it’s, you know, everybody’s looking for a job and I am perceived as competition in this market so that’s something that I understand. I think if I was an American and I’ll probably have similar, you know, similar sort of thinking. That’s why I understand it. No hard feelings. (Interview 11201)

This reflection reveals the recognition that the state of the national economy affects more than just the wallet. Concerns of economic stability can affect social interactions and comfort in the workplace and influence decision making regarding diversity at work.
Even though this participant shared that she understands the behavior, it does not change the effects it may have on coworker or supervisory interactions.

When resources are limited by the economic condition, those within the dominant group assert privilege in more direct and effective ways (Marx, 1867/2000). This practice ensures that those with the socially understood and accepted power in a context will be able to retain that power through subtle shifts in existing formal structures. This is exemplified by the effects of the current economy on foreign-born workers, particularly foreign-born individuals working on H1-B visas\textsuperscript{16}. When visa workers lose their employment, even in the instance of layoff due to organizational financial woes, they also lose their visa and there is no grace period allowing them to find new work (USCIS, 2010). The employee and their family can be immediately deported.

Additionally, the new Sanders Amendment to the American Recovery and Reinvestment Act of 2009:

limits any recipient of funding under the Troubled Assets Relief Program ("TARP") of the Emergency Economic Stabilization Act of 2008 or under Section 13 of the Federal Reserve Act from hiring H-1B visa holders for two years unless the recipient first attempts, but fails, to recruit any qualified United States worker. The recipient also must attest that its hiring of the H-1B worker will not displace a United States citizen or permanent resident. In addition, the recipient cannot place any H-1B worker at the worksite of another employer – meaning it cannot outsource a worker for a client – unless the recipient first makes a “bona fide” inquiry as to whether the other employer has displaced or will displace a United States worker within 90 days before or after the placement of the H-1B worker. (Parser, 2009, para 5)

\textsuperscript{16} The H-1B is a specialty occupation visa granted to individuals with appropriate educational and employment-based experience. Not all professional fields qualify for an H-1B visa; the government maintains a public list that details which fields meet the H-1B requirements (such as required educational degrees and posteducational training). Many H-1B workers are in highly skilled, highly technical positions.
This hegemonic behavior is couched by the U.S. government as a commonsense response to the economic condition, suggesting that the TARP is good for all in that it will assist in the stabilization of the economy. What is subtly absent from this “good for all” legitimation tactic is that, in fact, the act is only good for “certain people” (Mumby, 1997). The stimulus act limits the ability of highly skilled foreign-born workers to gain lawful employment with companies that have accessed relief funding and ensures that U.S.-born workers retain primary rights to employment. This act does not take into account that highly skilled foreign-born workers may actually have the capacity to assist the U.S. in recovering from the economic recession. Foreign-born workers, who make up only 10% of the U.S. working population, actually account for 25% of the science and engineering workforce in the U.S. (Kerr, 2010). As noted in the literature review, immigrant-founded companies represented over $52 billion dollars in 2005 sales alone and created more than 450,000 jobs (Wadhwa et al., 2007). In addition, visa workers that live and work in the U.S., even temporarily, pay into the U.S. tax system and unemployment, social security, and Medicare systems and are not generally able to access the resources associated with these taxes (Pradhan-Chitnis, 2006). In essence, they add to the system without equally drawing from it.

Promoting an economic case for not hiring foreign-born workers stimulates an underlying construction of said group: foreign-born workers are bad for the economy and bad for the U.S. These types of discourses consequently maintain power systems that guarantee unequal treatment for this population in gaining, retaining, and developing work.
Even organizations not in need of government funding are being extremely careful with their budgets, meaning that employee development and education is becoming a lower priority. “So at the moment, you know, part of the problem is actually really the recession. That there isn't really so much money left over and they all are worried they'll be running out of it…” (Interview 1117). In the analytical chemistry occupation, the economy not only plays a role in how foreign-born workers are viewed by other workers in the U.S., but it also promotes systems that require U.S.-based organizations to move analytical chemistry work to less expensive countries around the globe. These decisions require analytical chemists to engage in conversations and interactions regarding difference even if they were able to avoid them in the past.

Yeah, so I think it’s becoming even more important…to understand the diversity of the workforce and the globalization. So people need to see…[that] other countries [have] cheaper labor and these things but on the other side, I think we have to become more competitive and we need to, you know, [understand that just because the government wants] job protection you cannot [avoid sending] jobs off site because that’s not realistic, you know. And so we have to be prepared on how to handle these situations and one very important [way] is to understand there are different cultures, different diversity, and different ways of doing business and the more you learn you know by diversity and also the more you develop the skills of handling different diversity, getting with different people, I think you are more prepared to handle, you know, multicountry jobs. Like right now, we may have to manage a study in [country] but if people who are managing the study, they don’t understand the culture of it will be maybe more challenging to, it’s not necessary you have to speak the language but it’s more [important to know the]…subtle difference in terms of the culture. (Interview 1218)

In this excerpt, this foreign-born supervisor shared that it is necessary for analytical chemists in the U.S. to understand diversity because of the increasing prevalence of outsourcing scientific labor. He believes that if U.S. workers become educated about the cultures and practices of other countries, they will also be able to transition work and labor more effectively and productively outside of the U.S. What this supervisor fails to
consider is that this push to understand diversity in order to outsource labor may be one of the reasons U.S.-born workers are hesitant and uncomfortable with becoming a “global workforce.” In essence, the acquiescence by U.S. workers to develop their understanding of different cultures and differences may feel as though it signals a tacit approval of the reduction of U.S. jobs. The economic condition of the United States appears to then activate certain constructions of foreign-born workers that are representative of impending loss or intensified economic instability for the U.S. worker.

Logic developed from conceptions of economic instability play a key role in the construction of foreign-born worker Discourse. Representations of the foreign-born worker in the U.S. denote the individual as a competitor and a roadblock to U.S. economic recovery. Constructions of the foreign-born worker working outside of the U.S. are representative of the U.S. losing its stronghold over the global economy and consequently, continuing economic instability and strife for the U.S. worker. Poor economic conditions appear to discursively serve as a catalyst to negative, inflammatory, and nonproductive Discourses associated with foreign-born workers. In addition, certain social interactions at work also appear to influence Discourse formations of foreign-born workers in ways that also are not necessarily advantageous to occupational status.

Social Interactions

In Chapter V, I offered that in social or semisocial contexts at work, foreign-born individuals may have the opportunity to exercise resistance to dominant modes of communication in the U.S. workplace by segregating themselves from U.S.-born workers through the use of their native language. In addition to this possible mode of resistance,
language choices may also provide foreign-born workers increased feelings of personal and group identity in the workplace. Generally speaking, there is an assumption that there are common cultural and interactional norms used by people who share the same native language that increase communicative comfort and comprehension. The following foreign-born participant response typified comments regarding socializing within groups in the workplace:

…[it is] like if you’re from different countries and your background is probably different, you know, when you socialize with other people, it’s just like you have less to talk about. That definitely will affect your acceptance in, you know, [work]. So if you grew up, you know, people grew up with the same background, they have, you know, more common experience, more to talk about. But if, you know, you’re from another country, then you have less to talk about with your coworkers, I mean [they are] less likely to be like a friend, you know, [to be] social together. (Interview 1217)

This participant describes the difficulty in finding aspects of life around which to socialize when there is a perception (correct or not) that individuals from different countries share little common interest. This was evident in survey participant comments as well: “we may choose not socially going out for things that are perceived by [those of a specific national origin] as waste of time (such as going to rock 'n roll, etc.)” (Survey Data, 2009). These reflections that differences in national origin mandate differences in personal interests promotes further constructions of foreign-born workers (and U.S. workers in the reverse) as strange at best and suspect at worst—neither of which encourages groups to engage each other.

The human tendency to congregate with those with whom you readily identify, which in and of itself is not problematic, appears to become unproductive when there is a gap in understanding regarding why the congregation is taking place. When one group fears that congregation signals dissatisfaction or conflict between group(s), additional
negative constructions of difference are given weight. Fear and anxiety regarding underlying beliefs and motives may taint perceptions of others. One U.S.-born participant speculated that the congregation of groups based on national origin in his organization was due to political or cultural strife:

…we have certain people in our group that are more apt to talk to other people that are the same nationality. They do definitely get along better with them and then the same thing is people that don’t get along because of that as well. Not saying our groups, but from group to group…. I guess it is people that maybe their countries that say don’t get along… And that when they’re [in the U.S. they] kind of take that into account. (Interview 12151)

This participant’s speculation that groups of individuals in his organization do not get along well due to country-based differences, accurate or inaccurate, gives insight into the perceptions that people from the U.S. often associate with non-Western countries. These images are perpetuated by the U.S. media, which distributes representations of national and ethnic conflict that construct the foreign-born individual as inherently prone to violence. These representations also promote a notion of ethnic conflict as something that only happens outside of U.S. borders.

While the U.S. media bombards its audience with demonstrations of violence in African, Asian, and Latin American countries, the portrayal of U.S. domestic conflict tends to subvert the intensely cultural and ethnic roots of our own wars. Promoting U.S. conflicts as differences over land, property, and resource rights instead of as cultural, power-based, and political strife based in geography, genealogy, and history cements the notion that ethnic conflict does not happen here. Images of foreign conflict and interactional difficulty encourage an “us versus them” mentality. They are the ones that do not get along and we are the ones that talk about it. This mentality appears to develop regardless of conflicts in the U.S.—such as the Los Angeles riots, the Crown Heights riot,
the profiling following 9/11, and responses to Hurricane Katrina—which could be
considered ethnic conflict but are rarely labeled as such domestically. One Egyptian
participant reflected on his own work experience shortly after 9/11:

When the twin towers collapsed, [my supervisor] told me, “Prepare to be bothered
by others. Prepare to disappear for a couple of days. So this is what I did. …I
remember what my supervisor tells me and I go home for four days. I do not show
up [for work]. I am scared, my wife is scared, my kids scared. We cannot go from
home and we have to survive on what we have at home. When I look to the news
I think, no one can go outside now. After four days my supervisor called and said
you must come back to work… When I leave [to go to work] I find a blood drive
and I go. I find when people see me they say, ‘Surprising.’ [A few days after
returning from work]…I am looking for a box cutter to receive supplies in the lab.
[Previously] I had a box cutter in my desk and [my coworker] took it. She says,
‘No box cutters here, uh-uh no more’. And I said, ‘What do you mean? This is
mine.’ And she said, ‘No sir, we don’t keep sharp things in the lab anymore.’
…But she was sincere. (Interview 1124)

Regardless of U.S. conceptions that ethnic conflict happens between “ethnic” groups
outside of the U.S. or to the U.S., this participant’s story demonstrates the material effects
that can be discursively linked to effects of foreign-born status. It would be difficult to
effectively remove all “sharp” things from an analytical chemistry lab, and it would also
likely hinder people from doing their jobs. In this post-9/11 moment between the U.S.-
born woman and the Egyptian-born man, the box cutter represented far more than a
method of opening boxes. It was a reflection of the ways in which social conditions
discursively frame our understandings of difference and in doing so, affect the material
organization of work.

Because Western forms of communication and culture are the norms in the U.S.,
U.S.-born workers are generally seen as holding the bulk of social power in the
workplace. While U.S.-born participants did not directly state that they avoided getting
to know foreign-born workers, they also did not reflect on any attempts to actually make
connections (whether successful or unsuccessful). Most stories about socializing shared by U.S.-born workers painted pictures of foreign-born workers spending time with each other whenever possible at work as opposed to mingling more regularly with U.S.-born workers. What was subtly absent from these discussions was the converse behavior—that U.S.-born workers generally fraternize with one another as well. Just as with the invisibility of White privilege, domestic privilege obscures understandings of one’s own position as privileged (Nakayama & Krizek, 1995). It is seen as normal or natural for U.S.-born workers to gravitate toward one another, but it is suspect when the same happens among workers with different national origins.

So in the break room, there’s two or three distinct tables [of people] that sit off to themselves and they’re all [from a specific national origin]. So maybe as far as friends, they tend to, and I think they actually have like a little organization or something… They tend to socialize more together and do things. That’s not to say we’re not friends with them also but if just left alone in a group, they’re going to tend to gravitate to each other. (Interview 11233)

This U.S.-born participant’s comments were typical of comments made regarding foreign-born workers socializing together at work (similar additional comments can be found on pages 159-160). This participant’s diminutive reference to the “little organization” at work suggests either a feeling of a certain level of superiority over the group or a reflection of the group as not important or superfluous. Social interactions at work, particularly those in which people congregate with one another in groups based in national origin instead of equally fraternizing with other groups and/or nationalities, appear to provide the foundation for constructions of foreign-born workers as distant and closed as well as easily prone to conflict and cultural strife. The Discourses associated

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17 This comment suggests simple axes of congregation based on national origin only; this is not a complete reflection of issues present and is meant only as a means of introduction to the social conditions that mitigate intersectional experiences. In the following section, a more complex discussion of axes of congregation will be developed.
with these constructions do not promote work-based interactions or discussions that are productive or potentially career-building for foreign-born workers.

Social and economic conditions play a discursive role in the activation of constructions of foreign-born workers. These constructions are problematic for the full inclusion and acceptance of these workers into U.S. occupations. In an increasingly stressful economic climate, openness to diversity decreases and concerns over competition increase. With tense conditions, aspects of social behavior that are evident across groups (e.g., congregation and segregation based on conceptions of identity) become suspect to those in positions of power and are used to solidify representations of foreign-born workers as distant and prone to cultural strife, both of which imply a lack of interest and/or ability in acculturation. These constructions promoted through economic and social conditions, however, vary based on the intersectionality of difference at play for individual workers. The closer a nation’s cultural, social, and linguistic performances are to those of the U.S., the less suspect those performances become and the more access and control the foreign-born analytical chemist will have in the makeup and development of his or her occupation. Conversely, the more these representations and performances are perceived as significantly different from those in the U.S., the more concerning the individual becomes and the less control the foreign-born analytical chemist will have in his or her occupation. I now turn to a discussion of how these Discourses vary based on intersections of difference.
Hierarchies of National Origin

It is common in many European countries to begin teaching children English shortly after they acquire their native language. Consequently, many European-born individuals speak English as fluently as native English speakers. In addition, given the U.S. history of European colonization and migration, many social and cultural practices in the U.S. have roots within European history and society. This has led to historical and contemporary links between U.S.- and European-born workers that cannot as readily be made among the U.S. and Asian, African, and Latin American workers. There is also a predominance of White individuals that retain primary control over economic, social, and governmental capital in the U.S. and European countries as compared to Asian, African, and Latin American countries. Generally speaking, the people with power in much of Europe look the same as many people with power within the U.S. This does not suggest that national origin is irrelevant for European individuals working in the U.S.; however, it is clear that the easier it is to link the nation’s cultural, social, and linguistic practices to domestically conceptualized norms, and the more similar a nation’s people of power are to the people of power in the U.S., the more likely it will be that those individuals will not be considered overtly negative or troublesome—in fact, they may prove to be an asset. Simply stated, some foreign-born people can “pass” in the U.S. better than others.

During interviews, female foreign-born participants from North and Eastern Europe all shared that, while their national origin was relevant to differing degrees in their work, it was not considered a negative and was discussed as a secondary concern after gender. This female participant from Germany offered her opinion that common beliefs regarding her national origin had likely been beneficial in her career:
I've seen that and probably people have definitely - I would say that came as an advantage for me as being a German - that Germans are considered to be meticulous and accurate. And that is something that is often associated with the analytical science and I believe that people [consider this an advantage]… I can say, I mean I can think of myself to be quite successful and so [my national origin] probably has been working out very well for me. …But I'm also sure if I were a male American, I would probably make you know, 50 thousand dollars more a year without you know, without doing more work. (Interview 1117)

This participant offered that because her country of origin was well-known for its craftsmanship and meticulous work and because these characteristics are also considered positive in the analytical chemistry occupation, the representations of her nation tended to positively impact her work. She did believe, however, that the combination of both U.S. and male status would likely benefit her substantially more than being a German female. Another participant offered that while her national origin was not represented by any particular skills or characteristics that benefit the analytical chemistry occupation, the intersection of images of her national origin and gender are extremely and positively sexualized in the U.S. She shared that this may be beneficial in working in U.S. male-dominated scientific areas.

I’ve been in organizations where there’s definitely been the good old boys network so if you’re a girl, that doesn’t help. Although they really appreciate, you know, the girl especially if you’re a Swedish girl…so I have a certain connotation. (Interview 11181)

This participant’s story proposed that her gender, when combined with images associated with her national origin, held a connotation that was alluring in the U.S. scientific workplace. As she reflects, being a girl does not help in the occupation, but being a Swedish girl does not hurt.

Stories shared by men and women in the interviews indicated variations in occupational experience based on national origin. Those reflections from Northern and
Eastern European women suggested that in some cases, national origin can mediate the consequences of gender.

Accounts from U.S. female analytical chemists suggested that in their experiences, social narratives of women, including assumptions, stereotypes, and beliefs, did not readily promote membership acceptance in the analytical chemistry occupation. Chapter IV survey data regarding stereotypes of the analytical chemist align with these notions. Out of the 34 participants that referenced gender when describing the stereotypical analytical chemist, 31 stated that the individual was male. Stories and reflections in the interviews suggested that the analytical chemistry occupation holds similar obstacles for women to many other science and engineering fields. This study did not add new insight into this experience but substantiated previous research on women in science and engineering, with participant stories reflecting that women face hurdles of primary socialization and education, reproductive concerns, and blatant marginalization (Etzkowitz, Kemelgor, & Uzzi, 2000; Faulkner, 2007; Gilbert, 2009; McIlwee & Robinson, 1992) in scientific work. Interestingly, discussions of gender among U.S.-born female analytical chemists did, in several cases, refer to age as a mitigating factor. In one instance, the participant referred to herself as “like a real old lady there in my particular department” but consequently stated that because of her age and tenure, she is “given a lot more leeway as to how to do something, [or] whether we should take [a project] in a totally different other direction” (Interview 1121). Another participant noted that as she has gotten older, her role has conceptually shifted from a female supervisor to, as she stated, “the mother role” (Interview, 11301). She asserted that being in the mother role is a positive experience for her because, as she put it, “I think there’s some level of respect
at this stage.” Women surveyed in the quantitative phase of the project also reported age as an aspect of identity that is considered relevant by others when appraising one’s work (see page 101). These references to age demonstrate how age can function as a beneficial attribute for women in analytical chemistry even while it is generally considered a negative in social contexts.

Participant stories demonstrated that the particular intersections of national origin, gender, and age incite variations in occupational treatment. These variations are not completely uniform or predictable, which served to develop one overarching pattern: differences do not equally detract from or add to occupational acceptance. For instance, participant stories supported this project’s quantitative data that indicated foreign-born and domestic women have slightly different views on whether being female is a detriment or a “mixed bag” in analytical chemistry (see pages 116-117). In other instances, if domestic workers see traits from foreign-born workers that appear beneficial or attractive to the occupation, those differences may be used to alleviate or account for other differences that may otherwise be considered suspect. For instance, believing that Germans are excellent at craftsmanship seems to have drawn attention away from one participant’s female gender, while gender for U.S.-born women caused significant difficulty.

Interestingly, for participants of, and reflections regarding employees of Asian national origin, traits and behaviors that were also considered advantageous in the workplace did not have the same mitigating effects as with those traits associated with European national origin. More specifically, European national origins seemed to mitigate concerns of difference that consequently improved the employee’s experience.
Asian national origins seemed to mitigate concerns of difference with consequently improved the employer’s experience but often detracted from the employee’s experience.

The most commonly referenced group of analytical chemists in discussions of diversity and its effects on the experiences and performance of work were women from Asian countries. Representations in participant reflections of Asian women were those of ideal workers that would willingly work difficult and long hours to accomplish their jobs. Although it could be assumed if using the European data that this would be beneficial to the individual’s career, this was not the case. Supervisors appeared to use these constructions to rationalize giving large workloads to Asian women:

Well I think the general perception is that yeah, Asian I think it’s even women more than men actually work a lot of hours, works really hard. And that’s I think that that’s, at least at work, has been true, worked a lot of hours and I think that that has been abused to some extent because then you can get always you know that someone’s going to work a long time so you always give them more projects. (Interview 11181)

This comment, which was typical of references to this population, reveals how performances are discursively linked to Discourses of difference that materially impact the work assignments and associated decisions by those in charge. This supervisor recognized the risk of overwork for Asian women in the occupation because they are constructed as hard workers that put a tremendous amount of time into their work. However, it did not appear that this recognition hampered the continued assignment of this level and type of work.

Until recently, the construction of Asian women and men as “model minorities” has not been critically considered in academia as regularly as more prevalent negative stereotypes (e.g., “yellow peril”) (Ng, Lee, & Pak, 2007). This is likely due to perceived positive valence of the model minority stereotype. Delener and Neelankavil’s (1990)
research on Asian men and women identified that the work-related stereotypical attributes most often assigned to this group were hard-working, technically competent, serious, and intellectually gifted, leading to an “if it ain’t broke, don’t fix it” mentality by those doing social research (Taylor & Stern, 1997). As demonstrated in participant narratives, this type of stereotype may appear positive in that it highlights attributes considered desirable in the U.S., but it also provides rationale for expecting and requiring more out of Asian employees (particularly female Asian employees, as will be further discussed) than employees from other national origins or cultures. This expectation can result in supervisory decision making that may give Asian employees access to improved opportunities for employment but less than ideal working conditions and occupational development. This U.S.-born participant shares a statement made to her by a U.S.-born male supervisor:

You work a lot and you get to be pretty good friends with those you’re working with and so just as a friend, he made an offhand remark, but he technically was like my boss’s boss, that if he had his choice he would fill his lab with Asian women. And I was like excuse me? And he said well because they do a really good job and they’re meticulous but yet they will work as hard as they can for you so they’re not going to complain. So they’re going to work their heart out and not complain. And I thought great, so where does that leave me? (Interview 11233)

This participant’s reflection reveals how constructions of intersectionality can produce multiple consequences. On one hand, the fact that a supervisor is motivated to hire a diverse workforce is a positive sign. However, this particular story provides a far more menacing view of supervisory decision making. Supervisors can rationalize the mistreatment of an employee population by arguing that it is somehow in the individual’s nature to work hard. This U.S.-born participant’s last comment, “So where does that leave me?” beautifully demonstrates how Discourses of difference can stimulate U.S.-
born workers’ fears and anxieties about personal work stability. This fear can then become linked to the difference, and consequently the person of difference, rather than to management and those making organizational decisions.

Management plays a crucial role in the ways in which difference is understood and responded to in the workplace. Asian women are constructed as powerless and shy victims in social and organizational settings (Buijs, 1996; Kim & Chung, 2005), making it possible for supervisors to feel justified in directing and controlling their behavior at work to a greater extent than that of other employees. One Asian male participant suggested that these Discourses about Asian women may promote the perception that Asian women are better able to integrate into the U.S.-centric model of work:

I think [Asian] women may have a little better chance in the U.S. than [Asian] men. I believe it will be the same affect that [Asian] women [are] more adaptable you know than [Asian] men. Also maybe it’s like in the U.S. a White male would be like dominant there but it’s like I say, you know, minority women would be better accepted than men, I believe. But I believe whether it’s Asian or Black, like men are dominant like we’re one race, I mean the… minority women would be more likely accepted than [Asian] men. (Interview 1217)

As an immigrated Asian male, this participant’s account of the ways that images of Asian men and women affect work systems displays the social and symbolic effects of representations of intersectionality. This participant goes on to explain why he believes that representations of Asian women versus men affect occupational acceptance:

I feel like [you can see it] more in the movies and the other things you know. You can see like Asian men, you know, we’re always like the villain. I mean it’s the same thing like it’s not only in the scientific field. I mean it’s kind of like gender discrimination, you know. Women are taken as a like property, you know, so it’s like men somehow [are] a threat. (Interview 1217)

Here the participant uses popular culture to demonstrate the image of the Asian man as threatening as compared to Asian women. Throughout U.S. popular media, there have
been two main stereotypes about Asian men: the Asian man as effeminate and somewhat asexual, and the Asian man as the dangerous and cruel villain (Aoki, 2001; Kimmel, 2004; Park, Gabbadon, & Chernin, 2006). This participant draws upon the second stereotype to explain why U.S.-born supervisors may feel less comfortable directing and controlling the work of Asian men. Shim (1998) establishes in his research on the shifts in stereotypes of Asian men and women in the U.S. from the early 1900s to the late 1990s that the predominantly negative stereotypes of Asian men and women have been, in many ways, associated with the labor markets in the given decades. As the U.S. and European countries began to lose their standing as manufacturing super powers, and countries like Japan, and, more recently China, began to take over significant shares of the financial markets, references to Asian men began to take on a less effeminate, submissive valence and a far more sinister and ominous quality. Popular U.S. films and T.V. shows have reflected these perspectives: for example, the films *Bloodsport* (1988), *Year of the Dragon* (1985), *Rush Hour 2* (2001), *Lethal Weapon 4* (1998), *Rising Sun* (1993), and the James Bond film *Dr. No* (1962). These films have in various ways represented Asian men as threatening criminals interested in making money or “taking over” at all costs. It is these representations and images of Asian men that the previous participant suggests affect the differences in task assignment and work practices between Asian men and women. U.S. supervisors will overwork Asian women because they will not complain, and they will avoid similar behaviors with Asian men so that they will not become a potential threat.

Participants did not just note the representations generated from popular culture or culturally developed behavior as salient in the constructions of intersectionality. A
significant axis of difference in the analytical chemistry occupation was education and, more specifically, where that education was obtained. Throughout the interviews, many references were made to education and the importance of being educated in the U.S., regardless of one’s national origin.

In the U.S., the belief that domestic universities and colleges are superior to foreign universities and colleges is prevalent. While there is no question that the U.S. remains a strong force in education, many other countries maintain some of the most prestigious universities in the world. *U.S. News and World Report’s World’s Best University* rankings for 2009 named 29 non-U.S. universities in the top 50 life sciences and biomedicine universities (*U.S. News*, 2009). Regardless, there is still a strong domestic feeling of U.S. superiority as it relates to education.

One of the things that I sometimes hear is comparisons in terms of education, you know, from different countries. People don’t want to believe that let’s say the American education system is not superior in any way. So you sometimes hear comments, you know, oh we are the, our system is the superior system and anything else from outside is not. (Interview 11201)

This participant’s comment typifies beliefs regarding the importance of having a scientific degree from a U.S. university, regardless of national origin. Because of the assumption that the U.S. has superior colleges and universities, and because U.S. supervisors have a method of measuring the comparative worth of these national institutions according to their known affiliates, people educated and trained in countries outside of the U.S. are often met with suspicion about their knowledge, skills, and expertise. As a result, “employers may devalue education undertaken in foreign countries when they make decisions about recruitment, reward allocation and promotion” (le Grand
& Szulkin, 2002, p. 41). This participant shared a story regarding the consequences of working in the U.S. with a foreign degree:

So yeah, we’ve actually had people that have had Ph.D.s from other countries that actually have started off as a lower position because it was from another country. I know one girl…she had a doctorate yet she was a basically a technician. But then there’s been other people that have gotten you know undergraduate degrees from other countries and then came here and got their [U.S.] master’s and that’s been more favorable I guess. …there have been people that always want to ask, ‘Where’s your Ph.D. from?’ (Interview 12151)

The women referenced in this story received her PhD from a university in India and was hired at a technician level in the U.S—a level generally reserved for individuals with an Associate’s or Bachelor’s degree. This story exemplifies how those who have obtained degrees in non-U.S. countries may find their career paths slowed and/or stunted (regardless of technical or intellectual skill) due to unspoken biases about their educations. The participant continued:

But the problem was here that she did very similar work to what a chemist would do here. But it was just the fact that, and you know and everyone knew that her degree was a PhD but yet she was still a technician, so people kind of treated her differently because of that. I mean fairly or unfairly, I guess that was her level. That was her job level. …she left after a couple of years. (Interview 12151)

In any field, obtaining a PhD is a significant and hard-earned distinction. This woman’s experience of being placed in an entry level position after significant graduate education likely resulted from perceptions regarding the perceived quality of PhD programs in India and consequently resulted in a lower perceived quality of her in the analytical chemistry occupation.

It is a common refrain from those in supervisory positions that it is difficult to ascertain the merit or value of a degree that was not obtained in the U.S. or a European country. One foreign-born participant from China agreed that degrees from countries
outside of Europe or the U.S. were problematic because U.S. employers do not understand or know how to evaluate them.

The university I [went to was in] Belgium [which] is a western European country so their education is very reputable. ...say you get a degree from somewhere nobody knows [then there will be a problem]. The university I went for my graduate study is actually the second oldest university in Europe so it’s very good university. It’s probably in the top hundred in the world you know. But there’s still other labs [in non-European countries] that I think are difficult, maybe the difficulty for people in the U.S. to understand. (Interview 1218)

It is likely that the difficulty in determining the merit or value of universities not in the U.S. or Europe stems from the issues of language discussed in Chapter V. Because there is no easy way for supervisors in U.S. companies to compare universities without the access to translated transcripts and university standings, it is often simpler to assume that these universities are not equivalent to U.S. universities than to take steps to understand their commonalities and differences.

Summary

It has been well established that aspects of difference impact one’s ability to gain, maintain, and develop employment. For instance, research has previously shown that women of all races and ethnicities face substantial hurdles to being accepted and treated equally in scientific work in the U.S., demonstrated by the still persistent gap in wages between male chemists, who earn $88,000 per year, and female chemists, who earn $66,000 per year (Chemcensus, 2005). This project complicated and added to findings of difference at work, substantiating quantitative and qualitative data indicating that differences do not work on simple axes of congregation. Instead, these intersections flex and move according to occupational expectations. Broad Discourses regarding specific
groups of foreign-born workers implied a hierarchy of national origins in the occupation. This hierarchy is diverse and filled with internal inconsistencies. These inconsistencies are representative of the ways that constructions of foreign-born workers shift based on contextual conditions as well as the Discourses related to specific intersections of nations, genders, and ages. For those working in organizations being directly impacted by the economy through reductions in force, outsourcing, and/or budget constraints, certain constructions of foreign-born workers as harbingers of economic instability appeared to affect acceptance. In addition, people native to the U.S. viewed congregation based on national origin as exclusionary, isolationist, or suspicious, and marked it as generally unproductive at work. Overall, this chapter suggests national origin is a heterogeneous Discourse that in varying and complicated ways, informs the occupation.
CHAPTER VII

CONCLUSION

I began this project with an interest in scientifically trained foreign-born individuals working in the United States. My professional and personal experiences with scientifically trained people from countries outside U.S. borders had fostered a strong curiosity about the hurdles my colleagues and friends were facing in their occupations. From my vantage point, I had watched stereotypes and assumptions about certain national origins and cultures affect how some individuals were treated at work. It appeared that their identity as scientists was shaped significantly by images of difference. Beyond the interactions and behaviors I had observed at the interpersonal level, I also wondered if these interactions were indicative of a larger occupational trend.

These questions that developed from my personal and professional experience triggered academic questions as well. My investigation into the literatures related to my field of interest made it apparent that difference was being conceptualized and invoked differently based on the epistemological traditions of each study. In addition, difference was not being actively taken up in studies of scientific work and so I became interested in understanding whether and how these varied conceptualizations of difference actually came together in communicative interaction related to the scientific occupation. I used the construct of occupational identity to help me gain this understanding.
Via the concept of occupational identity, I considered the ways in which locally achieved performances of difference as well as the broader social narratives and associated socially coded characteristics of difference were used in conjunction with formal and informal aspects of occupational standards, practices, and beliefs in order to explain, justify, or reify decisions regarding diverse occupational practitioners. In doing this, I determined that differing definitions and conceptions of difference cannot only be considered simple products of epistemological traditions. I assert that these varied conceptions of difference actually mark the individual processes ongoing in the social construction of difference. As a result, I suggest that all definitions of difference (i.e., difference as situated embodied talk and performance; difference as a social narrative and ordering force; difference as physically manifested and relatively stable characteristics) be addressed and examined in order to fully theorize difference in the occupation, because all of these definitions make up the lived experience of the diverse worker.

In this final chapter, I will first reconsider the literatures which informed this project’s guiding argument that science and technical work should be studied through the lens of difference and that difference should be studied through the lens of science and technical work, and I will offer my contributions to that argument. Next, I will explore in more detail how this study informs my research problem, and I will then review Chapters IV, V, and VI and discuss their theoretical and methodological contributions. This chapter will end with recommendations related to the findings in this study and a brief statement on the importance of further research of this type.
Literature on the Foreign-born Scientist at Work in the U.S.

The literature review in this project was undertaken in order to uncover how research on difference in scientific occupations (specifically as it related to foreign-born workers) had been conceptualized and performed across the social sciences and humanities. Quite specifically, I needed to know whether previous literature had investigated the experiences of highly skilled foreign-born occupational practitioners in U.S.-based scientific organizations and, if not, what associated literature could help bring to light about the potential issues at stake. What I found were four major topic groups that most directly related to my field of interest: foreign-born workers in the U.S.; occupational segregation; difference at work; and science and technical work literature. My review also pointed to four major gaps in the literature that suggested the need to study difference through a lens of science and science through a lens of difference. In this final reconsideration of the literature, I will highlight my initial critiques and respond with my contributions.

The first group of literature I reviewed covered research on foreign-born workers in the U.S. Numerous researchers have studied this population from a multitude of perspectives. Most commonly, research focuses on questions about the potential level and valence of contributions that foreign-born workers make to the U.S. economy, as well as their perceived social impact on the areas in which they live and work (Borjas 2006; Peri, 2010; Wadhwa, 2007). Additional research has examined the experiences of foreign-born workers in the U.S., specifically issues of their acculturation and social acceptance (Chakravartty, 2006; Subramanian, 2000; Varma, 2004). Although this research is extremely valuable for its contributions to the understanding of foreign-born
workers as a population, one of its shortcomings is that it has not examined how these experiences can be understood through a lens of work. Specifically, the majority of these projects have not seriously examined the occupation as related to foreign-born worker experience. An additional issue with this research is that it has primarily positioned the foreign-born worker as a “problem” in social and organizational contexts. Research on the foreign-born worker as the primary site of difference misses a key issue in studies of work and difference. In other words, the majority of this research focuses all attention on the individual and thus misses the opportunity to examine the ways that work itself enables narratives of difference to be taken up, used, and rationalized in the occupation and workplace.

In this project, I aimed to address these issues throughout both phases of study. I examined job duties, supervisory responsibilities, and occupational acceptance in the quantitative phase of the project. Survey data provided evidence that there was a pattern evident in the occupation across organizations and geographic areas which suggested a link between socially coded characteristics and experiences and assignments of work. That pattern, which I noted through statistically significant findings regarding job and supervisory makeup, language importance, and levels of organizational acceptance, was abstracted through my analyses of interview data on language, communication, and social narratives in the qualitative phase in order to better uncover how difference discursively functions in the occupation.

In response to the current literature on the foreign-born worker, this project moves from the individual level of analysis to an occupational level. In doing so, it illustrates that the occupation is, in part, divided along lines of difference and that these divisions
are explained and rationalized through occupational decisional premises (to be discussed in greater detail in upcoming sections), which implicate difference as a sometimes unfortunate, but nonetheless necessary, divider for good science. For scholars interested in studying the experiences of foreign-born workers in the United States, these findings indicate the value of multilevel analyses of difference in the occupation and suggest that the future of research on the ways that work itself can function to enable and constrain discourses of foreign-born workers is quite promising.

The second set of literature reviewed was occupational segregation. This research has primarily aimed to understand how key aspects of identity (most notably gender) affect the division of labor (Charles & Grusky, 2004). In order for theorists to measure and generalize whether difference impacts an occupation, they regularly survey things like occupational title, categorical class, and seniority level (Weedon, 2004; Weedon & Sørensen, 2004). Covering the particularities and intricacies within occupations is then, reasonably, out of their purview. The findings in this study suggest that in addition to studying the segregation of occupations, there is value in studying segregation within the occupation itself in order to understand how duties and tasks rely on occupational decisional premises which implicate certain bodies as more or less appropriate for certain aspects of work.

Occupational segregation theorists also routinely study how aspects of identity such as gender and race significantly impact one’s ability to gain employment in certain market sectors and earn wages comparable to those of privileged counterparts (Bonacich,

18 I am not suggesting that occupational segregation scholars do not study segregation within occupations, but rather I am concurring with those who continually work to provide greater levels of nuance and specification within their research on occupational segregation (see Maume, 1999 for an example).
1972; Greenhaus et al., 1990; Maume, 1999; Reskin, 1988). Quite a few of these studies examine gender as the only or primary variable of difference (Anker, 1998; Baunach, 2002; Goldin & Rouse, 2000; Jacobs, 1999). Many of these studies have provided necessary and useful information about work equality across the globe (Melkas & Anker, 1998; Tzannatos, 1999) but what historically has been clear in U.S.-focused occupational segregation research is that it primarily measures domestically relevant socially coded characteristics (e.g., many studies assume a relatively homogeneous population outside of gender and U.S.-oriented racial categories). A sizable portion of this U.S. research has consequently failed to account for the increasing global diversity of individuals working in U.S. contexts.

Because U.S. scholars have primarily focused on domestically relevant characteristics, many of the organizational decisions and management styles related to diversity have focused on these same domestic characteristics. This project asserts that domestically focused “diversity management” does not adequately address the issues and difficulties both foreign-born and U.S.-born workers face in the workplace. For researchers engaged in the study of occupational segregation, these findings suggest the importance of studying globally relevant aspects of difference in U.S. settings. Studies of more globally relevant aspects of difference may uncover new ways to address difficulties that often lead to segregation within the occupation.

Because this project centered on issues of difference in the occupation, it was vital that I review the literature on difference at work in addition to the scholarship already covered. This critically and interpretively based scholarship on difference has primarily examined how aspects of difference affect self and others in organizations. This research
covers considerations of gender and race most regularly, and it more recently has begun attending to aspects of nation. Difference theorists have shown that gender has substantial effects on the organization and occupation (Acker, 1990; Alvesson, 1998; Ashcraft & Mumby, 2004; Collinson, 1988; Murray, 1996; Pringle, 1989). Race research has also offered that race is often perceived as a defining aspect of human identity which strongly affects how diverse workers are accepted and treated in the workplace (Allen, 2007; Meares et al., 2004; Nkomo & Cox, 1989; Orbe, 1998; Parker 2001). Research on experiences of national origin at work is growing, but it is still relatively new to organizational studies (Grimes & Parker, 2009). This research has varied in findings regarding the role of national origin at work. Some researchers have argued that at the interpersonal level, national origin may function as a positive source of identity for foreign-born workers to rely on in the organization (Alkhazraji et al., 1997), while others have suggested that its relationship to organizational identity can be a source of conflict (Das et al., 2008). At the occupational level, non-U.S. national origin has been routinely negatively associated with “job stealing” and outsourcing, and as a result, it is often viewed poorly by U.S. workers (Banerjee, 2006; Tannock, 2009). Differences in English language skill for foreign-born workers can also identify them as outsiders in the occupation, which can negatively impact occupational development (Davila et al., 1993; Gouveia & Rousseau, 2007; Lazear, 1999).

Difference at work research has added tremendously to our understanding of the ways that difference impacts and directs experiences at work. The majority of this research focuses individually on a specific type of difference (i.e., race or gender or nation) in order to do justice to its respective unique symbolic and material history in the
U.S. It was the goal of this project to not only build on these studies of difference but to complicate them by providing additional insight into the intersectional experiences of difference at work. Because I wanted to ensure that nation-status, in addition to other aspects of difference, was adequately examined in this study, I consciously designed this project to access issues related to national origin. It was a concern of mine that in previous domestically focused studies, nation-status may have been subsumed under the broad category of race, resulting in studies of occupations which inadvertently conflated domestic issues of race with global/international issues of nation. To address this, I gave participants the option to state their race in their own words instead having to choose from a set of U.S. census-based choices. As a result, one participant identified as Black and all other participants either indicated their race as White or repeated their national origin or family’s national origin as their race (e.g., one participant wrote race as, “family is from India”). This methodological choice to give participants the option to identify their race in their own words had two effects. First, those participants who did not identify as White or Black seemed to feel more comfortable indicating their geographic or cultural roots rather than attempting to categorize themselves in terms seen commonly in U.S.-based census data. If this is so, this provides researchers studying difference important insight into the ways in which our own domestic biases may be framing studies of difference. I suggest that expanding research processes to be more open to globally-relevant characteristics may better enable difference scholars to understand how domestic systems of power that we regularly take for granted (e.g., categories of difference considered salient in domestic difference research) drive our research in substantive ways.
The second effect of my choice not to mandate race-specific identity options in the survey was that I was unable to study how race, as domestically categorized, related to the questions in my survey. In other words, if I had used census-style race categories, my findings may have looked substantially different. It is possible that the study would have uncovered the importance of studying race in scientific work. Of course, studying race in scientific work is research that should be undertaken, considering the low percentage of U.S.-born Black (1.9%), Latina/o (2.7%), and American Indian (0.2%) individuals in the chemistry occupation (Chemcensus, 2005). However, it would also reify conceptions that U.S. studies can continue to focus primarily on U.S.-born workers as noteworthy contributors to U.S.-based organizations without acknowledging the substantial role foreign-born workers play. In summary, I point difference scholars toward the problem related to studying difference in specific contexts in order to invite further inquiry into how critical and interpretive studies can be questioned and enhanced through significant consideration of how difference is conceptualized from the outset of study.

Research on difference at work has provided a considerable amount of information about how difference generally functions in organizational and occupational contexts (Adler & Gunderson, 2008; Essers & Benschop, 2009; Tiernari, 2005). However, because of my specific interest in scientific occupations, I turned to the final set of literature in my review, science, and technical work, to consider how all of the above aspects of my project (foreign-born status, difference, and the occupation) are treated in this scholarship.
Literature on science and technical work has not taken up studies of the foreign-born worker as foreign-born in science or technical work with any alacrity. Research in this field examines scientific work itself but does not appear to consider how labor may be affected by the diverse embodied worker. This project has demonstrated that the body is linked to the work in substantive ways. Specifically, I suggest that the concept of “good science” in scientific work assumes those doing good science adhere to cultural and linguistic performances considered appropriate in the occupation. For scholars who study science and technical work, this finding indicates that difference is woven into beliefs, concepts, and expectations associated with occupational identity, and that in order to maintain that identity, occupational practitioners will make decisions in their work which may adversely affect those considered different. These findings suggest that research in science and technical work has a promising future in examining the ways in which difference is part of science.

Summary

While reviewing these four distinct fields of scholarship, I have broadly referred to the four gaps I noted in the literature surrounding foreign-born scientists working in the United States. First, the foreign-born worker as an individual has been conceptualized as the site of the problem when related to discussions of difference in much of the research. This conceptualization ignores how occupations are organized through and around difference. This project has attempted to address this gap by highlighting how discourses of difference are used to organize occupations. Second, U.S. studies have primarily used domestic conceptions of difference, such as race, when
considering the foreign-born worker, and in doing so, we have failed to see the distinctions that studies of national origin can bring to U.S.-based studies of difference. In an effort to address this concern, I avoided preidentified categorizations of race and rather allowed participant data to drive formulations of difference in the study; this, in turn, pointed to the important ways in which nation-status impacts the occupation. Third, research in the field of science has overwhelmingly ignored the role that difference plays in the organization of work, and consequently, it has not examined the experiences of foreign-born workers in U.S. scientific organizations. The driving focus of this study was on proving the importance of research on diverse employees in science, and the statistically significant findings throughout Chapter IV and the critically identified findings in Chapters V and VI offer both straightforward and nuanced demonstrations of the importance of future studies in this area. Fourth, research regarding multiple aspects of difference at play for foreign-born workers has tended to examine and compare how aspects of race or gender impact work individually, which has diminished our ability to see how intersectionality plays into the organization of work. By considering the discursive formations of intersectional difference in the occupation, I tried to show the puzzling, paradoxical, yet broadly discernable effects of intersectionality in the occupation.

Across these four literatures, it is apparent that more interaction among these fields of study is desirable. It is particularly important that difference scholars and scholars studying the experiences of foreign-born workers engage difference through a lens of science in order to study the discursive formations which function to organize work. In addition, science and technical work and occupational segregation researchers
need to study work through a lens of difference. This will allow science and technical work researchers to more deeply examine the tasks and responsibilities associated with scientific work and how those tasks and responsibilities are informed and arranged, in part, through discourses of difference. For all researchers, these new directions will require making decisions regarding the methodological and epistemological standpoints from which to engage the research. It is apparent that problems associated with these standpoints will likely surface at one time or another. I invite scholars to be open to considering new ways to engage this broad area of research in hopes that in doing so, researchers across fields will become less averse to speaking with and across disciplines and ways of knowing.

Throughout this reconsideration of and contributions to the literature, I have pointed briefly to the areas in which my research has added to and/or addressed the highlighted gaps. These gaps have all developed because, for the most part, these bodies of literature have functioned in isolation from one another due to their somewhat conflicting epistemologies and methodologies in research focus and design. As I work through the process of more fully detailing the contributions of this project, I will emphasize the theoretical and methodological bridges I used to complete this study.

**Theoretical Bridgework and Research Question**

I used a theoretical lens in this project that could handle simultaneous and often conflicting epistemologies and methodologies. This lens was the communicative concept of occupational identity (OCI). I used OCI to theoretically frame and analyze the experiences of difference. Specifically, I asked in my research question: *How, if at all,*
are discourses of difference and socially coded characteristics experienced and understood as part of the occupational identity of the analytical chemist?

Occupational identity is a “social construction process and outcome” (Ashcraft, in press, p. 1) that attends to conceptions of the worker and the work in a given occupation. OCI provides multiple ways that the performance of work and the embodied worker can be studied (e.g., through the body-work link, image and performance, and intersectionality of the worker), and it can also be used with multiple methods because it is not reliant on a single epistemological frame to be considered relevant. In this particular project, OCI has enabled me to measure the effects of difference as constructed characteristics, while also analyzing difference as d/Discourse, to understand how practitioners in the occupation explain and rationalize different types of occupational treatment.

Before delving into this process, it will be useful to review one of the key terms used in this project. As covered in Chapters V and VI, the term discourse in this research has taken on two distinct meanings. Alvesson and Karreman (2000) explain that discourse can be understood as “local achievements, analytically distinct from other levels of social reality” (p. 1126)—framed as the “little d” discourse. And discourse can also be defined as “general and prevalent systems for the formation and articulation of ideas in a particular period of time” (p. 1127)—known as the “big D” Discourse. In Chapter V, I focused on “little d” discourses and examined the everyday talk and embodied performances noted by occupational practitioners as different. In Chapter VI, I changed focus and looked primarily at “big D” Discourses in order to see how broad social narratives of difference functioned as ordering forces in the occupation.
In response to my research question, I found that discourses of difference as well as socially coded characteristics play a significant role in the experience and understanding of the occupational identity of analytical chemists. Specifically, differing definitions of discourse demonstrate how politically-charged *Discourses of difference*, constructed in part through culturally, socially, and linguistically loaded *discourses of difference*, are activated by *socially coded characteristics* seen as manifested on the body. These manifestations, coupled with discourses of difference, are then used to inform occupational decisional premises associated with occupational identity. More simply, I argue that this project provides a unique way to trace the experience of difference as associated with occupational identity. Imagine a dialectical circle (see Figure 1).

While there is no formal beginning to this cycle, I will begin the discussion with embodied performances and everyday talk that mark the actor as different. As discussed in Chapter V, these discourses of difference are noted by occupational practitioners during the performance of everyday tasks. Occupational practitioners evaluate these differences for their perceived positive or negative impact on the work itself. In this project, practitioners were primarily concerned about difference due to internalized beliefs regarding its negative effect on doing “good science.” I argue that these internalized beliefs come primarily into an occupational identity from the secondary socialization process. Formal and informal educations about the technical requirements of the occupation, the standards and practices of the tasks, the types of people that are good scientists and those that are not are all bound up in the beliefs, expectations, and rules that come to feel normal and natural (Mumby, 1987) in the occupation. These natural and normal beliefs are the basis for occupational decisional premises formed by
occupational practitioners. These premises consequently unobtrusively control the behavior and interactions of those aligned with the associated occupational identity.

As conceptualized here, these discourses of difference that are locally achieved and observed in the occupation serve to “feed” broader narratives of difference, in this case, Discourses of national origin as they relate to science. As these discourses become distanced from their embodied context, they stop being seen as local achievements and instead become validating texts of the Discourse that suggest that this is “just the way things are” (Berger & Luckmann, 1967).

Discourses of national origin are intimately attached to representations of difference in that Discourses draw upon visual representations of the subject that they reference. The connection between physical attributes and d/Discourse demonstrates
how socially coded characteristics can be conceptualized as discursive effects. Socially
coded characteristics seen and processed by occupational practitioners trigger
occupational decisional premises based out of d/Discourses of difference. I suggest this
is a dialectical process in which discourses of difference align with socially coded
characteristics in ways that validate broader Discourses of difference and vice versa.

Chapters IV, V, and VI all contributed to this perspective and, in differing ways,
used OCI as a bridge to do so. The following sections will review the contributions of
these chapters in order.

Statistical Understandings of Occupational Identity

and Difference

Chapter IV engaged the occupational identity of the analytical chemist by
considering four basic areas of work: 1) job makeup and supervisory responsibility; 2)
full occupational membership; 3) varied aspects of occupational acceptance, such as
inclusion, understanding, varied ideation, and positive treatment; and 4) job satisfaction.
The data regarding these aspects of the occupation demonstrated that the tasks associated
with the occupation and the experiences derived in the occupation are significantly
impacted by socially coded characteristics, specifically gender and national origin. As I
emphasized in Chapter IV, I did not operate this phase of the project with the assumption
that difference, in and of itself, causes work effects. It was necessary for me to phrase
survey questions in a way that would increase the likelihood of participant
comprehension and ease of response. This often meant phrasing questions from a fairly
realist standpoint. However, my underlying assumption within the project was that socially coded characteristics function discursively to affect work.

Findings regarding job makeup indicated that national origin is associated with the likelihood to perform certain tasks in the analytical chemistry occupation. These tasks are primarily technical and mechanical aspects of labor associated with skilled precision and aptitude. In scientific and high-tech fields outside of analytical chemistry, these have also been the types of tasks associated primarily with highly skilled Asian workers in the U.S. (Cheryan & Bodenhausen, 2000; Ng et al., 2007, Varma, 2002). Mean data regarding supervisory differences between U.S.- and foreign-born female supervisors evidenced that foreign-born female supervisors responded more frequently that they supervised technical lab equipment, lab areas, and indirectly supervised personnel while U.S.-born female supervisors responded more frequently that they supervised research projects, directly supervised staff, and had the ability to hire, fire, and promote. These findings were interesting in that they suggested a relationship between national origin (as a characteristic of the body) and occupational tasks and responsibilities. Because of this, I interviewed participants in the qualitative phase of the project about their beliefs and perceptions regarding national origin in order to better understand how discourses surrounding characteristics promoted the assignment and accomplishment of certain types of labor.

Responses to questions about supervisory responsibilities demonstrated a significant difference between men’s and women’s likelihood to supervise in the analytical chemistry occupation (men routinely reported supervising more lab space, equipment, and research programs than women and also reported hiring, firing, and
promoting ability at a higher rate than women). This finding is similar to those of previous research on gender effects in scientific and technical occupations (Chemcensus, 2005; Robinson & McIlwee, 1991). Interestingly, a significant difference between U.S.- and foreign-born workers was not detected for supervisory responsibilities. This was surprising given previous research on foreign-born workers in science, which indicates little opportunity for advancement into supervisory and management roles (Fernandez, 1998; Takaki, 1989; Varma, 2004). Because of the relatively low number of participants in each demographic group for this question, however, it was not possible to determine whether this lack of significance was due to a lack of power in the study or an absence of effect in the analytical chemistry occupation.

In addition to job makeup and supervisory responsibility, it was also important for me to understand whether participants felt like they were full members in their work groups and whether there were any aspects of difference that they believe impacted that membership. Foreign-born workers reported that their own demographic background impacted their ability to be full group members at a significantly higher rate than U.S. born workers reported. When asked what aspects of difference were most salient in demographic background, foreign-born participants, more so than U.S.-born participants, noted language as a substantial barrier to group membership. Because of the significant difference between reports from U.S.- and foreign-born workers regarding language, questions in the in-depth interviews further engaged issues of language. It was the combination of answers from the survey and interview data that prompted my detailed inquiry into the role of communication in the analytical chemistry occupation in Chapter V.
Foreign-born men and women and U.S.-born women\textsuperscript{19} in the analytical chemistry occupation had a number of things in common. Specifically, all of these groups reported significantly more experiences of perceived exclusion, misunderstanding, negative treatment, and the necessity of enacting conforming ideation in the workplace. These findings are substantial in that they indicate that issues of difference associated primarily with gender and national origin appear to significantly affect acceptance in the occupation across organizational and geographic contexts (145 participants from different organizations in 25 states).

These substantial differences in acceptance would be expected to impact job satisfaction for foreign-born individuals and women in analytical chemistry. However, that was not the case. Neither foreign-born nor female participants reported significant differences in job satisfaction as compared to U.S.-born male participants. All groups reported that, on average, they were very satisfied with their jobs. In the case of foreign-born workers, this intriguing finding suggests that, because this particular population has already endured significant hardships and sacrifices to move across the world in order to work in the United States, they measure job satisfaction in ways not directly related to acceptance but more likely related to increased opportunity and research freedom compared to previous employment in their home countries (Ang et al., 2003; Fozdar & Torizani, 2008). U.S.-born women in this profession have also had to overcome significant hurdles to achieve their educations and occupational status; as such, Clark (1997) posited that women in occupations that require significant education and training

\textsuperscript{19} Ninety-three percent of U.S.-born women in this survey identified as White, with the remaining 7% reporting Asian ancestry. Because of the high percentage of White women in this study with reporting levels of acceptance on par with foreign-born women and men of multiple nationalities, this study indicates that gender and nationality may be experienced differently in interaction but have similar endpoint effects.
would measure success as related directly to their occupational status and development rather than their experiences of acceptance within the occupation. In addition, Wharton and Baron (1991) demonstrated that job satisfaction is higher among men and women when one gender is clearly the minority or majority in the particular work setting. When the work setting has a primarily balanced or “nontrivial other-gender minority,” men and women are not as satisfied in their jobs; this finding reveals that “work setting gender-mix is an attribute that potentially affects satisfaction directly, rather than simply as a proxy for rewards and working conditions” (Wharton & Baron, p. 380). As similarly forwarded by Clark, female “tokens” likely weigh the costs and benefits derived from their work experiences when determining job satisfaction, which allows them to be relatively satisfied in their careers despite aspects of discrimination.

The findings put forth in Chapter IV established that aspects of job makeup, supervisory responsibility, full group membership, and occupational acceptance are significantly related to national origin and gender as socially coded characteristics. The findings from Chapter IV also brought to the forefront the particular aspects of difference that I was interested in investigating in the in-depth interviews. In particular, I focused the in-depth interviews on discourses surrounding language and communication. This led to new perspective on occupation control as well as the communication-difference enthymeme of science and the occupation as a filter metaphor in Chapter V.
Survey data indicated the importance of language in the analytical chemistry occupation. Accordingly, I asked interview participants to talk to me about how they saw language and communication affecting analytical chemistry work. U.S.-born participants indicated a greater concern regarding this topic in the interviews than their survey responses had indicated. This difference between responses was my impetus for studying this topic in-depth.

My analysis of participant responses regarding language and communication resulted in my development of the communication-difference enthymeme of science. I drew from Tomkins and Cheney’s concept of the enthymeme; in this project to demonstrate how conclusions regarding foreign-born workers in analytical chemistry are “drawn from premises (beliefs, values, expectations)” (Tompkins & Cheney, 1985/2006, p. 189) which I forwarded as part of one’s occupational identity. As reviewed previously, beliefs, values, and expectations developed from standards, practices, and performances of work are central to occupational identity. Using this enthymeme and both Tompkins and Cheney (1985/2006) and Cheney and Barker’s (1994) theories of unobtrusive control, I forwarded an extension of the theory of occupational control. Occupational control has currently been defined as the process by which members maintain the unique boundaries of their occupation and determine the requirements for entrance or removal from the occupation (Child & Fulk, 1982). I added that the definition of occupational control should be extended to reveal how expectations, values, and beliefs (both formal and informal) associated with occupational identity serve to
inform occupational decisional premises which resultantly control the interaction and behavior of occupational practitioners.

In this project, I illustrate that occupational control is by no means a coercive process; instead, premises socialized as part of one’s occupational identity are adhered to in order to follow domestic conceptions of “good science” in the analytical chemistry occupation. The motivation to adhere to beliefs revolving around “good science” is due not only to the practitioners’ investment in maintaining their status in the occupation, thereby maintaining their occupational marketability, but also because practitioners’ beliefs and expectations about work are bound to their own occupational identity. “Good science” is achieved not only through the execution of tasks but through the reflection of the discursive meaning of those tasks. The occupational control associated with following occupational decisional premises is thus diffuse and subtle in that it simply feels like the accomplishment of good science. Importantly, premises of good science only indirectly implicate difference as detrimental; as such, practitioners do not have to directly consider the ways that the occupation enables biased behavior toward those of difference—they just have to do good work.

The enthymeme that developed out of occupational decisional premises about good science offers a way to see how discourses of difference have been effectively eschewed from direct discussions of occupation. By framing scientific work as unrelated to difference, standards of the occupation have implied the type and quality of work as the only things relevant to the occupation. It is this belief on which the first premise of the enthymeme relies: good science prevents discrimination. In the process of analyzing this first premise, I developed the metaphor of the occupation as a filter to conceptualize
the important ways that the occupation enables and limits the occupational practitioner. Specifically, I developed the metaphor after noting the ways that participants navigated discussions of good science and difference. Most participants routinely stated that difference was not salient in considerations of scientific skill and ability. However, when pressed, most also suggested that the ability to communicate effectively and expeditiously was a key measure of good science. As a filter, the occupation unobtrusively controls who passes as a good scientist and who does not. The criteria for this judgment are outwardly suggested to be the scientific and technical aptitude and skills to perform scientific work well. Under scrutiny, however, the criteria appear to be based on more than technical skills; the judgment is also about communication, language, and cultural interaction. As such, the occupation as a filter metaphor highlights how aspects of difference play a role in occupational identity even while difference is distinctly argued as immaterial. This metaphor is valuable to organizational research because it can allow researchers to forefront what aspects of work are considered salient in an occupation (whether stated or implied) in order to consider whether and which politically-charged discourses of difference impact the organization of the occupation.

Responses from participant interviews and the use of the occupation as filter metaphor pointed to the ways and methods of measuring good scientific work that were loaded with representations and beliefs regarding difference. Specifically, the communication-difference enthymeme highlighted that it is the ability to communicate in the English language with accompanying culturally specific and appropriate communicative behaviors that is the key measure of good scientific work. In other words, those who cannot speak and act the ways that U.S. scientists speak and act are
likely going to be seen as problematic in the occupation. This expectation leads to the second premise of the enthymeme: good science is impeded by communication problems related to difference. When an individual is flagged as unable to communicate in domestically appropriate ways for the analytical chemistry occupation, that individual is generally understood as not being a good scientist or doing good science. This understanding results in the enthymeme conclusion: difference may prevent good science.

Overall, this chapter explained that discourses of difference activate beliefs, expectations, and values bound to occupational identity which suggest that difference may be detrimental to good science. Chapter VI moved forward in this study of difference to consider how broader social narratives of difference impact the performance of work.

Hierarchies of Difference

In Chapter VI, I primarily built on earlier findings which demonstrated that perceptions of national origin and gender can affect the types of tasks one performs in the occupation. I used these results to question participants about Discourses of difference related to the occupation—specifically, I asked them to talk about their broad beliefs, understandings, and assumptions about analytical chemists from particular national origins. I also asked them to talk about their own cultural backgrounds and how they believed them to have affected their work as analytical chemists. What I learned was twofold: First, Discourses of specific national origins, gender, and, in some cases, age interacted with one another to create particular stereotype-specific constructions of
workers that implied the appropriateness of certain types of occupational duties and status. Second, there was evidence of an overarching Discourse of national origin constituted by varied and specific constructions of national origin. In other words, national origin can be conceptualized as a heterogeneous discourse, rife with inconsistencies that flex and shift around the occupation.

When participants discussed how they felt difference affected their work, they pointed to the ways that tense economic and social conditions represented their fears regarding the stability of their work and their ability to maintain insider status in the occupation and organization. Their reflections implied that the lived pressures associated with these contemporary conditions activated for them negative constructions of foreign-born workers in their occupation. These negative constructions adversely impact both foreign-born and U.S.-born workers. Because these negative constructions have become common narratives regarding foreign-born workers (Tannock, 2009), their ability to access and maintain work is significantly more difficult as compared to their U.S. counterparts (Banerjee, 2006). Because U.S.-born workers are regularly exposed in social and organizational settings to narratives of foreign-born workers as “job stealers,” potential indictors of outsourcing, or just as particularly hard-working occupational practitioners, it is not surprising that the foreign-born worker becomes discursively linked to U.S. worker anxiety. The group that does not appear to be adversely impacted by these negative constructions and actually gains some benefit from them is management. The focus on foreign-born workers as the “source” of U.S. worker problems effectively obscures management’s strategic role in labor practices such as outsourcing or paying inappropriately low wages to foreign-born workers. In addition to discussing contextual
factors associated with constructions of foreign-born workers, participants also shared beliefs, commonly-heard stereotypes, and metaphors regarding difference in the occupation.

Responses from interviews implied that national origin functions as a primary force in intersectional experiences. However, the combination of a particular national origin, gender, and, in some cases, age resulted in substantial variations in treatment. For women born in European countries that, in many ways, share similar language and cultural behaviors with the U.S., aspects of national origin considered attractive to U.S. workers (such as the fine craftsmanship Germany is known for or the particularly attractive women for which Sweden is known) appeared to mediate troublesome aspects of gender that were considered particularly relevant by U.S.-born female analytical chemists. For women and men born in Asian and African countries, constructions of national origin associated with discourses ranging from aggressive and overbearing to shy and easily controlled seemed to adversely impact the abilities of individuals from these nations to autonomously direct their work or gain work commensurate with their educational training.

The analysis of interview data on intersectionality revealed that variations in treatment and experience for individuals based on discourses of difference (both the local everyday talk and performance occurring at work as well as the broader social narratives common and understood outside of the local context) were apparent. These findings point to the importance of studying intersectionality not as an additive formula but instead as a distinctive, varied, and coherent representation of difference that

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20 Class is an aspect of identity in this project that is not directly engaged but that is likely pervasive in its effects and understanding of this population. This aspect of identity is referenced in more detail on pages 167-168.
promotes particular ways of interacting and behaving with those different from one’s self. Drawn together, these variations provide a complicated map of national origin that represents hierarchical systems of practice in the occupation which, depending on the occupational task or organizational need, raise or lower the value of a particular national origin. In the next section, I will review the methods I invoked in this project and point to the contributions evidenced from this methodological choice.

**Methodological Bridgework**

This project has attempted to break relatively new ground in organizational communication research. While the use of mixed methods is commonplace in a number of fields in the social sciences, they have an extremely limited place in communication research. In Chapter III, I covered the disjunctures between postpositivist and critical research in an attempt to create a thoughtful but tension-bound relationship between the two. I highlighted substantial tensions of vocabulary, reification, and methodology in this process and argued that, through code-switching and reflexivity, the first two tensions can be productively managed. Regarding the final tension, I asserted that the pairing of methods and theories for analysis—for instance, measuring difference as a property statistically and measuring difference as a performance discursively—was crucial for a coherent project. Beyond this practical matter, I also asserted that a shift in knowledge orientation must occur if using mixed methods in a single project. To undertake a project of this type, one must agree that methods can function as more than a reflection and extension of an associated epistemological tradition. They can also
function in the service of differing traditions in order to forward arguments that cannot be fully undertaken by one method alone.

Using multiple methods allowed me to describe the ways that difference affects work while also interrogating those differences in-depth. I employed a quantitative survey and statistical analyses in order to capture and demonstrate broad patterns of foreign-born occupational experience and the resulting “realness” of inequity faced by foreign-born workers in the U.S. In addition, I used in-depth interviews to consider more critically 1) the ways that difference is manifested through linguistic, cultural, and social representations and performances and 2) how these representations and performances trigger, develop, and maintain Discourse formations of foreign-born workers that result in substantial variations in occupational experience and power.

This project has allowed me to demonstrate the value of mixed methodological approaches to critical questions of organizing and difference in two key ways. First, I demonstrated patterns of differing treatment and occupational experience among analytical chemists of diverse backgrounds, and I then explained how that differing treatment is a function of d/Discourse. Second, and more notably, I outlined an inventive and practical way to study and conceptualize difference. In the postpositivist survey research, difference was studied as a property considered easily recognizable and stable across contexts. While this was not to say that I accepted difference as a “real” or “innate” property, I studied it from this perspective in order to demonstrate how it is treated as such in occupational contexts. I was able to develop significant findings from this survey data regarding the experience and treatment of analytical chemists. Specifically, the body-work link concept derived from OCI research provided me the
bridge to link the socially coded characteristics of workers to the work they performed and the experience of work in the occupation. From these findings, I moved my consideration beyond the question of whether aspects of difference considered stable affected work and began questioning how experientially they impacted work. In this way, I provided an opportunity for postpositivist methodologies and epistemological conceptions to be used to forward critical research on difference.

When undertaking the second phase of the project from a critical perspective, I defined difference as something that is performed and accomplished through human interactions. I conducted my research with the belief that difference is constituted through communication. This conception of difference allowed me to question how social, political, and economic conditions affect perceptions of difference. In turn, I used the occupational identity concepts of image and performance to trace the ways that representations of difference (shared as mundane talk, stereotypes, occupational beliefs, etc.) were discursively linked through larger social narratives of difference to occupational tasks that employees were thought to be skilled or unskilled at performing.

While these conceptions of difference are not new (they have been at play in the social sciences and humanities for some time now), using them to inform one another provides a new direction for difference research. This research makes a case for not ignoring or castigating differences in epistemology but instead embracing them for the ways that they diverge. Quantitative, postpositivist research can cooperate with critical qualitative research. Examining difference in both ways allows us to tease out how discourses of difference feed expectations of difference rooted in Discourse formations that serve to naturalize socially coded characteristics. I invite difference researchers to
engage this mixed methods model of difference in order to more deeply discuss
difference as a discursive effect that functions in the occupation to materially impact the
organization of work.

In an effort to sum up my use of multiple methods, I will liken them to the ideal
human interpersonal relationship. Each method, like each human, is capable and
valuable as a standalone entity. Both have beliefs and understandings that inform their
world view. However, while each method (and person) is capable of standing alone,
standing together provides new and stimulating ways to appreciate an issue. In this
project, the combination of quantitative and qualitative methods stimulated me to uncover
new insights into the inconsistencies of language in the occupation, the shifting
hierarchies of difference at work, and the magnitude of effect difference has on
experiences in the occupation.

With careful and thoughtful effort, standing together can allow each method to
invoke the other’s knowledge, expertise, and value in order to make their own claims and
arguments as effectively as possible. They can rely on each other to ensure that the
importance of a topic is not overlooked and can stand alone when it is their rare
experience that has the power to draw attention to the topic. The quantitative methods in
this project provided the opportunity for me to demonstrate with statistical significance
the difference in treatment for foreign-born workers and women compared to U.S.-born
workers and men in the analytical chemistry field. The qualitative methods in this project
offered me the ability to establish how language functions as a method of occupational
control. Different methods, like different people, show us distinctive ways to view and
consider the world. However, creating a partnership between methods, as with humans, can provide all sorts of excitement.

**Communicating Across Science**

As outlined above, I offer that the contributions of this study can be used to further study difference in science and at work. English is quickly becoming the global language of science and scholarship, which I assert may be limiting access and attention to equally significant scientific breakthroughs and contributions made outside of the U.S./Western mainstream. As such, those that speak and perform English and accompanying appropriate cultural behaviors effectively may embody massive global privilege—in particular, scholarship and publication abilities and organizational resource allocation as well as economic resources for research and development. This potential access to power and political capital suggest that language differences may be more than just representations in cultural divergence, but perhaps also a matter of privilege and oppression at the simplest level.

In addition to continued academic research and engagement regarding these topics, the most pressing and unanswered question to have developed in this project is, “What can and should be done to assist occupational practitioners in communicating about global difference?” At the outset of Chapter V, I made clear that the supervisors interviewed in this study seemed genuinely interested in treating their employees fairly and equitably. None of the participants demonstrated overt racist or sexist mentalities. In the majority of cases, participants appeared to sincerely struggle with how to handle issues of difference.
The difficulties supervisors face when addressing difference are of legitimate business concern. It could be reasonably suggested that communication competence and efficiency are necessary components of work, and so limiting work opportunities for those that cannot demonstrate these attributes is just a part of working life. I assert that the statistical evidence in this project demonstrates that this mentality and associated behavior is not productive or scientifically logical. If diverse employees are experiencing significantly more exclusion, misunderstanding, and negative treatment and are not being treated as full group members, it is reasonable to assume that that both foreign- and U.S.-born workers alike are not able to openly consider, debate, and brainstorm with each other regarding the scientific projects on which they are working. This lack of interaction will result in errors in projects and missed opportunities for scientific progress.

Communication competence and efficiency are necessary components of work; however, limiting group members with scientific and technical expertise to offer because they have yet to master the English language or standard U.S. cultural behaviors will cause the employee, team, and organization all to suffer. Organizationally and economically speaking, human mental and physical labor is being lost or wasted every day because of Discourses that measure intelligence and “fit” for work through domestic standards and expectations.

It is my recommendation that to mediate the direct effects on the individual as well as the more diffuse effects on the occupation and organization, that organizations and occupational associations should provide communication training which focuses on cultural competence. Specifically, I would strongly encourage communication training that develops cosmopolitan communication (Grimes & Richard, 2003).
In their research on communication in the organization, Grimes and Richard review four forms of communication (initially elucidated by Pearce, 1989) present in organizations: monocultural, ethnocentric, modernistic, and cosmopolitan. The authors focus their review on the final three, noting that monocultural communication assumes an organizational culture devoid of diversity. Grimes and Richard describe ethnocentric communicators as people who willingly communicate with those like and unlike themselves, but, because they believe (whether consciously or subconsciously) in their own/gender/racial/national superiority, they fail to consider different communication styles as important or relevant. Modernistic communicators are those heavily immersed in the jargon of their occupational/social/cultural group who rarely consider how their communicative practices alienate others. Instead of using these styles of communication, Grimes and Richard call for practitioners to encourage cosmopolitan communication within the workplace. Cosmopolitan communicators recognize those like and unlike themselves, engage others with willingness and openness to change, but also allow themselves to hold on to parts of their communication that make them who they are. The authors suggest that even though it is difficult for some organizations, and I would add occupations, to believe that racism is embedded in their practices, change is only possible through concerted communicative effort by organizational leaders and members. Based on the conversations I had with the participants in my study, I would argue that many would be willing to develop their communication skills to more openly and directly communicate with their colleagues. In addition to communication training, I would also recommend that organizations and occupational associations provide options for free or reduced-cost training during or after work hours for foreign-born employees to assist
them with aspects of cultural transition that have proven problematic. For instance, training in aspects of American cultural communication and courses in developing and refining English language skills would likely prove advantageous not only for employees but for organizational productivity.

In addition, I hope that the demonstration of statistically significant differences in acceptance and treatment of foreign-born men and U.S.- and foreign-born women in the analytical chemistry occupation in the U.S. will be motivation for organizational professionals (whether scientists, administrators, or managers) to engage in the suggested changes. Specifically, I wish to motivate organizational professionals to pay greater attention to the ways in which characteristics of identity seen as stable (such as gender and national origin) and discourses of difference (such as the social and linguistic performances and representations that shape human understanding) can impact work. In recognizing the consequences of limiting full occupational membership due to differences in language, communication, and cultural behaviors, I hope that decision makers will be more open to providing access to training and development for foreign-born workers so that they will have the option of choosing how they interact in the U.S. workplace. Additionally, supervisors and hiring professionals may begin to consider carefully the ways their beliefs and internal understandings of difference may impact their decisions of recruitment, job organization, advancement, and termination in order to better acknowledge and address unequal practices at work.
Conclusion

I began this project with an interest in understanding how difference played into the occupational identity of the analytical chemist. To engage this interest, I reviewed the related literature and found that it had not done justice to the study of difference in occupations. Because I believed that there was something valuable to be gained in studying this aspect of work, I devised a study that could examine the full scope of the occupational identity experience and its relationship to difference. Having done this, I assert that this project has demonstrated the significant and varied roles that difference, conceptualized as both a socially coded characteristic and as a d/Discourse, plays in the occupational identity of analytical chemists. Occupational practitioners understand and experience their occupational identity through the performance of tasks and duties associated with their work and a significant contribution of this study is the revelation that these understandings are shaped in crucial ways by d/Discourses of difference. Occupational practitioners draw upon these d/Discourses when they observe socially coded characteristics, and these d/Discourses and characteristics activate occupational premises which affect the ways that diverse employees are assigned tasks, recruited into occupational positions and levels, and included as members of work teams. Depending on the d/Discourses specific to a particular intersection of national origin and gender, some foreign-born workers are able to easily pass in the U.S. scientific community and experience very little difference in treatment in U.S. organizations. In fact, a number of participants noted that stereotypes regarding their national origin provided them with certain benefits in the workplace. For those workers who cannot pass easily in the U.S. scientific community, discourses that construct them in primarily negative ways affect
their experience at work. However, the ways that nation both diverges and converges with domestic racial logics is surprising. At times, aspects of nation assist an individual in passing, particularly when the nation-status constructs them as more “White.” At other times, depending on the national origin under scrutiny, it is the nation that negatively impacts occupational status even when U.S. racial logics would not necessarily align the individual as “non-White.”

This project has enabled me to attempt to combine concerns of theoretical and practical import and, in doing so, has taken on an epistemological and methodological approach that is far from common. I see this endeavor as an example of the interesting ways that scholarship can take note of and advance new ways of researching and theorizing in order to uncover findings and provide answers to practical problems. This project does not answer every question about how difference operates in the occupation, but it does provide an initial bridge toward discovering those answers. As U.S. scientific organizations continue to struggle over issues of immigration, globalization, and diversity in the workplace, I hope that this research moves us closer to understanding the ways that we can improve occupational experiences for all people.
APPENDIX A

ANALYTICAL CHEMISTRY SURVEY

The analytical chemistry survey was created as an online instrument. Please type the following link into your browser to review the survey:

http://www.surveymonkey.com/s/CKCBH68
APPENDIX B

INTERVIEW GUIDE

Overview Questions

These questions were aimed at allowing the participant to speak about general topics that are very commonly discussed in job interviews and in conversations with coworkers. These questions allowed the participants to get comfortable talking with me about themselves and gave me grounding in their background.

- Please tell me how you chose analytical chemistry as your life’s work? I would appreciate hearing about your educational and industrial background as it relates to this question as well.
- What do you see as some of the defining characteristics of an analytical chemist?
- Could you briefly describe your organization (no need to identify the company) to me?
  o What drew you to your current organization?
  o Under what division is your analytical chemistry department housed?
    ▪ How do you think your analytical chemistry department is perceived by the organization? For instance, do you think it is a valued area of expertise or do you feel it is undervalued by other departments or management? Why?
Questions About Work

These questions were focused on several aspects of the participant’s organizational and occupational experience as an analytical chemist. First, for foreign-born workers being interviewed, there were questions about the participant’s experience gaining the right to work in the U.S. Because this process is generally publicly known (in organizational and social settings), most participants had discussed it publicly before.

The second set of questions were regarding analytical chemistry as an occupation. These questions provided me a basis for understanding how the participant characterized their occupation and whether these characterizations relied primarily on duty-driven responsibilities or personal attributes as defining characteristics (e.g., “one has to have experience with gas chromatography” versus “you need to be a hard worker”). And third, questions were posed about chains of command and hierarchies within the analytical chemistry department. These questions helped me understand how the department was structured and how responsibility was apportioned within the group.

- Could you tell me your story about looking for and obtaining your right to work in the U.S.?
- What stories or anecdotes could you share with me that would relate how easy or difficult it was to obtain your right to work?
  - Could you tell me about any times a coworker or supervisor asked you about your status in the U.S.?
- Could you talk to me briefly about your primary duties at work? What do they actually entail? Feel free to be as specific (without compromising confidentiality) as you can be.
What aspects of this work do you most enjoy? Can you tell me about a time you were able to do this?

What aspects of this work do you least enjoy? Do you have a story about doing this type of work that you could share?

- From your perspective, what do you think it takes to be a good analytical chemist?
- How is supervision handled in your department?

This section was tailored to the participant’s supervisory experience. If they had no supervisory responsibilities, questions regarding their supervisor’s background and attributes were posed. If they did have supervisory responsibility, questions regarding the breadth and scope of those responsibilities were posed. For each set of questions, participants were asked to share anecdotes emanating from their answers.

Questions Regarding Difference at Work

The following questions were central to my research question and focused on the participants’ understandings of how assumptions, stereotypes, organizational and occupational myths, etc., and an individual’s race, gender and nation impact and/or shape occupational identity and organizational and occupational work systems and practices. These questions were largely informed by the data developed from the survey in Phase I of the project

- Do you feel like your demographic background (like nation and gender) or the backgrounds of others affect how you/they are accepted and understood in work groups? I am wondering if you can talk about your experience with that?
• I am wondering if you have seen examples at work (whether in your personal experience or in the experience of others) where language, dress, jargon, particularly as they relate to being from another country, have affected one’s ability to be included in the workplace? I am wondering if you can discuss or add to this?

• In my research, I am looking at issues of diversity in order to better understand how to address them in specific occupational fields – like chemistry and science broadly. Any insight you have into how science seems different or similar to other contexts you have been in as they relate to diversity would also be really useful.

• You mentioned that you were born in ________, correct? What are some of the assumptions or stereotypes you think people have about ________ analytical chemists?
  o Can you tell me a story about when you felt these or similar assumptions were directly related to either your work or the work of a peer?
  o Do you have any guesses about where those assumptions or stereotypes come from?
  o Do you think there are detrimental or beneficial to your work as an analytical chemist?
  o Do you think they are accurate, inaccurate or somewhere in between?

• Have you heard stereotypes of analytical chemists of backgrounds different than yours? (For instance, something I have been told is that a common stereotype is that Russian men and women are very creative chemists but difficult to work
with.) So to be clear, I am not suggesting these are true but am rather trying to ascertain what the common stereotypes are in the field.

- As a supervisor, I am wondering if you can try to tell me if and how these types of beliefs or knowledge have helped you in assigning duties?
  - Can you talk to me about that time?
- Has this information ever helped just work better with a person?
- Are there any final things you would like to discuss?
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