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Bodies of Science: Gender and Impression Management among Private Sector Life Scientists and Technologists

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in

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by

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The Dissertation of Jonathan Kyle Shafran is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

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DEDICATION

This dissertation is dedicated to my mother, Gail Shafran. Although she could not accompany me to the end of this intellectual journey, her love of knowledge, ideas, and the written word were beacons that guided my way.

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ABSTRACT OF THE DISSERTATION

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Women are markedly underrepresented in many science, technology, engineering, and mathematics (STEM) fields. They also encounter numerous gendered barriers to their professional advancement. However, there is a lacuna in the research on the diversity of field cultures and experiences of the large majority of scientists working in private sector STEM. I argue that the cultures of STEM fields have consequences for how workers construct professional identities in these fields.

Focusing on two numerically important fields with very different gender distributions, this qualitative comparative case study draws on 40 semi-structured interviews with life scientists and technologists to explore how STEM professionals use impression management to establish credibility and belonging in their respective fields.

I find that appearance norms in both the life sciences and technology fields privilege men's bodies and clothing styles. Women, especially those in hard skills occupations, establish credibility in part by avoiding clothing that accentuates their bodies. In addition, I find that emotion control is important for success in these fields. Women in management frequently eliminate emotional expressions from their leadership behaviors in order to counteract stereotypes that they are innately weaker leaders. However, men and junior women do not engage in this emotional labor and perceive different consequences for expressing risky emotions, such as anger and sadness. Finally, I argue that women in both fields engage in embodied impression management strategies in response to the gender barriers they perceive in their fields. In contrast, men largely perceive their fields as gender-neutral meritocracies. Both of these perceptions reinforce an ideology of individualism that limits the potential for structural changes in these fields.

This research contributes to studies of culture, gender, and bodies. I identify a culture in both fields that associates leadership and professional credibility with masculinity. While women in both fields engage in similar impression management strategies in response to this culture, gender only becomes salient for them within particular interactions and contexts in their workplaces. Finally, this study demonstrates that, even in fields which prioritize rationality and discourage the display

of emotion, women are engaging in significant unrecognized and unrewarded emotional labor.

CHAPTER 1: INTRODUCTION

There are approximately 6 million scientists and engineers employed in the United States (NCSES 2016).[1] The majority of these professionals have careers in for-profit companies that create cutting-edge technologies, pharmaceuticals, and other lucrative innovations. Science, technology, engineering, and mathematics (STEM) fields produce new knowledge and solutions to some of the most pressing social, economic, and public health problems that face the nation. The importance of the work conducted in these fields is undeniable.

These professionals who earn academic STEM degrees have the advantages of working in a sector of the economy where wages are higher and unemployment is lower on average than in any other field (Beckhusen 2016). Newly minted STEM graduates will earn some of the highest starting salaries in the labor market. In 2014, the median salary for a software developer with a bachelor's degree was $90,000 (Beckhusen 2016).[2] However, social scientists have identified a persistent underrepresentation of women within many of these fields (Hill et al. 2010). This study

[1] Estimates of the size of the STEM workforce vary depending on the scope of the survey and whether STEM workers are defined by their occupations, degrees, or use of STEM skills in their jobs. This study relies on the National Science Foundation's convention of identifying STEM workers by their occupations.

[2] Despite the increasing scarcity of stable long term employment in many other industries, STEM employers are focusing substantial resources towards recruiting and retaining the best talent available. Exceptionally profitable technology companies are offering non-monetary benefits to their employees in order to gain their long term loyalty. These benefits include generous family healthcare policies, free food at company cafeterias, free on-site child care, and up to a year of paid parental leave. Google even offers death benefits that compensate widows and widowers up to half of their departed spouse's salary for a decade.

focuses on a numerically important group of these professionals: men and women who work in the private sector of two STEM fields that possess strikingly different gender distributions. These individuals have received far less academic attention than STEM professionals employed in academia or the leaky pipeline in STEM education. The analysis that follows reveals subtle workplace gender barriers that continue to affect women in science long after they earn their academic degrees.

Previous research on women's underrepresentation in STEM fields has productively focused on describing and understanding women's experiences in early education, post-secondary education, and graduate training (Chen and Weko 2009, Goulden et al. 2011, Hirshfield 2011). These studies identify a host of gendered barriers to entry and persistence for women in STEM that include overt harassment, subtle forms of bias, and masculine cultures that are hostile to women (NAS 2006, Corbett and Hill 2015). These obstacles ultimately contribute to women's cumulative attrition from science and engineering programs across the country, metaphorically named the "leaky pipeline" (Blickenstaff 2005).[3]

Social scientists have also turned their attention to their colleagues in academia. Recent research in the last two decades has identified structural and cultural barriers to women's advancement and employment in academic STEM departments around the country (Hill et al. 2010). Sociologists find that many STEM departments have chilly

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[3] This term describes the cumulative departure of women in the transition stages of majoring in a STEM degree as an undergraduate and then switching to a different degree, to pursuing a graduate degree in STEM then exiting graduate training, or to graduating with a STEM degree but choosing to work in a field outside of STEM. The end result of this attrition is fewer women studying and working STEM organizations or universities.

climates towards women. In addition, there are subtle biases that slow women's progress up the tenure ladder through unequal evaluations of their work, exclusion from informal networks, and stigmatization of motherhood (Bystydzienski and Bird 2006). In contrast, scholarship on the patterned experiences of men and women who graduate from academic STEM programs and pursue careers within STEM fields in the private sector is much smaller.

Researchers have identified many of the processes that slow women's progress in STEM academe compared to men, but scientists who successfully pursue a career within STEM's private sector have received less critical attention up until the past decade.[4] This lacuna in the scholarship is especially surprising given that the private sector employs 70% of all STEM workers, and women comprise 30% of this population (NCSES 2016). These women work in diverse scientific fields, some of which are undergoing rapid changes in their gender composition. Others have remained relatively stable for the past four decades. In the context of these changes and concurrent stalled progress, it's imperative to capture the diversity of women and men's experiences working within industries that have been almost universally male-dominated for the past several decades. For instance, we know little about whether the cultural association of masculinity with science is equally salient within fields that are approaching gender parity. Nor do we have many contemporary accounts of the experiences of women working in the most male dominated industries, such as technology.

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[4] See (Cheryan et al. 2016, Corbett and Hill 2015, Hewlett et al. 2008, Hewlett et al. 2014, Williams et al. 2014b) for notable exceptions.

In addition, debates over suitable interventions for increasing gender diversity in STEM predominantly focus on altering STEM curricula in order to recruit more women into specific STEM disciplines or altering the culture of STEM as a whole (McIlwee and Robinson 1992, Seymour and Hewitt 1997, Wasburn and Miller 2006). But these debates obscure the diversity of cultures across STEM fields as well as the actual experiences of STEM workers. Science and engineering graduate programs standardize the skills and knowledge that graduates need for success in their chosen fields, but each STEM field possesses a distinct culture into which scientists are socialized (Cech 2015, Seron et al. 2015). These cultures have implications for gendered processes of exclusion in private sector businesses because cultures shape professionals' thoughts, actions, and practices (Chiu et al. 2014).

The foundation of social studies of science and technology is built upon an understanding of science as a social system that possesses its own norms and values (Cotgrove 1970). Consequently, research on STEM has a tendency to assume that all STEM fields share a monolithic culture that is gendered in similar respects (Cheryan et al. 2016). In addition, most studies only examine a single STEM field rather than differences between fields. Research has yet to fully engage with men and women's perceptions of and gendered strategies working within fields which have varied cultures.

In this dissertation I analyze semi-structured interviews with a sample of women and men working in two markedly different STEM fields, life sciences and technology. This qualitative case study explores the diversity of experiences, impression management practices, and cultures within private sector STEM fields. In

contrast to previous studies that examine the structural aspects that lead to women's attrition from STEM fields, this study focuses on the subtle labor that occurs in interactions among workers within STEM workplaces. This labor around professional image construction and professional conduct is an essential avenue through which STEM workers establish their expertise, credibility, and belonging among their colleagues.

While previous studies focus on the culture of a single STEM profession or single STEM discipline, I am interested in the culture of STEM fields. The embodied labor examined in this study occurs among STEM professionals who are trained in a variety of different disciplines, but these professionals come together to work in organizations within a clearly defined STEM field. For example, the technology field includes engineers, computer scientists, and mathematicians. The field's culture shapes the interdisciplinary content and relations of their work. Studies that examine a single academic discipline or profession will not capture the social contexts in which patterned inequalities and impression management strategies occur across professions.

I take up gender as my primary focus in this analysis while recognizing that gendered processes of exclusion and inclusion in STEM intersect with race and sexuality as well.[5] The aim of this study is to explore how scientists and technologists

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[5] My sample of life scientists and technologists reflects the level of diversity extant within both fields. In the life sciences women represent 48% of the workforce. This population has the following racial and ethnic composition: 70% White, 19% Asian, 3% Black, 7% Hispanic, and 1% more than one race. In technology women represent 24% of the workforce. Looking at this population by race and ethnicity, 65% of technology workers identify as White, 22% identify as Asian, 6% identify as Black, 5% identify as Hispanic, and 2% identify as more than one race (NCSES 2016). My sample of life scientists is 72% women, 83% White, 8% Asian, 5% Hispanic, 4% Middle Eastern/Arab, and contains no Blacks. My sample of technologists is 55% women, 70% White, 20% Asian, 10% Black, and contains no Hispanics.

use impression management to negotiate professional identity and professional credibility. I argue that embodied performances of professionalism are linked to broader gender inequalities in each field.[6] STEM professionals visually demonstrate conformity to their field cultures through these nuanced impression management strategies.

The findings in this project clarify how gender and body work are incorporated into STEM field cultures. I find that women in both fields exclusively enact embodied impression management strategies in order to demonstrate their professional credibility and belonging, but they do not always experience the cultures of their fields as particularly "chilly." Rather, gender and gender inequality become salient for them during particular interactions with colleagues and within specific workplace contexts. In addition, women in these ostensibly emotionless professions engage in significant labor around the expression of emotions. Men in both field do not engage in this labor nor do they perceive the forms of subtle bias that women in the sample describe. This is because both fields possess a culture that associates leadership and professional credibility with masculinity and men's bodies.

Perceptions and Responses are Under-theorized in Existing Models

Previous analyses of gender inequalities in STEM emphasize, to various degrees, that structure, culture or a combination of both impact women's persistence in

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In both samples I made efforts to recruit more women than men since these individuals are significantly more difficult to locate in higher ranking positions within both industries.

[6] In this dissertation I use the term embodiment to describe the experience, phenomenological and social, of possessing a particular body. This study examines both the way individuals experience and perceive body-related aspects of their workplaces, work performance, and work identities as well as how they perceive these aspects in their professional colleagues.

these fields. These studies focus specifically on the structure of STEM workplaces or broadly track career outcomes for large samples of women graduating with STEM degrees. Neither of these approaches adequately captures the nuanced features of scientists and technologists' everyday workplace experiences. In order to advance these approaches, in the next section I analyze these dominant cultural and structural lines of inquiry into explaining gender inequality in STEM and propose the benefit of attending to perceptions of f culture.

One dominant line of research on inequalities in STEM takes up structure as the driving factor in women's ability to succeed. These structural explanations for where women thrive in STEM often focus on subdisciplines that adopt unique flexible work configurations. For example, before the 1980s women with life science doctorates who did not want to work in academia were largely shut out of large pharmaceutical industry research labs (Koput and Gutek 2010). The widespread belief that women were ill-suited for the demanding hours inherent in this type of work environment made it difficult for them to gain access to entry level drug company positions.

Smith-Doerr (2004) argues that the structure of more recently established small biotech companies, with their flat networks, benefitted women by enabling them to enter and advance into leadership positions more easily and frequently than in traditional large life sciences firms. By observing nascent biotech organizations and conducting interviews with biotech scientists working in small firms, Smith-Doerr finds that the flexibility of this subdiscipline's project teams and work roles reduces the subtle gender discrimination that is more common in larger bureaucratically rigid firms. Women in biotech are thus better able to navigate around "gender hurdles" that

stall their progress (133). Smith-Doerr's findings challenge those of established work and gender scholars who have argued for many years that the implementation of formal bureaucratic rules and structures in organizations will lead to more gender egalitarian promotion practices.

This research is important for shedding light on how particular workplace structures can facilitate women's career advancement, but it is unclear how these findings may be extended into the rest of the life science industry that is dominated by the larger firms included in this dissertation. Importantly, the crux of the argument is that the structure of work contexts matter more for women's advancement than workplace culture. But a second line of research demonstrates that the culture of workplaces powerfully shape women's persistence in STEM fields. This second distinct line of research explores how gendered cultures in STEM lead to women's attrition from these fields.

Researchers find that women across many STEM fields experience a uniquely strong perceived lack of cultural fit compared to women in non-STEM fields (Hewlett et al. 2008). This perception does not dissipate with tenure in the field or when women move into leadership positions (Glass et al. 2013, Williams et al. 2014b). Women in STEM fields that are exceptionally male dominated, such as engineering and technology, experience cultures that largely exclude or marginalize them (Faulkner 2009, Williams et al. 2016). The sole meta-analysis of factors that contribute to women's underrepresentation across STEM fields finds that these masculine cultures signal to women that they do not belong and are the primary driver of women's

attrition (Cheryan et al. 2016). However, few of these studies examine how the cultures of STEM fields differ from one another.

Finally, other scholars have merged the two dominant lines of research to produce models that give equal causal power to culture and structure. One of these prevailing theories for why women struggle to persist in STEM is "the team organization of scientific work combined with the attitudes and expectations of coworkers and supervisors who hold more traditional beliefs about the competencies of women" (Glass et al. 2013:754). Koput and Gutek (2010) alternatively propose that women's diminishing representation in science and technology over time is the result of interactive effects between individual characteristics, status expectations, social network positions and structure, implying that "men and women face different experiences on the path to becoming established" (14).[7]

Regardless of their exact formulations, comprehensive theories for explaining the ongoing dearth of women in certain STEM fields propose that both structural and cultural mechanisms are significant. What is not as well understood, however, is exactly how scientists and technologists perceive, experience, and reflexively react to these cultures and structures within their fields. In this dissertation I contribute to this research using original empirical data to argue that current theories can be bolstered by attending to how STEM professionals perceive patterned inequalities, where they locate the causes of these patterns, and how they respond to these patterns through specific embodied impression management strategies. These impression management

[7] International research indicates that national contexts and policies influence STEM women's career trajectories as well (Herman et al. 2013).

strategies are ultimately limited by the prevailing ideology within both fields. In order to contextualize this claim, in the next section I review theories of gender, the body, and agency.

Gendered Bodies, Impression Management, and Agency in the Workplace

The body occupies a unique position within social life. It is experienced as a possession that can be subjected to the will of the individual who inhabits it, and it exists as a representation of the intangible social self that is essential to the formation and maintenance of identity (Cooley 1902, Gimlin 2002, Mead 1934). It is both a seemingly stable part of one's self conception and a malleable social object. Therefore, the subjective experience of embodiment is a complex phenomenon, and the body's duel individual and social nature leads to difficulties in theorizing its role in the maintenance of inequalities. Nonetheless, theorists have made inroads into understanding how the body is brought into social processes of identity formation and maintenance.

Early social theorists argue that the body is a starting point for the development of one's sense of identity. The social self as we understand it resides within the body.[8]

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[8] While classical sociologists did not explicitly address the significance of physical bodies for the maintenance of social inequalities, symbolic interactionists recognized the formation of the social self as a process of conceptualizing how others view our physical appearance (Turner 1996). Cooley (1902) argues that it is through the body that we come to understand how others interpret our motivations and intentions. The body is also the source of our self image, the characteristics we use to judge ourselves and the characteristics by which we imagine others judge us as well. Similar to Cooley, Mead (1934) argues that our identities are embodied because they develop from a process of self-reflexivity in which individuals visualize how they physically appear to others and are evaluated by others. The self develops out of a process of internalizing gestures within the physical body. Therefore, we can understand that the very experience we have of our body as a possession is derived from the image we have of other's reactions to our body. We view ourselves through the lens of the social groups to which we belong.

Goffman (1959) provides a groundwork from which to investigate how identity is intricately tied to physicality and the management of perceptions. He advanced this social aspect of identity formation with his concept of impression management. Impression management entails consciously shaping others' perceptions in social interaction. It is the social process by which individuals attempt to control external perceptions of their social identity. Goffman argues that an individual does this "by expressing himself in such a way as to give [others] the kind of impression that will lead them to act voluntarily in accordance with his own plan" (Goffman 1959:4). Impression management necessarily includes altering one's appearance and expressions in order to elicit particular judgments from other people. Therefore, the body is inextricably tied to impression management in every social context.

Goffman did not pursue how gender influences the experience of embodiment and identity formation, but his theories provide a sociological framework that is useful for understanding how identity is the product of social interaction. Goffman recognizes that others evaluate our every utterance and physical appearance in order to infer and negotiate the meanings attached to a given social interaction. Indeed, early theorists posit that the self only comes into being through visible performances accomplished through the "medium of the socially interpreted body" (Turner 1996:40).

Following early symbolic interactionists like Goffman and West and Zimmerman (1987), I extend these impression management and identity insights into contemporary conceptualizations of gender as a social construction. People do not possess gender; rather, people are always "doing gender." Gender is viewed as a feature of social interaction that emerges within every context. Doing gender implies

acting in a way that will signify an underlying sex category. This interaction with others depends on "managing such occasions so that, whatever the particulars, the outcome is seen and seeable in context as gender-appropriate" (135). Individuals are constantly managing their gender interactions so as to avoid being mislabeled as feminine or masculine. This managing presupposes that the performer is aware of his or her actions and is cognizant of their significance. Importantly, gender is done in the context of accountability: "Societal members orient to the fact that their activities are subject to comment and … actions are often designed with an eye to their accountability" (136). Thus individuals continually orient and adjust their gender performances in front of others in service of their validation. Those who do not do gender in normative ways are socially penalized.

Doing gender is the process that links individual action to social institutions. Social institutions are the sites of gender performance, and they maintain the durability of the gender order. Institutions allow people to act out their gender differences within a prescribed social context. If people do gender correctly, they reinforce, legitimate, and sustain social institutions that are based on essential assumptions about sex characteristics. If an individuals does gender incorrectly, that individual is called into question and not the institutional arrangements (West and Zimmerman 2002).

Though the concept of gender as a social construction is useful for this study, West and Zimmerman's work has been criticized for failing to account for how doing gender is "experienced in and through the body" (Messerschmidt 2009:87). The physical body is surprisingly absent from the social constructionist perspective. Scholars such as Connell (1995, 2005) have picked up this critique and posited that the

body plays an active role in the construction of gender. Connell asserts that the body must be accorded its own agency. Importantly, this agency allows for the body to act and react, to be incorporated into the formation and maintenance of gender.

Equally important, however, is the recognition that doing gender and engaging in impression management is not easy and effortless; it is very real labor with significant personal and professional consequences. Doing gender intersects with the negotiation of other identities as well. Gender is embedded in "jobs, divisions of labor, processes such as hiring and wage setting, in images of workers and managers, in interactions in the workplace, in work/family interconnections, and in individual constructions of identity" (Acker 2011:67). As this dissertation will demonstrate, professionals engage in particular forms of impression management that are both gendered and tied to professional identities. Professionals must work to adjust their impression management activities to align with both normative expectations for gender and professional self-presentation. This labor is inherently embodied. In professional contexts it is directed towards workplace colleagues and supervisors who validate performances. Yet we know little of how STEM workers engage in this labor across fields. The kinds of impression management activities that individuals may draw upon in particular social contexts are also limited by cultural schemas.

Professional Identities and Professional Image

Cultural schemas shape whether and how individuals are able to act within social contexts (Emirbayer and Goodwin 1994). In scientific fields, there is a powerful

cultural schema of individualism.[9] As I will show, the individualism schema affects men and women's agency differently. Namely, it constrains women's choices for demonstrating merit in male dominated workplaces. Furthermore, the cultural schema of individualism exists alongside ideal worker schemas in STEM.

Ideal worker schemas are shared cultural beliefs that define how employees should approach and conduct their work (Acker 1990, Williams 2000). The ideal worker schema, especially in professions, describes an employee who is completely devoted to work at the expense of all other non-work commitments (Blair-Loy 2003). These schemas influence workplace inequalities because organizations reward workers, primarily white men, who are able to most closely align with these ideals. As in any other field, careers in science and technology are subject to ideal worker schemas.

The high salaries offered by science and technology companies are accompanied by intense pressure for STEM workers to personify the image of the ideal worker through their professional identities. Most STEM occupations demand extremely long hours that frequently extend into weekends and collide with other commitments outside of the workplace. Because the ideal worker is a standard which no individual can realistically meet, STEM professionals work to accomplish this ideal. That is, they perceive and experience pressure to conform their own professional identities to that of the ideal (Simard et al. 2008). Contrary to the popular belief that these intellectual workers effortlessly experience their work with emotionless objectivity, the process of becoming a STEM professional, learning and enacting the

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[9] See (Cech and Blair-Loy 2010) for evidence of individualism's pervasiveness among STEM professionals.

components of the attendant professional identity, is a challenging form of labor.

How highly skilled and credentialed STEM professionals manage their professional identities is not well understood. Kelan (2008) notes that it is "important not only to explore how ideal workers are constructed, but also who enacts the ideal worker skills and who is successful in doing so" (53). While scholars have conducted laboratory studies, ethnographies of scientific workplaces, and collected academic scientists' individual career experiences, there is scant research on the ways in which scientists and technologists actively construct their work identities in the workplace for their colleagues. This project examines the strategies industry life scientists and technologists employ in order to embody the ideal worker image within their industries. The following section clarifies why examining embodied impression management among STEM professionals helps explain the persistence of gender inequality in these fields.

Body Work in the Shaping of STEM Professional Identities and Careers

It may seem peculiar at first glance to structure an entire study around how scientists engage in embodied impression management. Scientists are frequently stereotyped as possessing a quintessential disinterest in personal appearances, and scientific work is rarely associated with physical labor. The intellectual work of scientific discovery takes on an almost completely disembodied image in the popular consciousness. However, all work is embodied and gendered regardless of its specific content (Morgan et al. 2005, Shilling 2005). Scientific work is no exception. Therefore, identifying the more subtle embodied aspects of these professions requires qualitative

research. Ethnographies of laboratories reveal that a scientist's sensing body serves an important role as a research tool and is incorporated into scientific work.

Cetina (1999) argues that the scientist's body is a "silent archive of experience, competence, and sensory information-processing" (98). Lab scientists are more likely to trust the results of their experiments if they have personally conducted them through embodied action, handling specimens and witnessing reactions. Similarly, Traweek (1988) observes that early in their graduate training novice physicists learn specific prized emotional qualities, receive training in "aesthetic judgments," and acquire "the emotional responses appropriate to those judgments (catharsis, pride, satisfaction pleasure)" (82). Graduate training in STEM includes learning the "correct" emotions and judgments necessary to carry out legitimate work in the field. In addition to these judgments, scientists maintain that practitioners in each discipline adopt a distinct but tacit dress code (Schiebinger 1999). These unwritten dress codes, gleaned through years of graduate training and experience in the field, are opaque to outsiders, but their existence points to the deeper unacknowledged and tenacious power that physicality plays in processes of professional legitimation.

How one dresses and interacts with colleagues communicate subtle but important social signals. They are far from trivial decisions. Professionals rely on these cues to evaluate colleagues, develop trust, discern positions, status, and power as well as develop trust, confidence in others' abilities, and camaraderie (Casanova 2015, Fineman 1993, Hall and Mast 2004, Humphrey 2002, Lewis 2000, Ridgeway and Johnson 1990). Clothing and emotional expressions are also bound up with social and gender distinctions (Davis 1992, Hochschild 1983). There are obviously a wide range

of differences in clothing styles available for men and women. Even down to the minute detail of the persistent convention of placing buttons on the right side of men's dress shirts and on the left side of women's blouses, one is reminded of the way that gender distinctions remain central to the everyday act of dressing for work. Examining these forms of body work in the context of scientific workplaces is the focal point of this dissertation.

While there is an entire field of inquiry devoted to the body and work, this study focuses on specific forms of body work that are oriented towards workplace contexts. Body work is the unpaid labor that individuals do on and for their bodies in order to adequately function in society (Shilling 2003).[10] The body work in which individuals engage is a visible aspect of social life.[11] It allows researchers to witness and interrogate the complexity of establishing one's sense of self as a gendered human being. Women and men also do not experience identical bodily demands and bodily consequences for identical jobs (Shilling 2012). Evaluating how men and women interpret their body work activities and how they use them in given contexts contributes to our knowledge of how gender differences are reinforced or challenged.

Job-related body work specifically describes the "unofficial tasks involved in maintaining the embodied self as viable within the environment of waged labour" (Shilling 2005:73). Service sector work and frontline customer service positions

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[10] Scholars identify three types of body work: job-related, reproductive, and cultural (Shilling 2005). These forms of labor frequently overlap with each other across the life course.

[11] Gimlin (2002) observes that body work is inherently "work on the self" (6). All types of body work, including job-related body work, are intended to physically materialize important aspects of an individual's identity.

typically include formal body work requirements in their labor contracts. These employers aggressively manage the consistency of interactions employees have with their valuable customer base (Leidner 1993). However, in the contemporary economy job-related body work has extended into all professions with no obvious or formal body-related requirements, such as in the case of the STEM professionals discussed herein.

Job-related body work is especially important for understanding STEM professionals' workplace experiences and identities because it serves as a powerful and compulsory mechanism for integrating individuals into workplaces. It cannot be avoided regardless of an individual worker's preferences (Jeanes et al. 2011b). Some workers perceive more or less social pressure to engage in body work, but all workers must ultimately engage in these strategies of embodiment that establish their membership in their profession as well as constitute themselves as capable workers. Body work is thus conducted for the sake of professional identity and for an audience of workplace peers.

To restate and conclude, the aim of this study is to examine how life sciences and technology professionals engage in impression management as part of their negotiation of professional identity and belonging within their fields. I argue that this job-related body work is essential for explaining variation in STEM professionals' experiences and professional outcomes because it is accomplished within distinct STEM field cultures. This process of identity negotiation through body work also intersects with gender schemas that create unique barriers specifically for women. Bodily demands for jobs differ depending on the gender of the person who is doing

them. How scientists communicate, dress, and even express their emotions as well as how those expressions are interpreted by colleagues subtly contributes to the persistence of gender inequalities in the sampled STEM fields.

Overview of the Dissertation

This dissertation consists of seven chapters that are divided into three broader sections. Section I (Chapters 2 & 3) positions this study in the literature on gender, bodies, and organizations and details the research methodology. Chapter 2 reviews the status of women working in STEM academic and industry positions, identifies demographic variations in these fields, and synthesizes the research on the gendered barriers to advancement these women experience. I claim that prior research has not adequately attended to STEM professionals' perceptions of their fields as well as the existence of variation among STEM field cultures. These culture differences help explain why some fields are more or less gendered. Then I analyze distinctions in the cultures of life sciences and technology fields and the unique culture and structural barriers to women's advancement in each field. I argue that in light of these differences it is necessary to explore how life scientists and technologists establish their professional credibility and professional identities among their colleagues. I focus on STEM professionals' impression management strategies as an under-theorized mechanism for gendered processes of inclusions and exclusion in these fields. In addition, this chapter explores the cultural schemas that associate science with masculinity from the macro level of U.S. society down to the micro level of scientists' workplace interactions and experiences. The data for the empirical chapters is drawn

from individual accounts of these micro level experiences. Chapter 3 details the research methodology, design of this project and provides a justification for the case study approach. This chapter concludes with my approach to sampling and coding the data presented in the following section as well as my relationship to the research questions and sampled population.

Section II (Chapters 4, 5, & 6) contains the empirical chapters that analyze life scientists and technologists' impression management strategies and how these strategies vary by gender, level, and field. In chapter 4 I argue that women in both sampled fields, especially those in hard skills occupations, engage in significant impression management activities using professional clothing as part of their negotiation of credibility among their colleagues. Chapter 5 further explores these strategies in terms of emotion control and expression among men and women in leadership positions. Finally, in Chapter 6 I analyze where women and men perceive gendered barriers to advancement in each field as well as how these professionals interpret diversity and inclusion in their workplaces. I argue that a shared individualism ideology among men and women ultimately limits women to individual impression management strategies and circumscribes opportunities for structural changes in both fields. The dissertation concludes with Section III (Chapter 7) in which I review the implications of my findings for future diversity initiatives, policy recommendations, the limitations of this case study, and fruitful avenues for future research.

CHAPTER 2: THE UNEVEN GENDER INTEGRATION OF THE STEM LABOR FORCE AND THE MISSING CONNECTION TO FIELD CULTURES

The previous chapter highlighted the lack of research into the experiences of STEM professionals working in the private sector. Despite the fact that women have made inroads into most STEM fields, their progress is limited in particular fields. This is in part because each field has a distinct culture that impacts whether or not women are able to thrive. These cultures can be productively examined by comparing scientists' perceptions and labor around establishing belonging in their workplaces.

In this chapter I argue that social scientists do not have a complete understanding of how the culture of scientific fields shape STEM workers' labor around their professional identities. Attending to the micro-level of scientists' impression management strategies and interactions with colleagues reveals the more subtle ways in which scientific work is gendered. Evaluating scientists' experiences in different fields reveals the often hidden labor they do in order to meet normative expectations for professionalism and belonging. My analysis of two distinct STEM field cultures in this chapter will frame the findings discussed in the next three empirical chapters

This chapter is divided into four subsections. In order to situate the research questions presented in the previous chapter, first I survey variation in women's participation in the STEM workforce and women's different career trajectories compared to men in these fields. The second section identifies the lack of studies on the variation in STEM cultures and argues for the value of comparing these cultures.

Section three analyzes the gender schemas for STEM fields, STEM workplaces, and STEM work. Finally, I analyze differences in the cultures of the two sampled STEM fields in this study, life sciences and technology, in order to demonstrate that the coupling of particular cultures and structures create distinct gendered barriers for women in each field.

Women and Minorities in STEM: Inconsistent Gains

Despite substantial gains in women's workplace participation, the revolution towards gender equality in the labor force is stalled and incomplete (England 1999) The persistence in U.S. labor force sex segregation and the gender wage gap indicate that men and women do not stop enacting masculinities and femininities once they enter the workplace. They do gender as they do their work (Acker 1990), and the very jobs they do are already themselves gendered (Britton and Logan 2008). Surprisingly however, much less research has been conducted on femininities than masculinities in work and organizations (Jeanes et al. 2011b). Since men usually occupy better paying and more powerful positions than women within professions, men's behavior often sets the standard for success in organizations (Martin 2003). In intensely masculine-typed work women face obstacles to progress that significantly curtail their ability to reach the highest levels of organizations (Paap 2006). This dissertation explores impression management among elite scientific professionals in two different STEM fields as one of these obstacles. The following section discusses the contemporary demographics of STEM for-profit industry and women's representation across STEM disciplines. I will

demonstrate that women and minorities have made uneven inroads into the ranks of the private sector scientific workforce.[1]

For 2014, the most recent year in which data is available from the National Science Foundation, there are 6.3 million scientists and engineers working in the U.S. labor force. 70% of these STEM workers are employed in for-profit businesses (NCSES 2016).[2] For-profit businesses employ the largest number of STEM workers by a large margin. Universities and other academic institutions employed 41% of STEM workers with doctorate degrees. In addition to its size, the STEM workforce enjoys higher average salaries (regardless of degree earned) compared to the rest of the workforce and lower unemployment rates on average compared to other college graduates in the labor force (NCSES 2016). The average salary for a STEM worker with a bachelors degree is $65,000, which is $15,500 more than the average salary for non-STEM bachelors degree holders (Cataldi et al. 2014). Along with these attractive benefits for STEM workers, there is also a noticeably persistent underrepresentation of women and minorities in these fields. [3]

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[1] Although a relatively small portion of the U.S. labor force, STEM industries are essential drivers of economic growth and innovation (Lee and Mather 2008). The science and engineering workforce has far surpassed the average workforce growth rate of all other U.S. industries since 1950. Between 1950 and 2016, the STEM workforce grew from 182,000 to 6.3 million, with an average yearly growth rate of 5.9% The yearly growth rate for the entire U.S. labor force was only 1.2% for this particular time period (NCSES 2016).

[2] The STEM private sector workforce accounts for approximately 5% of the total U.S. workforce (Falkenheim and Burrelli 2012).

[3] While women are underrepresented in most STEM fields, it's important to note that racial and ethnic minorities are underrepresentation within STEM as well. Over 75% of the STEM workforce is comprised of white men and white women. Research on the embodied intersection of gender and racial identities has begun to reveal more about intersecting processes of exclusion in STEM (Ong 2005). This project, however, seeks to understand the gendering of particular STEM fields by attending to the impression management strategies, aesthetic, and emotional labor men and women undertake within two specific STEM fields.

Men have numerically dominated the STEM workforce for more than 50 years, but women have increasingly moved into all private sector STEM industries. Unfortunately, this shift has been modest at best, and women make up just 29% of the entire workforce (NCSES 2016). This gain in STEM constitutes just a 4% increase in women's representation over the last decade. In 1998, women constituted only 23% of STEM workers. Thus, gains in women's representation have been regrettably slow moving. However, more nuanced data on women's representation across STEM fields reveals surprisingly large differences. Researchers have only very recently begun to explore the underlying causes of these marked differences.

Field Variation Requires Further Research

Women are not universally underrepresented in private sector STEM. Clustering occurs in specific fields within the industry.[4] Some of these fields have exhibited noteworthy shifts in their gender composition, while others have remained remarkably stable over the past thirty years. For example, women constitute the majority of professionals in the life sciences. Indeed, much of the increasing parity of women to men in STEM is attributed to women's greater representation in the life sciences which more than doubled from 1993 to 2008 (Blickenstaff 2005, NSF 2013).

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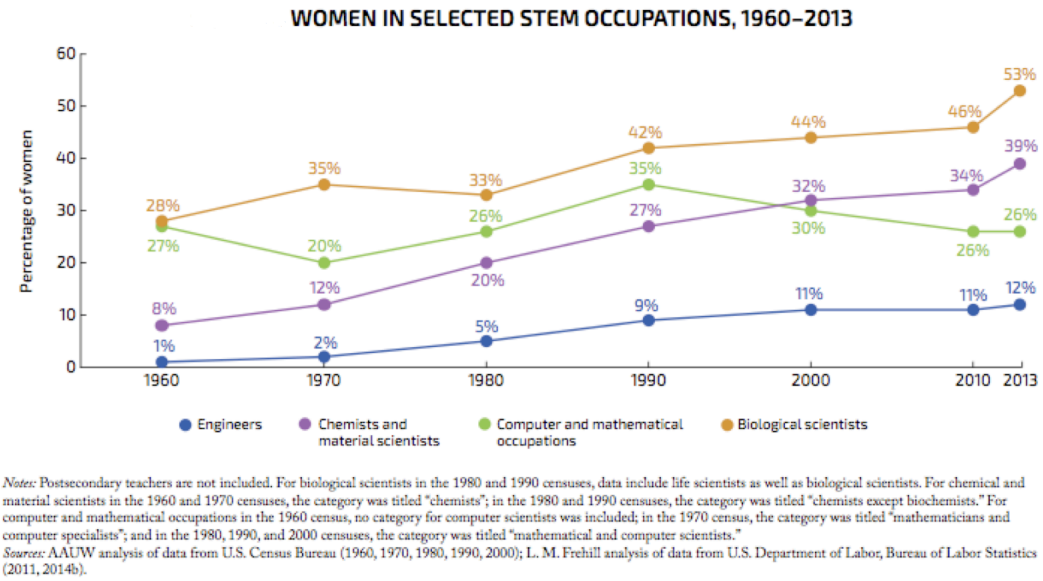
[4] Researchers and federal agencies tend to include or exclude slightly different fields in their analyses of STEM. The Department of Education and the AAUW separate STEM into five distinct fields: physical sciences, natural sciences, computer/information sciences, mathematics, and engineering. This particular delineation will be used throughout this project. However, it is important to note that some organizations include social and behavioral sciences in their surveys of STEM workers. This project excludes the behavioral and social sciences because women are well represented in these fields, and industry jobs comprise a very small proportion of these fields (Hill et al. 2010).

As a counter-trend, the most historically male-dominated STEM fields (physical and computer sciences) still remain significantly tipped in men's numerical favor. Some of these fields are consistently losing more and more women each decade.[5] Women are a much smaller minority in mathematical sciences and engineering, 26% and 13% respectively (Corbett and Hill 2015). Women's participation in mathematics and computer science has increased at the doctoral level, but it has steadily declined at the masters and bachelors level since the early 2000's (NCSES 2016). Women earned just 18% of all computer science degrees in 2014 (NSCRC 2014). These differences become even more apparent at the occupational level, with women's representation becoming scarcer often in the more purely technical or mechanical occupations, such as is the case for mechanical engineers and computer/information scientists. By 2014 women accounted for only 25% of computing professionals, almost equal to their proportion in 1960 and a substantial decrease from their 31% representation in 1990 (BLS 2015, Corbett and Hill 2015). To put these figures in a broader perspective, out of all the women employed in the labor market, only 6% work in computer and mathematical occupations (BLS 2015).

[5] Women graduating with STEM degrees who do not plan to marry early or start a family are no more likely to enter STEM employment than women who do (Sassler et al. 2016). This finding demonstrates that career orientation or family plans do not explain women's lower representation than men in STEM employment



Notes: Postsecondary teachers are not included. For biological scientists in the 1980 and 1990 censuses, data include life scientists as well as biological scientists. For chemical and material scientists in the 1960 and 1970 censuses, the category was titled "chemists"; in the 1980 and 1990 censuses, the category was titled "chemists except biochemists." For computer and mathematical occupations in the 1960 census, no category for computer scientists was included; in the 1970 census, the category was titled "mathematicians and computer specialists"; and in the 1980, 1990, and 2000 censuses, the category was titled "mathematical and computer scientists."
Sources: AAUW analysis of data from U.S. Census Bureau (1960, 1970, 1980, 1990, 2000); L. M. Frehill analysis of data from U.S. Department of Labor, Bureau of Labor Statistics (2011, 2014b).

Figure 1: Women in Selected STEM Occupations, 1960-2013
Reproduced with the permission of the American Association of University Women.

This project specifically focuses on these variations by examining the experiences of women and men in two STEM fields with substantially different gender compositions. My data is drawn from interviews with Ph.D. scientists and professionals working in life sciences and technology. More women than men are now graduating with bachelors degrees in the life sciences, and women have reached parity with men at the doctoral student level in the life sciences. In contrast, women are still substantially underrepresented in technology (NCSES 2016). These demographic variations are not trivial due to the fact that occupations with notably fewer women, such as in engineering and technology, are predicted to have higher average growth than all other occupations over the next decade (Lacey and Wright 2009). Surprisingly however, social scientists have paid less attention to these women working private sector STEM compared to their colleagues in academe.

Women's Private Sector STEM Career Trajectories: Up then Out

Job satisfaction measures and exit rates for women in STEM industry are more disconcerting than those for academia. National surveys indicate that female scientists, regardless of their relationship or parenthood status, are twice as likely as their male colleagues to leave their industry job for a position in government or academia (Hill et al. 2010, Simard et al. 2008). These attrition rates also follow a particular pattern in terms of their timing. A recent comprehensive international study of scientists and engineers working in the private sector finds that while across all STEM fields women occupy roughly 40% of the lower level positions, 52% of these women exit their careers at mid-level around the time that they reach age 35. The highest industry exit rate at this level, 56%, is reported among women in technology (Hewlett et al. 2008, Hewlett et al. 2014). Another recent 30 year longitudinal study that compared cohorts of women working in STEM with women working in other fields finds that women in STEM are significantly more likely to leave for occupations outside of STEM, especially within the first 12 years of their employment (Glass et al. 2013).[6] These findings indicate that quit rates for women are unusually high in STEM fields, and these women are exiting the fields in which they've received training rather than leaving their positions for a different job in the same field.

Surveys of employees across STEM fields indicate that senior level women are also less likely than their junior counterparts to perceive their organizations as

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[6] 50% of the women in STEM followed in this study left for other fields within the first twelve years, compared to only 20% of the professional women who left their occupations within the entire thirty year duration of the study. Other surveys of U.S. STEM workers find that women are 45% more likely to leave STEM fields than their male colleagues (Hewlett et al. 2008).

meritocratic and are more likely to believe their gender has slowed and continues to slow their professional advancement (McKinsey 2015). In response to these perceptions, the vast majority of Fortune 500 science and engineering organizations have implemented diversity and career development programs to address the low representation and advancement of women and minorities among their managerial ranks. However, preliminary in-depth qualitative studies of these programs in geoscience demonstrate that they rarely succeed because interventions often encourage women to accept their marginalized status (Williams et al. 2014a).[7] With few exceptions, flex-time programs, diversity training, mentoring programs and affinity groups rarely alter the established structure and culture of organizations (Dobbin and Kalev 2016).[8]

The early and mid-career attrition of women from private sector STEM is also frequently mistakenly attributed to women's purported interests in starting a family or opting out of work in response to childcare responsibilities. However, research demonstrates that family factors do not play a significant role in women's exodus from STEM (Sassler et al. 2016). Most women who leave their STEM jobs do so before they marry or begin to have children, and very few leave the workforce completely (Simard

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[7] Due to the size of the sample in this study, I am unable to focus specifically on differences among minority STEM scientists and technologists. However, the first large scale report interviewing 60 minority women across STEM fields finds that they unanimously face gender and racial bias in the workplace. Women of color also face unique patterns of bias that White women in STEM do not report (Williams et al. 2014b).

[8] These programs are almost universally under-utilized or culturally stigmatized at the organizational level. Utilization rates for part-time work options have been recorded as low as 2%. Over 90% of sampled women and men across industries fear that they will jeopardize their position if they take advantage of their organization's extended family leave program (McKinsey 2015).

et al. 2008). Other aspects of STEM fields, namely discrimination against women, are likely leading women to exit STEM early.

These women who leave their jobs indicate that they experience isolating and hostile work environments, unclear paths to advancement, a lack of sponsorship, and extreme work schedules (Hewlett et al. 2014, Simard 2009). Alarmingly, 63% of the women surveyed reported experiencing some type of sexual harassment throughout their careers (Hewlett et al. 2008). Another large survey of scientists found that 52% of the female respondents had personally experienced gender bias, and women selected bias as one of the top four reasons why they left their field altogether (Cell Associates 2010). These perceived unfavorable conditions have been identified in numerous federal and not-for-profit research reports on STEM (Fouad et al. 2012, Hill et al. 2010). However, these survey findings tend to report on the experiences of women in STEM at all levels in the aggregate rather than looking more closely at the structure and climate differences across STEM fields. Until the last decade, research on STEM has largely taken for granted that STEM fields share a single monolithic culture that varies little from field to field.

The Dearth of Field Culture Analyses

Some STEM fields are male-dominated and associated with masculinity, and many possess cultures that reward masculine-typed behaviors that disadvantage women working in these fields (Bystydzienski and Bird 2006). Consequently, previous research often analyzes STEM with the assumption that work environments and cultures vary little among these fields (Cheryan et al. 2016). This is a surprising

oversight given recent evidence of differences in gender inequality practices and gendering across academic STEM fields (Bring and Benschop 2011). Assuming that all fields are identical and comparable doesn't account for the reality that each STEM field has a particular culture that influences the overall climate men and women experience while working within the field (Cetina 1999, Ecklund et al. 2012). These cultures are fundamental to the identities of STEM workers; these professionals frequently report stronger ties to their professions than to the companies that employ them (Simard et al. 2008).

Certain cultures are perceived as more or less favorable to men or women. For example, recent research demonstrates that scientific cultures vary and may exclude or include women over time depending upon whether formal versus informal relationships are exalted (Cain and Leahey 2014). Similarly, Hewlett et al. (2008) identify three cultures that create barriers for women in different STEM fields: lab coat culture, hard hat culture, and geek culture. 31% of women in tech report an exclusionary late-night "hard-hat" culture. In some fields, such as engineering, women experience a mix of more than one of these cultures (9). These cultures affect women's ability to gather sponsors, maintain productive networks, assume leadership positions, and ultimately persist.[9] Despite these previous findings, few projects interrogate how

[9] Notably, scientists cite discrimination at different points in their intellectual development and careers as the main explanation for why more women than men elect to pursue research careers in biology instead of physics (Ecklund et al. 2012).

men and women scientists and technologists understand and strategically engage with professional norms that shape their careers in the workplace.[10]

Each STEM field has a particular culture that transcends organizational contexts and shapes the experiences of professionals within the field. Analyses of private sector STEM have not scrutinized the content of these particular cultures in detail. Recent research finds that these cultures can vary in numerous respects (Bystydzienski and Bird 2006, Cain and Leahey 2014, Hewlett et al. 2008).[11] We also have less knowledge of which aspects of culture in particular scientists in private sector STEM fields perceive as supportive of women's progress or how scientists use impression management to establish their belonging.[12] There is preliminary evidence that women in STEM actively shift their "coping behaviors" as they react to the professional norms and structural conditions within their workplaces (Alfrey and Twine 2017, Haas et al. 2016). This lacuna in the research coupled with the poorly understood experiences of scientists working in the private sector necessitates a more focused analysis of the field-specific cultures within STEM.

Scholars cannot assume professions that are dominated by men are also necessarily masculinized. Rather, it's productive to look at multiple analytical levels to reveal whether and how professions are gendered (Britton 2000). The following section examines how cultural schemas at different levels of analysis shape STEM fields,

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[10] See Herman et al. (2013) for a notable exception focusing on motherhood.
[11] For example, even scientific professions that have shifted towards having more women than men in them may remain gendered towards masculine-typed performances of competency and expertise (Irvine and Vermilya 2010).
[12] With the exception of engineering, these questions have not been adequately addressed in other STEM fields (Hatmaker 2013, Jorgenson 2002, Miller 2002, Powell et al. 2009, Williams et al. 2012)..

STEM workplaces, and STEM work. I demonstrate how gender schemas broadly associate STEM work with masculinity generally. Then I analyze how specific cultural and social structures in the life sciences and technology create different barriers to women's persistence in these fields.

Mapping Gendered Cultural Processes in STEM

Table 1: Cultural Processes Implicated in the Gendering of STEM

Level of Analysis	**Cultural Processes that Facilitate Inequality**	**Components**
U.S. Society	Gender schemas that associate STEM work and skill sets with masculinity and men's "innate" abilities	Ubiquitous stereotypes shared through media and socialization
Science professions	Schemas that characterize scientific work as gender-neutral and meritocratic	Scientists' graduate training, graduate socialization, and professional socialization
STEM fields	Research characterizes the culture of these fields as masculine, but few studies evaluate this claim or explore the potential for variation.	Field-level value systems and exalted competencies that are tied to gender schemas
Organizational position	Gender schemas that bias expectations for and evaluations of leaders	Formal employer promotion policies and bias against women who are managers or who seek management positions
Workplace interactions and professional identities	Gender schemas for engineers create additional labor for women. Little is known about other STEM fields.	STEM workers' beliefs, perceptions, workplace experiences, and labor around professional identity

In order to understand how science as a particular pursuit of knowledge is gendered, scholars must map the culture of STEM at all levels of analysis. Table 1 diagrams the cultural processes involved in the gendering of STEM at various levels of analysis from the macro level of U.S. society to the meso level of organizations to the micro level of scientists' daily workplace experiences and identities. Each level of analysis is paired with the data that researchers use to understand these processes.

Culture at the macro level of society, the meso level of the profession, and the micro level of scientific workplace interactions shapes the experiences and identities of the men and women who work in each field. A culture which prizes particular value systems and interaction styles closely associated with masculine stereotypes can deeply affect women's success within that industry in the long term (Dryburgh 1999, Miller 2002). In addition, an apparent meritocratic culture can equally obscure interpersonal and organizational processes which reproduce gender inequality (Roth 2006). At the level of the organization, implicit support among top level predominantly male executives for a predatory and hostile work environment towards women can filter down to the lowest levels in ways that create a chilly and unwelcoming climate for women. The central focus for this study is the relationship between culture and gendered processes of inclusion and exclusion, particularly at levels 3, 4, and 5 in the table above. I briefly review cultural schemas at the broad level of U.S. society and at the level of science professions before moving deeper into describing life sciences and technology cultures.

Level 1: U.S. Society

At the macro level of American society, there are cultural beliefs, or schemas at work that further the association of men and men's bodies with science (Valian 1999) Schemas are powerful cultural models, or hypotheses that individuals continuously rely on to make sense of the social reality that they encounter and create each day (Valian 2006). They comprise an "ordered, socially-constructed and taken-for-granted framework for understanding the world" (Blair-Loy 2003:220). Schemas are essential for categorizing, interpreting, and predicting the actions and motives of groups of people. Gender schemas specifically encompass assumptions about what men and woman are like, and importantly, should be like. Gender schemas remain powerful because men and women largely share the same sets of schemas regarding gender differences (Valian 2005).

Schemas primarily discourage women's entrance into U.S. STEM fields through the association of men with innate ability in science and mathematics. In western culture science, men, and the prestige accorded to scientific work have become associated to a very high degree (Keller 1985).[13] Men are assumed to be more capable of using reason and objectivity in order to come to conclusions, an essential component of scientific discovery. Emotion and subjectivity has long been associated with femininity (Hochschild 1983). Consequently, gender schemas that associate men with agency and reason perpetuate the assumption that men are more well-suited for scientific or mathematical work and that women are either uninterested or incapable of

[13] However, Losh (2010) finds that these associations have declined in the past two decades.

thriving in scientific professions (Carli et al. 2016). For example, laboratory studies find that successful women scientists who are perceived as having more feminine appearances are judged as less likely to be scientists (Banchefsky et al. 2016). Even advertisements in science journals and magazines reinforce the association between men, masculinity, and scientific work (Barbercheck 2001). Boys and girls are socialized according to the perceptual incompatibility between femininity and science as well. This gender socialization process explains much of the observed durable trend in which girls and young women eschew mathematically-intensive fields (England 1999). The association of men with STEM fields creates a host of conflicting messages and barriers for women entering these fields and attempting progress up the career ladder.

Level 2: Science as a Profession

Paradoxically, at the level of the profession, cultural schemas characterize scientific work as potentially the only vocation in which subjective bias, favoritism, and exclusion based on differences do not occur. Science historians note that science as a discipline and source of knowledge maintains much of its widespread regard and influence in society from the belief that scientific work and scientists are entirely objective and free from any context dependent or broader cultural influences (Harding 1986, Long and Fox 1995, Merton 1973). Traweek (1988) famously called this extreme objectivity science's "culture of no culture" (162). Scientific work operates under the assumption that it is entirely meritocratic; scientists who do the best work in their field are rewarded accordingly with the most grants, best academic appointments,

and international recognition. But recent social psychological research demonstrates that fields characterized as more meritocratic, such as in STEM, are actually more likely to exhibit bias (Castilla and Benard 2010). This belief in science's neutrality, and especially its gender neutrality, extends to professionals in the highest levels within STEM organizations (Cech and Blair-Loy 2010).

The broader characterization of scientific work as value-neutral obscures the existent of subtle biases towards gender, race, sexual orientation, and class particularities that create unequal outcomes within STEM. The combination of societal-level schemas that associate science with men and professional level schemas that characterize science as gender-neutral leads to a common finding in social science research that both men and women within science fields discount or downplay the gendered aspects of their fields (Miller 2002).[14] These contradictions in schemas can be fruitfully explored through field comparisons, which are lacking in the literature thus far. In order to fully asses the gendering of science, it's necessary to take analytic steps deeper into the cultural components of individual STEM fields.

Level 3: STEM Field Cultures

Scientists generally view scientific work as value-neutral and meritocratic, but STEM fields have their own distinctive cultures that valorize certain capabilities and foster particular values and practices that are far from gender neutral (Chiu et al. 2014, Corbett and Hill 2015, Sewell 1992). STEM cultures can perpetuate gender bias when

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[14] Interestingly however, narrative interview studies of scientists find that a proportion of scientists believe that their gender influences their scientific style and conduct (Ecklund et al. 2012).

exalted competencies are linked to stereotypes for innate gender competencies. For example, STEM fields that are dominated by the belief that practitioners require innate intellectual brilliance in order succeed, a stereotype associated exclusively with men, are significantly more likely to have far fewer women in them (Leslie et al. 2015).[15] In practice then, science as a profession appears value-neutral on the surface, but science disciplines often possess gendered internal practices and belief systems. (Seron et al. 2015)

Despite these internal culture differences, researchers rarely compare cultures across different STEM fields.[16] For example, it's unclear whether or not the belief in the gender neutrality of scientific work holds across STEM fields that employ a larger proportion of women than men. In addition, some professional cultures actively reproduce gendered categories of difference by fostering the distinction between technical (i.e. masculine) and social (i.e. feminine) work (Faulkner 2000). However, little is known about whether these kinds of distinctions exist across STEM. Researchers have only recently begun to turn their attention towards understanding how scientists themselves perceive their cultures.

Organizational Cultures Reflect their Field Culture

Researchers have theorized the importance of organizational culture for explaining gender disparities in a given field. Organizational cultures may vary in particular aspects, but they are shaped by the larger culture in which they are

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[15] Women in these fields are less likely to acquire a strong sense of professional role confidence and to see themselves as "fitting" within the field (Cech et al. 2011).
[16] See (Cheryan et al. 2016) for a recent exception.

embedded. A field's particular culture ultimately transcends individual organizational cultures within it (Cain and Leahey 2014). Therefore, it is fruitful to examine STEM cultures through an assessment of how STEM organizations foster particular assumptions and shared values among their employees.

Joanne Martin's distinguished work on organizational cultures demonstrates that culture is embedded within the lives of every organization member. In formal organizations, such as corporations, organizational culture can take the form of informal practices (norms for behavior), formal practices (hierarchies of power, written policies), organizational stories or rituals, and physical arrangements (office decorations and dress codes) (Martin 1992, Martin 2002, Martin 2004). Values are also essential components of organizational culture. Gideon Kunda's ethnography of a technology firm demonstrates how normative cultural values guide action. But culture also shapes workers' feelings and thoughts in significant ways as well; their own self-conceptions are pulled into the organizational culture (1992). Martin argues that while there are multiple approaches to studying organizational culture, it's imperative to attend to the context of the work that's being performed in order to begin an evaluation of the culture within organizations.

With respect to culture and gender, organization theory scholars have established that gender is a fundamental organizing principle which shapes the structure of and practices within organizations (Acker 1990, Britton and Logan 2008, Kanter 1977). Joan Acker argues that all organizations possess inequality regimes composed of "loosely interrelated practices, processes, actions, and meanings that result in and maintain class, gender, and racial inequalities within particular

organizations" (2006:443). Jobs are not just gendered because more men or women occupy them; rather, entire organizations are gendered through their cultures and practices. These cultures and practices "enable and validate the unequal distribution of recognition, resources, and rewards" (Berrey 2015:49). STEM fields such as technology are frequently singled out for possessing cultures that privilege hegemonic White masculinity, marginalize women, and stigmatize feminine stereotyped skills and competencies (Panteli et al. 2001). Yet research that compares STEM field cultures is rare.

In order to contribute to this line of inquiry, in the following section I synthesize the research on cultures and social structures in life sciences and technology, specifically pointing out gaps in our knowledge about these private sector STEM fields. This synthesis allows for a more nuanced framing of the findings discussed in the later empirical chapters in this study. For the sake of clarity I delineate social structural and cultural factors involved in the gendering of these two fields. In practice, social structural and cultural factors work together in ways that disadvantage women and minorities in STEM.

Life Sciences Culture and Gendered Structural Barriers

The life sciences, with their genesis in the seventeenth century, are significantly older than the more contemporary field of technology (Magner 2002).[17] While theorists posit that from their inception the life sciences have been inherently androcentric in

[17] Scholars locate the origins of modern biology in ancient Greek philosophers' theories and principles (Caullery 1966).

their approach to knowledge production (Harding 1986), these fields are presently characterized as more gender-neutral and welcoming to women than the physical sciences (Hewlett et al. 2008). By the mid-19th century the life sciences were among the first STEM fields to formally offer employment opportunities to women (Tolley 2003). Biology, the premier life science, also quickly and thoroughly embraced feminist critiques as they emerged (Schiebinger 1999).

The life sciences take living organisms, including humans, and their relationships to each other as their object of inquiry. Theorists argue that this relational approach creates more emotional attachment in life science practitioners. These fields are therefore thought to be associated more closely with women's stereotypically "innate" aptitudes than other fields (Jardins 2010, Koppman et al. 2015). In addition, the life sciences are broadly conceived of as closely aligned with the "softer" and more introspective social and behavioral sciences (Fanelli 2010).

In terms of culturally valorized skill sets, there is no evidence of a cultural emphasis on technical preoccupation and ability over other proficiencies in life sciences. Smith-Doerr (2004) notes this finding in her extensive research into the workplace experiences of life scientists: "The geek culture of living and breathing computers obsessively does not seem to have the same counterpart in the life sciences. Biologists certainly work long hours in the lab and are committed to their work, but I never met one who didn't have a hobby or life of some kind outside of his or her experiments" (145). Intense dedication to technical mastery in the field is not considered a chief criteria for advancement; consequently, there is not a strong cultural

association of life sciences work and masculinity.[18] Case studies of life sciences employers support this claim. They find that relatively few women describe their workplace cultures as masculine (Hewlett et al. 2008)

The products of work in the life sciences are also perceived as creating tangible social benefits outside of the field in ways that more theoretical disciplines do not. A recent study of biologists, for example, finds that many consider their research as directly or indirectly helping people through the creation of novel treatments for human diseases and disabilities (Ecklund et al. 2012). This characterization of the life sciences as more socially-oriented and therefore implicitly associated with stereotypically feminine emotion work makes it a fitting case to compare against the masculine-typed and technical-centric culture of technology.

Finally, gendered structural barriers to advancement for professionals in private sector life sciences have not received nearly as much academic attention as in technology. But scholars describe intense work commitments in excess of 50 hours per week on average for scientists employed in research labs, a dearth of mentors for women, and evidence of unclear paths to career advancement for women (Hewlett et al. 2014). These findings regarding life sciences culture and life sciences structural barriers do not neatly map onto the field of technology. Each of these fields possesses distinctions that set each other apart.

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[18] Although life scientists rarely report a geek culture that emphasizes technical mastery in their workplaces, they do frequently report a lab coat culture that is tied to the extreme time commitments of experimental work (Hewlett et al. 2008). This culture is especially difficult on women because they are more likely to have commitments outside of the lab that take them away from their ongoing and time-sensitive experiments.

Technology Culture and Gendered Structural Barriers

Technology is a comparatively young field without the century-long pattern of demographic male dominance that characterizes many other STEM fields (Tai and Sims 2005). Women have always been present and have made fundamental contributions to the field from its inception. In the 1940s women primarily worked as coders translating instructions into machine language for the very first computers based in the U.S. and U.K. (Ensmenger 2010). By the mid-1950s technology work still lacked a clear gender association and attracted women and men in roughly equal numbers; women were actively recruited for computing positions throughout the following two decades.[19] For example, during a period of acute high demand for software programmers in the mid-1960s employers frequently preferred women over men for open positions because programming work was characterized as being congruent with women's innate aptitudes: patience and attention to detail (Abbate 2012).[20] Nonetheless, computing historians note that beginning in the late 1960s technology occupations became increasingly male dominated as the work became conceptually tied to engineering. Burgeoning technology professionalization networks and the industry's widespread adoption of aptitude testing also heavily favored men applicants over women (Donato 1990, Ensmenger 2010, Koput and Gutek 2010).[21]

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[19] Estimates of the population of individuals working in computer-related occupations before the late 1960s place women at between 30% to 50% of the labor force (Ensmenger 2010)

[20] Abbate (2012) notes that computer programming positions were frequently advertised in magazines for women readers, such as *Cosmopolitan*. These advertisements likened programming work to knitting, music, and cooking, "thus casting women's participation in computing as natural and desirable" (65).

[21] Ensmenger (2010) argues that the hiring and professionalization processes favored throughout the late 1960s created a "gender-biased feedback cycle that ultimately selected for programmers with

Today women constitute a much smaller proportion of the workforce. They account for less than 20 to 30% of professionals in most occupations in the field (Corbett and Hill 2015). The pairing of women's low representation in technology along with their occupational segregation into the lower paying positions within the field lead researchers to assume that technology careers themselves are gendered as masculine.[22] It is believed that women have difficulty progressing into higher positions within the field because those valued positions require skillsets that are culturally associated with masculinity (Simard 2009).

Surprisingly however, technology's culture has only received close scholarly attention over the past two decades. Interest has been steadily rising with the massive growth of the industry and the advent of the world wide web. The following analysis of technology culture begins with widespread cultural messages about the average characteristics of professionals who work in the field. Stereotypes of workers in technology, as conceptualized by those looking in from the outside, center on the geek or hacker image.

The earliest research on technology culture highlights popular conceptions of technology workers. The stereotypes characterizing the people and work involved in computing contribute to the gendering of the field. Most of these stereotypes remain

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stereotypically masculine characteristics" (78). Scientifically dubious personality and aptitude tests over-selected for antisocial, mathematically inclined men; the overrepresentation of these men in the industry then reinforced the belief that potential programmers should be antisocial, mathematically inclined men. The concurrent emerging professional organizations that excluded women meant that programmers were constructing a particular gender identity for themselves at the same time as they were constructing their professional identity (239).

[22] A study conducted by an industry salary tracking firm found that 75% of the top roles in technology have a higher gender pay gap than the national average (Chamberlain 2016).

salient up to the present. The popular conception of a technical worker evokes the image of a lone, always male, "hacker," coding solitarily away in a cubicle into the small hours of the night (Margolis et al. 1999). The stereotype of the male software hacker is particularly pernicious in that it significantly reduces women's interest in pursuing computing degrees (Margolis and Fisher 2002, Morrell 1996). The collective conception of computer science work typically includes devotion to being at a computer every waking hour as well as being obsessed with anything related to technology. Indeed, "the expectation is still that young men, sequestered in their cubicles, living and breathing computers, are creating the new world" (Margolis and Fisher 2002:67). These stereotypes regarding total commitment to the field align with studies of technology culture in educational settings as well.

Surveys of technology culture in academic institutions find that it is gendered and emphasizes extreme time commitments from employees. Computing culture in these environments is strongly associated with masculinity, heterosexuality, extremely long working hours, and high work-family conflict (Ahuja 2002). This culture of technology work positions dedicated male students as "bright and creative, " while women face real and perceptual hurdles towards achieving acceptance among their academic peers and colleagues (Ahuja 2002:26). Present research suggests that the difficulty women face establishing belonging in academic technology occupations is also present in industry as well.

The few earlier studies of technology's culture conducted in the mid 1990s and early 2000s find a similar culture to that of technology in academia. These studies propose that women avoid or leave technology jobs due to two factors: strong cultural

messages associating technical work with men and technology's similarity to engineering culture. (Ahuja 2002, Wright 1997). In these analyses, the historical origins of the work and media portrayals of computing work are theorized to have had lasting effects on the industry.

Wright (1997) argues that due to technology's origination in electrical engineering, the field possesses a similarly masculinized engineering culture. This culture exists despite the fact that contemporary technology work and organizations have little relation to traditional engineering. In support of this assessment, studies incorporating interviews with computing professionals find that technology is dominated by a culture of calculation. The calculation culture values structure, discipline, and technical mastery over social skills (Turkle 1984). These qualities are closely associated with masculinity. Turkle (1995) argues that this culture of calculation in technology fosters an inhospitable climate for women. In addition, more recent studies also contend that women and minorities face greater difficulty than men in fitting into technology's culture (Guzman and Stanton 2009). However, limited research exists on how women and minorities manage this tension, and the majority of smaller qualitative studies on women's experiences in technology remain focused primarily on cohorts outside the U.S.[23] The studies that do focus on U.S. technology

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[23] See (Alfrey and Twine 2017, Bartol and Aspray 2006, Joshi and Kuhn 2007) for recent exceptions. The majority of contemporary U.S research analyzes the distribution of men and women among technical jobs or women's attachment to technical jobs. Industry groups frequently produce reports and surveys, but these efforts are rarely peer-reviewed. Peer-reviewed studies find that women are more often clustered in lower level non-managerial technical positions, and they exit the industry at a much higher rate than men (Glass et al. 2013, Hewlett et al. 2008, Wright and Jacobs 1994). At least one study also captures women's perceptions of being directly discriminated against in technology, perceived incompatibility between technology work and family obligations, and perceived bias in promoting

workers do not typically capture technologists with masters and doctoral degrees, a group that is conspicuously absent from past research.

Technology organizations claim to prioritize collaboration. However in practice individual contributors who have more assertive or aggressive communication styles move more swiftly up the corporate hierarchy (Margolis and Fisher 2002, Simard 2009). Being a good collaborator is closely associated with femininity and women's leadership styles, yet in primarily masculine corporate cultures, such as in technology, it is men who are rewarded for demonstrating competency in collaboration (Appelbaum et al. 2002).

Software coding is frequently held as the pinnacle of high status work among technical positions in the field. The individual contributions of software developers are held in higher regard than in more collaborative technical positions, such as program management (Simard 2009). More men than women are employed in software development positions as well. This gender disparity as well as the prestige accorded to individual contributors particularly affects gender diversity in the field because women are more likely to be in technical positions that support projects across the organization. Technology employers that claim to prioritize collaboration as a core value over other types of contributions possess cultures which reward individual contributions more frequently in practice (Simard et al. 2008). This mismatch between

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patterns. However, this study only captures the experiences of women working in a single Fortune 500 technology company (Allen et al. 2004). Wright and Jacobs (1994) in particular have called for more data on women and men's perceptions of barriers to entry, persistence, and advancement in technology as well.

stated values and values-in-practice points to the difficulty of evaluating contributions that are more diffuse and not easily measured in sheer output.

Research demonstrates that in fields in which men numerically dominate and in which masculinity is closely tied to the work, such as technology, skillsets are differentially evaluated depending on the gender of the person being evaluated (Ahuja 2002, Panteli et al. 2001). Expectations for job performance frequently become conflated with expectations for an employee's performance of gender. These expectations specifically negatively affect women more than men in the field. For example, Woodfield (2002) finds that for technology workers, "the degree to which social skills are defined, recognized and assessed is highly dependent upon a worker's gender" (133). Women in technology who have the communication skills that employers increasingly desire do not reap the occupational benefits in practice. Communication and relationship building skills are extremely important in technology work, but they are evaluated as less important when women are doing them because possessing these skills is understood as an effortlessly natural part of being a woman and not a skillset that women must work to attain. Men are rewarded and recognized for developing these social skillsets because they are understood as something men must work towards for proficiency rather than a given "fact" of their gender. Woodfield goes so far as to argue that we might expect women's skillsets that are associated with femininity may be even more undervalued in technology than in other fields due to the strong link between masculinity and technology within the profession's culture. That is, merely expanding the proportion of women working

within technology doesn't necessarily lead to women's inevitable promotion up the corporate ladder in equal numbers to men.

Cultural factors do not fully account for the barriers to entry and persistence that women frequently face in the field. Structural factors inherent to technology work play an additional role in shaping experiences and limiting opportunities for women in various ways. These structural constraints present primarily in the form of work/life conflict, availability of mentors or social networks, and organizational practices. Technology organizations typically maintain workplace policies in which commitment to exceedingly long hours is mandated, and workers who commit to being constantly engaged and available for "put out the fire" crises are rewarded with recognition (Hewlett et al. 2008). Technology companies generally do not offer flexible working arrangements; there are rarely telecommuting or part-time arrangements to be made for workers who have childcare or other family commitments to meet. [24]

Technology's demands for continuous commitment to work are coupled with shared cultural schemas that also prizes complete devotion to work. These schemas of work devotion contradict schemas for being a devoted mother (Blair-Loy 2003). Men in technology, as a result of their frequently lower child care responsibilities, are more often able to derive workplace rewards and status from their ability to work exceeding long hours and hew more closely to the schema of workplace devotion (Damaske et al. 2014). Thus technology workers who are mothers or who are considering starting a family face additional stressors and occupy a uniquely difficult position in the field

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[24] Yahoo's new CEO recently drew criticism for ending all of the company's work from home options (Goudreau 2013).

(Appelbaum et al. 2011). A small-scale qualitative study of women who are IT managers in Ireland finds preliminary evidence that this confluence of structural and cultural factors leads some of these women to create a personal "self imposed glass ceiling" in which they avoid applying for more senior positions due to concerns over diminishing work/life balance (Cross and Linehan 2006). Other large surveys of women in technology find that 64% of women agree that a lack of confidence and a male-dominated workplace are the two most pressing issues limiting their career advancement (Pluralsight 2016).

Additional structural barriers to advancement for women endure through a lack of formalized mentor programs and a lack of transparency in promotion decisions. Relationship management and having a strong mentor are critical resources for obtaining a promotion in technology (Appelbaum et al. 2011, Simard et al. 2008). Because women rarely occupy the highest levels of technology organizations, they report feeling extremely isolated due to an acute lack of mentors (Liu and Wilson 2001). In addition, women report more difficulties than men in securing a mentor; they are frequently excluded from formal and informal social networks (Cross and Linehan 2006). One study found that 45% of women in science and technology lack mentors, and 83% report that they lack sponsors who can increase their visibility for responsibilities and positions that lead to promotions (Hewlett et al. 2014). Women are often in the minority in technology companies. So they are faced with the challenge of locating mentors outside their immediate department and need to capitalize on their network ties in a different manner than their male colleagues.

The dearth of mentors for women in technology is coupled with the persistent finding that technology employers' promotion policies and practices systematically disadvantage women due to a lack of objective measurement criteria and low transparency (Simard et al. 2008). Women working in technology report that promotion decisions in their firms are frequently made ad hoc and depend upon executive management's subjective perceptions of a candidate's perceived "fit" within the existing leadership group (Cross and Linehan 2006). The lack of transparency around promotions allows for an in-group bias towards all-male executive leadership (Panteli et al. 2001). Coupled with a strong gendered cultural association between men and natural technical ability, women report needing to repeatedly prove their technical abilities above and beyond their male colleagues to be considered for promotions (Lyness and Heilman 2006).

Moving from Describing Field Cultures to How STEM Professionals Navigate their Field Cultures

The preceding analysis of life science and technology fields illuminates the importance of examining STEM cultures as containing nuanced differences rather than assuming they are uniform. Research on STEM fields often assumes the numerical dominance of men within a field or a field's association with mathematical ability leads to a culture that is inherently "masculine-typed" (Ridgeway 2009). But an alternate line of research demonstrates that in order to understand how a particular field becomes more or less gendered, it's fruitful to examine the ideal worker schemas present within cultures and the meanings scientists imbue in both their workplace activities and identities (Rosser 2004).

Ideal worker schemas play a powerful role in every profession because they set the boundaries of inclusion and are regularly at work in processes of evaluation and exclusion (Turco 2010:904). Ideal worker schemas can lead to exclusionary practices if they become associated with gender-typed traits and behaviors over time. For example, Gorman (2005) finds that managers who make hiring decisions in law firms interpret a candidate's qualifications through various gender stereotypes. And women receive more intense scrutiny from hiring managers for managerial positions as they attempt to move into top positions that are historically male dominated. [25]

In depth studies of cultures in fields outside of STEM illuminate how ideal worker schemas can reproduce gender inequality. Turco's (2010) study of the obstacles that women face working within the culture of the leveraged buyout industry finds that the LBO industry's ideal worker schema is deeply gender-typed as male "because it conflicts directly with other schemas about women and defines commitment to the occupation as incompatible with motherhood." (895). The ideal worker in LBO is expected to be aggressive and exclusively committed work over all other responsibilities. The undivided commitment to work schema conflicts with the larger cultural norm explicitly applied towards women that compels mothers to be exclusively devoted to their families. Although not all LBO women will become mothers, the potential for them to be "at risk" of getting pregnant and their association with motherhood impedes their complete integration into LBO culture.

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[25] Also see (Acker 1990) and (Blair-Loy 2003) for the conflict that women in high finance experience between work and family roles.

We have little knowledge of what the ideal worker schemas are for each STEM field and how these schemas may contribute to gendered processes of exclusion. Previous research on gender in STEM demonstrates the importance of attending to field cultures because many of these appear gender-neutral on the surface but are in fact deeply gendered (Cheryan et al. 2016, Correll 2004). For example, there are numerous individual accounts of a pervasive masculine "brogrammer" culture in technology in which sleeping in one's cubicle, drinking alcohol at work, and celebrating sexual exploits in and out of the workplace are commonplace and valorized (Shevinsky 2015).

This dissertation addresses the veracity of these accounts by exploring how STEM workers experience the cultures in technology and life sciences workplaces. Furthermore, at the analytic level below STEM professions it addresses how a scientist's position within a science organization relates to their perceptions of a gendered culture within their field. Occupying a high or lower status position with a field entails different experiences of gendered processes of inclusion and exclusion.

Level 4: Organizational Position

A limitation in the research thus far is that studies often possess data on women but not men working at both junior and senior levels in an organization. These studies will capture only the experiences of a particular group of women within a given field. In addition, to my knowledge we have no studies investigating how STEM workers rely on resources and status to navigate ideal worker schemas. This dissertation

addresses the variability of men and women's experiences by comparing high and low position STEM scientists in two differing scientific fields.

Previous research on gender in organizations finds that in addition to organizational culture, one's position within a company affects how they perceive and frame forms of inequality and obstacles to professional advancement (Cech and Blair-Loy 2010). Having a supervisory or entry-level position in an organization leads to often strikingly different access to resources, career sponsorship, and other form of social capital. The description of each job requirement as well as how individuals perceive the work they are doing is important for understanding inequality in STEM because "people tend to gender their *descriptions* of what they do more than they gender their actual *practice*" (Faulkner 2000:784). However, we do not know how particular scientific professions within STEM fields are perceived as gendered.

Scientists do not all work at the bench in private sector STEM companies. Contrary to the academic scientists' primary duties of running controlled experiments in a research lab, private sector scientists work in business development, marketing, and client driven executive positions in addition to research and management positions. More senior line management positions are often far removed from the "doing" of scientific work; yet, these scientists who occupy advanced positions are required to maintain their expert technical knowledge while adopting a much broader set of

skills.[26] Often these skills entail managing direct reports and clients through aesthetic and emotional labor.

For example, research has not empirically determined if all occupations within technology are gender typed in the same way, let alone across business development and research divisions within organizations in the field (Joshi and Kuhn 2007). Joshi and Kuhn (2007) explore the self-reported characteristics of exemplary IT consultants with a focus on gender typing. They find that men and women's descriptions of the skills necessary for the prototypical top IT consultant were equally associated with masculinity and femininity. Interestingly however, respondents reported masculine-typed skillsets when imagining what external stakeholders considered to be the skillsets for top performers, and masculine-typed skillsets were reported by both men and women as being necessary but not sufficient for upward mobility in the field. Further research into the variability in the gender typing of prized job skillsets in technology is needed, especially when considering how the value of particular skillsets may shift depending on the social context and gender of the individual being evaluated.

Preliminary research with high-level women executives in non-science fields demonstrates that one's structural position within an organization is associated with particular perceptions of gender inequality (Cech and Blair-Loy 2010). We do not know how these findings may differ among men or scientists across STEM. This study attends to the impact of position within STEM workplaces as an important factor for understanding whether scientists perceive their fields as more less gendered. But in

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[26] For example, senior life scientists at pharmaceutical companies are evaluated on their ability to identify and shepherd profitable new products into the marketplace (Joy 2008).

order to fully elucidate the gendering of scientific work, one last analytic level, that of the interactions and experiences within the work place, must be observed.

Level 5: Workplace Interactions

Finally, and most central to the research questions outlined in the introduction, this project links the micro-level experiences of scientists as they perform and reflect on their work and workplace interactions to the macro features of particular STEM fields. These experiences and perceptions are crucial pieces of data for understanding how STEM professions become gendered and remain sex segregated. At the micro level of scientists' daily interactions with each other, we find that the culture of particular fields prize particular interaction styles and emotional expressions (Cain and Leahey 2014). Indeed, preliminary research focusing on academic scientists in biology and physics demonstrates that some fields, namely the life sciences, are perceived to be more closely associated with emotional labor and women's "innate" interest in emotionally engaging work (Ecklund et al. 2012). These prized cultural attributes do not appear only in the form of behaviors, relationships, values, and physical appearances in the workplace; they permeate down to a scientist's fundamental professional identity. Professional identities are intimately tied to the presentation of self in a multitude of ways.

Self-presentation, attire, and communication styles are all essential for establishing a professional identity (Jeanes et al. 2011a). Body and gender theorists identify these body practice as an "important means by which the norms, values and beliefs associated with a particular culture are enacted, and proficiency as a cultural

member is demonstrated" (Kenny and Bell 2011:172). Haynes (2008) research demonstrates exactly how the body is central to establishing professional credibility in the workplace. The physical body is "symbolic of aspects of identity and the self, an embodied representation of a perceived identity" (490). In her analysis of women in accounting firms, Haynes finds that attitudes towards bodies are gendered such that "the ways in which women's and men's bodies are perceived, categorized and valued are undoubtedly important in legitimizing and reproducing social inequalities" (345). Haynes goes on to argue that the process of establishing a professional identity in professional services firms intersects with gender stereotypes and stereotypes about bodies. She notes that women in these firms experience marginalization because they lack particular masculine-typed physical capital resources that are essential for embodying legitimate professional identity in the field. Analyses of private sector engineers come to similar conclusions (McIlwee and Robinson 1992).

Haynes' research demonstrates that gendered embodiment of a particular professional identity is crucial for success in the workplace. Women in professional services firms struggle to negotiate their professional identities through their bodies at the same time as the firms' culture circumscribes what counts as an acceptable professional body image. The difficulties of walking the line of dominant professional embodiment helps to explain why many women end up leaving accounting and law. Yet with the exception of engineering, we have no clear understanding whether and how scientists manage their professional identities through embodiment. Furthermore, we do not know how embodied identities are implicated in STEM culture or whether certain groups experience negative career repercussions because they face unequal

bodily expectations within the profession. These dynamics are already being uncovered among women in elite positions in many industries (Mavin and Grandy 2016). Examining the presence of particular dominant gendered embodied identities for scientific disciplines provides social scientists with a more robust set of tools for explaining differences in attainment of capital (physical and social), status, and career advancement among groups of scientists.

Other strong evidence for the importance of attending to the micro-level aspects of work as well as the structural macro-level conditions that lead to gender inequalities can be found in Jennifer Pierce's research. In her ethnography of trial lawyers and paralegals within two law firms, Pierce finds that these two law occupation are deeply gendered to the point that the emotional labor lawyers and paralegals are required to enact reinforces gender stereotypes. Almost all lawyers in the two law firms in Pierce's study are men, and the gendering of this occupation leads to the enactment of universally aggressive behaviors. However, the women who are litigators are unable to effectively engage in these behaviors because the gender norms available for men deny these very same behaviors for women. In contrast, most paralegal positions in the firms are staffed with women who are assumed to be nurturing and supportive because these are the schemas attached to the enactment of femininity. In practice when lawyers lose their tempers and yell at paralegals, the paralegals engage in deference and comforting behaviors which "unwittingly reproduce their subordinate position in the law firm hierarchy" (Pierce 1996). The job of a lawyer or a paralegal becomes conflated with masculine and feminine respectively through these repeating interactions. Pierce's

work demonstrates the way that emotion work is implicated in the gendering of occupations.

Similar to Haynes' assertion of a dynamic relationship between structural constraints and behavior, Pierce notes a dynamic between the gendered feeling rules for paralegal positions and the emotional labor the women in these positions do to either reproduce the gendered rules or work around them to their advantage. Pierce's work serves as a useful starting point for understanding emotional labor in professions, but the weakness in her study is that it is often unclear whether the gendered stereotypes she identifies are a result of women's token status within the higher positions of the law firm or whether those particular positions are entirely gendered one way or another. That is, gender and level are conflated at times. This study of women and men in STEM addresses this weakness by examining the experiences of professional men and women in both high and lower status positions in each examined STEM field. I am interested in identifying these dynamics within STEM as current research indicates that embodiment, ideal worker schemas, and emotion work are all at play in various forms within scientific fields.

Aside from the stereotype that scientists are white men, many science workplaces reward displays of aggressive behavior and value independence and singular competitiveness with one's colleagues (Georgi 2000, Ong 2005, Traweek 1988). There is evidence that in some fields graduate student scientists are socialized early on to value competition, hierarchy, and even sexist behavior (Hirshfield 2011, Sallee 2011). These ideal behaviors and values embedded in some fields make it more difficult for women to successfully maintain a professional identity that recognizes

their authority and expert knowledge. Women who work in these fields often face skepticism about their abilities as scientific workers. Men in these fields rarely have to contend with increased scrutiny of their accomplishments (Correll 2004).

For women in STEM, the challenges of appearing to conform to a paragon for scientific work and professional identity in which femininity is already considered outside the bounds of a scientist's identity creates unique challenges. Indeed, many women report that the culture of some STEM fields is inherently hostile to them (Corbett and Hill 2015). They labor to achieve recognition and acceptance as full members of their field at the same time that their gender makes them more visible, and in a sense, out of the ordinary. That is, these women must engage in specific interactional styles, emotion work, and body projects in order to conform to their male colleagues and supervisors' expectations (Eisenhart and Finkel 1998, Pronin et al. 2004). Women in engineering, for example, are "visible as women, not as engineers, and so have to routinely (re)establish their engineering credentials" (Faulkner 2007:334). This unrecognized and essentially invisible additional work that women are compelled to engage in on a daily basis creates cumulative difficulties for women as they attempt to rise up the management ladder within STEM.

Research on how women persevere while working in male-dominated or masculine-typed fields illuminates the risks inherent in the choices women must make in these contexts. Etzkowitz et al. (2000) find that in these fields, women are typically viewed as 'honorary men' or 'flawed women.' A 2007 report from Catalyst finds that women face a 'double bind' situation in the position of managers in masculine-typed fields. They are often judged to be too aggressive and unfeminine when they exercise

their authority and thought to be too weak and unable to command authority if they act according to expectations for femininity. Women who work in male dominated occupations often persevere either by emulating men, leaving if they are not able to adapt to the culture, or persisting in the industry in limited positions of power or prestige (Powell et al. 2009). This double bind contributes to a gender gap in women's advancement due to the fact that women are typically viewed as unsuitable for leadership if they adopt feminine-typed leadership traits or appearances and unsuitable as women if they adopt masculine-typed leadership traits. Thus, women face the often insurmountable obstacle of being judged as inadequately feminine if they match the traits of successful professionals or inadequate professionals if they align too closely with the schemas for women and mothers (Blair-Loy 2003, Valian 1999).

Research on these unique burdens for women in STEM confirms that scientists experience a conflict between appearing competent in their work in addition to appearing feminine. For example, in their study of women in engineering McIlwee and Robinson (1992) note that women often fail to advance in this field because they "do not *appear* to conform to the culture of the workplace" (138, italics original). It is not the case that female engineers do not identify with engineering culture; rather, these women find that their self-presentation styles, which are used to signal solidarity with the workplace culture, do not gain the same recognition or purchase as those of their male colleagues (Faulkner 2009). Reflections from prominent women in technology echo the findings for engineers:

> I'd seen the ways in which men could succeed in hoodies and flip-flops. In some circles, that was the secret handshake that said "I'm one of the dudes, I'm trustworthy and smart." For us, there isn't an accepted dress-

> code that creates that trust. If we do not want to emulate men with hoodies and jeans, we are expected to either wear the clothing of the young, sexy office girlfriend, or the well-to-do mom. Neither of these uniforms creates inclusion in the tech circle.
>
> (Shelley 2015:115)

Not appearing to align with the schemas for what a competent scientist or technologist should look like puts these women at risk for scrutiny regarding their professional competence as well. However, sociologists have yet to empirically examine these claims for technologists, and it is unclear whether they extend to other STEM fields.

Conclusion

In order to resolve tensions and persist in STEM, women either adopt particular gendered strategies or leave STEM altogether (Dryburgh 1999, Rhoton 2011). These strategies for persistence have only recently begun to attract scholarly attention, and how women and men across STEM fields use embodied impression management to establish their credibility and expertise is all but absent from the literature. Research thus far has focused on, lawyers, scientists in academe and engineers in the private sector. These studies also rarely compare fields to each other.

Pierce, Turco, and Haynes' work bridges the gap between macro and micro level processes of gender inequality in the workplace. Pierce demonstrates that gender inequality emerges from the dynamic between the gendered structure of organizations and the gendered meanings workers create for the work they do, including emotion work. Turco identifies the importance of cultural resources and ideal workers schemas, and Haynes points to the importance of attending to the body and the embodiment of professional identities in professions. This study extends this focus on professionals'

labor around negotiating credibility and belonging in their fields for two private sector STEM fields.

In this study I take up life scientists and technologists' reflections and perceptions of their experiences working in their fields as discourse on the daily interactions that occur within STEM industry workplaces. The empirical chapters examine how life sciences and technology professionals engage in impression management strategies as part of their negotiation of professional identity and belonging within their fields. This comparison of the experiences of scientists working in these fields is an ideal starting point for understanding the more subtle processes of exclusion across STEM as both fields have markedly different gender distributions and cultures. In the following chapter I describe the methods and sample for this comparative qualitative project in greater detail.

CHAPTER 3: RESEARCH METHODS AND DATA COLLECTION

The previous chapter summarized the research questions that motivate this project. This chapter presents the data sources and research methods I employed in this study. I begin with a survey of women's representation across all STEM fields. Following this survey I argue that the life sciences and technology are ideal comparison fields because one is at the high end and one is at the low end of women's representation in STEM. These demographic differences provide a fruitful contrast for examining women and men's experiences in each field. In addition, research demonstrates that these two fields have dissimilar cultures. The following section moves on to detail the sampling and interviewing methods in this study. The final section discusses the coding methods I used in analyzing the interview data as well as my reflexive relationship to the research questions and participants.

Demographic Variation Among STEM Fields

In order to capture the variability of men and women's experiences within STEM, this study compares life sciences, a field with the largest proportion of employed women scientists by far, and technology, a field in which women's representation has remained relatively low. It is often assumed that the slow march towards gender parity in U.S. science education is inevitable. However, recent national statistics on women's enrollment and graduation rates in STEM demonstrates substantial variation in women's representation. Over the last three decades women have earned a growing proportion of undergraduate and graduate degrees in U.S.

STEM fields (NCSES 2016). But this increase is not consistent across these fields. For example, in 2013 women earned more bachelor degrees in biology than men, half of all degrees in chemistry, and about half of all bachelor degrees in mathematics (NCSES 2016) There are now more women than men in life sciences undergraduate and graduate programs across the country. But women also earned fewer than a quarter of all bachelor's degrees in three STEM fields: physics, engineering, and computer science. The proportion of women earning degrees in computer science has actually decreased since the 1980s, a trend that is central to my sampling of professionals working in technology. In addition, we find that women still earn fewer than 20% of doctorate degrees in engineering and fewer than 30% of doctorate degrees in physical sciences. The slow but relatively consistent gains women have made in many STEM fields sits in stark contrast to the status of women in STEM after degree attainment.

The most recent estimates put women's representation at only 29% of the STEM workforce despite the fact that women constitute 50% of the college-educated U.S. workforce and earn almost half of all STEM bachelors degrees (NCSES 2016). This low representation of women in STEM has remained remarkably stable since 2000 despite the fact that more college educated women enter the STEM labor market each year. We find about half as many women working in the STEM workforce as we would expect given their STEM degree attainment. In addition, women are less likely to work in STEM occupations than their male graduates in the same cohort (Hill et al. 2010, Sassler et al. 2016)

Examining the latest statistics on private sector STEM workers reveals that gender parity across fields is just as variable as in STEM education. At the high end of

gender parity we find that women represent over half of the workers in life sciences (Hill et al. 2010).[1] Coupled with more women than men earning degrees in life sciences, this field graduates and employs the most women by far.[2] On the other end of the spectrum we find that women represent just 15% of the engineering workforce (NCSES 2016). Clearly progress in gender parity across STEM fields is anything but linear. These field level differences point to the potential variability in the experiences and trajectories of women in STEM. Given this variation by field, the following section further examines the demographics of the two fields in which this study takes up its focus.

Life Sciences and Technology Demographics

The low representation and retention of women in technology compared to the larger proportion of women in life sciences led me to select the two fields as an ideal comparison case. These demographic differences significantly contribute to perceptions of gender equality for scientists working within these fields. While STEM fields in general are perceived as male, looking at the demographics demonstrates that some of these fields are hardly male-dominated.

Life sciences is particularly exceptional. The life sciences attract and retain more women than any other sector of STEM (England et al. 2007). For example, more women than men are currently employed in biological science and medical science

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[1] Life sciences include the following occupations: food scientists, biological scientists, conservation scientists/foresters, medical scientists, chemists, environmental scientists, agricultural scientists, food scientists, biological technicians, chemical technicians, and geological and petroleum technicians.
[2] Estimates put women's employment in life sciences at 309,000 and men's employment at 329,000 (NCSES 2016).

occupations. Female dominated occupations are not uncommon in the life sciences. Compared to life sciences, technology has seen a much slower and in some cases a reversal of progress towards gender parity.[3]

Women in technology are still in the minority despite the fact that U.S. technology job growth has outpaced overall job growth since 2008 (TechServe Alliance 2013). As of 2014 there were 4.6 million private sector technology workers, but the proportion of women in technology has declined to 25% in 2014 from a high of just 31% in 1990 (Beckhusen 2016).[4] As a counterpoint, the proportion of women in all U.S. occupations has steadily climbed from 38% in 1970 to 47% in 2014. The low representation of women in technology is glaringly evident in leading technology company workforce diversity reports.

A recent widely publicized report disclosing Google's global workforce demographics reveals that just 17% of this industry-leading company's technology positions are occupied by women (Google 2014).[5] Women are even more underrepresented at the very highest levels of private sector technology businesses. For example, women constitute only 11% of executives and a mere 10% of directors among the 150 highest revenue earning technology companies in Silicon Valley (Bell

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[3] The technology field consists of the following computer-related occupations: Computer scientists and systems analysts, computer programmers, computer software engineers, computer support specialists, database administrators, network systems administrators, operations research analysts, network systems and data communications analysts.

[4] The largest proportion of STEM degree holders, 2.4 million, work in computing occupations (NCSES 2016)

[5] Black, Hispanic, and other underrepresented minorities constitute 3% of Google's technical workforce. Other industry-leading technology companies report remarkably similar workforce statistics. Reliable data on the proportion of women and minorities employed in Silicon Valley companies is markedly scarce, with individual reports indicating that the proportion of women in technology start up companies is even lower than the industry average of 20%. Employers are not legally obligated to reveal demographic data on their employees.

and White 2014). The largest annual survey of two thousand technology Chief Information Officers further demonstrates this trend. 45% of CIOs report that women make up less than a quarter of their technical teams, and one quarter of CIOs say that there are no women on their technical teams. There are even fewer women in technical management positions. 35% of CIOs indicate that there are no women in management IT roles in their organizations, and 93% of CIOs surveyed in 2012 were male (Mitchell 2012). An unpublished follow-up survey conducted in 2014 finds that women's representation in the top technology positions, Chief Information Officers, dropped from 10% to 7% in the intervening two years (2014). Women also receive much less outside equity support than men when they start their own tech companies, potentially limiting their success over time (Robb and Coleman 2009).

These demographic differences between the two fields also correlate with women's retention in both fields. Women are 45% more likely than men to leave technology careers in their first year, and 56% of women leave technology altogether by the 10 to 15 year mid-point in their careers (Hewlett et al. 2008, Hewlett et al. 2014). This attrition rate for women is higher than in all other STEM fields (Ashcraft and Blithe 2016) and indicates that women are specifically leaving technology jobs for jobs in other fields. Accurate data on women's quit rates in the life sciences is surprisingly scarce (Peters and Lane 2015), but one survey of these women finds that 75% plan to remain in the industry (Warren 2011).

Given these demographic and retention differences, I expected to find that scientists working in life sciences and technology would experience and perceive their fields differently based upon the presence or relative absence of same-sex colleagues.

Social scientists note that when the representation of women in a field is less than 20%, as is the case in technology, bias is more likely to occur (Kanter 1977). Indeed, recent research on women in male-dominated technology organizations finds that women are more likely than men to perceive their workplace culture as competitive instead of meritocratic, and women in management positions are perceived to be less technically competent than their male peers (Simard et al. 2008). In addition, an "old boy" culture that excludes C-level women from important informal meetings and work events is also especially prevalent in higher levels across technology companies (Soe et al. 2009). Thus in addition to divergent gender distributions, I selected these two fields due to evidence that they possess different cultures that contribute to gendered processes of exclusion.

Life Sciences and Technology Cultures

Just as not all STEM fields are heavily male dominated, certain STEM fields are more closely associated with stereotypical masculine or feminine qualities (Ecklund et al. 2012, Irvine and Vermilya 2010). Research that compares scientists' perceptions of different STEM fields demonstrates these associations. Ecklund et al. (2012) explore how academic physicists and biologists explain gender distribution differences in their fields.[6] They find that scientists in both fields predominantly use gendered reasoning and gendered biological explanations for demographic differences in their fields. In addition, scientists in both fields associate biology more closely with feelings and

[6] Mirroring the two fields selected for this study, the authors compared fields with opposite gender distributions. Biology is rapidly reaching gender parity while women are underrepresented in academic physics departments.

emotional labor. These two traits are closely linked with gender schemas for femininity. However, Ecklund et. al. only compare two academic STEM fields, and the conclusions they draw are limited by their sample of only academic scientists. Nonetheless, this research demonstrates that STEM fields are perceived to be gendered in particular ways, even among practitioners in those fields.

Much of what we know about the content of STEM cultures is drawn from personal accounts. Research on the self-perceptions and experiences of scientists generally come in the form of either in-depth ethnographies or collections of individual narratives. While not very numerous, these ethnographies and collections uncover the lived experiences of working in specific, usually academic, STEM disciplines (Hacker 1981, Hermanowicz 1998, Newton 2001, Traweek 1988, Ullman 1997). These revealing texts aid in understanding how scientists and technologists experience their day-to-day responsibilities, the norms inherent in their workplaces, and the ways in which scientists create meaning out of their work. Hermanowicz (1998) succinctly sums up these accounts as glimpses of "what life is like on the inside" (14). Ethnographies and narratives are snapshots of the culture and periods in which they were collected; they reveal the workplace interactions and discourses that sustain culture. Scholars are also paying more attention to how these beliefs and practices unique to a given STEM field influence women's retention and attrition within the field (Seron et al. 2015). However, these personal accounts and studies typically focus on only a single STEM field.

As I examined in greater detail in the previous chapter, ethnographies and personal narratives of women's experiences working in private and public sector high

technology describe a culture that is gendered masculine. Ullman (cited in Newton 2001) notes that the typical culture of private sector technology companies is generally that of "perpetual guy adolescence (73);" offices are overwhelmingly staffed with young single men and older men who are single mindedly committed to their work and devote all of their free time to the technical "toys" within the workplace. Life science workplaces do not feature this intense devotion to technical mastery (Smith-Doerr 2004).

In terms of cultures, life sciences and technology do not mirror each other with respect to their valorization of particular skill sets. The core skill sets for technologists center upon "hard" skills that include software programming, hardware design, and system administration (Simard 2009, Wright 1997). These skills are prized in technical culture because they are associated with direct profit-generating work in the field.[7] In the life sciences, however, we do not find such an emphasis on the centrality of hard skills. Certainly almost all life scientists begin their training and careers with hands-on bench work in laboratories, but success in the field is ultimately characterized by leading an entire lab of scientists or direct reports while being almost entirely removed from the actual physical act of experimentation. Successful life scientists both in academia and the private sector are oriented towards the social aspects of establishing a reputation among colleagues and marshaling the talent and human resources necessary for bringing products to market (Cetina 1999, Joy 2008). In addition, the life sciences

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[7] Line positions in technology, in contrast to staff positions, generally have higher average salaries. These positions directly contribute to the development of a company's core profit-generating products or services.

are closely associated with emotional attachment and emotional labor (Jardins 2010, Koppman et al. 2015). For these scientists the phenomena that make up the objects of study "assert themselves as independent beings and inscribe themselves in scientists' feelings and experiences" (Cetina 1999:79). This cultural association between emotionality and life sciences mirrors that of qualities stereotypically associated with femininity.

Leveraging Cultural and Demographic Differences

The demographic and cultural differences between life sciences and technology make the two fields especially attractive for this study's focus on ideal worker schemas, professional identity negotiation strategies, and scientists' perceptions of the gendered cultures within their respective fields. To begin, this comparison allows for an investigation of how ideal worker schemas intersect with gender schemas as scientists and technologists work their way up their career ladders. For example, because women are well-represented in the entry and lower levels of life science organizations, there is the potential for the mistaken believe that gender bias does not affect women in these fields. However women are underrepresented in these fields both in academia and in industry the higher up one looks across positions (Sheltzer and Smith 2014, Warren 2011). We do not know how specific biases against women affect them as they advance into more senior management positions.[8] This study specifically

[8] Sheltzer and Smith (2014) find that in biology women are underrepresented in postdoctoral positions in labs run by male faculty. The most prestigious laboratories run by elite male faculty are also significantly more likely to train graduate male scientists. The authors hypothesize that this tendency contributes to the dearth of female candidates who are competitive for faculty positions in the field. In

addresses how bias in various forms affects women's ability to advance across both fields.

In addition, the different demographics of each field in this study are fruitful for exploring how men and women professionals negotiate professional credibility, expertise, and belonging among their colleagues and managers. We do not know whether and how these activities occur when gender distributions are equal versus skewed or when cultures are gendered more or less masculine. We know that women engage in a variety of impression management strategies in older and consistently male dominated STEM fields (Hatmaker 2013, Miller 2002, Powell et al. 2009, Rhoton 2011), but scholars have not examined these strategies within STEM fields that are reaching gender parity or are not closely associated with masculinity.

Analogously, we do not know how demographic and cultural differences in STEM fields shape workers' perceptions of gendered processes of inclusion and exclusion. While previous research often characterizes particular scientific fields as masculinized due to the large majority of men in these fields, we cannot assume that a majority of workers being male necessarily creates a masculine culture (Britton 2000). Comparing a male-dominated field with a field that has almost gained gender parity allows for a better understanding of how scientists perceive these demographic differences as salient for explaining gendered barriers.

Interviews

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contrast, another recent experimental study across STEM disciplines finds that scientists prefer female candidates over equally qualified male candidates for tenure-track faculty positions (Williams and Ceci 2015).

The data for this project is drawn from 45 semi-structured interviews with men and women scientists currently employed in private sector life sciences and technology organizations. Interviews are particularly effective for studying gender in organizations due to their ability to capture reports of interactions and experiences over a broad time period. Seale notes, "Interviewees can recall and summarize a wide range of observations in seconds, which would take weeks and months of observational work to achieve. They can also speak about things that cannot be observed (Seale 1999). Interviews benefit the researcher by compressing events and revealing the interviewee's perceptions of which experiences appear significant to him/her. According to Czarniawska (2011), allowing individuals to retell their experiences edited in their own words has two major benefits: "The very act of editing gives clues to what is perceived as normal and as deviant; and the way the narratives are shaped is a result of collective sensemaking" (92). In addition, the narratives produced within interviews serve as discursive tools that participants use to construct social realities (Davies and Harré 1990). Direct observation does not directly allow for this kind of analytical insight.

The utility of interviews for studies of gender in organizations is readily revealed in Patricia Martin's research. In Martin's 2003 study on the reciprocal dynamic of practicing gender and gendered practices in large for-profit organizations, she argues that gendered interactions and processes are not conducive to direct observation. All practices are extremely difficult to observe and describe using language. But Martin argues that gendering practices are particularly difficult to capture because "they are done unreflexively; they happen fast, are 'in action,' and

occur on many levels" (Martin 2003). Therefore, it's productive to rely on individuals' accounts and interpretations of gendered practices as they recollect and interpret them.

For this study, I conducted all of the interviews from 2010 to 2014. When possible, the interviews were conducted and recorded in-person in my university office or at a public location that the participant designated. Approximately half of the interviews were conducted and recorded via telephone for participants outside of my geographic area. I took notes on interview participants' physical appearance, including attire, for all of the in-person interviews. When these details were unavailable for the recorded phone interviews, I asked participants to describe the clothing that they routinely wear to work.

The participants were not given any compensation for their time, but they were offered access to the final dissertation once completed. All of the recordings were transcribed using a transcription service. The transcripts were then imported into ATLAS.ti, a qualitative data coding software package.

Interviews varied in length from forty minutes to just under two hours in length. The interview format was semi-structured, which enabled me to ask questions about the relevant experiences of participants depending on how much detail they were interested in providing in their responses. Because I am particularly interested in the participants' experiences and impressions of the STEM fields in which they work, I asked them a series of thematic questions related to four broad categories.

After I collected relevant demographic information, the first set of questions focused on the participant's perspective on her given field, what types of divisions s/he perceived, as well as the qualities and competencies s/he saw as necessary for success

in her field and occupation. The second set of questions asked about leadership in the field, the type of leadership style that is prized, the importance of different kinds of clients, and the ways in which the participant leads (if they are managers). The third set of questions asked participants to talk about the salience of gender differences in their field and organization, whether or not they had experienced differential treatment because of their gender, and if they could reflect on their experiences as a man or woman in their field. The final thematic set of questions asked the participant to discuss how s/he maintained and communicated professionalism in the workplace. These questions included specific references to physical and self presentations aspects of the workplace in the form of dress codes, grooming, demeanor, and emotion management. In addition, I asked the participants discuss their interactions with colleagues and direct reports. This final part of the interview also discussed managing family obligations, pregnancy in the workplace, and any perceived gendered differences in the physical requirements for men and women in the field.

At the end of the interviewing phase I discarded three interviews with scientists who were not currently working in the life sciences or technology. In addition to the 45 life scientists and technologists that make up my sample, I also conducted interviews with a broader set of industry informants. These include three HR managers in technology, two technical recruiters, one Chief Learning Officer of a technology company, one former VP of a technology company, and two academic researchers with ties to life science or technology industry organizations.

Sampling and Sample

While this project does not analyze a representative sample of scientists from each field, the findings from my sample may reveal similar perceptions of cultural processes of exclusion and ideal worker schemas across life science and technology workplaces. In addition, as all scientists are involved in socially constructing science, analyzing even a small sample of scientists' perceptions of their fields contributes to our understanding of gender inequality within those fields (Ecklund et al. 2012). The sample of men and women I interviewed were selected for their theoretical importance as a group whose experiences and perceptions of their private sector workplaces are understudied.

As discussed in the previous chapter, work in STEM industry fields is inherently interdisciplinary. Professionals working in the two sampled fields in this study are educated in a variety of disciplines and hold different occupations. However, these fields hang together based upon mutual understandings of professional conduct and collaboration. The culture of each field shapes the content and relations of work.

Technologists, especially women in senior technology positions, are a difficult population to access. I found that technology companies were particularly reluctant to grant access to their underrepresented employees, and industry disclosures about these populations are rare. There is also a dearth of any large sociological studies of this group, which makes qualitative studies especially useful for revealing embodied patterns of gender inequality.

In order to capture the experiences of scientists and technologists working in private sector science and technology firms, I interviewed men and women from a range of industry positions. My focus on the perceptions these scientists have of their

field is complemented by the inclusion of high and low status STEM workers within this analysis. These differences in position allow me to look for potential differences in how these professionals perceive and experience processes of exclusion depending on access to organizational power, status, and resources.

In technology, jobs are divided along support, technical, and manager levels (Roldan et al. 2004). Support level professionals are often embedded in helpdesks or departments within larger organizations. These individuals were not included in the sample as I was particularly interested in finding individuals working in technology companies rather than those who perform technological support at companies in other industries. For technical levels, occupations include software developers (engineers), quality assurance engineers, and hardware or network administrators. Finally, at the managerial level, professionals manage technical or products teams in addition to serving in purely executive roles. In the life scientists, positions are divided between research and business development.[9] Almost all of the life science business development and managerial positions are mirrored in technology. These individuals are line managers, directors, or vice presidents of entire departments. On the research side of the organization, life scientists work as research lab scientists and in lab scientist manager positions. In my sampling for this study I included professionals from a broad swath of occupations within both fields in order to account for differences

[9] Peters and Lane (2015) follow the convention of dividing the life science industry into five distinct sectors: agriculture, drugs and pharmaceuticals, medical devices and instruments, hospitals and laboratories, and research and testing.

by position. My sample includes professionals from many of these occupations. See Table 2 for a detailed list.

Table 2: Sampled Occupations by Field

Technology	**Life Sciences**
Vice President (unspecified)	Vice President (unspecified)
Director (unspecified)	Director (unspecified)
Operations Manager	Director of Marketing
Project Manager	Senior Manager (unspecified)
Program Manager	Business Development
Senior Scientist	Senior Scientist
Sr. Statistical Software Modeler	Support Scientist
Software/Hardware Engineer	Research Scientist
Data Analyst	Scientist Analyst
	Engineer

I located the participants in this study through chain referrals via email and telephone. I began my search by reaching out to colleagues in my social network. These referrals netted additional referrals from interview participants' colleagues and acquaintances either in their workplaces or in the same industry. These referrals took quite some time to acquire as I did not have an extensive connection to STEM workers outside of academia. So I was graciously assisted by the staff of a university business affiliates program in locating additional interview participants. In addition to my chain referrals, I reached out to a national organization that promotes equity and advancement of women in scientific professions. As a member of this organization I expanded my contacts substantially and was able to locate more participants for the second phase of interviewing. I also observed five monthly local organization meetings in order to collect data on the topics that were of most interest to the members.

Approximately half of the women who participated in the project are active members of this organization for the advancement of women in STEM.

Scientists employed as postdocs or directly employed at academic institutions were excluded from this study for obvious reasons. Scientists who did not have Ph.D.'s were not excluded due to the fact that this particular degree often isn't necessary to advance in many private sector STEM companies. For scientists interested in attaining top positions on the business development side of STEM companies, an MBA or equivalent is more desirable. Nonetheless, the majority (60%) of participants hold either a M.S. or Ph.D. in a field related to their work.

In order to mitigate any effects of geographic idiosyncrasies, I drew my sample of interviews from three regions of the U.S. The majority of interviews (60%) were conducted with STEM workers working along the northern and southern regions of the West Coast. The remainder of the remaining interviews were conducted via telephone and split evenly between men and women working in the South and East Coast (40%).

The area in which the majority of my west coast interviews were conducted is an especially fruitful location for studying STEM professions. This area is classified as a science and technology regional cluster with a dense network of science and technology firms (Blair-Loy and Cech 2010). One out of every ten private sector workers in the nearby city is employed in a science or technology business.

My final sample consisted of 45 life scientists and technology professionals. I interviewed 29 women and 16 men in total. 11 of these professionals are women who work in technology, and of these, 6 are currently managers/executives in a STEM organization and 5 are more junior level scientists in research or production positions. I

interviewed 8 men who work in technology, 3 of whom are managers and 5 are junior scientists. My comparison group of scientists work in private sector life sciences organizations. I was able to locate women interviewees more easily in the life sciences because they are employed in much higher numbers, and the biotech industry is geographically close research site. There are 10 women in the sample who work as managers/executives in life sciences, and there are 9 who are junior scientists. For the men in life sciences I interviewed 4 managers and 3 junior scientists. See Table 3 for a complete distribution. Salaries for the sampled STEM professionals ranged from $68,000 to $350,000 with a median salary of $100,000 for the sample.[10]

Table 3: Distribution of Sample by Field, Gender, and Level

Technology	**Life Sciences**
Men	*Men*
Managers/Executives: 3	Managers/Executives: 4
Junior Scientists/Researchers: 5	Junior Scientists/Researchers: 3
Women	*Women*
Managers/Executives: 6	Managers/Executives: 10
Junior Scientists/Researchers: 5	Junior Scientists/Researchers: 9

Although there is some variation, STEM is not a racially or ethnically diverse sector of the economy.[11] In my efforts to recruit for this study I still attempted to obtain as diverse sample of scientists as possible. Gender, race, class, sexual orientation, and age are important social categories that impact how professionalism and ideal worker

[10] The mean salary is $129,000.

[11] The majority of STEM workers in the industry identify as White. The next largest racial group across all STEM fields identifies as Asian, especially in computer and mathematical occupations. Estimates of the distribution of racial groups in industry across the two sampled fields are as follows: Technology is 65% White, 22% Asian, 6% Black, 5% Hispanic, and 2% Pacific Islander or multiracial. The life sciences are 70% White, 19% Asian, 3% Black, 7% Hispanic, and 1% Pacific Islander or multiracial (NCSES 2016)

representations are enacted. However, it was not possible to obtain a very large sample that varied by race and ethnicity. While this limits the scope of the study, I was still able to find scientists of diverse ages and backgrounds. My sample includes 35 White men/women, 6 men/women who identify as Asian American, one woman and one man who identify as African American, and one woman who identifies as Mestiza. 34 participants identify as heterosexual, and one woman identifies as gay.[12] The participants' ages range from 21 to 60. I also recorded each professional's family and relationship status. 40% of the participants in the sample are parents. In my coding of the participants' responses I kept these characteristics in mind as well. All direct quotes from the interviews include references to participants' preferred racial or ethnic identification.

Coding and Analysis

This study makes use of grounded theory to generate results from the data. While this method of inquiry does not begin with a bounded theoretical frame, it does allow the researcher to generate and modify theory from many types of qualitative data. Theory emerges from the particular research situation while the research is being conducted (Glaser and Strauss 1967; Lamont and White 2009). Therefore, the data I collected in the interviews was coded and compared to the guiding theories in the literature and novel theories that I generated as the analysis progressed.

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[12] 10 participants declined to state a sexual orientation. One participant declined to state a racial or ethnic identity.

This methodology is dialectical as theory and concepts emerge through the process of coding qualitative data, then evaluating expected findings in relation to data, then adjusting the theory as necessary after collecting more data. Grounded theory combines induction and deduction in order to reach a theory which fits the data. Patton (2002) notes that grounded theory takes the researcher "into and close to the real world so that the results and findings are grounded in the empirical world" (125). Unlike other methodologies, theory generation and data collection occur simultaneously.

In practice, my coding and analysis proceeded with looking for expected patterns in the data based upon previous research as well as the main themes of this project. I was especially attentive to participants' explanations of ideal worker stereotypes in their field, their strategies for managing professional identity, and their reflections on interactions with colleagues or managers in their field. Other patterns that emerged from the data were gender-specific professional identity negotiation strategies focused on professional appearance and emotion management as well as variation in these strategies by level and occupation. When possible, I noted the absence of patterns that I had expected to find based on the STEM literature. For example, women in senior positions in both fields describe similar informal gendered feeling rules for the expression of emotion. Surprisingly, women and men's responses in these two disparate fields more often resembled each other than exhibited differences.

Notes on Methodology

As an academic sociologist I faced a few hurdles in gathering the data. Not being affiliated with any natural science social networks made it necessary for me to locate companies through personal and professional contacts as well as through career fairs. Finding contacts that could refer me to a sufficient number of participants took quite some time. In addition, I had originally hoped to supplement my interview data with data gleaned through direct observation of technology and life science workplaces. However, this turned out to not be feasible.[13]

My lack of familiarity with the day-to-day details of scientific work in the life sciences and technology created some advantages for this research. I was able to benefit from my outsider status during the interview stage as well. Respondents recognized my initial unfamiliarity with private sector science organizations, and they often took it upon themselves to carefully explain the dynamics of their work environments as well as the structure of their workplace relationships. These nuanced accounts of on-the-ground experiences provided invaluable richness to the interviews. The participants also often paused to carefully explain the significance of particularly important career transitions or workplace interactions as well as define any relevant industry slang. These moments when the scientists explained how their choices or experiences reflect the culture of their industry (as they perceived it) gave me a unique

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[13] All of the businesses I contacted declined to allow me to engage in observational research either due to "legal concerns" or a generalized fear of potential legal actions against the company on behalf of the employees I would be observing during the data collection stage. The fact that many of the companies I contacted were wary of having their employees observed and interviewed about diversity and gender-related aspects of scientific work speaks to the potential unspoken acknowledgement that many science and technology workplaces have particular observable patterns of inequality. Indeed, the technology sector has been the subject of years of negative media reports regarding its lack of gender and racial diversity as well as high profile discrimination lawsuits.

perspective that an industry insider may not have received. The extra detail the respondents provided in the interviews ultimately led to a more rich and varied account of their workplace experiences and reflections on those experiences.

My position as an academic outside of the local STEM private sector community also allowed me to glean particular details about often emotional and painful experiences of exclusion or discrimination. Many of the interviews contained details of shocking coworker and supervisor behavior. I believe that my status as someone outside of the industry who has little contact with participants' colleagues made them more comfortable.[14] Lastly, my own particular social characteristics and the characteristics of the research participants likely influenced how my interview questions were answered and how participants interacted with me.

As a white male I originally assumed it might be more difficult for the women and minorities in this study to speak with me during the interviews. However, if at all, the scientists who are women generally seemed more at ease during the interviews and opened up more frequently and in detail. It was much more difficult to find men to speak with me during the interview gathering phase of the project. Of the men that I interviewed, some of them did not have anything to say regarding gender in their field. Others seemed resistant or unable to reflect on their experiences. I am unable to speculate as to whether or not some of the participants would have contributed more in the interview had I been a woman or identified myself as a member of a racial/ethnic minority group.

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[14] Four of the scientists in this project explicitly stated this fact themselves after the formal interview concluded.

Some participants were more reflexive than others regarding the interview topics. The majority of the women I interviewed had grappled with issues of gender discrimination to a certain extent throughout their careers. With the exception of the women who only very recently began their careers, most of the participants had experience contemplating and often acting upon occurrences that they perceived as bias on the part of their managers or colleagues. Therefore, many of the interview questions that asked about gender in STEM did not come as a surprise to the participants. On the other hand, with the exception of three participants, the men in this project generally denied the presence of gender bias or explained gendered structural barriers as unalterable components of work in all scientific fields. However, neither group of scientists evaded some of the more uncomfortable questions regarding gender dynamics in their workplaces. In all, the women I interviewed were more articulate in describing their perceptions of their field's culture. This trend is also likely due to the fact that many of the women in the study were members of professional organizations for women in science. These organizations hold monthly meetings that frequently cover issues of discrimination, politics, and the culture in scientific workplaces.

All of the interview participants in the sample were able to recount their work histories and perspectives on their advancement through STEM employment. Some had much more to say about the characteristics of their given field. These interviews tended to last longer and have more rich data from which to draw upon. Finally, my grounded theory approach to the data allowed me to identify relevant concepts and themes that emerged across interviews.

As an exploratory case study of scientists working in two different STEM fields, the interview data in this project reveal the power of intersecting gender and ideal worker schemas embedded in each field. The following chapter details these themes and cultural processes that animate scientific work in private sector technology and life sciences businesses. It will explore gender differences in how these professionals use clothing to signal their credibility and belonging.

CHAPTER 4: WHAT DOES A STEM PROFESSIONAL LOOK LIKE?: GENDERED CLOTHING STRATEGIES FOR CREDIBILITY AND BELONGING

Scientific work in life sciences and technology requires the same rigorous commitments as other high-pressure professions. Fifty to sixty hour work weeks along with multiple looming project deadlines are the norm for scientists employed in the private sector. These scientists and technologists' demanding workloads are strikingly similar to those of other professionals working in law, medicine, and finance. In order to persevere over the long term within these high-stress positions and to establish belonging within their field, scientists must adopt both a professional identity and professional image that demonstrates their "cultural fit" within the field. Establishing belonging within a life science or technology organization is essential for being perceived as an authority within one's specialty, being perceived as suitable for promotion, and for establishing trust among colleagues. In this chapter I analyze the interviews with life scientists and technologists in relation to their negotiation of professional identity. I argue that women and men perceive and experience different expectations for demonstrating belonging in their fields depending on the gendered associations attached to the dress code and the hard skills nature of particular core occupations in each field.

Technologists and life scientists occupy fields with varying gender distributions and disciplinary norms for demonstrating professional competence. While research demonstrates that there are complex interactional and self presentation strategies that women in engineering employ to establish their professional identities

(Bird and Rhoton 2011, Faulkner 2009), research on whether or how these strategies occur in other STEM fields is scant. In addition, particular undermining workplace interactions lead STEM women to exit the industry at higher rates than men, but these experiences have also primarily been explored among engineers (Fouad et al. 2012). We know less about how other STEM workers negotiate and manage the positive and negative impressions and interactions of their colleagues.

This chapter examines how life scientists and technologists' negotiate professional identity and image through their professional clothing strategies. As scientists scale the corporate ladder and occupy jobs that combine scientific and business demands, they must manage two different sets of professional benchmarks. These STEM workers respond to these changing demands by shifting their professional identity strategies in complex ways.

Specifically, I argue that physical appearances are more significant to these occupations than previously thought. Women in life sciences and technology modify their professional clothing in order to appear as experts and to communicate their belonging among colleagues. In technology, the culturally dominant dress standard is ultra casual. However, this loose dress standard is difficult for women to negotiate because it privileges men's clothing preferences, and women struggle to project technical credibility and belonging through wearing more formal professional attire. Similarly, I find that the dominant dress standard for life sciences industry occupations is business casual. This standard is taken for granted by most men but presents a double bind for women due to the fact that feminine professional clothing is perceived as antithetical to the cultural stereotype that science workers' are disheveled in

appearance. In addition, for laboratory scientists and software developers, the core hard skills occupations in both fields, professional dress strategies are both more difficult and more important for women. The cultural emphasis for both groups to dedicate themselves exclusively to their work, rely on individual expertise, and in the case of lab scientists, to maintain a high degree of safety yields distinct clothing rules. However, both the rigid uniforms for lab scientists and the anything goes dress standards for developers create extreme versions of the tightrope problem for women, while men in these occupations are able to manifest their competence and belonging regardless of their clothing choices.

Establishing a Professional Identity: Conforming to Professional Cultures and Negotiating Gendered Expectations

From its beginning, the sociology of science and technology has addressed two core aims: describing the distinctive professional characteristics that motivate individuals to identify as scientists and understanding science as a social system with distinct values and norms (Cotgrove 1970, Merton 1973). Foundational theorists contend that a principal means of mapping the contours of science as a social system requires an understanding individuals' motivations for seeking out scientific work. Early analyses of scientists' identities and commitment to their work characterize scientific labor as closer to a calling than any other occupation (Price 1963). Indeed, Max Weber went to great lengths in his seminal essay on science as a vocation to relate the single-minded dedication and passion required to persevere as a scientist (Weber 1946). Analyses of professional identities have since become more nuanced. However,

the importance of establishing a professional scientific identity in order to persevere in the discipline and establish belonging among colleagues remains.

Professional identities are established through academic curricula, work experience, and ultimately social interactions with colleagues working in the field (Cech et al. 2011). However establishing and maintaining a professional identity that facilitates an individual's acceptance as a colleague within the scientific community is not a linear process of acquiring the requisite skill sets and demonstrating expertise in the field. As examined in Chapter 2, professions each have their own unique cultures which in some cases are rigidly gendered in ways that disadvantage women.

How scientists negotiate the gendered aspects of their field culture has only recently received scholarly attention. The most developed literature professional identity negotiation thus far has focused on engineers' professional culture in the private sector (Fox 2006).[1] The following section reviews these findings and discusses their implications for private sector life scientists and technologists. This review will inform my empirical findings on life scientists and technologists in the remainder of this chapter.

Gendered Professional Identities and Culture in Engineering

Engineering's distinctiveness makes it a fertile ground for research on gendered processes of inclusion and exclusion in STEM. The magnitude of gender disparity in the field is unmatched by other STEM fields. Engineering is not only the most male-

[1] See (Fox 2006) for a particularly thorough breakdown of engineering demographics across academe and industry.

dominated discipline in STEM, it is also the most male-dominated profession in the United States (Fox 2006 cited in Hatmaker 2013, McIlwee and Robinson 1992). In addition, engineering culture is highly masculinized. Values, interactions, and behaviors associated with masculinity are prized, such as technical expertise and self-promotion (Hacker 1981, McIlwee and Robinson 1992). Indeed, to become accepted as a competent engineer one must engage in particular gendered behaviors:

> Competence as an engineer is a function of how well one presents an image of an aggressive, competitive, technically oriented person…. To be taken as an engineer is to look like an engineer, talk like an engineer, and act like an engineer. In most workplaces this means looking, talking, and acting male.
>
> (McIlwee and Robinson 1992:21)

Both men and women are measured by this standard. However, they are not equally positioned to personify this ideal. The masculine culture of engineering and its skewed demographics provides a unique case for studying how aspects of professional identity can be gendered and create obstacles for women who work in this profession.

Because engineering professional culture is not gender-neutral, women face the task of embodying the position of an expert in their field while often being singled out and subject to scrutiny for not conforming to the culturally expected masculine traits associated with the profession. This "in/visibility" paradox, in which women are perceived as women or engineers but never both, makes it particularly difficult for them to identify as both women and STEM professionals (Faulkner 2009). Being highly visible as women but invisible as engineers creates an environment in which women must constantly re-establish their engineering credentials to colleagues in every encounter (Faulkner 2006). More recent research demonstrates exactly how women in

engineering enact multiple coping strategies and impression management strategies in order to overcome interactional threats to their professional identities (Hatmaker 2013).

The strategies that women employ in order to negotiate a professional identity and belonging in engineering culture vary and can frequently contradict each other (Jorgenson 2002, Miller 2004, Powell et al. 2009). Each strategy is the product of a woman's individual decision within social constraints to either cope with the dominant performance of masculinity inherent within engineering culture or to adopt a more feminine gender performance that distances herself from the masculine cultural norm. Researchers generally group these negotiation or positioning strategies into four categories: blocking, rationalization, proving oneself, and image projection (Hatmaker 2013, Miller 2004). These strategies serve one of two purposes. They neutralize experiences that minimize women's professional engineering identities, such as interpreting a negative sexist interaction as a "normal" part of engineering culture. Women who use this strategy project a confident image while also demonstrating their solidarity with other male engineers (Dryburgh 1999, Eisenhart and Finkel 1998). Alternative strategies help to establish a woman's sense of belonging in the field by affecting how colleagues perceive her, such as a when a woman impresses a male colleague to the extent that he recognizes her as a competent "gender-neutral" engineer (Hatmaker 2013). But overall women in engineering primarily enter and persist in the field "conceptually as men" rather than as women *and* engineers (Ranson 2005).

Regardless of whether or not women in engineering reject or embrace feminine appearances and interaction styles in order to be accepted by their male colleagues, they still experience a role conflict within their profession. Women in engineering who

attempt to do masculinity in the workplace perceive that their status as women overrides any alternative performances (Miller 2002). Powell notes that overall, "only male masculinity is likely be accepted because this appears to be the norm" (Powell et al. 2009:423). The conflict women in engineering experience between their gender identity and professional identity does not appear unilaterally as a result of the "masculinized" culture of engineering. Research has begun to reveal how the nuanced meanings systems within the profession are coupled with biases that produce intra-profession gender segregation and inequalities.

Cech's research on the cultural dualisms within engineering reveals why it's imperative to attend more carefully to the content of professional cultures instead of generally characterizing them as more or less gendered masculine or feminine. Meanings and values within professional cultures are crucial for understanding interaction styles and judgments of competence (Cech 2013). For example, professional cultures shape perceptions of which subfields are more or less prestigious, difficult, or which particular skillsets are considered most closely aligned with the true nature of the field. They even shape perceptions of "who most 'naturally' embodies expertise" (Cech 2013:1149). Cech finds that within engineering subfields, gender segregation and wage inequalities breakdown along the core technical/social dualism that is at the center of engineering's professional culture. Thus women in engineering are underpaid for their work in hard skills technical positions. Those positions are most closely associated with masculinity, and work in those positions is valorized in the field.

Miller, Powell, and Hatmaker's findings demonstrate that women manage embodied feminine subjectivity in order to persist in the profession. Cech's research further points to the specificity within STEM disciplinary cultures for shaping how impression management and physicality are interpreted as evidence of expertise and belonging. Women in engineering face the difficult challenge of conforming to a professional culture that marks them as different because of their gender. So they adopt particular strategies to embody the appearance and interaction styles of their male colleagues; nonetheless, these styles are not perceived to be representative of these women's expertise as engineers because the professional culture of engineering is deeply gendered (McIlwee and Robinson 1992). These interactions between professional culture, impression management and physicality have significant implications for the findings in this chapter. The following analysis sheds light on how scientists and technologists consciously negotiate their physicality and interactions styles in order to establish belonging within their cultures of their respective fields.

Gender Disparities in Establishing Professional Identities

Professional identities are established through undergraduate and graduate training, professional organizations, work experiences, and ultimately through reinforcement from colleagues and managers in the form of performance feedback and positive interactions (Dryburgh 1999). These professional socialization processes occur across one's education and career such that they reinforce the beliefs, values, and meanings collectively held within the discipline. As a result, over time workers within a given field come to identify with and internalize particular beliefs, gendered or

otherwise, regarding necessary abilities. The consequences of this internalization process for perpetuating inequalities vary based on whether or not the cultural beliefs are more or less gendered.

Much of the research on barriers to women's advancement in male dominated fields focuses on the outcomes of women's internalization of particular gendered beliefs regarding their expertise and abilities. Work and gender scholars characterize self-efficacy or role confidence as a key factor for predicting persistence within a given field. For example, Cech et al. (2011) argue that among engineers, women are more likely than men to lack the professional role confidence that facilitates persistence through engineering's credentialing process and into a lasting career in the field. Repeated encounters with the gendered norms and values inherent within the discipline gradually erode women's affiliation with the engineering profession (Seron et al. 2015). These findings suggest that professional role confidence likely plays a similar role in other fields that are male dominated. Research that compares women across STEM fields bears out this finding: women are more likely to remain in STEM careers if they develop a strong professional identity (Buse et al. 2013).

In technology specifically, research on workers in the beginning stages of their careers demonstrates that women are more likely than men to report lower perceived technical self-efficacy for themselves, and men are more likely to express lower confidence in the technical skills of their female colleagues (Michie and Nelson 2006). These findings suggest professional role confidence remains salient for explaining barriers to persistence in private sector technology. Despite the evidence that cultural constructions of ideal workers varies by discipline, few studies examine how women

and men negotiate and experience cultural ideals through contact within the workplace itself (Cech et al. 2011, Cech cited in Corbett and Hill 2015). The data collected for this study explores how men and women establish their technical efficacy through means other than meeting their workplace goals.

Measuring "Cultural Fit"

Acquiring and internalizing a professional identity is only one required characteristic that's needed for persistence in a given STEM field. In order to predict whether or not a prospective worker will thrive in a given workplace, organizations increasingly rely on cultural measures in their selection criteria. This ascension of cultural fit measures is important for understanding the reproduction of inequalities in STEM for two reasons: organizations increasingly rely on fit measures in evaluating and promoting employees, and cultural fit measures are established by comparing applicants and employees to the perceived generalized characteristics of other employees within the organization. The process of evaluating workers based on cultural fit and using cultural fit to predict future performance has unintended consequences that contribute to gendered processes of exclusion in STEM.

Cultural matching is an analog to cultural fit in terms of its common-sense usage within industry (Lamont and Molnar 2002). The concept emerged out of organizational psychology research in the mid-1970s (Furnham 2005). Cultural fit broadly encompasses a congruence between a job candidate's norms and values and that of her potential employer. Fit plays a key role in hiring and promotion decisions because it's used as a proxy for "soft" qualities that include anything from one's work-

style, leadership potential, values, personality, even one's sense of humor. Cultural fit criteria are used to assess whether an applicant will be comfortable working with her colleagues.

Assessing cultural fit is also a potential source of bias because there isn't a reliable standardized means to test for cultural similarity. To assess cultural fit, employers rely on interview questions and managers' impressions. When incorporating these fit measures into hiring and evaluation decisions, managers believe they are able to rely on a ostensibly objective measure of qualities that are particularly hard to capture. However, these seemingly objective cultural measures are easily subject to the biases of the evaluator. Evaluators' own preconceptions of appropriate cultural fit may facilitate homosocial reproduction throughout an organization (Bye et al. 2014).

Research on the role of cultural fit in hiring decisions bears out this possibility. There is strong evidence that contemporary corporate America relies extensively on assessing and selecting job candidates via personal similarities (Sharone 2014). This process has been most closely examined in professional services firms.

Elite professional service firms rely on cultural matching to a surprisingly high degree. Hiring managers report that cultural similarity is one of the top three criteria by which evaluators assess applicants during the job interview, and in the majority of sampled firms hiring managers ranked cultural fit as higher in importance than an applicant's ability to think analytically and communicate effectively (Rivera 2012). Evaluators routinely assess cultural fit by finding similarities between their own interests and self-presentation styles and those of an applicant's. When an applicant's merit is in question, hiring committee members rely on subtle gendered and racialized

stereotypes that more frequently disqualify women and minorities (Rivera 2015). This hiring process reveals how merit is socially produced through the lens of cultural matching and implicit biases.[2] Rivera's study is illuminating, but it focuses entirely on the hiring process. More research is needed on how cultural fit plays a role in ongoing employee evaluations and interactions among professionals past the onboarding stage.

For the sample of life scientists and technologists selected for this study, we would expect to find more emphasis on cultural fit within the technology firms and potentially much less among the life scientists. The few studies that assess the role of cultural fit in high technology companies find that those companies which construct employment relations in terms of cultural fit and employee similarity at their founding have significantly fewer women in technical (hard skills) positions and are much slower to achieve gender parity across the organization over time (Baron et al. 2007). Based on this preliminary evidence we would expect that the technologists in the sample would be more aware of and potentially actively engaged in establishing their cultural fit into their firms. There are no similar studies assessing cultural fit among private sector life science firms.

While cultural fit is typically understood as a tool for assessing worker productivity, engagement, and collegiality, it has the unintended consequence—

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[2] While this study focuses exclusively on professional services organizations, science and technology firms' selection criteria resemble that of elite professional services firms. Both industries are highly selective, evaluate similarly credentialed applicants on perceived merit, and prioritize candidates with advanced degrees from Ivy League and top public universities. Scientific work also mirrors professional service work with its demanding work schedule of often sixty hours per week and recurring tight project delivery deadlines.

especially in technology fields where the work is already associated with White masculinity—of reproducing gender and racial inequality within the workplace (Alfrey and Twine 2016). But even in fields which are not male dominated, hiring managers may unconsciously use cultural fit as a justification for hiring men who are similar to them at the expense of equally qualified minority men and women. Indeed, Rivera's study notes that hiring managers tended to use their own interests and self-presentation styles as measures by which to evaluate applicants' potential cultural fit. In addition, within organizations managers can use perceptions of cultural fit to promote technologists and scientists who most closely resemble the current management team.

Previous studies have productively examined how scientists use self presentation strategies to negotiate authority, expertise, and belonging in classrooms and lab settings (Conefrey 1997, Hirshfield 2011). But there are less than a handful of studies that explore how technologists and life scientists use these strategies to conform to the culture in their fields (Alfrey and Twine 2017). This is a surprising lacuna given the large body of popular self-help literature that is specifically directed towards helping professionals demonstrate competence through professional attire and body modification (Kenny and Bell 2011). Given that being perceived as professionally capable is a central element for establishing membership in a professional community, analyzing these STEM workers' fit strategies reveals how they may be linked to gendered patterns of inequality (Faulkner 2009).

Findings

Scientists and technologists in this study report that clothing serves an important role in maintaining their professional credibility, signaling their expertise, and establishing their belonging among colleagues. However, this "presentational labor" (Hirshfield 2011) is not equally shared among STEM professionals, and it varies by gender and occupation. I find that women in both technology and life sciences perceive the need to manage embodied feminine appearance in order to establish belonging among their colleagues. These women find that adopting a feminine self-presentation style is a liability, and women in hard skills occupations are especially intentional about their clothing strategies. In contrast, men in both fields rely on their communication styles in order to signal their expertise and credibility among colleagues; they do not believe that their professional clothing decisions play any significant role in these processes.

The business casual dress standard in life sciences and the ultra casual dress standard in technology are problematic for women because they mask a set of unwritten gendered rules. Wearing clothing that colleagues perceive as stereotypically feminine has specific consequences for women's claims to competency in their positions. Many perceive that their clothing choices are tied to evaluations of their professional capabilities, and thus they risk credibility if their clothing choices are interpreted as excessively feminine. This balancing act of matching the looseness of the culturally dominant dress standard while also maintaining a professional feminine wardrobe is compounded by the fact that women have many more options for workplace attire and their clothing decisions are frequently subjected to scrutiny.

Dominant Standards for Professional Attire in Life Sciences and Technology

As professionals with advanced degrees working in high paying sectors of the economy, life scientists and technologists enjoy a substantial degree of control over their workplace clothing choices. Participants in the sample disclose that standardized uniforms, outside of laboratory settings, are unheard of in their fields. Of the 45 scientists and technologists I interviewed, only one describes her workplace dress code as business and strictly enforced. In addition, only one respondent could recall an instance of seeing a supervisor discipline another life scientist for a dress code violation.[3] However, there are discipline specific differences among the dress standards reported in the sample. I define these two dress standards as: business casual and ultra casual.

The ideal-typical dress standard among the STEM professionals in life sciences is business casual. 21 of the 25 life scientists describe this dress standard as typical for their industry.[4] David captures the details of this particular standard well:

> There is a dress code here. And we're required to sign off every year that we've read the employee handbook. Within that is a one-page dress code that specifies professional attire. But it does allow like a Friday casual day. It says on Fridays, you can wear jeans. You still can't wear t-shirts. You have to always wear a collared shirt, that type of thing.
>
> (Sr. life scientist, white man)

With the exception of jeans on Fridays, leisure clothing in the form of tennis shoes and t-shirts are not allowed in the life sciences organizations sampled. Even the most

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[3] This particular instance was in regard to a rarely enforced policy that forbade arm tattoos from being visible in the workplace.

[4] 4 of the life scientists described having no dress code at all at their organizations, but these scientists also described their own dress preferences as business casual.

loosely defined business casual dress codes in my sample of life science companies drew a line at wearing shorts and sandals in the workplace. Conversely, the technologists' dress standard typically begins at what would be appropriate clothing only for a Friday in the life sciences.

The large majority of respondents in technology report that their workplaces have no formal dress codes or possess an extremely loose interpretation of appropriate professional clothing. This ideal-typical technology dress standard will be referred to as ultra casual from this point onward. The ultra casual dress standard is consistent across technology organizations in the sample. [5] Only two of the twenty technologists in the sample described their company's dress codes as anything but ultra casual. Technologists explain that their industry typically expects workers to dress in whatever they feel comfortable wearing as long as it doesn't offend or distract other technologists. Terrance and Nicholas, a software engineer and data analyst respectively, [6] aptly describes this minimum dress standard for most technology companies:

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[5] Technologists occasionally submitted that dress standards for working on the West Coast are slightly lower than on the East Coast. But they often qualified these statements by suggesting that these higher standards depend upon whether or not an organization has its corporate campus in the east as well. Additionally, four technologists surmised that dress standards are more formal for their East Coast counterparts, but they just as frequently suggested that these differences might be the result of the more variable weather conditions in that part of the U.S. rather than regional cultural differences.

[6] There are no standardized industry guidelines for differentiating between occupations for individuals who work in software development. Technology companies frequently use software developer, software programmer and software engineer interchangeably to describe positions that involve software coding. However, companies list differences in skill and education requirements for each of these positions across the industry. For example, companies hiring software engineers do not necessarily require an applicant to hold a software engineering degree or even have experience in engineering. Many software engineers have training in electrical engineering, computer science, mathematics, and even physics. For the sake of clarity throughout this project, participants who work in software-related jobs occupations be identified by their current job titles. However, when referring to these individuals outside of direct

> You've got to wear clothes and you probably can't wear anything offensive, with logos and stuff that are offensive, but I mean, you have to wear pants. I mean, people wear shorts and flip flops. Actually, my manager wears shorts and flip flops all the time.
>
> (african american man)

> The dress code is very relaxed which is a really nice thing for me, not because I don't like wearing nice clothes, but because I mostly like being comfortable. So I can wear jeans and a t-shirt, and that's completely okay.
>
> (white man)

The ultra casual dress code, even for managers, is described as one of the perks of working in the industry. But the interviews with technologists reveal that this ideal-typical standard does not typically match their own daily dress preferences.

It's important to note that while many technologists describe their workplaces as having an ultra casual dress code that allows employees to wear sandals and shorts, only two of the technologists in this study routinely wear ultra casual outfits to their workplaces. This mismatch in the sample between what technologists perceive to be the dress standard in their field and how they prefer to dress in practice suggests that the eschewal of any dress standards in technology is more of a cultural ideal than a typical practice. The difficulties that emerge for women in technology from the incongruence between how technologists actually dress and ideal-typical ultra casual dress standard in their discipline will be discussed later in this chapter.

Analysis of the interview data reveals that in daily practice technologists most frequently describe their dress preferences as closer to casual in the form of jeans, t-

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quotes, I will use the term software developer because this designation broadly encompasses any position that features software work.

shirts, polo shirts, and blouses. In addition to these subtle differences between the fields, men and women conveyed different understandings of how clothing is perceived by coworkers and how they manipulate their clothing in order to achieve desired impressions from their coworkers or supervisors. These practices are not equally distributed among the men and women I interviewed.

Gendered Patterns for Establishing Credibility and Belonging

Clothing is connected to how one is perceived in both fields. Analysis of the interviews demonstrates that both men and women in STEM fields alter their professional clothing in particular situations in order to achieve certain desired impressions. All of the respondents in the sample discuss the importance of being dressed professionally for important meetings and appointments with clients.[7] However, the interviews also reveal that women in technology and life sciences are much more likely than men to manipulate their clothing in order to increase the perception that they are credible professionals or experts. And only women in the sample articulate the perceived effect their clothing has on how seriously they are taken as scientists and leaders. Women in the sample report that their work and credibility are questioned more depending on their clothing choices. As such, they engage in forms of presentational labor that include clothing in order to be taken more seriously in their position. But the unwritten standards for "professional attire" are harder for women to achieve because standards for appropriate feminine workplace clothing are fraught with

[7] Clients in this study include external customers outside an organization as well as customers who are coworkers in other departments within an organization. These colleagues are the "internal" customers of the individuals in the sample.

uncertainty and unintended scrutiny from colleagues (Kenny and Bell 2011). This conflict appeared in almost half of the interviews with women. In addition, women are much more likely than men to explain their clothing choices as strategic tools for managing how their male coworkers interact with them, a specific gendered strategy. These professional image strategies around clothing serve to highlight these women's professional identities instead of their gender identities.

Both men and women in the sample describe the importance of displaying confidence for establishing credibility among colleagues. While men tend to focus exclusively on confidently conveying their expert opinions, women in senior and junior levels in both life sciences and technology describe the importance of clothing in maintaining their professional credibility. For many of the women, this credibility, characterized as being "taken seriously" by colleagues, is in part maintained through careful selection of workplace clothing in addition to conveying confidence. Men in the sample did not perceive a connection between their clothing choices and maintaining their professional credibility.

Men Communicate their Confidence and Expertise

Having confidence is perceived as vital for success in both fields, and participants often point out that it is an essential quality to have if one wants to be heard and recognized by colleagues:

> I've always tried to display confidence, and I think it's gotten me a long ways … and that actually then kind of perpetuates and even builds to higher levels. So when I think about the people that I've had reporting to me in the past and people that I see around that are at lower levels, and they come to meetings and interactions, I think, "Boy, sit up and say

> something. Bring something to the meeting and share it. Be confident with yourself."
> *So you actually looked for that in other people?*
> Yeah, and I see it. I see the lack of it in several people and think they should show it more. If they did, they could gain more trust, they could gain more visibility. They can elevate themselves by showing a bit more confidence.
>
> (David, Sr. research life scientist, white male)

David understands the importance of demonstrating confidence for establishing trust among colleagues as well as for advancing one's career. However, how he and other men characterize their techniques for demonstrating confidence to others differs from the women in the sample.

Men most frequently portray displaying confidence as always being prepared to deliver information and sharing an expert opinion in workplace meetings or discussions. Here David explains how he demonstrates confidence in his workgroup:

> I have to interact with a lot of scientists that have more education and credentials than I have. And a lot of them are very bright and brilliant. And so I could be intimidated by them, but I have gotten to a point where I can either be comfortable with my own expertise and my own value that I bring, but with that I know that I tangibly try to connect with confidence and bring it in. So if I'm going to a meeting, I try to not shy away, not be quiet. I try to be an active contributor, even if I feel like I'm a little outclassed by who I'm with. But I think that they appreciate a certain amount of bravado or confidence that, "Hey, you can go toe to toe with me. I can share my ideas without a fear of being wrong." And so when they sense that from me, then they more easily welcome me into their confidence, as well as their trust.

Similarly, Nicholas describes exhibiting confidence as speaking up when decisions or discussions are occurring in meetings:

> It's honestly just answering honestly what do I think about — I mean it's speaking up in cases where you say "it's not necessarily right the way our system is configured or I don't know if it's the best fit because of" — like giving recommendations and actively participating in conversations and meetings and stuff. It's kind of being that participant

> that will speak up when something doesn't make sense or doesn't just necessarily get told what to do and "I'm going to do whatever they decide." It's also contributing, and also understanding when things are confusing. It's taking the time to really understand something fully so then when someone asks you about it you completely understand it so you're able to explain it better and quicker as well…. Staying ahead of the question, I guess.
>
> (technical data analyst, white man)

Robert shares a similar view:

> I do things which I think do enhance my authority and credibility. I'm willing to talk about what I am doing. I'm willing to explain it as best I can to people. I'm willing to express my opinion. I'm big on the meaning of what we do here. I think what we do here is a pretty unusual activity, and I think it's a very high falutin', if I can use such a term, activity…. And so I'm really proud of that, and I try to convey that to people. And I think that that level of enthusiasm on my part sort of makes them take notice of what I think a little bit. I am opinionated in meetings at times, especially ones that are devoted to technical topics, and sometimes in meetings that are not devoted to technical topics. So whether that gives me credibility or just makes me annoying, I'm not quite sure, but I think people at least know that I'll speak up.
>
> (Sr. technology scientist, white man)

This perception of managing the display of confidence through offering input is mirrored in other men's comments regarding being prepared for the types of interactions that call for input:

> I think the one thing and maybe I didn't mention it is, like in presentations being self-confident in what you're talking about, and being well prepared is part of that, right. If you're well prepared, it's easier to present a self-confident thing because you are confident, you understand the problem. You understand the data, you understand the model. Throw whatever questions you're going to have, I've probably already thought of it and I have the answer. So, that's the desire. And if you don't have the answer, hopefully you can say, well let me call someone a little bit later, I can get that answer for you, something like that.
>
> *When you mentioned self-confidence, is it in the way you present information or is it in what you say, or is it something else?*
>
> Probably both. I mean it's probably almost more the way you say it though.

(Nicholas, Sr. statistical software modeler)

David, Nicholas, Robert, and Thomas' responses emphasize that confidence can be inferred from whether or not an individual contributes to solving a problem or an issue that is under debate. Voluntarily sharing an expert opinion based on one's preparation for and deep understanding of a problem as well as being able to argue one's point, according to these men, is what distinguishes confident STEM professionals. Being able to "go toe to toe" intellectually features heavily in these men's responses. This is because intellectual confidence and credibility are tied together in these men's explanations for what it takes to be taken seriously by colleagues.

Men in the sample closely link displaying confidence with the process of establishing credibility. They perceive that maintaining their credibility involves frequently disagreeing or engaging in competitive intellectual debates with colleagues. Indeed, as Charles points out, demonstrating intellectual competence in order to earn the respect of colleagues is often of paramount concern: "I think the most important thing is that I like to be seen as competent and able to contribute. That's kind of the respect that you have to earn in most cases " (life sciences engineer, white man). Men in the sample emphasize that they engage in a particular communication style that is tied to demonstrating credibility in their disciplines. Engaging in this communication style assures that men are taken seriously by their colleagues:

> I would say it's characterized by inquisitiveness certainly. Sort of willingness to say what you think but willingness also then to be corrected by somebody who claims to know better or not. And then you can argue it out. It's a very interesting thing. You have to have a strong ego because you have to be willing to say what you think. But the ego has to be secure in the sense that when somebody tells you you're wrong and convinces you of it, you can say, "Oh, okay, let's go from

> there." It's a very interesting interaction between being confident and being right. The two are not the same, and you have to be willing to modify one in the face of the other, in a sense.
>
> (Robert, Sr. tech. scientist, white man)

Robert's emphasis on the importance of intellectual debate is mirrored frequently by other men in the sample. Engaging in intellectual disagreements while also being able to not be personally invested in the outcome of such debates is described as a means for establishing belonging and credibility among colleagues. Men in the sample describe these interactions as part of the social process of doing science rather than as a taken for granted cultural practice in their particular workplaces. James is exceptionally direct about the importance of this aspect of his work when I ask him if there are any ways he manages his presentation or interactions with colleagues:

> My style is you're a member of the department, you're presenting your data, if I think there's something wrong, "What does that mean? I don't believe that. I don't think that's right. Here's the way I'd look at it." I mean some people, that's not the way they play, right? It's sort of like giving somebody a dressing down in front of people or something. But we're just talking about the science, right? It's nothing personal … junior people who are less confident and secure are of course more likely to have a bad reaction to that kind of thing. Also, the other example would be a really big ego, right, that prevents them from hearing things or tends to make them defensive or whatever. But certainly in my group, I think people have an opportunity very quickly to understand exactly what I am and what I care about and what it means whenever I'm asking a question…. This is the forging furnace that I came out of, right? After all my years in academics. I mean, nothing personal. It's just science, you know? And it's all fair…. I know people here that will sit through a meeting and they'll hear ten things that they know are completely wrong and never say a word. To me, I think, "That's why you should be fired. Not for wearing shorts, but for not doing what you're paid to do." Because that's what I'm paid for. How can the company get any benefit from my knowledge if I don't say anything?
>
> (Sr. life scientist, white man)

James points out that openly challenging his colleague's conclusions is a given aspect of working in science, and that graduate training in life sciences solidifies this particular challenging professional interaction style – it is the "forging furnace" for industry work. Like Robert, James emphasizes that having a big ego or not being confident enough in oneself to share one's expert opinion is an indicator that a colleague is not fit for work. His admonishment of people who don't speak up as deserving to be let go from the company demonstrates how central he perceives this ability is for being successful in the discipline.

As evidenced in the previous excerpts, men in the sample characterize demonstrating confidence as debating information with colleagues. They perceive this process of sharing their expert opinions as necessary for establishing credibility and belonging in their workplaces. Being able to argue a point that ultimately proves to be wrong is more important than ultimately being right. These men focus on the style of information delivery and consider engaging in intellectual debate as a demonstration of their confidence, credibility, and trustworthiness. How one should present while delivering this expert information does not appear in these explanations. And maintaining one's appearance in the context of establishing credibility appeared in only two interview with the men in both fields. While men frequently discuss the interactional aspects of demonstrating credibility in their discipline, they were all but silent about how they present themselves to colleagues.

When the topic of professional clothing emerged in the interviews with men, just one scientist and one technologist characterized its importance under only two specific circumstances: demonstrating seniority in a position and demonstrating respect

for clients. Otherwise, the men in the sample did not perceive how they dress as having any bearing on their professional credibility or belonging. Charles, a life science engineer, succinctly summarizes this perception of almost all of the men in the sample regarding whether how they dress matters for their careers: "No, I really don't. I mean, unless you're interacting with customers or people outside the company that you don't interact with on a regular basis, you know, just with my coworkers, the people that I see every day, I don't think it matters how I dress and I don't really take into account how they dress" (white man). Charles' response is representative of the men in the sample. However, two men did specifically point out the importance of attending to clothing in two particular situations.

For the few men that do perceive a connection between credibility and clothing, they understand clothing as being important for signaling their respect for business partners:

> Inasmuch as my career is both technical work as well as communication related, that is to say I'm dealing with either potential clients or actual clients, if you think of my career as incorporating both of those, then I think how I look does speak to the degree to which people are comfortable with meeting with me and discussing things. It's odd, it's sort of a form of respect for them in my mind to dress well. It says that you think that they're reasonably important. And inasmuch as that whole effort then is more effective, I would say that that is career enhancing. I don't think it's as straightforward as, "You dress sharp. He must be in charge." It's not quite that simple.
>
> (Robert, Sr. technology scientist, white man)

Robert views dressing well for clients as a sign that he takes them seriously and respects their importance to the organization. Dressing professionally is part of a the process of developing trust with clients. However, he does not perceive how he dresses as reflecting anything about his abilities as a scientist.

In addition, Steven explains that clothing becomes important in a second circumstance for STEM workers when it serves as a marker for one's role in the organization. When I ask him if there are any consequences for dressing however one wishes, Steven proposes the following:

> I think there becomes a perception that you're not serious about the level of your role. I think that's when you begin to take a hit in credibility…. So as I moved up, especially into the VP level, I was a lot more careful about my appearance. I tended to try and wear better grades of clothing. I tried to have a nice balance between yes, I'm an officer in the company but also I'm still me. So I tried to walk that balance.
>
> (life sciences VP, white man)

In summary, men find that clothing impacts their credibility when there is a perceived mismatch between one's professional level and the perceived level of one's professional attire. Clients and colleagues expect a particular high level of dress for STEM professionals in management and executive level roles. Failing to meet that minimum standard can suggest that one is not seriously committed to one's occupation or that one does not know how to demonstrate respect for important clients. None of the men in either field in the sample perceived an additional connection between their clothing preferences and their credibility. However, as the following analysis will show, women shared numerous examples of how they perceive their clothing impacts their professional credibility. For these women negotiating credibility and belonging is intimately tied to their professional clothing choices.

Women Employ Clothing in Order to Navigate the Tightrope of Credibility and Belonging

Less than a quarter of the women's responses in the sample resemble the men's in terms of their belief that effective communication with colleagues supports the perception that they possess confidence and professional credibility. My data show that unlike the men, women much more frequently use professional clothing in nuanced ways in order to establish credibility in their workplaces. The excerpts from these interviews reveal that women experience a "tightrope" (Williams et al. 2014b) in their workplaces in which when they wear gender-normative clothing, they are perceived as feminine but professionally deficient. When they avoid feminine professional clothing they experience a conflict between gender identity and professional identity. In both cases, women experience pressure to trade off either on their gender identity or their professional credibility. This phenomena has been documented extensively in engineering fields (Faulkner 2009, Hatmaker 2013, Miller 2004). Analysis of the interview data demonstrates that tightrope issues around clothing are just as salient for women in life sciences and technology as well.

Only women in the sample emphasize that their clothing choices impact whether they are heard and are taken seriously. They report how their appearance matters for whether or not the content of their message is questioned. These women in both life sciences and technology frequently connect the importance of their appearances for establishing and maintaining credibility:

> How you carry yourself is incredibly important because you can be really smart and know whatever your technical job is, but if you look like a slob, you slouch, you just don't appear confident, people aren't going to take what you're saying seriously. So I think that's always the course. That whatever you're doing, you approach it and you present it and you have a confident sort of carriage and nature to it.
>
> (Mary, life sciences director, white woman)

Mary explains that the perception of confidence does not come primarily from intelligence or ability to engage in debate in the way that men in the sample overwhelmingly describe; rather, it emerges from the ability to appear compelling in addition to delivering compelling information to colleagues. Angela, a junior level research scientist, shares a similar impression of the importance of managing physical appearance for gaining the respect of people in her field:

> I think it's very important. It's an image. It's an impression. Like if you show up for your interview all casual, it just implies that you don't really care. Or when someone is giving a presentation and you don't even feel the need to clean up a little bit, still wearing some flip-flops or grubby jeans or what have you, to me at least, it gives the impression that they don't really care. I mean, maybe they do, but it's all about impressions and how you present yourself. And there's stuff that you will notice if your colleagues have cleaned up a little bit because you're giving a presentation, and they know that you're taking this seriously. They treat the presentation as important, which usually means that your audience is going to want to take you seriously…. And for all of my interviews, and especially the ones that I've really cared about, the positions I really, really wanted, I wore my most formal suit, my favorite jacket, things that made me feel confident. I know I look strong and professional. The way you dress can give you confidence too. And that will be conveyed to your audience as well.
>
> (asian american woman)

Angela perceives that managing the impressions generated from her appearance is a necessary part of garnering respect in the workplace. She identifies that looking confident and being perceived as confident includes clothing choices. Dressing more professionally conveys she is "serious" about her work and thus should be treated as such. Similarly, Alexus notes that clothing is tied into judgments of professional esteem as well:

> I would say not so much authority, but certainly respect and professionalism, perceived professionalism. And the respect that you

> can garner in a situation is impacted by how you're dressed…. It's a look, right? Especially in an all-male meeting except for me, there's a difference in the looks that I get when I'm probably a little bit more professionally dressed than if it's a jeans day and a t-shirt and sneakers, right? I feel like there's a little bit more respect. It could be something internal that I'm throwing onto the situation, but I've felt that before.
>
> (technical project manager, african american)

These women perceive that clothing can enhance credibility among their colleagues. Therefore, two thirds of the women in the sample, describe intentionally regularly dressing more formally in their workplaces in order to ensure that their colleagues perceive them as professionals. Sheila explains her personal logic behind this widespread use of formal clothing as signaling one's readiness for promotion:

> So I always dress for the job I want, not the job I have. I dress in business attire every day … based on feedback that I've heard from other women executives, things I've seen them, I mimic their dress and mannerisms. You know, so there's kind of like the unwritten rules.
>
> (technical director, white woman)

If one wants to be taken seriously, as Sheila explained to me, one "has to look the part." But what looking the part means in practice is complicated for many women. Obviously wearing professional clothing a level above colleagues indicates that one cares about professional image. But exploring these responses regarding the use of professional clothing further demonstrates that these women also perceive that dressing more professionally is especially important for them because they find that their competencies and that of other women in their organizations are judged based upon the specific associations attached to their wardrobe choices. For these women deciding whether to wear a skirt or business slacks to a meeting is not a matter of preference; rather, it is a process of negotiating prescriptive gendered expectations regarding how women scientists and technologists should appear in the workplace. By adjusting their

appearances these women anticipate and negotiate how their colleagues interact with and perceive them. Dressing a grade above their colleagues in gender-conforming professional attire doesn't necessarily garner them the professional credibility they seek. A central objective of these appearance strategies among the women in the sample is to manage and in many cases prevent interactions that marginalize their professional identity or over-emphasize their gender identity (Hatmaker 2013).

When women in the sample talk about being taken seriously they are referring to how they are treated and perceived by their male colleagues, especially in terms of being an equally competent colleague. Jennifer, a white senior life scientist, explains that she makes a pointed effort to dress the part of a leader, and that includes avoiding wearing any casual clothing in the workplace. She perceives that dressing professionally signals that she is organizationally savvy and does not come across as having low-confidence. However, when she discusses how professional clothing matters for her interactions with her colleagues, she considers that "from a female standpoint, a woman has to be especially careful to dress conservatively" (interview notes). During her graduate training her mentor told her that wearing excessive makeup or distracting jewelry negatively impacts how men perceive women in her field. Other women in the sample reiterate similar advice they received from senior women mentors during their graduate education, namely that appearing less feminine would enable these women to be taken more seriously in the workplace. Nicole explained that she doesn't want to appear too interested in her physical appearance. She notices over time that if a woman in her field is too fashionable, then she is not taken seriously by colleagues. If she is very dedicated to her work and fashionable, then she has to work

harder to prove her expertise to colleagues (interview notes, research life scientist). These responses indicate that dressing more professionally isn't as important as the kinds of professional clothing these women decide to wear.

The experience and belief that appearing to colleagues as being too interested in one's appearance can be detrimental to one's relationship with colleagues is unique among the women in the sample. These women proactively manage their appearances in order to draw their colleagues' attention to their professional identities rather than the fact that they are women as well. Additionally, they relate that their clothing choices impact whether or not colleagues take their work seriously and view them as relatable. This is the second way that women in the sample find they need to manage their appearance in order to maintain professional credibility and belonging within their field.

The experiences women in technology and life sciences recount in the interviews reveal that the clothing they wear when delivering information can unintentionally detract from their professional credibility and the degree to which their colleagues heed their expert knowledge. Even though dress standards are loose in both fields, women frequently convey that they find their knowledge is more often heard or accepted by colleagues when they dress in clothing that minimizes feminine appearance. Women frequently find it difficult to manage their appearance as women and as STEM professionals because they experience conflict over how they want to dress professionally and how the culture valorizes particular types clothing (Williams et al. 2014b). Dressing in ways that inadvertently emphasize one identity over the other creates problems for how their work is received and how colleagues view them as

relatable. This link between gendered self presentation expectations, credibility and relatability emerges in the interviews when women discuss how they make decisions regarding their workplace outfits:

> For me at least I'm working as part of the scientific analyst group with three guys. At some level, I was like, “Well, I want to dress professionally.” But because scientists are so used to this low level of dress, you kind of want to fit in with other scientists…. So I actually was looking forward to dressing a little more professionally. But I was like, “I don't want to out-dress my male scientific counterparts.” Whereas the salespeople are wearing cute little dresses and heels. I'm like, “No, I'm just going to wear flats because if I wear heels, then I won't be a scientific analyst. I’ll be more of a salesperson.” And so I don't want to look to the point where I'm too polished. I want to look like the schluppy scientist. So I'm not going to wear heels to work. It would just be obvious.
> *So is it expected that you’re supposed to be less concerned about how you look?*
> Yeah, almost because scientists in general have this sort of like — disheveled look about them. So if you try to look more together, you get taken less seriously.
>
> (Jessica, life science analyst, white woman)

Jessica’s description of her decision making process illuminates several concerns that only women in the sample share. First, she perceives a tension between maintaining a professional feminine appearance and fitting in among her men colleagues. If Jessica doesn't achieve a "schluppy scientist" look, then she will stand out in her position in a negative way. Her response conflates dressing professionally as a woman to "looking together" or “polished,” which is a violation of the tacit dress code to which scientists are expected to adhere. Secondly, Jessica perceives that by dressing professionally as a woman she cannot also be taken seriously as a scientist. Wearing professional feminine clothing is associated with the polished appearance that signals one’s lack of commitment to scientific rigor. Dressing in ways that emphasize

her femininity among her peers implicitly calls her credibility as a scientist into question. Finally, by dressing professionally, Jessica also perceives that she will become less relatable to her colleagues. Looking disheveled is a powerful enough stereotype that if Jessica dresses professionally as a woman, she risks being identified as a salesperson, a female dominated lower status position in her organization. This risk of misidentification further emphasizes the importance these women place on being relatable to their male colleagues while also minimizing the way that they often stand out as women. Jessica decides that negotiating the disheveled stereotypical appearance of the committed scientist requires that she downplay clothing and shoes that highlight her feminine embodiment. She ultimately forgoes shoes with heels and dresses in her new position. Instead, she compromises on her clothing in ways that de-emphasize femininity. These compromises are more frequent when women find that they are in male dominated occupations, but these strategies around clothing are not exclusive to women in these environments.

Sarah, a junior life scientist, recounts a similar effort she puts into her appearance in order to manage this perceived conflict between being visibly feminine in appearance and being taken seriously as a scientist:

> I think that I can go to a scientific meeting and be dressed casually or slightly revealing or even just slim fitting. And my actual science, I think that it will be taken with a very large grain of salt. Whereas if I am not that visually appealing, I feel like my science is definitely paid closer attention to. And I think that's just because, I don't know, there's a stigma that scientists need to be ugly and frumpy and so focused on science. And when they're not, it's like, “Well, why aren't you just focused on science? You should have your hair back in a ponytail and haven't showered for three days. Like what's going on here?”

> *Correct me if I'm not hearing you correctly, paying attention to your appearance can in some ways be negative because it's seen as detracting from your work?*
> Yeah, definitely. And I think I'm just as much at fault of paying attention to making sure that I am at a good frump level. A person who's making sure they're at a good appealing level. I mean, I'm just using it on the complete opposite side. But I definitely have noticed a difference between reactions of things that I'm wearing…. I've given quite a bit of talks and presentations and posters, and I would never, ever, ever be in a skirt doing that.
>
> (white woman)

Mirroring Jessica, Sarah's preference for clothing that mutes her body specifically in contexts in which she is demonstrating her scientific expertise is revealing of the implicit gender biases within her field. Her experiences at industry events is that appearing professionally presentable and groomed as a woman who is a life scientist detracts from her credibility rather than enhances it. She perceives that if any part of her appearance reminds her scientific audience of her gender, then her findings will be questioned. Her avoidance of clothing that emphasizes her body at meetings shows her cognizance that colleagues find it difficult to see her has both a woman and an equally competent scientist.

Sarah also puts effort into appearing to have the right "frump level," similar to Jessica's desire to appear "schluppy." In doing so she explains that she is attempting to avoid the stigma associated with scientists who appear to put too much effort into their appearances. Her description of proper conference attire suggests that a legitimate scientist must appear as if all of her mental and physical effort has gone into her work at the expense of her appearance. But similar to Angela's insistence on wearing a business suit to her interview, Sarah avoids any clothing that might be visually attractive in terms of being form fitting or slightly bodily revealing in any way.

Although Sarah is describing frump as avoiding a too polished appearance, her description of ideal presentation clothing skews towards avoiding clothing that reminds individuals of her female body, rather than her dedication to her work. This is why she specifically mentions not wearing a skirt for her presentations. She perceives that the risk of not being taken seriously for her is in wearing professional gender-conforming clothing rather than just professional clothing in general. Many women in the sample, such as Sarah, report similar instances of controlling the appearance of their bodies as a means of avoiding "spillage, slips, and excess" (Trethewey 1999) that put their professionalism at risk. By revealing their bodies, they damage their credibility.

Life scientists feature prominently in the previous examples. But similar sentiments appear in the interviews with two thirds of the women in technology as well. While perceiving pressure to dress in ways that minimize the appearance of femininity has been identified in other studies of women who are engineers and scientists (Miller 2004, Williams et al. 2014b), I find that technical women also frequently engage in negotiations of professional fit through their clothing choices. These women echo the importance that Sarah attributes to wearing professional clothing that is not too gender-specific, especially in contexts that are male dominated:

> I think it just helps people take me a little bit more seriously. I don't think it's at the forefront of their minds at all, but I think if I did come in in super girly dresses and everything like that all the time, I maybe wouldn't be taken quite as seriously as if I didn't. I think that I feel the pressure a little bit more, though, because there are no other female developers, so I kind of feel pressure to not be super, super girly or feminine…
> *Did you have any particular experiences that made you more aware of this?*
> So I guess my experience last summer was that if I was dressed more girly, my coworkers would be a lot friendlier to me and kind of more

> patronizing. So they would dumb things down a little bit more than they usually would, which really confused me for a while. And then I kind of switched and I was like, "Okay, is it just me?" And I talked to some other women who were working at the same place I was. So that does occasionally happen. So I guess it's something that I'm kind of aware of now. If I wake up and I want to wear a dress, I wear a dress. But it's something that I maybe consider if I have a bigger meeting or if I know that I'm working with a particular person.
>
> (Victoria, software engineer, white woman)

Victoria's experiences working as one of the few women in her department has made her acutely aware of how the way she regularly dresses impacts how her colleagues treat her and perceive her. She points out that her token status specifically amplifies these clothing choice concerns because her colleagues notice her wardrobe choices. When she wears stereotypically feminine clothing she perceives that her colleagues do not treat her as an intellectual equal, and she believes that regularly dressing in this way would also lead to her being not taken seriously in her position. Again, we see that the degree of visibility as a woman in these contexts is an impetus to avoid wearing feminine clothing. Victoria understands that what she wears in many respects affects her ability to be treated as a colleague who fits in as well as a professionally credible software developer. Women who work in core hard skills technical positions' perceptions of the role that professional clothing plays in their negotiation of fit will be explored in further detail in the coder section of this chapter.

In summary, the previous analysis demonstrates that women in life science and technology experience a tightrope for choosing professional clothing. This tightrope resembles the in/visibility paradox women face in engineering in which they are expected to fit into the masculine culture of their organizations as honorary men while also experiencing pressure to preserve their sense of femininity by appearing distinct

from their men colleagues. When they dress in feminine professional clothing, their scientific credentials are questioned by coworkers because they are perceived as too focused on their appearance instead of their work. Appearing feminine and competent are experienced as being mutually exclusive. As such, these women labor to strike a difficult balance of personal gender authenticity and professional belonging. Excerpts from an interview with Erin, a young software developer and Mary, a life science director, neatly lay out how this tension operates in practice in the workplace:

> So it's kind of like a fine line you have to tread between on the one hand, I want to maintain my femininity, and I don't want to seem like one of the guys. But then on the other hand, I don't want to seem like I'm shallow.
>
> (Erin)

> So women have that edge where if you come in super made up, then people don't take you seriously. So it's like there's that other end … it looks like you're more worried about your appearance than doing your job.
>
> (Mary)

This tension in regards to appropriate professional dress for women in both fields makes it more difficult for them to establish their professional identity among colleagues. As this analysis demonstrates, masculine clothing is positioned as the standard for appearing as a credible technologist and life scientist. When women deviate from this standard, even by dressing in more formal attire, they find that they experience enhanced scrutiny and their professional abilities are subject to critique. Their bodies do not fit the gendered expectations for authorities in their field. But dressing in a more masculine style has substantial repercussions for women as well. It creates additional presentational labor and a tension between how they experience their desired professional and gender identities. This finding is especially significant because

it crosses both disciplines in the sample and has received little critical examination outside of academic contexts. The following section examines why this appearance tightrope is so narrow specifically for women and not men.

The Narrowness of the Tightrope

The previous interview excerpts point to the difficult choices and perceived consequences women in the sample experience when selecting a wardrobe that's more or less feminine in appearance. These women's choices are made as part of intentional presentation strategies for managing credibility in their fields, some of which are male dominated. Jessica's decision about whether or not to wear shoes with heals and Victoria's deliberation over wearing dresses among particular colleagues or in meetings makes stark the fact that there are unspoken but narrow norms for how women scientists and technologists can appear as professionally legitimate in the workplace. These norms for professional bodies do not apply to men and women equally. Norms for men's bodies are wider and more forgiving in terms of the sizes and shapes that are considered acceptable in the workplace (Trethewey 1999). This tightrope is compounded by the general ambiguity surrounding professional clothing and makeup use for professional women.

In addition to masking secondary sex characteristics through careful avoidance of stereotypically feminine clothing, many women also find it difficult to successfully navigate the narrow acceptable clothing and grooming standards in their fields. These participants describe unwritten gendered clothing and grooming rules for women to which they also must conform despite the loose dress codes within their workplaces.

These unwritten clothing rules create an additional set of and labor on top of the work these women do in order to establish their credibility and fit among colleagues. Dressing and appearing professionally as women in these fields entails passing ever closer to an invisible line of acceptability, one in which "mistakes" are easy to make.

Slightly more than half of the women in life sciences, three quarters of the women in technology, and a quarter of the life science and technology men in the sample point to the difficulty women face when making decisions regarding what types of clothing are suitable for women in these fields. They say that the number of options women have for clothing and grooming in the workplace makes it difficult to know if one is meeting an "appropriate" level. Below, Nancy sums up the nuance involved in meeting this standard for herself and her colleagues who are women:

> It's harder, and you have to pay attention to it. You may not have to wear a $500 suit, but you have to make sure that your accessories, your watch, your everything match. I mean, the little things maybe stand out a little bit more, or you just have one or two type of things. But yeah, I think you do have to pay attention to it, and you have to be cautious. Are you wearing something that's too low-cut? There's a lot more that a woman has to take care of in their dress than men. Is their skirt too short? Is this not looking completely right? For some reason, how a woman looks versus how a man looks is different. I don't know whether it's two different standards. People look more at a woman, "Oh, that doesn't look good on her. It's too tight." I never hear comments about a man of how they're dressing or how they're dressed or how they look. It's like, "Who cares?" But a woman, it's like you're either going to be good or you're going to be bad, like, "Oh god, why'd they pick that out?"
>
> (Nancy, technical director, white woman)

Nancy attributes the difficulty of managing workplace appearance for women to the perception that women receive more scrutiny than men. She says there are more aspects of appearance to which women must attend than their men colleagues. The

additional attention to details required to meet this standard is made apparent in her reference to the fact that she doesn't recognize the possibility of a neutral or unremarkable choice for a woman's attire, grooming, or personal accessories. All of these components feature in composing one's professional image at work. In her impression, a woman can either make good or bad appearance choices, and it's particularly difficult for women to consistently make the "right" choices. Hence Nancy's admonishment to be cautious when making these everyday choices.

In addition to the importance of maintaining a complete look, just under a quarter of all the women in the sample further explain the pressure they experience to introduce variety in their wardrobe as an extra burden for appearing professional in their workplaces. They point out that men have a limited set of professional clothing options that make it easier for them to essentially ignore these sorts of decisions around clothing. One junior life science analyst explained that "they [men] can have three suits and different shirts, and you have to have a different dress every day" (Jessica, white woman). Senior scientists and technologists also make this claim:

> Women don't have that slacks, sport coat, shirt, and tie. There's not really an equivalent. It's kind of a little different. And I think men just in general have fashion or style that's a little more stable on the professional men's end than the professional women's end. You don't want to be wearing trendy just because it's trendy. I think it's important to be a little bit more conservative to be taken seriously just in general.
>
> (Mary, life science director, white woman)

A senior technologist echoes similar sentiments:

> I think the women have more options, and so I do think they have to pay more attention because, since they have more options both inside and outside the workplace, that what they might be comfortable with outside the workplace may not be an option inside the workplace. I like to wear shorts and tennis shoes, but I don't do that at work. But I also think that

> it's easier for guys to put on a sport jacket and instantly dress up even if they're wearing jeans. That can be an acceptable way of presenting yourself. I guess I'm aware of what I wear and I try not to wear the same thing to repeat meeting the same people. Whereas if a guy has a navy blue suit and a black suit and a grey suit, that's all he needs.
> (Michelle, technical program director, white woman)

The number of additional choices a woman can make for fitting within the dress code along with selecting the clothing that conveys professionalism makes it challenging to gauge when one is consistently dressing well. One technical operations manager says that she feels exasperated with the amount of clothing options available for professional women and that she wishes there was a "Women's Wearhouse" (Diana, white woman) where she could purchase all of her work clothing, gesturing towards the relative ease with which men can purchase their entire professional wardrobe in one shopping trip to a single clothing store. Like Mary, many of the women who voiced this concern regarding too many potential clothing choices and their pitfalls typically erred on the side of more conservative clothing as a strategy for being taken more seriously within the range of options. For example, Stephanie explains:

> Your style is more on the conservative side, and you dress business appropriate. I've shown up to stuff and I've probably been business casual and other people are very casual. But for me, it errs on the side of caution because I think it's all part of your perspective of how you're viewed. And I think my style might be unique compared to others because I just try to keep it probably in line and very neutral.
> (life science business development, white woman)

Women in the sample did not reference clothing selection as being the only trying aspect of negotiating professional appearance in their workplaces. Grooming also appeared to a lesser extent in the interviews as well. Specifically, four women

point out that they notice that using makeup and maintaining certain hairstyles are equally important to them for managing a professional appearance in their positions. Women in technology more often stated that grooming expectations are lower for both men and women in their field, to the point that only having extremely poor hygiene would ever be a detrimental to one's career. But two thirds of the senior women in technology and just under half of the senior life sciences women argue that women in their fields must also attend to grooming standards in ways that men do not:

> I think there is a minimum of grooming that's expected. And that includes makeup. Too much makeup? That can convey less professionalism, I think. But I guess I don't see that that happens very often. Hairstyle, for the most part I think you can get away with quite a bit in the workplace. But I think, for the most part, I think quite a range of hairstyles is acceptable.
>
> (Michelle, technical project manager, white woman)

Carla, a technical VP, expresses similar sentiments regarding the importance of grooming for women in her field. She points out that "the men aren't wearing the makeup, right? And they're not as affected by the jewelry. Or I guess the hairstyle to a certain point. But I do feel that there is more upkeep and maintenance on the women's side, for sure." Lastly, Victoria echoes Carla's interpretation of grooming standards for women. She adds that her frequent visibility in male dominated settings amplifies the expectations that she will engage in stereotypically feminine grooming practices:

> *Do women need to pay more attention to their grooming?*
> Yes, without a doubt. But I think that also might just be — I have long hair. If I had short hair, I'm sure I could roll it and not brush it and it would be okay. Whereas if I roll out of bed and go brush my hair now, it looks like something nested in it. So that's not okay. But I think that for men, it's kind of there's more slack for not being as well groomed perhaps. So if a guy's nails are a little bit long, okay, fine, whatever. Not a big deal. But I feel like if I went in and my nails weren't very well

> done, people would be like, "Oh, that's kind of strange." So I guess it's just different expectations that are set.
>
> (software engineer, white woman)

While makeup use came up more frequently than hairstyles, a few women also view makeup use and hairstyling as equally essential for establishing a professional image. Makeup use and hairstyles can convey maturity and seriousness as well for women:

> I think they're probably a bit more important than dress. I think with hairstyle particularly, someone at my level needs to have a proper professional haircut. I used to have my hair much longer when I was younger. I cut it shorter and shorter and shorter because I think it looks unprofessional having it long. And with makeup too, I didn't used to wear makeup when I was a bench scientist. But when I went into management consulting, I wore it. And I wore it at the time to make myself look older. But now I am old, so I wear it to look younger.
> *So the motivation behind it was to look more mature?*
> I think it was to look more mature, but also more business-like because bench scientists don't typically wear makeup. They just go in the lab, they throw on a lab coat, no one cares. But if you're standing up in front of a group of people leading a meeting, then I think it's a little bit more important. So I think it's about being taken seriously. But also I think if you look young for your age, it can add a sense of authority. And if you're older, then sometimes you worry about ageism. So you try and look younger.
>
> (Monica, life science director, white woman)

Senior women both in technology and life science fields almost exclusively shared these concerns regarding hairstyles and makeup in the interviews. Many of these responses focus on being perceived as serious about one's leadership role in the organization reflecting a perceptual divide among managers and entry level professionals in the sample. It's less surprising then that the younger men and women in the sample did not discuss the various ways that their grooming can convey professionalism. However, the concern with wearing an adequate amount of makeup to

help one to appear mature did emerge in interviews with three lower level lab life scientists in the sample.

The final section of this chapter analyzes the ideal-typical dress standards for software developers and lab bench scientists. These two occupations serve as analytically important exemplars of the previous findings on clothing because they possesses distinct rules about dress and are core hard skills positions in both fields. Individuals in these research and development occupations create the software products and pharmaceutical discoveries that generate the majority of revenue in the two fields.

Lab Scientists and Software Developers: Distinct "Uniforms" for Core Hard Skills Occupations

Decisions about professional attire are more problematic for women in particular STEM occupations in the sample. Analysis of the interviews with lab scientists and software developers reveals that these occupations are both closely aligned with the core technical work in the field and have different clothing requirements. The rules for appropriate attire in these occupations create additional double binds and higher credibility tightropes for women to negotiate.

The typical dress standards for these two occupations in my sample are unique in terms of what workers are expected to wear on a day to day basis. I define these two dress standards within life sciences and technology as the lab coat uniform and the coder uniform, respectively. Lab workers and software developers explain that the distinctiveness of their work responsibilities necessitates either a dress code designed for safety, in the case of lab workers, or no dress code at all, in the case of software developers. The coder's "anything goes" uniform is the product of the perception and

belief that these hard skills technical workers are too focused on their individual work output to be held to any professional dress standard.[8] In life sciences, the rigid lab coat uniform is designed around the safety risks inherent in laboratory work. While these positions appear to be an exception to the previous finding that STEM professionals depend on dress to negotiate fit, my data analyses demonstrate that having no dress code or having an extremely rigid safety dress code in hard skills occupations counterintuitively creates enhanced pressure on women.

Surprisingly both the lenient coder uniform and the rigid lab scientist labcoat uniform are problematic for women. For software developers, being able to dress however they please appears to solve the problems that women frequently face in terms of manipulating their clothing in order to establish their credibility and belonging. But women in these occupations actually engage in more self-presentation work to establish belonging, not less. This is because the software developer position is already gendered as masculine, and the looseness of the dress standard allows for a tacit gendered standard to dominate. Women in these positions describe heightened difficulty fitting into the cultural ideal of the "unkempt" and "nerdy" technologist. For lab scientists, the homogeneity of the lab coat uniform creates a different double bind. All lab workers are required to wear a white coat over their clothing. Women in these positions also experience a unique conflict between this practical safety requirement and their own particular preferences for wearing professional feminine clothing. In

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[8] I describe software developers' almost non-existent dress standard as a uniform to emphasize that although these professionals claim that they can wear whatever they prefer, this occupation possesses an implicit casual masculine "uniform" that men take for granted and that women negotiate around.

addition, younger women lab scientists find that altering their clothing helps them navigate subtle gender bias and ageism in these particular environments.

The Coder "Uniform" According to Men

Software developers write the raw code that ultimately sustains the technology industry. With six figure salaries routinely offered to entry level developers at top technology firms, the industry depends on individuals in these occupations to create products that justify market valuations in excess of one billion dollars. Unsurprisingly then, this occupation sits at the very heart of the economic engine, culture, and lore of the industry.

Developers are almost unanimously exempted from the dress code in their organizations, and these men in the sample explain that they can wear whatever they like without repercussions. These individuals articulate that how they look or present themselves in their workplaces doesn't matter in any meaningful way in terms of how they are evaluated. Terrence, a junior software engineer, reflects on this aspect of his work:

> To be honest with you, I probably look like a homeless person right now. And, I mean, no one really cares. No one says anything to me like, "You need to shave" or, "You need to like do something with your hair." I mean, there's times when I just roll out of bed and come to work…. I think, especially in this field, it's very output-based. So I don't think it matters how you present.
>
> (african american man)

References to output and quality of work trumping all other standards for evaluation were typical among men who are software developers. Nicholas elaborates on the other

most frequent evaluation criteria for this work, that of being intelligent in addition to having a willing attitude:

> They really just care about your brain, I guess, and your attitude. So it's very much like kind of your personality and how well you work. I think that's really the most important aspects of doing well and succeeding. Other than you don't have to be in good shape. You don't have to lift heavy boxes. There's really nothing like that at least in my side of the building — or in my field. Mine is very — you should have a desk to do your job on, and a computer screen.
>
> (data analyst, white man)

Nicholas makes the point that his occupation remains entirely based on intellectual output such that the only thing he would ever need is a computer to create evidence of that intelligence. Thomas, who is a senior statistical software modeler, succinctly repeats this contention that clothing is unrelated to one's career in development: "I think as long as you're producing, I think my bosses, they don't care" (white man).

Software developers also point to the unique nature of their work as a second justification for why their clothing choices have no bearing on their perceived competency, in addition to the claim that their work is primarily based upon output. The software code that a developer produces is almost without exception part of a larger product in which teams of developers are contributing their code. However, the work itself is often stereotyped within and outside of the field as being solitary and devoid of social interaction. As part of their regular workplace responsibilities these developers rarely meet with or present work to customers. So developers' dress standards are often left to personal preferences rather than the minimum professional standard to which technologists in other occupations adhere. This exemption for developers is occasionally explicit in organization dress codes. But it is more

frequently an implicit rule within the organization: the software developers are free to look however they please if they are not interfacing with others. Jeffrey clarifies this unspoken expectation: "All the client relationships and stuff like that, that's all done outside of our building. So we're just in the back behind the scenes doing all this work. So that's why our dress code is very loose and relaxed and we can wear whatever we want really" (tech. systems architect, white male).Terrance further reiterates the assumption that software developers are held to a lower standard because they are not expected to be held up as representatives of the organization:

> If I was maybe an architect or an integration engineer, or if I was dealing with other people and kind of representing [the company] in that sense, then yeah. I might expect to have to dress a certain way, but I don't interface with anyone outside. So I don't feel like I should have to. I think that's why they don't care.
>
> (software engineer, african american man)

But software developers do not only see themselves as being held to a different dress standard than other technologists because of their lack of interaction with customers. They also perceive themselves as a distinct community that is defined by their lack of a specialized dress code.

Dressing a level above one's software developer colleagues is perceived very differently among this group than all other technologists and life scientists in the sample. Daniel notes that he perceives software developers as a select group that possesses its own particular benchmarks in regard to self-presentation. He characterizes developers as distinctive because of the fact that they don't dress in the way that other technologists do; however, he and other men also maintain that how a developer dresses is simultaneously unimportant:

> For a programmer, [how they dress] is probably the least important thing about them. So, yes it makes a difference, but of all the people in the company, the way a programmer dresses is probably the least important…. A little bit is also kind of the — not the stigma, but they sit in the corner and do the work. They don't really interact with people. They're never customer facing kind of thing. So, they're just the goblins that sit in the dark and do work and don't complain. It's just that kind of stigma, but of course, light heartedly, but that's just kind of the way it goes. And, programmers, they dress accordingly too, sometimes.
> *Meaning — when you say dress accordingly*?
> I mean, they dress more comfortably. They're not fashion conscious in the first place. They're just not that type of person. So, the way they dress and what they feel would be dressed up would not be the same as a marketing person's dressed up.
> *So, for a programmer then, how if at all does dress relate to them? Is it important for their career in any way?*
> It isn't within the department. There's a different standard for programmers. Again, because they're their own community, they're almost in their own little world that the people that would be judging you are really only your colleagues. And so, your colleagues, the programmers they don't really care about how you dress. So, it was more about what you said and what you did. Your dress is not that important.
>
> (software engineer, asian american man)

The claim that programmers "aren't that type of person" in regard to dressing up to the standard of other technology professionals is a recurring theme in the interviews with men. They argue that programmers are a distinct community in which workplace clothing has little to no bearing on the work they do.

Mirroring the majority of men's responses in the sample, men who are software developers emphasize that they perceive clothing as only rarely being important in terms of how one's work and level or professionalism are evaluated. And in some cases, disheveled clothing can actually enhance one's sense of professional credibility. With few exceptions, men developers perceive that the quality of one's work is the primary means by which credibility is established in their occupation. Only three men

in the sample describe clothing as having any bearing in developer work. Of those three, two describe clothing as being important only for first impressions before a working relationship can be established with new colleagues or direct reports:

> For leading a team project or simply working with coworkers that I've never worked with before, stuff like that, I would say it may benefit a little bit having an attire that is a little more not too uptight with full suit and tie, but not too lax to where it's a tank top and flip flops and shorts. I think a good balance can, in my opinion, show the team that you're not too crazy, but also you're not too stuffy to where you think you're GI Joe or something. Just being a lax team player is an important persona to develop.
>
> (George, software engineer, asian american man)

George explains that clothing becomes almost immediately irrelevant for assessing abilities because coworkers will use one's demonstrated competence and leadership abilities to make judgments in the long run. Another technical man conveyed a similar sentiment that he avoids making assumptions about a person based on their clothing until he's worked directly with them:

> Just looking at them, I don't know, but it's more of my interactions with them. And all that entails words, right. There's probably a difference if someone comes in dressed with holes in their clothes and dirty clothes, that's maybe a different thing. But, in general, I guess I don't really think about it.
>
> (Thomas, Sr. statistical software modeler, white man)

A third developer in the sample points out that clothing can serve as a cue for a programmer's unique intellectual status or a lack of polish, depending on that person's confidence:

> I think there's an element of people who are recognized as being really good, but a little bit out there. The fact that they're wearing ratty shorts and flip-flops can kind of contribute to sort of — that might reinforce guru status. They're so good they don't need to sort of conform. At the same point, people who may not have that obvious sort of aura of

> confidence, if they're sort of dressed kind of sloppy in jeans and t-shirt, you might question the professionalism and attention to detail.
>
> (Jeffrey, systems architect, white male)

Appearing unkempt can be taken as representative of intellectual eminence or as a lack of professionalism depending on whether an individual has high status within the organization. In certain cases, dressing well below the dress code is perceived as an indicator that one is a "thought leader" (Kurtzman 2010) or guru, someone who is recognized as an expert and leading intellectual innovator in his or her field. Indeed, thought leaders are particularly exalted within technology. Dressing well below the organization's dress code when one is considered an established developer can actually enhance that individual's perceived status, according to Jeffrey. In contrast, workers dressing below the dress code who lack an established reputation or perceived sense of confidence may be perceived as potentially lacking proficiency in skills that carry over into the workplace.

For these particular developers in the sample, clothing is an indicator of one's professional credibility and intellect only under very specific contexts in the absence of other information. For them, dressing ultra casually to the point of sloppiness is an unspoken expectation for the position. While these men relate that they will dress more business-like when working with colleagues for the first time, they do not view their professional clothing as a meaningful indicator of their professional capabilities.

Women's Contrasting Perspective

Women in software and hardware design positions describe a very different perception of the importance of clothing in their workplaces. Far from perceiving

clothing as unrelated to their negotiation of professional credibility, they explain that they frequently rely on clothing in addition to hard skills to establish cultural fit. Overlapping with this clothing adjustment practice these women also experience difficulties grappling with the gendered industry stereotype of the "frumpy nerd" who is unconcerned with appearances. Rather than experiencing the ultra casual ideal-typical software developer's dress standard as freeing up their time to focus on their work, women find that it creates an additional obstacle towards credibility that they must.

This tension is acute for the women who are developers in the sample because they go to great lengths to stand out as talented workers but also to minimize the markers of femininity that make them visible in teams in which there a few to no other women. These women perceive that changing their clothing in any form away from the extremely casual standard can actually take away from their perceived technical abilities. Therefore, these clothing strategies are in part a reaction to stereotypes surrounding women's lack of ability in hard skills roles. Carla explains this widespread misperception:

> On the technical side, I will tell you that although I think we have come just tremendously since even I was a mechanical engineering student, I think that we women still have a hard time being accepted by males as having deep technical thought leadership. That's generally a stereotype to be more of a male type of thing. So I think they have to try harder, and I think it's more work. And as a result, we lose more people in that area. It's not that they don't want to work harder. They're definitely willing to do that, but it's harder to gain acceptance in the male population for that.
>
> (tech. VP, white woman)

Lacking the appearance of having hard skills ability is not inconsequential. As Shiela, a technical director explains, “If you are not viewed as being technically competent, people will have discussions with other people who they think can give comment and give direction…. In our industry, if you don’t have some kind of technical credibility, then you do not have authority” (white woman). As a result of this perception that women lack innate technical “though leadership,” women in hard skills developer roles are far more aware of how colleagues interpret their professional image.

Unlike men’s view that clothing is inconsequential for assessing developers, women in the sample explain that the culture of computing explicitly rewards workers who appear to have dedicated all of their energy to their work at the expense of their appearance:

> I think the stereotype of software engineers is still pretty alive with needing to be nerdy even though there's so many of these six-week group camps for learning how to code and they're really strong. And there's all these different ways to learn now. They still want to see the person that stayed up until four in the morning and only cared about coding and have that reflected well through dress.
>
> (Melissa, software engineer, asian american woman)

This interpretation of how software developers’ appearances matter situates them as very important for establishing credibility and belonging. Melissa implies that dressing more professionally as a software developer contradicts the expectations and stereotypes for performing the role competently. That is, dressing well would be perceived as not being committed to the work at hand or not being serious about one’s work in general. This claim is similar to Daniel’s claim that developers aren’t the type of people who would ever dress more businesslike for their work. But Melissa’s

language reveals that for women there's intentionality involved in meeting this standard because women's abilities in this occupation are not assumed to be given.

Conflicts appear for women in these positions because they also use clothing to ensure that colleagues take them seriously. Here Victoria shares her general strategy for selecting workplace outfits that contrast with then men in the previous examples:

> I try to look put together, I guess. So the first impression I want is put together and not kind of sloppy, generally. Put together and professional. I don't want anything about my appearance to get in the way of people thinking about me first as someone they're working with and someone whose work is valuable. So I guess I don't want to go in wearing, I don't know, a parachute or something ridiculous. Or I don't want to go in a Halloween costume to work or something like that because that detracts from people thinking about me in professional ways and gets people thinking about me as kind of strange. And I don't want the first thing people think of me is, "Wow, she's kind of strange." I want them to think, "Wow, put together. Let's consider what she's been working on," or something like that.
>
> (software engineer, white woman)

Victoria's dress strategy is specifically oriented towards presenting the impression of professionalism and credibility. Her previous wardrobe involved dresses, tights, and cardigans, but she explains that it made her appear younger than her age, which she believed wasn't helpful for impressing upon others that she is capable. Her desire to appear older than her age highlights the work she puts in to appearing to be more senior, and implicitly accomplished in her position rather than demonstrating her fit through the quality of her work alone.

More so than women in all other occupations in life sciences and technology in the sample, women like Victoria are exceptionally deliberate about how they dress for work. This is a common finding for women in engineering, but it has not heretofore

been explored for women in technology (Faulkner 2009). These women correlate their wardrobe with their treatment by their colleagues. Some of these women are extremely meticulous about these efforts.

Megan, a jr. software engineer, describes her how she used clothing to convey a particular impression of herself during her initial job interview at an industry leading software company. She went to great lengths to manipulate her appearance in order to fit within the existing software "nerd" gender stereotype:

> For interviews I have fake glasses. I have a bunch of kind of more masculine button-up shirts and ill-fitting jeans — things to make me look more nerdy. And I would make sure my hair was up really tight in a bun so that I don't have really long blond hair because if you're going to see me and then make a decision and judgment on me in 45 minutes, you need to think that I am as smart as you can possible think from my appearance.
>
> (white woman)

It's clear that Megan's attempts to appear more "nerdy" are attempts to downplay any associations between her appearance and femininity. When interviewing Megan goes to great lengths to associate her presentation with masculinity, including hiding her body by wearing poorly fitting pants and choosing masculine clothing. She also anticipates that even her long hair and its color will signal that she's not as intelligent as other candidates. She attributes her success in all of her interviews to these "micro-adjustments" in her presentation of self. Before securing her current position, she assumed that technical recruiters would judge her appearance based upon her perceived fit into the narrow and masculine definition of how software developers are expected to look. Although she assumed that this deliberate presentational work in which she engaged in for interviews would only be necessary due to the fact that evaluators have

limited information about her, she explains that she quickly realized that maintaining a less feminine style of casual dress is necessary for her to seem relatable to her coworkers in the long term:

> I think I've fixed this a lot but I think you have to work really hard and how you appear and how you talk in this [position]…. And now I feel like people take me really seriously because I do this and I've talked to friends about this but I just wear like yoga pants and a t-shirt or jeans and a t-shirt and it doesn't matter if it matches.

Unlike the men who identify clothing choice as the least important aspect of a developer's claim to professional competence, Megan perceives that laboring to maintain the appropriate (i.e. masculine casual) developer dress level is necessary for colleagues to consider her as competent in her position. Instead of being unimportant for the performance and evaluation of her work (as the men assert), Megan contends that being taken seriously depends on her ability to navigate around unconscious bias that associates femininity with a lack of technical proficiency. Megan's original interviewing clothing strategy soon became a permanent aspect of her professional dress style.

> I think if you're an incredibly strong coder or once people around you have realized you're good at coding, then you can dress however you want, depending, right? I think there's some people who just don't care and dress however they want the whole time. But I work with a lot of different teams and a lot of different people, and so I think there's something threatening, especially about a woman who dresses well or trendy. Potentially because like we still have like high school stereotypes a lot of times even if we don't like to pretend that we do. There's this whole stereotype of the bitchy cheerleader or whatever is still a thing. And so if I dressed really trendy, I don't think people would take me seriously at work…. So for my work now, for full-time, I think initially I wanted to dress down just because it works in interviews. It makes people think you're smarter in general or more capable.

Megan's explanation of how clothing is related to credibility for software developers exemplifies the additional presentational labor that women in these roles frequently undertake. Developers who dress however they want have either already established their expertise or are unconcerned about their appearance in general. However, she explains that women in these positions specifically need to manage their appearance by avoiding dressing professionally using distinctly feminine clothing because doing so jeopardizes their credibility and relatability among colleagues, a similar finding among junior scientists: "If I dressed trendy that would be one thing. That would be unforgivable. Even if I dress professionally — like sweaters and nicer professional clothes, what my friends wear when they work at a publishing company—business casual, I think I would still be seen as unrelatable." Megan describes wearing feminine professional clothing as sign that a woman does not fit among her developer colleagues and is implicitly not suitable for the work. She mentions that the cultural association of extremely casual clothing and expertise in software development roles is particularly powerful and that it's a cultural preference that she also shares now that she's an experienced software developer. She gives an example of two women who are completing a software internship at her company. Although both women are equally capable, Megan confides that it's easier for her to view the one that wears poorly fitting internship t-shirts and jeans as more technically capable and a better fit for her position than her professionally dressed counterpart. By the end of our interview, she acknowledges that there is a strong preference for "the nerdy" look in her field regardless of the fact that not everyone dresses in this fashion.

Of the twelve women in technology in the sample, only two doubt that how they or other women in their field dress has any bearing on how they are perceived as technologists. Even though these women express a similar perception as their male colleagues that clothing does not have any bearing on one's career progress in technology, they nonetheless take steps to manage their own professional clothing in ways that distance themselves from the gendered ultra casual norm. Unlike Megan, these women work to maintain their distinctive appearance as women in male dominated workplaces but experience negative reactions to their clothing choices.

One of these women, Erin, an entry level software engineer, offers up her manager, who is a man, as evidence that clothing doesn't matter for people in her field: "I really doubt it. I mean, it might have some very minor, intangible effects. But the lead of our project, for example, wears gym shorts, t-shirts, and flip flops every single day. And he's the lead and people respect him a lot" (white woman). It is important to note that Erin singles out her male supervisor as evidence that what one wears has little bearing on professional regard. But she clarifies later in the interview that although she could dress like her manager, she prefers not to because she perceives that style of professional dress to be unkempt:

> I wear jeans most of the time, but I try not be sloppy. Like I don't wear sneakers or sandals.
> *Do other people do that?*
> I don't wear sweats. Some people do…. I just think it's really sloppy.

Erin's avoidance of the clothing her well-respected manager wears appears to be an aesthetic preference. But upon further discussion of her clothing preferences, she explains that she puts a considerable amount of thought and effort into her appearance

choices because of the implicit associations that her coworkers make as result of those choices:

> This is something that I think about a lot. I think it's sometimes almost the opposite here because like as a woman and with my background, I've always liked to put effort into my appearance with makeup and hair and nails and everything. But I think here there's a danger of if you put too much effort into it, then you're not taken as seriously because you're seen as one of the secretary ladies or something.

Appearing feminine through her grooming and appearance routines in a male dominated workplace is important to Erin because she does not want to give up obvious markers of femininity, but these efforts to maintain a feminine appearance carry the risk of a potential loss of regard among her developer peers. Erin finds that dressing and grooming in ways that emphasize her femininity creates the perception among her colleagues that she is more concerned about maintaining her image rather than the quality of her work.

Women in software development are still very much in the minority. So Erin's concern that she will be associated with secretaries, a profession which is heavily female dominated, reveals that she is faced with a perceived mutually exclusive choice of appearing as a competent developer who fits the culture and as a woman (Williams et al. 2014b). She perceives that if she dresses or appears too feminine she will be associated with a lower economic class of female dominated occupations. None of the male developers in the sample expressed any concern about being mistaken for any male dominated lower status occupations in their workplaces, such as custodians. Erin's concern about socially distancing herself from secretaries demonstrates the perceived precariousness of her position as a woman in a typically male dominated and

masculine-typed developer position. This association between women's workplace clothing choices and perceived competency is not accounted for in prior research on software developers specifically.

Similar to other life scientists and technologists in the sample, Erin also worries about comments she receives from her male coworkers in regard to how she dresses because it sows doubt in her mind that she is not meeting a professional standard of dress that's narrow for women in her position: "So if someone notices it, then I almost feel like, 'Oh, maybe I've gone too far.' Because I don't want it to be noticeable…. I would guess that it's not just this company or this part of the company. It's probably this field in general. And I would guess it's this way in science as well." When she stands out as a woman via the comments that her coworkers direct at her clothing, Erin assumes that she has crossed an invisible line on the tightrope of professional role credibility and proper gendered clothing. As detailed earlier in this chapter, this concern regarding wearing clothing that is interpreted as appropriate for a developer who "fits" in the profession is an additional component of professional identity formation. Being visible as too feminine in her position, via her clothing choices, is a perceived liability. And the work that Erin and other software developers put in to try to fit the perceived clothing norms for the profession is labor that their men colleagues are not doing.

The Lab Coat Uniform

Lab science work is an analog to software development in that it is an essential part of basic discovery research and is a life science occupation that relies on the core

hard skills training one receives in the discipline. My sample of lab scientists is drawn from pharmaceutical, bioengineering, and support organizations. The fundamental success of these organizations depends directly upon patentable research discoveries. Lab scientists' output in these organizations provides the building blocks of future profitable products and patents. Their research drives the development of the industry. Of all the life science occupations, lab scientists work most directly with the core hard skills taught within the discipline. And like their software developer counterparts, their unwritten dress code is more problematic for women in these positions. They report experiencing a mix of ageism and sexism that they attempt to deflect through carefully altering their appearances.

After analyzing the responses from life scientists in my sample, a similar pattern of dress code exceptions to that of software developers emerged when respondents described the dress requirements for "pure science" lab positions versus customer-facing managerial or business development positions. Lab scientists have a uniquely stringent dress code in the industry that makes them visibly stand out among other occupations in these organizations. These respondents emphasize that their positions have a restrictive safety-related dress code that is identical across the entire discipline, both in industry and academia. This safety dress code requires particular types of clothing to be worn at all times within lab environments. Due to these already stringent safety clothing requirements, most lab scientists are exempt from their organization's formal dress code policies. Therefore, what lab scientists can wear underneath their lab coats is uniquely left to personal preference. Lab scientists report

that their dominant dress standard is a bare minimum that bears a striking similarity to the standard for software developers in technology companies.

Life science respondents explain that the hazardous nature of lab work requires that they wear more functional and less professional clothing. Lab work frequently involves dealing with dangerous or bleaching chemicals. While accidents are rare, the risk of having any exposed skin coming into contact with these substances is always present.[9] Lab scientists repeatedly stress this risk when discussing how they dress for their positions: "Labs especially have a dress code when you're working with acids and bases and stuff like that will eat through your clothes and your skin. You're pretty much completely covered" (Sarah, research life scientist, white woman). Skin coverage considerations take priority over style preferences:

> The only dress code we have is actually dictated by the safety regulations. Like we can't wear shorts, we can't wear open-toed shoes, but that's because you're in the lab. You don't want anything to get spilled on your legs or feet. But in terms of dress code, people were dressing in a way that they were comfortable. And most scientists are not known for their sharp sense of fashion.
>
> (research life scientist, white woman)

Other lab researchers couched this low lab clothing standard as a "loophole" in the general company dress code. But the loophole is described as being in service to the lab workers' general safety. Nicole, a synthetic lab scientist, made it clear why the lowered dress standard loophole is essentially unavoidable. At the very least, "It could be unsafe to have a tie catch on fire, and it's just not practical."

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[9] Only one individual in my sample reported being temporarily injured from a chemical accident in the lab. The consensus among lab respondents is that one learns to select one's lab clothing carefully after witnessing numerous lab accidents during one's graduate training.

Respondents also frequently mention that lab scientists, in addition to wearing protective clothing, always wear a lab coat over their work outfits for the majority of the workday. A typical lab scientist's day-to-day clothing concerns will revolve much more around function and comfort, as Leslie notes. These safety regulations and concerns regarding comfort lead to a dress standard that resembles that of software developers. Blue jeans and tennis shoes under the lab coat are the most frequently described minimum dress standard for these scientists.

None of the lab scientists I spoke with articulated a specific minimum dress code for themselves outside of workplace safety mandate. But many of these scientists describe the typical lab scientist as 'frumpy' and unstylish, similar to the software developers. Sarah, a research scientist captures the stereotypical appearance of people in her position:

> There were people who were wearing like heels, for example, but those don't usually last for very long because they're also a health hazard. I mean, in the lab. When you're constantly moving and you're standing all day, heels are just a liability…. I mean, we're all pretty frumpy at that point. Like there's nothing exciting about our attire. And then you've got a lab coat and goggles and gloves. I mean, you look like the mad scientist.
>
> (white woman)

Two thirds of the lab scientists point out that they are not known for their sharp sense of fashion and that they typically take the path of least resistance when selecting clothing to wear under their lab coats.

Similar to the software programmers, all of the men in lab scientist positions and a quarter of the women point out that the uniformity of the lab coat safety

requirement creates a situation in which how one dresses is unrelated to the performance of the role:

> For the pure scientists, I don't think it does. It's just assumed that they're thinking about their science and so they don't have time to care about that…. I think it's the industry in general. I think scientists, they're not too concerned with the way they look overall. You know, what they're wearing and especially in the lab.
>
> (Brian, research life scientist, white man)

Note that Brian describes his position as dealing with "pure" scientific work. He singles out the position's exceptionalism in the field and its conceptual proximity to the core of the field. Just like the software developers, he portrays lab scientists as knowledge workers that are too busy to think about their appearances. Similarly, Leslie relates that wearing more professional clothing in the lab would be exceptional but not necessarily have any relationship to one's career prospects.

> I think, at least in the lab, if you dress a little bit nicer, you would stand out more because the majority of people don't really pay that much attention to what they wear in the lab, but whether it would be advantageous for them professionally, it's hard to say.
>
> (research life scientist, white woman)

However, like the software developers, many of the women in these positions describe a tension between wearing what they want and wearing what is considered practical for the role.

Women in Lab Science Positions Walk a Higher Tightrope of Credibility

An anecdote from one of the lab scientists helps frame the tension women experience between dressing professionally in ways that they prefer and the cultural assumption that lab workers are all poorly dressed scientists. Angela explains that if one wants to wear a skirt in her company's labs, then one is typically required to also

wear tights to prevent acid burns. She says that her company attempted to ban wearing skirts and shorts in lab settings, but other women on her team resisted the implementation of this policy. In her words, there was "such an outcry" that the organization backed down on banning skirts but not shorts (interview notes). According to Angela, the actual risk of having caustic chemicals splash one's legs is extremely low. Other women point out that when women in the lab wear skirts or high heals, they are frequently commented upon and seen as unusual.

Furthermore, many younger women lab scientists in the sample explain that they work to avoid the casual clothing that is associated with their position, which is more difficult to accomplish in the caustic lab environment. Angela explains that she avoids "grubby sweats or workout clothes" in favor of practical business casual clothing in the form of jeans and blazer jackets. Other young women in these positions struggle to avoid wearing any casual clothing in the lab, which is difficult and expensive due to the prevalence of bleaching chemicals.

In addition to avoiding casual clothing, just under half of the women in the sample who are lab scientists single out a perceived amalgamation of sexism and ageism that pervades these positions and motivates their clothing strategies. The ageism that they describe is the opposite of the kind that is typically identified in workplaces. This particular form of ageism manifests as a bias against younger life scientists. These women report that they attempt to enhance their appearance of maturity through clothing and accessories. Hannah, a research scientist, intentionally chooses visual accessories to enhance her appearance of intellectual maturity:

> I wear my glasses to work a lot just so I look older and nerdier…. I am extremely blind. I never wear them ever, but I purposely wear them to work because I don't want to be perceived as flighty. Or I don't know if it's so much gender. I think that I look younger than I am and I act different than I am. I talk about drinking all the time and how much I like sports, but that doesn't mean that I'm not good in the lab. So I feel like I look more serious and older when I wear my glasses.
>
> (white woman)

Rather than being given the benefit of the doubt that she is not "flighty" and is serious about her lab work, Hannah relies on her glasses to encourage the impression that she is capable, mature, and "nerdier." Recall that Megan, a young software engineer, also uses glasses in her job interviews to enhance her "nerdy" more masculine appearance. There are no men in the sample of technologists and life scientists that rely on these kinds of personal accessories for establishing their professional credibility. Hannah points out that she also enjoys following entertainment that is associated with men's interests, such as sports, but she does not perceive these interests as in any way offsetting her need to wear accessories as a way to influence her colleague's perceptions.

Other women in the sample echo Hannah's impression that there is bias against young women and not young men in laboratory life sciences:

> I've always sort of taken it that in science, as you get older, you get more respect. And I don't know — its hard to separate the ageism from the sexism…. So you don't feel as bad, but I mean, sometimes you wonder, "Do I come across as being younger because I'm female?" Or this idea of age and experience is, you know, something difficult to place on your gender or on your age.
>
> (Jessica, life sciences analyst, white woman)

Evidence of the presence of an appearance tightrope for STEM women that emphasizes not appearing to be too young or too mature has been identified in one

large scale survey (Hewlett 2014). But the findings from this sample support the claim that this particular bias is especially strong among younger lab life scientists who are women. Recall Monica, a life science director, who earlier in her career as a bench scientist began to wear makeup to appear more mature and "business-like." This impression of a cultural bias towards more mature professionals is not shared among the interviews with men in lab scientists positions. In addition, I found no evidence of this bias in the interviews with technologists. While there is no direct interview data in this study to confirm, the bias in technology is skewed towards younger appearing professionals (Johnston 2016). This is likely due to the fact that the entire industry itself is young, and age rarely correlates with experience or role seniority.

Conclusion

This chapter analyzed how life scientists and technologists use professional clothing and accessories to establish credibility and belonging in their fields. I extend previous work on engineers' impression management strategies into two understudied fields. In this analysis I found distinct gender differences within both sampled fields and within core hard skills occupations. Contrary to the expectation that scientists and technologists working within meritocratic cultures are unconcerned with their appearances, these STEM professionals value particular clothing styles and engage in appearance management techniques in order to navigate biases in their field culture. These findings address this study's broader aim of revealing how gender schemas create additional presentational labor for women in STEM.

The argument throughout the chapter has been that women perceive the need to alter their clothing choices in order to be considered and treated as a credible colleagues. Women in the sample frequently detail avoiding professional clothing that accentuates feminine embodiment. While women in traditionally male dominated hard skills occupations are more actively engaged in appearance management, the majority of the women in the sample acknowledge the difficulty of navigating dress standards in their fields in addition to the range of professional clothing options for women. As such, they find that they walk a tightrope for managing feminine appearance and professional fit. Women face particular pitfalls with these strategies. When adopting more feminine professional dress styles they risk "going too far" and highlighting their difference from men colleagues.

This labor around self presentation is especially heightened for women who are software developers and lab scientists because these hard skills "pure science" occupations are gendered as masculine more so than other life science and technology occupations. The men in these positions do not share any apparent concern with appearing sufficiently disheveled for conferences or in their daily interactions with colleagues. They do not perceive an enduring association between how they dress and their scientific credibility or relatability because their bodies align with cultural expectations for the gender of the person occupying the position. Thus there is no additional labor required for men to successfully accomplish that professional image in their day to day interactions. They are free to rely more on rapport and workplace accomplishments to distinguish themselves and establish credibility.

These findings also have significant implications for understanding how cultures in life science and technology shape expectations for self-presentation. It is not unexpected that women in technology and in significantly male dominated technology occupations engage in more labor around appearance. They perceive they are, at least symbolically, outsiders in their own field. But this labor was also surprisingly common among laboratory life scientists who work in a field that is reaching gender parity and is not closely associated with masculine stereotypes. This finding indicates that explaining gender disparities within STEM fields requires attending to both field cultures and specific occupational cultures.

Finally, as this chapter has demonstrated, attending to professional image and putting effort into managing others' perceptions are particularly culturally devalued behaviors within hard skills life sciences and technology occupations. But these positions are the very ones in which women in the sample perceive a heightened need to engage in such behaviors. This contradiction is especially difficult for women to navigate because they rely to an extent on clothing to establish a sense of belonging among their predominantly male colleagues. Engaging in these strategies helps them minimize uncomfortable workplace interactions that highlight their gender identities over their professional identities. The following chapter shifts the focus of analysis from the management of appearance to the management of emotional expression.

CHAPTER 5: GENDERED EMOTIONAL LABOR IN LIFE SCIENCES AND TECHNOLOGY MANAGEMENT

The previous chapter analyzed how life scientists and technologist use professional attire to project a normative professional image and manage their colleagues' impressions. Gender differences in dress strategies are apparent across both the sampled fields and within hard skills occupations in each field. I find that when women minimize clothing that accentuates feminine embodiment they are able to more convincingly demonstrate their professional credibility to colleagues. As STEM professionals move into management positions, their self presentation requirements also shift. Enacting normative leadership behaviors is critical for success in these roles. This chapter furthers an understanding of impression management in STEM by analyzing how managers express and suppress their emotions.

Although scholars have studied impression management and emotion management at work, there is a dearth of research on both emotion management among STEM professionals and on leadership. In this chapter I foreground this important labor by examining how women in management positions engage with unwritten emotional expression rules in comparison to men and more junior women. Despite the fact that none of the sampled professionals describe emotional labor as a formal aspect of their job descriptions, my analysis reveals that this form of invisible work is commonplace in life sciences and technology. Women in senior positions describe engaging in emotional labor according to specific gendered "feeling rules" (Hochschild 1983) for expressing anger and sadness. I argue that they engage in this informal labor

in order to avoid being perceived as emotionally fragile and therefore weak leaders. These expectations for emotional expression impact how these women demonstrate leadership. Men largely do not engage in this labor and often successfully incorporate anger into their leadership toolkits. These emotion management strategies reveal how essential professional qualities, such as leadership ability, are evaluated and perceived in different ways for men and women in similar STEM organization positions.

This chapter is divided into four sections. The first section highlights how research on gender and management has overlooked the conflict women in leadership experience around emotional expression. This absence is especially pronounced for scientists working in industry. In the second section I argue that both sampled fields are emotionally taxing and that being perceived as a good emotion manager is important for success in these fields. The third section explores how women in management engage in preparatory emotion management and avoid expression of their felt emotions in their leadership behaviors, especially anger and sadness. In the final section I compare these women's labor and perceptions of the consequences of not doing this emotional labor to men and junior women in the sample. I show that these two groups identify different consequences for their emotional expressions compared to women in management.

Gender, Emotional Labor, and Leadership

The importance of emotional labor in the perpetuation of gender inequality in the labor force has been productively examined for over thirty years. Hochschild (1983) first introduced the concept of emotion management to describe how

individuals actively modify and manage their feelings according to social norms. But Hochschild's most productive contribution to this research area is in revealing how institutions, specifically businesses, also encourage employees to manage their outwardly expressed emotions according to a specific set of on-the-job normative "feeling rules." Many organizations, often informally, encourage employees to labor on their felt feelings and the expression of those feelings. Consequently, individuals and social structures are involved in shaping the performance of emotional labor. Recognizing that emotional expression is structured but not determined allows for individual constructions and interpersonal negotiations of emotional expressions in organizations (Hearn 1993).

Subsequent studies of emotional labor focus either on how individual employees personally manage the expression of their emotions or how organizations shape their employees' emotional expressions in service to customers (Wharton 2009). This research has most productively examined service workers, but it has only recently been extended to professionals in STEM.[1] Moreover, a focus on leadership is conspicuously absent from these studies.

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[1] While emotional labor has most productively been analyzed in customer-facing service occupations (Leidner 1993), scholars have also extended the concept to inquiries into how professionals manage their emotions. Professionals possess much more autonomy over their work than interactive service workers. The few studies of emotional labor among professionals primarily focus on socialization, the way professionals learn the rules for managing their emotional expressions or for establishing authority during their training (Pierce 1996, Smith and Kleinman 1989). But this research rarely engages with both how professionals shape their emotional responses in the workplace and how they understand their emotional labor in relation to their professional identities. Scholars have also only recently begun to map out the specific internal disciplinary feeling rules that shape the expression and interpretation of "appropriate" emotions in STEM workplaces (Koppman et al. 2015).

Sociologists have paid little attention to the relationship between emotional labor and leadership (Hassard et al. 2000).[2] This lacuna is surprising given that leadership is fundamentally a social process. It depends upon group dynamics in which "social hierarchies of prestige, influence, and power develop among people when they are oriented toward the accomplishment of a collective goal or task" (Ridgeway 2003:65). Importantly for the aims of this study, effective contemporary leaders are required to manage their own emotions and their subordinates' emotions (Barsade and Gibson 2007, Humphrey 2002). However, there are no studies of how scientists and technologists who are leaders engage in emotional labor, and researchers have called for additional studies on emotional labor among men and women in similar positions (Sloan 2012). [3] Given that the qualities ascribed to individuals employed in leadership positions are closely aligned with the qualities ascribed to men in general, there is an additional gendered component to emotional labor in leadership. The following section explores the research on these gendered cultural processes.

Gendered Backlash and emotional Expression Among Leaders

Emotional expressions are uniquely problematic for women who are leaders because these expressions are frequently perceived as evidence of leadership deficiency rather than a normal aspect of working in emotionally charged environments (Eagly and Carli 2007). Crying is especially damaging to women in leadership positions that

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[2] The most recent review of the sociological research on emotional labor does not include references to leadership or how leaders perform emotional labor (Wharton 2009).

[3] I am aware of only one study by Kelan (2008) that examines how support technologists understand and enact emotional competencies.

are typically occupied by men. Women in these positions who exhibit almost any emotion, especially sadness, are perceived as confirming the stereotype that women are at the mercy of their emotions and cannot lead or exercise stable control (Cockburn 1991, Eagly and Carli 2007). Expressing anger is similarly problematic for women in workplace leadership positions.

Social psychology experiments demonstrate that when a woman displays anger, an emotion that's associated with masculinity and hierarchical leadership, there are multiple perceptual penalties. Evaluators rate women expressing anger as deserving lower salaries and status as well as lower in competence compared to angry men and unemotional women (Brescoll and Uhlmann 2008). These ratings hold regardless of the professional position or professional rank of the woman being evaluated. In contrast, men who display anger are rated as deserving higher status than all other candidates (Rudman and Phelan 2008). Just as in the case of women who display sadness, women are perceived as emotionally unstable when they exhibit anger. These perceptual penalties specifically leveled against women who express anger are especially troubling for women in leadership positions because expressing anger is also associated with strong leadership ability (Bass 1998).

By expressing leadership conforming but gender nonconforming emotions in the workplace (e.g. anger), women face backlash effects that hamper their career progression in senior positions. These effects appear when women violate both descriptive and prescriptive gender expectations. Women are perceived as less agentic than men (descriptive), and women are expected to act in a less agentic (prescriptive) more submissive fashion than men (Eagly and Karau 2002). Consequently, a woman

who expresses or uses anger in a manner consistent with her leadership position is perceived as acting in a way that is inconsistent with being a woman.

In addition to perceptual backlash effects for expressing certain emotions, women in leadership positions are dependably perceived as competent but lacking in warmth in ways that men are not (Rudman and Phelan 2008).[4] While stereotypes regarding men being naturally assertive or aggressive overlap with expectations for leaders, women in leadership positions face addition social backlash effects when they adopt the assertive behaviors of a leader (Rudman and Glick 1999, Trethewey 1999). As Rudman and Phelan (2008) note, this double bind entails that "ambitious women may have to choose between being liked but not respected (by displaying communal qualities) or being respected but not liked (by displaying agentic qualities), a dilemma not faced by men" (65). Colleagues and direct reports evaluate these qualities by attending to how leaders present themselves in the workplace.

Executive Presence as a Proxy for Leadership Ability

Importantly for this study, impressions of warmth and leadership competence are managed through behaviors and nonverbal cues in the form of interactions styles and body language.[5] Recent literature on executive presence reinforces this popular and

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[4] Cross-cultural research in psychology establishes that social judgments of individuals and groups are based upon two primary perceived dimensions: warmth and competence (Cuddy et al. 2011). These judgments, in the form of individuals' impressions or interpretations of behavior, are frequently biased by pervasive group stereotypes. As a result, some social groups, when they are perceived as being high on one dimension, are evaluated more negatively on the other dimension.

[5] In all social interactions individuals are continuously communicating subtle nonverbal cues regarding warmth and competence, or the lack thereof (Cuddy et al. 2011). Specific postures during meetings, facial expressions during difficult performance reviews, and even dominant or submissive body poses during tense negotiations signal and reinforce impressions of status and ability (Hall et al. 2005). An

academic turn towards the role of nonverbal cues in shaping judgments of leadership abilities. The possession of leadership or "executive presence" (EP) is consistently identified in popular business publications as being vital for promotion into executive level positions across industries (Benton 2003, Halpern and Lubar 2003, Su and Wilkins 2013). However, little academic attention has been devoted to executive presence's substantive qualities (Meriläinen and Tienari 2015).

EP encompasses the visible external qualities and behaviors perceived to be associated with leadership ability. These qualities are not direct measures of an individual's leadership performance; rather, they are used as a proxy for leadership aptitude. EP includes behaviors as well as appearance characteristics. In a national survey of 4000 professionals, researchers found that senior executives characterize EP as comprised of three main components: how one acts (gravitas), how one speaks (communication), and how one looks (appearance) (Hewlett 2014). Being perceived as possessing EP is considered essential for establishing and maintaining credibility as a leader.

Despite the importance top executives attribute to EP, most professionals assume that nonverbal cues matter very little to not at all in evaluating leadership capability and that an individual's capacity for exercising good judgment, motivating teams, and communicating effectively are the sole means for assessing leadership effectiveness. Even so, gravitas in the form of appearing as if one has a deep and

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entire industry of self-help literature has developed specifically aimed at helping women adjust their expression of behaviors and emotions, tone of voice or crying for example, in order to align their presentation of self with masculine norms (Kenny and Bell 2011).

commanding grasp of her position, comprises over two thirds of EP (Hewlett 2014). Therefore, one's ability to appear in command of oneself, including emotions, has bearing on whether or not one is perceived as possessing leadership potential.

These findings on the importance of emotion management in leadership effectiveness and gendered backlash effects directed at women point to a cultural contradiction in which women have few good options. Women in leadership are expected to strike an impossibly fine balance in which they are expected to be aggressive, but not too aggressive. They are also expected to be passive, but not too passive at the same time.[6] Rogalin and Hirshfield (2013) argue that the result of these conflicting stereotypes is that "women's access to and ability to express the emotion most associated with power and status (anger) is reduced in comparison with men," (492). Therefore, women who are perceived as not exhibiting the appropriate or ideal emotional expressions for successful leadership are less likely to be selected for further promotion. Their professional identities depend upon these types of judgments from colleagues (Roberts 2005).

Much less is known about how women manage these conflicts across fields, and reviews of the sociological research on emotion management and leadership call for more studies (Rogalin and Hirshfield 2013). Specifically, we don't have a firm understanding of whether women employ strategies for managing this conflict in STEM professions outside of engineering. In addition, comparing emotional labor

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[6] Independent surveys of women in technology management positions find consistently strong evidence for this effect. One particularly large survey of 220 women working as technical managers found that 84% had been told that they are either too aggressive or too meek (Vassallo et al. 2016).

among men and women in two fields where women are the minority in one and have reached gender parity in the other helps clarify whether numerical dominance impacts the performance of this labor. Exploring how men and women in each field perceive the need to engage in emotional labor also lends empirical support to theories of women's restricted emotional expressions in leadership roles. Previous research has heavily relied upon evidence from laboratory studies. These unanswered questions are particularly germane to the fields included in this study because STEM professions are assumed to be highly rational and without the need for emotional labor.

Findings: Emotional Situations and Frustrations are Common

It is widely believed both within and outside of the scientific community that scientific disciplines exist in a linear status hierarchy that corresponds to the experience and expression of emotions (Simonton 2009). Physical sciences, such as physics, are believed to have the highest status and therefore are more dispassionate, metaphorically hard, quantitative, abstract and lacking in emotional engagement (Schiebinger 1999). The more qualitative, soft, and "compassionate" life and social sciences are characterized as having greater levels of emotional engagement (Koppman et al. 2015).[7] But this neat emotional hierarchy for does not hold under close scrutiny of the experiences STEM professionals describe in this study.

Contrary to accounts which characterize scientific work and workers as highly rational and lacking emotion (Hearn 1993), technologists and life scientists are equally

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[7] Technology is not a scientific discipline in and of itself. The field emerged from engineering, and its practitioners are predominantly educated in university engineering or computer science departments. Engineering is closely aligned with the physical sciences in the perceptual hierarchy I have outlined.

emotionally invested in their work and routinely work in emotionally challenging environments. Lower level workers must meet sales quotas, interact with difficult clients, adjust to shortened project deadlines, and appease demanding managers. These are just a few examples of typical contexts in which emotions run high. Professionals in supervisory positions often use emotions in their interactions with direct reports in order to communicate task priorities and instill urgency.

Life sciences and technology workplaces are frustrating and routinely emotionally challenging for workers at all professional levels. A senior life scientist succinctly notes that "people just understand that's part of science. It's frustrating sometimes" (James, white man). Daniel, a young lab researcher agrees: "I think there are always frustrations, especially in this competitive environment" (white man). The trying nature of scientific work is repeated again by another senior life scientist who points out that the social nature of lab work is an additional frequent source of workplace frustration: "There's always going to be conflict in the lab when you're dealing with people. That just comes with the territory … There's going to be misunderstandings, and you have to manage that as well" (Shari, middle eastern woman).

The technologists describe similar emotional frustrations that originate from working collectively on projects as well: "I think it's accepted to be frustrated because especially when you're dealing with so many different companies at the same time and different people that you're working with, everyone gets frustrated at some point" (Nicholas, data analyst, white man). Two of the software developers in technology

single out frustration specifically as an emotion that must be grappled with primarily in their line of work:

> I think frustration is the most common emotion. And managing that — it's a really big personal battle, it's probably the biggest thing…. So when you're trying to do something and your boss tells you to do it the other way and you don't like the way, you get frustrated…. In programming tasks, you have to do something as an individual, and it can be a little bit more frustrating because you're being told what to do as a person. It can kind of seem like you're being singled out a lot easier. Having to manage that and stay on task and stay on point, that can be hard sometimes.
>
> (Daniel, asian american man)

These emotional pressures extend into STEM leadership positions as well. Nancy is particularly eloquent in her characterization of the emotional pressures leaders experience:

> There's a lot of emotional situations, especially with resource actions that might be going on in the company or workload. The workload is very heavy. So how do you deal with the employee who can't balance work and home, and you're working many hours? Are you able to handle that emotionally? And in these higher leadership roles, you're working a lot of hours, you're traveling globally. There's a lot of wear and tear that you have to be able to endure, whether you're a man or a woman. And it's sometimes tough to handle everything.
>
> (technical director, white woman)

Clearly frustration is commonplace. But these STEM professionals also describe anger and sadness as pervading their workplaces. These two emotions, and the consequences for successfully managing or failing to manage them, emerged as particularly important sites of personal conflict for more senior women in leadership.

The majority of the men in technology claim that anger, and its predominance in technical workplace cultures, varies by organization: "Aggression is generally discouraged. Aggression in terms of, you have a problem with someone for some

reason, and that's like in any workplace. It's discouraged" (Tyler, software engineer, white man). Robert, a senior technical scientist echoes Tyler's perception:

> The most obvious is that, you know, shouting anger or rage, if you want to use that terminology, is not normal around here. And if you average across the whole company, it's very unusual, I would say…. Now I'll draw a contrast. There are other companies in the Bay Area, those other companies are known to be much more in your face.
>
> (white man)

In addition, men in technology claim that technology firms that lack a diversity of positions and the presence of more women are more likely to tolerate expressions of anger:

> It depends on the culture of the organization. And I think some of the older hardcore engineering firms, there can be sort of an element of locker room bravado. So you need to have a reasonably thick skin. The life science companies have a very different vibe than some of the more hardcore engineering hardware companies. The life science companies, there's both technical diversity because you tend to have the chemists and the biologists, as well as you tend to have a lot more women. So I think they tend to have a little bit more of a softer vibe. There very technically aggressive behavior kind of stands out as being a little bit extreme.
>
> (Jeffrey, senior scientist, white man)

Despite men's assertions that expressions of hostility are relatively rare and vary from organization to organization, just over half the women in technology share the perception that confrontation and displaying anger are the norm in their industry. A junior software engineer explains: "Crying or sad emotions are very negative. People are very uncomfortable with them. But on the other hand, being very happy or being very angry are totally acceptable" (Megan, white). Sheila conveys a similar perspective on the limited range of appropriate emotions one can exhibit in her field: "If you get into a meeting room and you work in a company where it's accepted that you stand up,

stomp around, scream, and slam your fists on the table, that's okay…. Anger, yes. Anything else? Not acceptable." (technical director, white). Other women in technology point out that the general interaction style in the field is one of confrontation and disagreement:

> I find that most kinds of conversations in software development are really arguments. And not arguments like hostile arguments, but most of the conversations that I tend to have with my coworkers, even about things not work-related, people take two different sides and try to convince the other one they're wrong. It's kind of the style of how our conversations go…. It's a little bit of anger, but more kind of fiercely defending something. People get their emotions pulled into it and suddenly they've got a stake in it. I think that's much more accepted than being upset about something.
>
> (Victoria, software engineer, white)

There is an evident incongruity between men and women technologist's perceptions in the same field. And while life scientists rarely describe anger as a frequent component of their workplaces, constant disappointment is embedded in the work that they do as well. A case in point, Jessica describes this dynamic in the following fashion: "I think anger in science is a lot lower than it is in other fields. I think the liability is more that somebody is going to break down at any moment because it's really emotionally taxing" (analyst, white woman). There is consensus in the sample that work in these fields entails difficult emotional situations, but there is a gender divide in terms of which types of emotions are acceptable to express.

I argue that these conflicting perspectives between men and women are a reflection of the finding that men and women in the sample experience different consequences for displaying polarizing emotions in the workplace, such as anger or sadness. In order to illustrate this point the following section discusses the high value

that technologists and life scientists place on emotional control. I then examine how women in senior positions perceive different risks and consequences for expressing anger and sadness compared to men and junior level women.

Professionalism Requires Emotion Management

Each scientist and technologist must develop the ability to deal effectively with conflict and frustration. Almost all men and women in both sampled fields emphasize that being a STEM professional demands careful control of one's emotions. Eric, a research life scientist, makes this case:

> You need to be able to basically manage your emotions is a part of it. It's another side that maybe people don't think about very often. In order to deal with stress and interpersonal interactions, which might be uncomfortable, you need to be able to come to resolutions in the conflicts in a way that is mature…. I think there is a time and place for expressing feelings, but again, it's got to be done at the correct time and place and carefully gauged.
>
> (white)

Kevin, a life science VP shares Eric's perspective: "What's acceptable is that you should absolutely manage your emotions. From my perspective, that's expected. I'm not tolerant of anyone in my group being abusive or getting out of control or unable to manage, whether it's anger or you know, breakdown or whatever it is. That has to be addressed" (white man). Eric and Kevin link emotional control with maturity and competency. Knowing when to express emotions, which ones, and under what circumstances are part of being a STEM professional. These scientists are describing the informal feeling rules for their field. Women equally shared Eric and Kevin's impression of the relationship between emotional control and professionalism:

> It all boils down to that professionalism. You don't want to lose your temper. That's counterproductive to anything. That doesn't get anything done. You just have to keep your emotions in check. You just have to -- like if there's any underlying personal issues, keep those inside of you and continue to be professional on the outside. And you could be going through god knows what, but I think a good professional would be able to put that aside and focus on the job at hand. Most of the time in any workplace, it's going to be about the work itself and not about a person. It's all about the work.
>
> (Angela, research life scientist, asian american)

Other scientists and technologists in the sample just as frequently characterize the importance of emotional control for effective problem solving in their positions. Since industry scientists work in teams, their ability to work together and share information is limited when emotions run high.

Men in both fields characterized being a poor emotion manager as damaging because it inhibits the effective exchange of ideas and information:

> What we're paid for is to provide information that allows ourselves and our superiors to make decisions about what we should do. And so if you don't have good information, you're dead. That's the absolute most important thing. Now if not being nice or being a jerk somehow prevents you from getting that information or somehow influences the quality of the information, then that's a serious issue.
>
> (James, senior life scientist, white man)

Robert, a senior technical scientists, echoes these sentiments. He remarks,

> Just because you're madder at somebody than they are at you doesn't mean that you're right and they're wrong. It doesn't actually aid the problem solving process if you're trying to address something, certainly if you're trying to address a technical problem. But even if you're trying to address a functional problem within the company, it just isn't that useful to yell and scream at people. So in that sense, I would say emotional control is pretty important.
>
> (white man)

Poorly managing emotions gets in the way of effective problem solving and knowledge sharing. In addition, scientists who can't manage their emotions face limited options

for promotion because managers are expected to remain calm under pressure and swiftly deal with interpersonal conflict. Women in life sciences are especially quick to point out that if a person loses emotional control, it influences how much that person is respected in the long term.

Emotional outbursts in these workplaces can have durable consequences for professional reputations. This perspective was especially strong for women in management. Over two thirds of women in leadership positions in the sample outlined these reputational effects. Mary, a life sciences director, makes this point very succinctly: "It can be very, very frustrating. But you definitely have to rein it in, because if you're in a meeting and you raise your voice and get irritated, you're definitely not respected…. If you progress and you're in a leadership position, you have to keep it together" (white). Monica, who works in an identical position and level as Mary agrees: "I find you have to keep a lid on your emotions because otherwise, you can be seen as perhaps you're not being in control, or not having good judgment in letting someone get to you as well" (white). Indeed, being good at managing one's emotions is frequently considered a visible marker for good leadership skills among junior members in the sample. Scientists on the cusp of a move into management are keenly aware of the importance of exhibiting tight emotional control in leadership positions. George, a software engineer, points out the way that a manager's careful emotional control can impact a team:

> Managing emotions, definitely if a team starts to see their leader crack or evoke more negative emotions than normal, the morale is sort of influenced by that to a small or even a big degree. But definitely it never really helps a whole lot. It does a little more damage than good. Granted there are certain situations where some teams want to see their leader be

> a little more emotional than just a robot, just because it shows they're a little more invested. They care a little more about the project than just any other job. So I would say managing emotions, there is a good balance between showing the team that you care, but also showing the team that you have a steady enough head to keep them in line and to help them get the job done as well.
>
> (asian american)

This awareness of the impact that leaders' emotional states have on direct reports is heightened among professionals who have many years of management experience. Jennifer is a life scientist who has just started in a management position. She says that demeanor plays a large part in how she views leaders in her organization. She respects people who are calm on the outside and emotionally balanced because they appear to have more self-confidence. Her team of mid-level scientists routinely talk about ineffectual managers who do not come across as emotionally composed (white). For new managers like Jennifer, being able to control emotional disappointment in the lab is perceived as a necessary condition for progressing in the field. Jessica, who is also about to make the move into a life science management position echoes this sentiment:

> It's hard to [manage your emotions], especially as you move up in science. Because as you move up in science and people break down under you, you think, "Oh god, I've been there, and I fucking cried over that gel ten times." But as you progress, you have to stop doing that in order to make people feel better about the field. Because if you look like you're despairing, people are only going to despair. So it's important as you continue to move up in the hierarchy to sort of suppress that, and I think you get better at that as you get older. And suppressing your emotions is sort of one of those things that comes with age and experience.
>
> (analyst, white)

Being able to suppress emotions is considered essential for not only inspiring junior scientists to persist in life sciences, but it also demonstrates that one is a seasoned scientist in the field. Jessica indicates that being experienced in life sciences inherently

includes dampening visible emotional reactions to disappointing experimental outcomes. Although I have argued that my two sampled fields are charged with emotions and that maintaining a professional identity as a leader requires strict emotion management, I also must demonstrate that failing to engage in emotion management according to field-level feeling rules creates significant negative career consequences as well.

Professional Consequences

Given the previously established importance of emotion control for scientists and technologists, instances of a visible loss of that control form lasting impressions for these professionals. Young scientists share vivid stories of managers breaking down after difficult meetings. And managers recount cautionary tales of colleagues who couldn't effectively manage their emotions or who managed their emotional expressions in a manner perceived as lacking. All of these anecdotes frame the undesirable perceptual outcomes for individuals who fail to appropriately manage their emotions. What is significant about all of the following examples is that men are absent from them.

When prompted for examples of emotional situations, young professionals reflected on managers that routinely physically expressed sadness:

> I had a manager once who was a huge crier. And I would say I'm kind of an emotionally stunted person in general and so I'm probably not the best person on this. But I had a manager who, after bad meetings, would just cry at her desk. And she was very open about it, but it was very awkward. We would have people come by and talk to her just to like make sure she was all right. But like more just to like hopefully diffuse the situation.
>
> (Megan, software engineer, white woman)

Megan shares this recollection of her former manager because even though her manager cried privately at her desk, Megan felt as though it made other colleagues uncomfortable to the point that people were being asked to step in to help on the manager's behalf. The fact that this manager did not make a concerted attempt to hide her sadness appears to have created heightened anxiety in her workgroup. But more than ostensibly making others uncomfortable, emotional expressions can also have serious career consequences for these professionals. The interviews with senior STEM professionals reveal this outcome.

Three life sciences managers precisely point out the potential career-ending liability of either not effectively controlling one's emotions or even merely being perceived as delivering important information with the wrong emotional tone: "Emotions are tough. I do have a direct report who has a hard time controlling her emotions in meetings. She gets very upset, and she had a hard time controlling it. And I think that doesn't help her" (Amanda, life sciences VP, white woman). David, a senior life scientist, shares a similar perspective:

> Certainly you'd like to have people around you that have the ability to control their emotions. And I had one direct report working for me up until a year ago, when she left, and she had very little control over her emotions. She would have outbursts, outbursts of frustration, outbursts of anger. And that was really tough to deal with.
>
> (white man)

These managers characterize employees that are poor emotion managers as particularly difficult to work with, but respondents also state that inadequate emotion managers end up hurting their own careers. More damaging however, leaders who are otherwise good

at their work but who are also perceived as "too emotional" in their interaction style can have their professional credibility called into question:

> One of my female peers I worked a lot with in meetings, the way she presented facts and issues in the meeting had a lot more of a pleading nature and a bit more emotional character to it. And she was taken less seriously to the point that it got to where she wasn't effective in the organization. Everybody understood she knew her job, but she just wasn't taken seriously as a leader in the company. She had a tremendous amount of technical and in fact business savvy. She had good sense for where we should go. But when she would try and direct things, to that end, she wasn't successful. I would actually pair up, and I could actually bring it more to conclusion than she could. I think part of it was just how she was perceived and communicated. She just wasn't taken seriously because she was more emotional.
>
> (Steven, life sciences VP, white man)

Steven's example lays bare how perceptions of emotional expression have substantial consequences for moving up the leadership ladder. He describes his colleague as very technically capable in her position as well as possessing good business sense. Nonetheless, because she was perceived as delivering facts in an emotionally incongruous manner, she was ultimately unable to build the consensus necessary to be successful in her position. How she delivered information was equally if not more important than the information itself. And unfortunately, the widespread perception that she wasn't a "serious" leader contributed to her eventual dismissal.

The emotional manner in which information is delivered in group meetings matters very much for establishing credibility in these fields. Women in the sample frequently describe laboring on the tone of their communications:

> I have had to adjust my posture a little bit in meetings, speak a little bit more forcefully at times where I'm trying to express that, hey, I'm the person that you need to talk to about this, rather than the person responsible for these things…. I have tried to be conscious of tone of voice, how I'm speaking, making sure that my message I'm

> communicating is, you know, clearly understood the first time. So I have been more aware of my self-presentation areas, especially when I'm in meetings where I'm with peers or higher-ups.
>
> (Diana, technical operations manager, white woman)

> I think in my position, one of the things you could do best is communicate. And sometimes it doesn't require good communication, it just requires a service communication because a lot of times when you work on things at a company this size, there are a lot of opinions on what are going into it. So if you want your opinion heard, you have to make sure that you can communicate it well but then communicate it, I would say, forcefully.
>
> (Meghan, software engineer, white woman)

Diana and Meghan explain that professional credibility is interpreted in terms of how forcefully one speaks. Ensuring that one is heard in important meetings is part of the process of gaining the confidence and respect of supervisors and colleagues. But reiterating the earlier finding in the chapter that particular leadership traits can be perceived as incongruous with enacting femininity, women who are leaders describe being judicious with their tone in their interactions. Diana, a technical operations manager, notes that she has seen some women have success with communicating forcefully at all times. But she tempers her claim: "I've also seen them punished for it. So, it's a very fine line that a woman has to walk." These excerpts and Steven's description of his colleague's trouble communicating in an emotional tone that's congruent with cultural expectations are key to understanding why only women appear in all the examples drawn from the sample.

Maintaining professional credibility in these fields requires that colleagues validate each other's communication styles as consistent with leadership behaviors. Women in the sample exclusively do labor and work on the tone in which they deliver information. They do this labor because they find their ideas and contributions are not

as recognized without it. None of the men in either fields describe having to adjust their tone or do work to fit their communication style into cultural expectations. Their professional credibility is not held in the balance based on how they speak. Only women in the sample describe having to speak more forcefully in tone than usual in order to ensure that their voices are heard. Just like Diana and Meghan, many women describe perceiving that they need to speak up more frequently and speak more forcefully than their male colleagues in order to be heard. And surveys of technology workers almost unanimously find that women must be more assertive with their colleagues in order to be heard in technology cultures in ways that men do not (Simard et al. 2008).

All of the excerpts from the sample of employees losing emotional control describe women executives or direct reports displaying too much emotion in the workplace. The absence of any examples of men being penalized professionally or being memorable for appearing to lose emotional control reflects the finding that emotional expressions are perceived to have different consequences or risks depending on gender. It is not the case that men in the sample are any more or less emotional; rather, their emotional expressions are not perceived as a significant barrier to their ability to effectively lead. Women, on an individual level, enact emotion expression strategies in order to overcome gender schemas that cast them as inherently emotionally fragile leaders. To illustrate this point, I draw on evidence from men and women's leadership tactics in management positions.

Restricted Emotion Expressions for Women in Management

A large majority of women in leadership positions in the sample engage in deliberate emotional labor strategies that serve to minimize the physical expression of their felt emotions. I find that emotional expression is much more precarious for women in leadership positions, and they hold themselves a much higher standard of emotional control than their men colleagues. While this is not a new finding for male-dominated fields, it is unexpected for women in life sciences.[8] I argue that women in both fields in the sample are highly aware that their professional credibility is jeopardized when they display anger or sadness in their workplaces. As a result, women in leadership positions engage in preparatory emotion management tactics before and during potentially emotional workplace encounters and within particular "emotion spaces" (Hearn 1993). They do this to minimize the potential for emotional displays that they perceive to be damaging to their professional identities. Their deliberate emotion management is a form of gendered emotional labor that is not discussed in the literature on scientists and technologists thus far. The analysis of the interviews with women in the sample reveals that physically demonstrating sadness is perceived as much more risky and damaging to one's professional credibility than demonstrating anger.

Women in management positions in both fields in the sample describe keeping their experienced emotions hidden from colleagues in their workplaces through

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[8] Kelan (2008) finds that men in technology benefit from exhibiting emotional skills associated with femininity. When women use these same skills, they are perceived as enacting one of their "natural" feminine social competencies and thus do not receive equal recognition.

deliberate forms emotional labor. Some of these women focus on preparing themselves mentally before engaging in potentially emotional interactions:

> I try to keep myself calm. And when I do get emotional, I try to keep it under control. Because it does not help if you start crying…. So I work really hard at controlling that aspect when I'm in control. And when I go into meetings, I'm very prepared so I don't get blindsided. I try to make sure I know what's going to happen. I'm prepared with what I need to present and I know. I try to just kind of get a sense if somebody's going to hit me with something I'm not expecting, I really try to know about it ahead of time. I just want to make sure I'm prepared so I don't get caught off guard.
>
> (Amanda, life sciences VP, white woman)

Intensely preparing for emotion-inducing meetings is one way women engage in emotional labor. In this excerpt Amanda describes this tactic as maintaining control of what she will present in a meeting as well as anticipating what attendees might say or do that could elicit an emotional response in her. Another way these women engage in emotional labor is in recognizing and planning to avoid difficult coworkers or interactions that have created stressful emotions for them in the past:

> There have been times I've been so stressed I've just broke down and cried. I usually try to tell the person in the room, because it's happened mostly in front of male managers, between sobs, it's okay, just let me finish because once I'm cried out, I'm done. And then I'm totally focused on what the task on hand and what we need to do. It's just how I express my stress…. I don't want to, and I try to hold that back. So, I've been trying to be more aware of what my emotions I feel for the day. And there's times I find myself frustrated with a situation, or frustrated with a person. I will normally try not to have meetings with them, or get into certain conversations because I know my emotions will come to the surface because I like to resolve issues.
>
> (Diana, technical operations manager, white woman)

Diana notes that when she becomes emotionally stressed she eventually expresses tears in front of male colleagues. She makes a point of explaining those tears to her male colleagues as a stress reaction rather than a loss of emotional control. She is also

actively working on preventing her emotional stress reaction in future interactions because she finds that it is frequently misinterpreted. Obviously, altering her physical response to stress is not an easy task. Diana's strategy of avoiding colleagues who upset her may or may not be fruitful in the long term. But it is one that she and other women have developed as they've progressed in their careers.

A second way that women in management uniquely engage in emotional labor is by removing all emotional expression from their leadership styles. For example, when I ask Monica whether she incorporates emotional competencies into her leadership, she responds:

> No, I would say it's the opposite. I mean, I try not to show emotion. If someone's really annoying me, I have to work hard not to get angry and just to be patient and to be very firm. I just use firmness instead, just say, "No, we have to get this done, and this is the deadline." And then I'll follow up a couple of times. I try and keep it firm but not emotional.
>
> (life sciences director, white woman)

Monica describes her tactic of actively removing all hints of anger from her dealings with direct reports. Rather than show anger to communicate the gravity of her concern, she eliminates all inklings of emotion in her communications with difficult direct reports. Unlike their male colleagues, these women describe how they often work to moderate their emotional expressions such that they never become visibly upset or saddened in their workplaces. This form emotional labor is the most frequently shared tactic among women who are leaders. It involves keeping a steady demeanor as a means of demonstrating leadership strength. The intent of this strategy is to portray a sense of unwavering emotional stability that counteracts stereotypes which cast women as emotionally fragile leaders:

> I think women have, justly or unjustly, this thought that we're more emotional than men, which is kind of ridiculous. But you have to show strength. And to me, strength is by controlling your outward emotion. My personal tact is if things get crazy all around me, I try to get as calm as possible. I try to be that calm voice of reason.
>
> (Sheila, technical director, white woman)

Carla mirrors Sheila's perspective on portraying herself to her direct reports as an emotionally stable leader. Both communicate their leadership strength through the unwavering appearance of calmness:

> I'm a strong believer of not losing your cool, to always be very factual and to not manage with emotion. Because once you get into there, the people that you're managing get into there and it's just a lose-lose cycle. So being very factual, not getting angry. It's not getting angry and yelling. I think being very factual. Now there's an opposite side of that, with emotion that you're very happy and you're excited for the person and maybe you want to display that. Of course, all the positive emotions. But I would tell you that all the negative emotions, I definitely don't think that that is effective…. Even keel is a great two words. I think trying to keep an even keel and be consistent is very important.
>
> (technical VP, white woman)

Sheila prefers to portray herself as a calm ship in the storm when circumstances in her workplace become stressful. As emotions rise in her department, she makes of point of presenting her professional identity as that of a rational leader who is unaffected by the pressures around her. Carla also opts for this tactic of removing emotions that can be perceived as anger or weakness from her leadership interactions, but she adds that expressing happiness is generally unproblematic for her. It is only "negative" emotions that require additional management. For example, Shari maintains the following rules

for disciplining her direct reports when they are underperforming: "I don't yell. I don't scream. I don't call people out." (middle eastern woman).[9]

These findings among women in management support previous studies which find that women are more likely than men to curtail their expression of anger in their workplaces (Sloan 2012). However, these studies attribute this tendency to women's unequal distribution in high status positions and jobs (Kemper 1990). Scholars have argued that women engage in more of emotional labor that emphasizes positive emotional expressions and minimizes negative emotional expressions because they are more likely to work in fields and positions that are associated with femininity and which demand the kinds of emotional labor associated with femininity (Hochschild 1983). In this study, however, I find that women working in identical fields and in similar positions in their organizations engage in much more emotional labor around anger and sadness than their similarly positioned senior men colleagues. These findings on anger suppression are somewhat even more surprising given that the ease of expression of anger is associated with both having high workplace status and workplace power (Pierce 1996, Ridgeway and Johnson 1990). Women in this study possess both of these characteristics. Yet their responses illustrate that job characteristics do not diminish gender schemas that guide emotional expression for women. Contrary to previous findings, women and men in my sample do not express

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[9] A potential alternative explanation for the findings is that these women in leadership positions possess a higher level of emotional intelligence than their male colleagues and therefore find that managing their emotional expressions makes them more effective leaders. Even assuming that this is the case, the data demonstrates that these women aren't choosing to engage in this labor as much as they feel obligated to engage in it out of necessity. They disclose that they struggle with successfully engaging in this form of labor, often working on improving their emotion management proficiency throughout their professional development.

and manage anger equally in their leadership styles (Cliff et al. 2005, Sloan 2012). The following section highlights these differences.

Men will Lead with Emotion

While women in management almost unanimously eliminated risky emotions such as anger from their emotional repertoire, men in these positions productively use anger in their own management techniques and interaction with direct reports. This strategic use of anger plays an important role in leadership effectiveness. Anger is therefore characterized as problematic in STEM workplaces but is also frequently part of men's leadership behaviors. James, a senior life scientist, is particularly frank about the anger that is incorporated into his management practice when he is disappointed.

> The joke is if I'm in the lab and things are going bad on a particular day, I'm not throwing things or swearing at people, but I get pissed off. And I think that it's not directed at anybody, although it has been a couple of times…. I'm probably the most out of control person in my group just because that's just the way I am. I don't edit myself very much, which I don't think — you would have to ask the other people in my group. But in general, I think people want to work in my group.
>
> (white man)

James recognizes that he gets visibly angry when experiments or direct reports do not meet his expectations. Later in our interview he explains that he believes younger scientists at his company still want to work in his group because they understand that his anger is a reaction to the frustrations inherent in the work they do rather than just a part of his personality. However, James' description of frequently expressing unconstrained anger is not representative of the majority of men who incorporated anger into their management repertoires.

Since exhibiting uncontrolled anger is regarded as very risky among a large majority of the study respondents, most managers who describe getting angry as part their management style explain it as a temporary tool for motivating employees: "I do occasionally shout or am obviously overtly angry in that sense, and it may or may not be profitable" (Robert, senior tech scientist, white man). Junior scientists also describe their male managers as sometimes using anger to get results: "Occasionally if someone hasn't delivered on a project, I've seen managers get emotional and angry. And that can actually be very effective because it almost scares people into performing better and doing a better job" (Monica, life science director, white woman). Clearly anger is also useful under certain circumstances, specifically when managers want to communicate their frustration with their direct reports or need to obtain higher performance from them.

Importantly however, these examples of individuals using anger in service of management goals are exist exclusively in the sample among men who are managers or among women describing other male managers that they have worked with in the past. In contrast, my data analyses demonstrate that women in leadership engage in markedly curtailed forms of emotional expression and avoid anger entirely. James' penchant for acting out of control when things do not go well in his lab would be strongly criticized among women in his position, as evidenced in the previous analysis.

Perceptions of Consequences Perpetuate Gender Differences in Emotion Management

I argue that emotional labor strategies are further gendered because only women in leadership positions consider emotional labor as necessary for counteracting

the stereotype that they are weak leaders. These perceptions are pronounced among the senior women in both fields, suggesting that cultural expectations for women to engage in emotional labor become more pressing as women move up within management ranks. In addition, women in management perceive that their emotional expressions will adversely affect their relationship with colleagues by making their colleagues uncomfortable. In sum, these women downplay their own emotional expressions because they believe that they will affect their ability to maintain professional credibility. Women at junior levels in the sample do not perceive these same risks as those in management. In slight contrast, junior women see the expression of anger or sadness as leading to the perception that they are difficult to work with but not weak performers.

Even though this labor involved in suppressing emotional expression is difficult, women in the sample describe that they find it to be essential to their continued professional success. These women are very articulate regarding how their emotional expressions are perceived by colleagues. Overwhelmingly, they couch their control of emotions, especially sadness, in terms of avoiding the perception of weakness. Sarah describes how a scientist who displays sadness in front of her colleagues is perceived:

> I think it shows weakness, honestly, and that you couldn't process and take this out back, which nobody honestly can. Scientists are emotionally invested. That's the only reason you're into it. There's so much failure. Of course you're emotionally invested. So to expect somebody to be able to constantly hold back their emotions like that seems kinds of ridiculous, but it's totally true. You cannot break down in the lab. That's just a major no-no. It sticks with you. People might like you and they may still work with you and everything, but you definitely are now not as good. It's tough; … we had hired a person, she had

> worked with another person eight years prior, and he still remembers when she broke down and ran out crying and was still holding it against her.
>
> (research life scientist, white woman)

Sarah acknowledges the irony that scientists are expected to conceal any negative emotional expressions when results do not come out in their favor despite that fact that all scientists remain emotionally invested in their work as part of their commitment to the field. Nonetheless, she says a scientist's professional reputation is permanently damaged if these outbursts occur in front of colleagues. According to Sarah, this is especially the case for sadness: "I think anger is not considered as a weakness as much as you're stressed out. Whereas crying is considered a weakness and not so much stress." Tina, the life sciences director, concurs that appearing weak in any way is particularly undesirable: "So you cannot show any type of emotion at work that will make people think you are weak, you are less strong. So crying at work, becoming emotional like that? Completely unacceptable. Never can be allowed to happen" (asian american woman). Diana echoes Tina in her characterization of the impact of expressing sadness in her workplace: "For me, when I've broke down and cried, I feel like, oh, damn it, now I'm looking weak. Like I can't handle the situation because I broke down and cried" (technical operations manager, white woman). A strong concern with not appearing weak in front of colleagues is coupled with the perception that colleagues will interpret weakness as evidence that women specifically are unable to manage their emotions in leadership positions.

Mary, a life sciences director, explains that women experience pressure to engage in intense emotional labor because any negatively framed emotional

expressions are “held against them more. You have to show that you’re not going to do that” (white woman). These women sometimes directly refer to the fact that because they are working in a male-dominated environment they must do more work to disabuse their coworkers of the perception that women are emotionally fragile leaders:

> Certain emotions don't look good on women. Certainly I think that women struggle because maybe we are a little bit more emotional and empathetic. And honestly, from a hormone perspective, it's just natural, right? But I think that showing that, it does not look good, right? It just solidifies the fact. Or, as you're trying to gain respect in a male-dominated environment, I think it makes it even tougher. “See? The women can't handle their emotions,” that kind of stuff.
>
> (Carla, technical VP, white woman)

Carla indicates that she believes that women are somewhat more emotional than men due to biological hormone differences. But more importantly, she recognizes that if she demonstrates any emotion or empathy it will reinforce the stereotype that women are emotionally unstable leaders. Her response reveals that suppressing emotional expression among women is particularly crucial in her male-dominated technical field. These women are working to minimize their gender identities in favor of their professional identities.

This finding further supports Eagly and Carli (2007), who argue that emotion management becomes even more essential for women who occupy leadership positions within male-dominated fields. Surprisingly however, both groups of women leaders in life sciences and technology express similar sentiments to Carla’s. Life sciences is far from a male-dominated STEM field. Nonetheless, women in leadership in this field discuss their emotional management tactics in terms similar to their technology counterparts. Finally, women explain that performing this form of emotional labor has

important consequences specifically for their male colleagues. This is the second way in which suppressing emotional expression is gendered.

Amanda, a life sciences VP, asserts that the rarity of women in higher level positions leads men to worry about how to handle women who express sadness in various contexts: "I think women will do that a lot more than men for sure. And since there are not that many of us, women in these types of positions, men get very uncomfortable when women start crying in meetings (white). Diana, echoes Amanda's assessment in terms of how expressing certain emotions creates tension among male colleagues: "It's a really important piece. And I think every individual has to find their comfort zone. You hear the normal statements, 'Oh, men get uncomfortable with women who cry.' Yes, that has been true" (technical operations manager, white). A result of this perception that their emotional expressions make men uncomfortable is that women engage in more emotional labor in order to hide their felt emotions. This leads many of these women to address emotion-inducing conflicts privately and after the fact as way to avoid the perception that they are driven by their emotional reactions. Victoria explains this strategy:

> But in terms of if I'm upset, if someone said something that upset me or work is kind of upsetting, I try to kind of keep it as localized as possible. So if someone said something and it kind of upsets me, I'll talk to them after about it. I try not to let everyone else know that I'm upset just because I feel like those kinds of things, especially if you can keep them contained and still address the issue, I think it's better that way. Because ultimately, we all have to work together, so me getting super upset and emotional and all that other stuff, it's not going to help me, it's not going to help anyone else, and it might make other people feel uncomfortable.
>
> (Victoria, software engineer, white woman)

Here Victoria recounts that she avoids revealing to coworkers that a colleague or situation has upset her because she believes doing so would make others uncomfortable and ultimately hurt her professionally.

In contrast to the senior women in the sample who characterize a lack of emotional control as appearing weak in their positions, men and junior women in both fields find that for their positions the uncontrolled expression of anger and sadness will only lead to a lack of trust. The men and junior women describe these emotional expressions as likely to hinder their career progress because colleagues will not want to collaborate with them. Appearing emotionally unfit for their positions does not factor into their responses, and thus they rarely communicate personal concerns with inadequately engaging in emotion management.

When men in the sample discuss likely outcomes for professionals in their field who lack emotional control, they focus on individuals potentially losing the support of their colleagues or receiving negative performance reviews:

> It may require that you get a performance improvement for displaying anger. And I've seen people terminated for their displays of anger. It's rare because you try to hire to avoid that. But you get surprised every once in a while. And usually people respond to, "Hey, that's not going to play out for you. This is how the other people in the room feel when you do that. That destroys the camaraderie that we're trying to do and it eliminates your ability to get input from people."
>
> (Steven, life science VP, white man)

Eric's perspective mirrors Steven's: "I think the simplest risk is not advancing or not getting as high of an annual salary raise. But also some people aren't just don't interact well with other people. Maybe they're not brought in on collaborations" (research life scientist, white man). Losing the support of colleagues or missing out on a potential

promotion are clearly important negative career consequences. Nonetheless, men and junior women don't characterize being a poor emotion manager as a sign of inherent weakness. Rather, not effectively managing emotions creates problems for colleagues and general dysfunction within workgroups.

Men and junior women focus much more on how poor emotion managers push colleagues away. Thomas captures the problem of poor emotion managers in workgroups within his organization:

> I mean, no one wants to really work with you, right. They tip-toe around you, and it's not going to be a good situation. It could be a positive feedback loop there, right, so people avoid you so that makes you mad that they're avoiding you, so now you've got this loop that you're just going to spiral out of control.
>
> (sr. statistical software modeler, white man)

Victoria describes a similar concern to Steven's: "If there's someone who is known for kind of blowing up or getting angry about things very easily, you don't really want to work with them as much because your perception is more negative" (software engineer, white woman). Erin, who is also a software engineer, uses almost identical language when describing the consequences of being a poor emotion manager: "I think people might not want to work with you. They might not trust you as much. They might not want to be friends with you" (white woman). Overall, these men and junior women do not perceive any sign of weakness in poor emotion managers. That finding appears to be entirely limited to women in senior positions. Furthermore, junior women and men do not perceive poor emotion managers as unskilled in their positions in the same way women in senior roles describe other poor emotion managers.

Discussion

Maintaining an ideal professional identity in both the “rational” fields of technology and life sciences requires emotion management. Displays of anger and sadness emerged from the data as especially problematic for these professional identities. However, men successfully incorporate anger into their leadership behaviors. For women in management, a loss of emotional control in the form of visible crying or anger is perceived as much more detrimental to their careers than their male colleagues'. Women in both fields relate that concealing the expression of sadness is especially important to them because of the pervasive gender stereotype that associates the expression of sadness among women with an inability to exert rational control over their professional work and embody leadership. Men do not share this perception. This difference in perceptions reveals the power of the stereotype that women in the sciences are more likely to be emotional rather than rational.

My analysis of the data also shows that women in management in both life sciences and technology work hard to embody management styles that are often devoid of emotion altogether. They understand that in failing to do this labor and expressing disappointment or sadness they will run the risk of being perceived as lacking leadership ability, especially in the eyes of men who report to them. Men in leadership positions and junior women in these fields also describe risks for displaying anger or sadness in the workplace, but they more often perceive the consequences of displaying these emotions as developing a reputation for being difficult to work with rather than a loss of respect or the appearance of weakness among their colleagues. Men in the sample also identify certain negative reputational effects from exhibiting anger, but none expend effort in planning or preparing themselves for their emotional reactions.

This type of unseen internal labor among women in management is particularly difficult because it creates a sense of personal inauthenticity. By frequently engaging in emotional labor, women experience a dissonance between what they actually feel and what they are able to express in their positions. Tina laments, "I wish my heart would just disappear during those times, only just my mind works. But sometimes it doesn't happen that way" (life sciences director). Emotional dissonance, as scholars have noted, frequently leads to stress and a loss of a feeling of an authentic self (Hochschild 1983, Zapf et al. 1999). More practically, these women feel that they are unable to express emotions that men in the sample are able to use in service of effective leadership. Not being able to express sadness or anger is an additional barrier to women's ability to develop strong professional identities in these fields because they perceive that these emotional expressions will damage their professional advancement. Furthermore, professional identities depend upon colleagues' expectations and judgments (Reid 2015, Roberts 2005). The women in management describe their emotional labor as a deliberate strategy for managing colleagues' feelings and perceptions. They also argue that by expressing particular emotions they are reifying gender stereotypes regarding women's inability to maintain emotional control, which reflects negatively on their perceived suitability for further leadership positions. Therefore, they are frequently laboring against this misperception.

Conclusion

This chapter addressed how men and women in the sampled fields manage professional leadership identities through emotion management. I argue that both fields

possess feeling rules regarding appropriate emotional expression and suppression. However, women in leadership positions tightly manage and frequently eliminate all of their emotional expressions in order to be perceived as effective leaders. They engage in this strict emotional labor in order to evade gender stereotypes that cast them as weak leaders who are lacking in emotional stability. Their heightened emotion management is an example of gendered emotional labor that is not discussed in the literature on scientists and technologists thus far. In contrast, men in these same positions and junior women perceive that their emotional expressions do not have consequences for their professional credibility. Rather, men in leadership positions frequently incorporate negative emotional expressions into their management behaviors.

These findings contribute to the growing literature on gender, embodiment, and management in science. My analyses show that gender schemas circumscribe effective leadership behaviors among STEM leaders. In addition, I have demonstrated that emotion management is a central component of professionalism in two "rational" private sector STEM fields. Women in these fields have very few options to successfully incorporate any emotional expressions into their leadership styles. Finally, my findings validate theoretical claims that men and women in the same positions encounter different emotional expression requirements and consequences (Rogalin and Hirshfield 2013, Shilling 2012). As I argued in the introduction to this study, gender schemas create unique barriers specifically for women in identical positions as men.

There is some indication that the gendered feeling rules uncovered in this study are shifting. Senior women acknowledge that although they still feel that they must

carefully manage their expression of sadness, some see indications that the "edges are softening" (Diana, technical operations manager) for these patterns of emotional expression in their fields. They find that they are hearing more discussions in their workgroups regarding how both men and women who express sadness are not necessarily weak scientists or technologists. These emotionally open workers are beginning to be recognized as expressing stress in healthy manner. Perhaps we are in the midst of a cultural shift towards Hatmaker's (2013) concept of "gender ownership" in which there is a space for these women to both emphasize their gender identity, emotional expression, and professional power. Why this cultural development has not come to fruition in these fields is explored in the final empirical chapter.

CHAPTER 6: FIELD-SPECIFIC PERCEPTIONS OF INEQUALITIES AND THE PERSISTENCE OF INDIVIDUALISM

The previous chapters analyze how STEM professionals enact impression management strategies using clothing and emotion control as a means of demonstrating credibility and belonging in their fields. I find that these strategies are not only commonplace, they vary based upon gender, level, and occupation. For example, whereas women in hard skills occupations in both fields carefully select clothing that de-emphasizes their feminine embodiment, women in leadership positions put effort into strict emotion management in order to maintain their credibility as capable leaders. Men describe engaging in few to no impression management strategies for establishing credibility in both fields. However, the most striking finding is that despite markedly different gender distributions and historical trajectories, discipline-specific differences for demonstrating professional credibility in the sample were rare. This chapter addresses this finding through an analysis of men and women's perceptions of gendered processes of exclusion within their fields.

The absence of strong distinctions for demonstrating credibility by discipline is even more unexpected given that research has established that women in engineering and other male-dominated or masculine gendered professions are much more likely to engage in extensive impression management (Hatmaker 2013). This study reveals that women in life sciences, a discipline whose practitioners are close to gender parity and in which the work task itself is considered to be largely gender neutral, are also engaging in extensive impression management strategies as part of their daily

workplace routines. This finding strongly suggests that the perception that job-related body work is essential for women in junior and senior positions is not exclusive to male dominated disciplines, such as computing.

Demographic differences between the two fields appear to have no strong relationship to women's perceptions of fit within the two fields. There are substantially more women earning advanced life science degrees and entering the life sciences industry than their counterparts in technology. Yet none of the women or men in the sample of life scientists recognized any distinct benefit to having more women working in the field. The cultures within both large life science and technology firms appear to be equally associated with the impression management dynamics identified for women in this study.

How then does one make sense of the similar impression management findings in both fields? A fruitful way forward, as this study demonstrates, is to understand men and women's strategies for demonstrating expertise and cultural fit at different levels as responses to their perceptions and experiences of their fields from within. This approach bridges the insights of structural accounts of gender inequality in STEM, which argue that gender scholars should focus their attention on workers' organizational positions and job categories, as well as cultural accounts, which focus on identifying "chilly" workplace climates that gradually push women out of STEM. Men's perceptions of their workplaces, male-dominated or not, are particularly lacking in the literature.

In this chapter I argue three points regarding the prevalence and source of the impressions management strategies identified among women in both fields in the

sample. The chapter is divided along these three interlocking claims. First, I argue that the gendered impression management strategies identified in my sample are not a reaction to the structure of workgroups or the content of STEM work itself; rather, they result from professionals' perceptions of where gendered barriers to advancement and inequalities are located. The interviews establish that women in life science perceive vertical segregation as the most salient gendered barrier to advancement in their field while technologists highlight their field's culture as being particularly hostile to women. In both cases women are accurately identifying the dominant processes of inequality present in each field, and both groups of women are using impression management strategies in response to these processes. Second, few studies capture men's perspectives of their fields, especially in private sector STEM organizations. I argue that despite the scarcity of women working in technology and the paucity of women attaining senior positions in the life sciences, men in both fields perceive their workplaces as gender neutral meritocracies. Men are largely unaware of or do not recognize the gendered barriers their women colleagues in the sample frequently identify. Men's perceptions are important for explaining why collective efforts to alter gender inequalities in these fields are difficult to implement. Third and finally, these two findings explain why women in both fields resort to similar individual impression management strategies over other collective activities that could potentially alter their workplace cultures and structures in significant ways. Their strategies reflect the narrowness of the individualism ideology that saturates both sampled STEM fields.

Accounting for Structural and Cultural Sources of Women's Underrepresentation in STEM fields

As discussed in the introduction to this study, researchers have found that cultural aspects, structural aspects, or a combination of both explain women's attrition from life sciences and technology (Glass et al. 2013, Koput and Gutek 2010, Smith-Doerr 2004).[1] But what has been largely absent from both lines of inquiry is an explanation of how these professionals reflexively react to their perceptions of these structural or cultural biases in their fields. Understanding these dynamics helps clarify why individuals select particular practices for navigating around gendered barriers, how perceptions of the source of gendered barriers shape these practices, and how these perceptions have implications for collective change. This chapter addresses how life scientists and technologists perceive gendered patterns of inequality in their fields, where they locate these patterns, and why they respond to these patterns in similar ways across both fields. The following section begins to address these questions in turn beginning with an analysis of the extent to which the sampled STEM professionals perceive their work as gendered.

Findings: Life Science and Technology Work is Interactive, Collaborative, and not Perceived as Inherently Gendered

The interview data provides no evidence that respondents perceive the workgroup arrangements in their workplaces or the content of life science and technology work as generating gender inequality. In addition, the structure of this work in which success is dependent upon cooperation among groups of dedicated

[1] This research focuses on how the structure of workgroups creates barriers for women's career progress or how bias and microaggressions towards women create inhospitable masculinize cultures that push women out over time.

stakeholders creates the impression of STEM workplaces that are far more egalitarian than popular depictions of these fields (Cheryan et al. 2013, Hüppauf and Weingart 2008, Losh 2010). Although technology work is more closely associated with masculinity and there are far more men than women working in the technology workplaces I sampled, both men and women working in the field largely do not locate gendered processes of inequality in their work tasks or teams. Life scientists similarly do not perceive the work they do in teams within their field as gendered in any way. This is a somewhat surprising finding given that surveys of women in these industries find that they frequently report that they have access to fewer mentors or opportunities for advancement, and they experience isolation (Ashcraft and Blithe 2016, Warren 2011). Indeed in both fields project tasks are distributed among large interconnected teams. I argue later in this chapter that the contradiction between the team nature of STEM work and the ideology of individualism that pervades these fields is significant for understanding why women engage in impression management over other forms of collective action.

Contemporary life science and technology industry work does not conform to the pervasive lonely genius stereotype surrounding it. The STEM workers I interviewed are all scientists and professionals with advanced specialized degrees. But contrary to the belief that advanced scientific work primarily involves long solitary hours in a lab repeating experiments over and over again (Ford 2006, Terzian and Grunzke 2007), in practice scientific work is almost never conducted in isolation. Since the 1960s collaborative research among groups of "team players with interpersonal skills" has been the hallmark of Nobel Prize winning discoveries (Jardins 2010:205).

Similarly, the stereotypes and images surrounding technological work that depict a single software programmer writing code into the small hours of the morning could not be farther from the contemporary reality.[2] The individuals I interviewed working in life sciences and technology, with very few exceptions, spend their days in constant collaboration building and reinforcing workplace relationships (Leahey and Cain 2013).

These professionals interact in labs, in meetings, and work on complex projects with their supervisors, colleagues, and direct reports. Life scientists doing basic research in the pharmaceutical industry, for example, work in teams running experiments in the lab. Principal investigators and executives in life sciences are in communication with their direct reports on a daily basis. The need to coordinate with other scientists and executives increases up the corporate landscape. Chief-level executives with advanced life science degrees are in constant communication with government regulatory agencies as well as the president and CEO of their organization. No one that I spoke with described her work as being detached from a myriad of larger interlocking projects or departments. So the assumption that scientific work is conducted primarily by independent individuals in laboratories does not capture the social reality of the industry. Tellingly, when I asked these professionals what they most enjoyed about their work, the first and second most frequent answers were the freedom to engage in collaborative scientific problem solving with colleagues and the experience of professional camaraderie respectively.

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[2] Software developers do occasionally have to commit to extended shifts, but these are usually infrequent and occur around significant new software updates or feature launches.

Technology professionals' work resembles that of life scientists in terms of the collaborative nature of the endeavor. All of the technical interview respondents in this study hold positions that require them to collaborate constantly either internally on work teams or externally with outside organizations. Information technology by definition deals with the integration of hardware and software systems which need to be able to "speak" to each other in order to share data. Technology professionals occupy a myriad of positions in this process, and with the advent of internet and cloud technologies, their work has become even more focused on managing the complexity of applications and hardware connected to networks. Most start-up biotechnology and technology companies, for example, routinely adopt flat workplace hierarchies coupled with flexible team-based working groups (Ridgeway 2011, Smith-Doerr 2004). Even software developers, who are often thought of as working exclusively on constructing complete software applications on their own, are in practice working on a team coding one part of a very complex larger application or system. This is not as surprising as it seems given that work in computing involves managing software systems and databases which involve the efforts of multiple teams often spanning multiple continents in the case of multinational technology corporations. Each of these teams of developers is typically managed by a software engineer who has moved away from creating software to managing the business side of program development.

In addition to the collaborative and flat workgroups described in the interviews, life scientists and technologists primarily did not characterize the work being done in their fields as gendered in any way outside of observable demographic differences. While some participants recognize that the work they do may align more closely with

men's interests on average, they do not locate the source of gendered barriers to women's advancement in widely held stereotypes that characterize their work as inherently more suitable for men than women. Both groups perceive their work as largely gender neutral with the exception of a few specific male dominated subdisciplines.

Life scientists most frequently characterize their field as gender neutral and the work itself as not having any gendered associations. Many of these perceptions come from the observation that there are increasingly more women than men earning degrees and entering the field. Shari makes this case: "I think life sciences as a whole is gender neutral. A lot of the people in HR and administrative work are female. So within life sciences, it's gender neutral. But if you break it down into departments then you'll see they get pocketed differently" (senior manager, middle eastern woman). Shari points out that she perceives her field as gender neutral but also identifies some horizontal segregation that occurs across departments. Brian, a research scientist, notes that "in terms of the science," his field is gender neutral (white man). Other life scientists highlight the equal distribution of men and women in life sciences as evidence that the field isn't gendered in any particular way: "I think the statistics is like at least 50% of people who get their degrees in biology are women. They're pretty well-represented" (Leslie, research scientist, white woman).

A few women and men in life sciences do identify their work as inherently gendered and therefore contributing to the stalled progress of women's advancement in this field. Two women in the sample note that they consider particular subdisciplines in science particularly masculine, namely electrophysiology and synthetic organic

chemistry, but that the life sciences overall are not gendered in any way. These women point out that some subdisciplines are outliers to the gender neutral frame due to the fact that they tend to attract more men and either involve perceived danger or work with dangerous instruments. For example, Nicole describes synthetic organic chemists as "the real studs of organic chemistry, if you will…. A lot of the things that they're doing, the reactions that they're doing can involve a bit of danger (research scientist, white woman). She claims that men are drawn to these subdisciplines. These are, however, minority voices in the sample. Moving on to the technologists, a similar pattern emerges.

Technologists also describe their field as gender neutral in terms of the work itself. None of the technologists identify particular types of work tasks or team structures that inherently favor men over women in their field. But both men and women in the sample view technical work as being more closely associated with men's interests and that the field is male dominated:

> I think just that the technology, I mean, just the technical, deep technical aspect of it is generally considered more male-oriented. Because it's not that women aren't interested in computers, computer programming, that kind of thing, but it's not salesy or flashy. It's not like retail, for example, and it's not design. And I think with women, it doesn't resonate as much.
>
> (Carla, VP, white woman)

A few men and women in the technical sample, like Carla, draw upon essentialist notions of women and men's differing interests in computer work. These individuals argue that men dominate their field because women "aren't necessarily attracted to being passionate about those things" (Erin, software developer, white woman).

However, in their view that association does not also translate into women's decreased ability to excel in the work.

The majority of technologists in the sample also agree that the field is male dominated but that the work is gender neutral. "Yeah, it's just there's a lot of men in the workplace and not a lot of women, but there's nothing that I can think of that's specifically very gender-oriented (Victoria, software developer, white woman). Other technologists emphasize that contemporary technology organizations select men and women applicants for technology positions based upon capabilities regardless of the fact that most technical positions have been almost exclusively occupied by men. "When I ran a lab in one of the sites for a development lab, the thinking is the work is not male or female, but who has the most capability…. I think these roles are looked at more traditionally as male-oriented roles, but now it's who the best candidate is" (Nancy, director, white woman). Given that participants perceive that neither the structure of workgroups, the requirements of their positions, nor the content of their work leads to gendered barriers to advancement, I continue this analysis by identifying differences in whether and where life scientists and technologists identify the source of gendered barriers in their respective fields.

Life Scientists and Technologists' Differing Perceptions and Experiences of Bias in their Fields

Distinct differences by field begin to emerge in the sample in terms of where women in each field locate the source of gendered barriers to advancement. The data reveal that women in life sciences primarily perceive a glass ceiling that prevents their promotion into the highest positions of their organizations. In contrast, women in

technology point out that they are frequently confronted with uncomfortable interactions with male colleagues and microinequalities in their workplaces that make it more difficult for them to achieve cultural fit in technical positions. Very few of these women identify vertical segregation as an important barrier to their persistence and advancement. These findings demonstrate that women in the life sciences and in technology are correctly identifying the larger trends of gender inequality that are most prevalent in their fields, and women in both fields are engaging in impression management strategies as a reaction to these different perceived inequalities.

Instances of overt sexual harassment are extremely rare in both sampled groups. This finding mirrors a larger survey of 1,500 women in technology which finds that direct sexual harassment is the least frequently reported perceived barrier to women's career advancement (Pluralsight 2016). Only two women in the sample, both technologists, report experiencing outright harassment during their tenure. In both cases the harassment occurred earlier in their careers in the late 1980s or early 1990s. As an illustrative contrast to the more subtle biases women shared in the interviews, Melissa describes one of the working environments she endured before being promoted into a different division early in her career:

> Our boss used to have posters of women wearing bikinis in his office, and he was also very aggressive. He used to just cuss like crazy in meetings and just sort of pinpoint one person and just pick on that one person, complete bullying. And also there were business trips where I went. There would be a group dinner and people would blatantly speak about things sexual in nature, which is prostitution, et cetera, multiple times and on multiple occasions. It was very freely discussed.
>
> (senior software developer)

The large majority of scientists and technologists do not have matching examples of blatantly sexist behaviors and sexist environments. Instead, women in the sample more often report experiencing and observing more subtle instances of gender bias. Women in each field, however, also predominantly single out a specific salient mechanism that explains the lack of diversity either throughout their field or within the executive ranks of organizations within their field. I examine each of these mechanisms in the following section.

Perceived Vertical Segregation Among Life Scientists

32% of the sample of women in life sciences describe a specific structural barrier in their field which prevents women from reaching the highest executive positions.[3] They identify a glass ceiling in the upper echelons of their organizations as evidence that their field disadvantages women and is not a meritocracy. Among senior women this perception is more pronounced. 60% of this group report a glass ceiling either in their organization or in the life sciences industry. While women in life science generally agree that their field is more welcoming to women due to their much greater representation in lower level positions, they recognize that women rarely achieve top positions across their industry. Jennifer, a young senior-level life scientist, recounts that at her company the glass ceiling is both perceptible and plainly visible. VP and chief level executives receive exclusive wall-to-wall glass window offices as a perk of their rarefied positions. These glass offices are surrounded on all sides by cubicles for

[3] 47% of the sample of women in the life sciences agreed that there is some form of gender bias in their organizations without specifying where the bias is located.

more lower level executives. She remarks that only men occupy the glass offices while the cubicles encircling the glass offices are mostly occupied by women such that it's difficult not to notice the contrast (interview notes). The wall-to-wall glass that literally allow women in management to view the absence of women executive's at the top of Jennifer's company is symbolic of the persistence of glass ceilings for women in life sciences. Other junior life scientists who were recently promoted into management describe this trend as being more subtle:

> If you look at my functional line, there are no women on the leadership team. There was one, but she left. She got an opportunity at another big pharma company to head up project management there. So it's just very, very subtle. And I didn't even notice it until a few years ago when I got into a more senior position, and I think I was perceived more as a threat.… I mean, it's very intangible and you can't really put your finger on exactly what it is other than when you look at all these senior management committees, there are no women on them."
>
> (Monica, director, white)

These perspectives on a glass ceiling for women in life sciences are reiterated among senior women as well. Women in top positions are better able to assess this trend in their organizations because they routinely interact with the heads of company departments and divisions. They point out that women occupy a sizable proportion of director positions, but women in chief executive officer, senior vice president, and vice president positions are rare. Deborah, a life science VP, notes that while she sees more women working in pharmaceutical regulatory affairs today, very few women serve as chief regulatory affair officers for the companies that are part of her multinational professional organization. Angela, a research life scientist on the cusp of moving into management, shares a similar viewpoint:

> I see a lot of women in my field. The one thing that I don't see that much is women at the very top executive level. They exist; they are there. Women have broken the glass ceiling and are CEOs and truly executive level, but it's not as commonplace as one would hope.
>
> (asian)

In addition to the gender imbalance in top positions at life science firms, women point out the perception that they are less likely to be considered as technically proficient. Consequently, they are encouraged to move out of technical positions and into non-technical ones as they advance in their organizations. Susan explains this observation:

> I think in companies there's a perception that women advance in certain functions more than in others. Where I've worked before, R&D is typically dominated by males. At this particular company, my peers, we work for the VP of R&D. I'm making this number up, but I'm in the ballpark. He has eight direct reports, of which one is female, and that would be me. And I think that from a functional standpoint, quality, regulatory, technical support, those are the ones that typically have women that move up higher in the ranks. And things like R&D and manufacturing are typically more male dominated….There are women at the director level. They just don't rise up to the VP level. And on the R&D side, a lot of times the companies, the CEOs and the senior VPs are male. And I don't know, maybe it has to do with the thinking that there's more stability around having males in the workplace because they're not going to be pulled in for family obligations as much as women.
>
> (life sciences director, white)

Susan proposes a theory for why departments appear horizontally segregated in her organization, but she also points to the vertical segregation she observes at other organizations as well. Her remarks point to a perceived bias against moving women into management roles due to the belief that they will have child care responsibilities that will take them away from the demanding responsibilities of top positions. Here again life scientists are noting a glass ceiling coupled with stereotyping. This

observation that women appear to be shuffled into particular types of work is an especially strong finding across both fields. The departments that Susan lists as having more women are staff or support departments that do not directly contribute to producing revenue.

The more frequently shared perspective that there is a glass ceiling specifically for women in life sciences in the sample, however, is supported by larger assessments of the field (Joy 2008, Peters and Lane 2015). Women are better represented in the lower and entry level positions throughout the life sciences. 90% of board seats in U.S. mid-size life science companies are occupied by men, and women account for only 21% of management teams (Liftstream 2014).[4] What's significant in these perceptions of vertical segregation in the life sciences is their absence among women in technology.

Technologists rarely bring up the dearth of women in top positions in their organizations; rather, they frequently experience their male dominated workplace environments as difficult. Women are even more underrepresented in leadership positions in the heavily male-dominated technology industry than in life sciences. Yet women in technology in the sample find that they experience more uncomfortable interactions with men colleagues than concern with stalled career advancement. Navigating their workplace climate is a more immediate concern for them rather than the unequal rate at which women are promoted to executive positions.

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[4] The proportion of women in management teams drops to 15% among the ten largest life science employers.

Perceived Chilly Climate Among Technologists

Among the technologists, 83% of the women identify moments from their careers in which they perceived they were singled out or treated differently due to their gender. Junior and senior women in technology often note that they must navigate more uncomfortable and inappropriate personal interactions with men colleagues as a consequence of both women's low representation in the field and a culture that highlights their difference from men. These interactions further the impression that women in technology are expected to literally labor to be perceived as competent:

> I think women have to try harder, and I think it's more work. And as a result, we lose more people in that area. You know, it's not that they don't want to work harder. They're definitely willing to do that, but it's harder to gain acceptance in the male population for that.
>
> (Carla, VP, white)

The "more work" that Carla references includes impression management, which has been explored in previous chapters in this study. This additional labor is also coupled with unwanted interactions from male colleagues that create uncomfortable workplaces for many of the women in technology in the sample. These inappropriate interactions are attributed to the masculine culture within technology organizations. Victoria explains her perspective on how these interactions affect women in the field:

> I think it's harder to stick around because it is a very male dominated, masculine kind of culture. So I think a lot of times you hear about incidents where someone's been inappropriate. I think it's unfortunately the norm that it happens to pretty much everyone. Like people are inappropriate and you have to handle it. And I think that that's daunting. And especially you don't want to face that for the rest of your life. No one wants to face that. So I think that can kind of be a barrier to people even being in it, and especially if you're in a workplace and those kinds of things are happening and they're not being handled appropriately, either from the woman who it's happening to or on the other side, managers and stuff like that.

(software developer, white)

As Victoria points out, experiencing multiple inappropriate interactions with male colleagues makes it more difficult for women to persevere in technology. She also alludes to managers or human resource departments that often do not handle harassment complains "appropriately." Many other women in the sample describe colleagues' behaviors and interactions that highlight the regularity of these dynamics. One software developer, Erin, recounted an "all-hands" department meeting in which there were not enough chairs in the room for everyone to sit in. One of her male colleagues offered his own chair to Erin and would not let her decline the offer. She explains, "I felt really awkward about that too because, on the one hand, I know that he was trying to be polite, so I really don't hold it against him. But it made me feel like everyone was staring at me." Yet another software project manager, Alexus, described meetings in which she would be the only women in the room and the only person who experienced being repeatedly talked over. She reflects on this experience: "That could be my personality. That could be something else other than being a woman because they probably certainly do it to some guys. But I feel like it's more so with me, right? So I internalize that. It could be a number of things, but I feel like it's because I'm a woman."

In both Erin and Alexus' recollections, the unwanted behaviors either made them feel singled out according to their gender or suspicious that their gender was the explanation for the uncomfortable interaction. These subtly uncomfortable and negative interactions do not only include silencing or misguided acts of generosity, some of these interactions involve unwanted romantic overtures and collegial

gatherings that are negatively misinterpreted by colleagues. Michelle, a technical program manager, relates an example of how the culture in her workplace creates networking difficulties for her:

> I think men have it easy in that I can't just go get a beer with a guy without it being misconstrued. I can't go out after work with one guy alone and have it not be weird. But men can. Sometimes if a guy comes into town and another coworker on my team wants to take him out, I can go if there are two people. Men can go if there is only one other guy because it's not weird then. So I think you have a level of camaraderie or connections that women can't have unless they work at it.
>
> (white)

Michelle states that if she met with any of her men colleagues individually after work it would lead to gossip about her potential romantic involvement with her colleague. Consequently, she finds that it's much more difficult for women to form workplace allies and support groups in her field. This form of after-work networking is essential for establishing solidarity. As Michelle points out, this form of networking is made more difficult by the assumption that women who spend time with men colleagues are seeking out more than just camaraderie.

Although I have shown that women in technology find it more difficult to network with men, men's own unwanted romantic advances towards women in the sample also support the claim that women in technology face a workplace climate that frames them as outsiders who are different from men in similar positions. These advances contribute to the impression that technology workplaces are proving grounds for heterosexual men. Megan explains,

> I think the weirdest thing that my coworkers don't have to deal with or the most awkward thing is being hit on. I'll get a lot of inappropriate comments from guys. Never my direct team. People I work with or people I see I think a lot of times men, especially ones who haven't had

> a lot of experience with women take being friendly as a sign of interest when I'm just trying to be friendly. And so I think that gets misconstrued a lot and you end up in kind of awkward situations.
> (software developer, white)

Another woman in software development recalled having men in her office routinely follower her into the women's restroom because they wanted to have a personal conversation with her (Melissa, asian american). These microinequalities, small discriminatory events or discriminatory behaviors, often go unnoticed by their perpetrators but have lasting effects for women who experience them (Rowe 1990). Previous surveys of women in STEM find that 17% of women in science and technology organizations have experienced unwanted attention as a result of wearing feminine attire or accessories (Hewlett et al. 2008). Over time, microinequalities introduce stress into women's working relationships and slowly chip away at their professional role confidence (Seron et al. 2015).

This finding correlates with the data in this study on women's emotional labor in which they explain that they need to develop a "tough skin" (Jennifer, life scientist) in order to persevere or experience difficulties managing their self-doubts during meetings and interactions. For example, one software engineer reflected on how she ruminates on whether or not to share her ideas with colleagues:

> The way I interact and pitching ideas. I always sort of doubt myself, and I think it might come from the whole gender issue. Like I'm never sure whereas I think some people can just blurt out ideas that they maybe even didn't even think through a lot. And I think I tend to sort of over-think different ideas to make sure that it really is a good idea.
> (Melissa, software developer, asian)

Individuals develop different preferences for when and where to share their ideas. However, Melissa describe her own self-doubts regarding sharing her ideas as a

"gender issue" rather than a personal preference. Women in technology leadership positions who have succeeded past the distinctive mid-career attrition point have more perspective on these self-doubts for women in their male dominated field. These women point out that these doubts occur more frequently among younger women in their field:

> I think we [women] second-guess ourselves all the time. So given a job opportunity, and this has been me in my past, given a job opportunity where it's a stretch for me. I go gosh, you know what? I don't have the base skills for that job. Like the one I mentioned earlier, right? The very technical job. I said, "No, I don't think I can do it." I mean, we lack the confidence in ourselves. We like to know everything before going in. And again, in generalities. As opposed to men who say, "Whoa, a stretch. Let me go. Yeah, I'm going to go do that." So I think that we second-guess ourselves quite a bit in confidence.
>
> (Carla, technical VP, white)

Women in technology also identify the funneling trend that life scientists describe in which women with training and aptitude for technical line work are gradually pulled into non-technical or staff positions. Technical women repeatedly single out the preponderance of women in project management positions in their field as the outcome of the subtle encouragement women receive to make this career move. Project management positions mirror the support and quality assurance positions that life scientists identify as being dominated by women in their organizations:

> I interned as a software engineer and then my manager from that was like, "Hey, I think you'd be really good at product management. We take a lot of people." I was like, "Okay, that sounds cool." And so that was one of the first weeks of my software engineer internship. And then I get into the PM internship and my manager at that time was like, "Hey, I think you would be really good at product marketing management." Which is completely not technical. It's as not technical as you can get. And so every time that I got into an internship within the first few weeks, I was suggested to join a less technical more soft-skilled role…. It's funny because it seemed as if every role that I got into, the person

> who was in charge of me was like, "You're not technical enough. You should move to something more girls do."
>
> (Megan, software developer, white)

Megan's interview reveals a career history of responding to suggestions that she might prefer to work in people-facing positions over her technical position as a software developer. Although she has been working in her developer position at a software company for just three years, she has been offered to switch positions two times. These offers to move within the organization come despite the fact that her performance as a developer is strong, and she has never indicated she is interested in working in any other position. Nancy, a technical director, outlines a similar observation to that of Susan in life sciences regarding a tendency for women to be over-represented in non-technical positions:

> We do see more gender in certain type of roles. For example, we might see them less in the technical roles. Women are still not the leader in the technical roles. It's not 50-50, so there is less women, but the growth has been there and has progressed. And you see in some other roles, like marketing and communications, there's more women, for example, in that field versus research and development, maybe for example.
>
> (white)

Megan and Nancy's recognition that women occupy fewer technical roles in their organizations reveals the specific interactions with decision makers that influence women to move out of technical positions. These interactions over time may also bolster the perception among these women that their professional identities and abilities as technologists do not fit with other's evaluations, thus weakening their professional role confidence (Cech et al. 2011). In addition, stereotypes about women being inherently more fluent in soft skills, such as empathizing and relationship

building, are likely influencing the frequent encouragement of women to move into support positions.

There are, of course, women who do prefer the customer-oriented product and team support positions outlined in the previous excerpts, but these findings point to gendered processes that filter women into these positions due to the belief that women are not as technically proficient as men. Women in technology brought up these interactions more often than those in life sciences. But none of the men in the sample of both fields describe instances of being encouraged to move out of their technical positions at any point. The greater frequency of these "career-shifting" interactions among technical women contributes to the perception that women in these positions are either unqualified to persevere in them or that they would be happier in more socially oriented positions.

These perceptions of barriers to women's are not universal, however. 53% of the sampled women in life sciences report not being concerned with or experiencing any instances of gender bias in their field. Tina, a director, explains, "I never even thought about the gender matter because there never had been any incidents that gender mattered or ever occurred to me." Some of these women point out that they have never felt isolated in any way because of their gender. Others, such as Nicole, a senior research scientist, note that their opinions hold equal weight among colleagues: "I've never felt as though I've been isolated or identified by my sexual gender type. If I make a suggestion, and it's not a completely stupid suggestion, it's taken just as seriously as any male colleague of mine." These scientists point out that they never have been given a reason to think that their gender mattered in any way. The

conflicting perceptions among the women in the sample indicates that there is a diversity of experiences within each field, but just under half of the women in the life scientist sample report experiencing some form of gender bias. And only 13% of women in the technologist sample combined report having never witnessed gender bias in their workplaces or having never personally experienced gender bias in their workplaces.

Men Perceive their Fields as "Gender-Neutral" or "Women-Promoting"

These perceptions of distinct sources of gender inequality among women in both sampled fields begs the question of how men perceive the climate of their workplaces. Men are inextricably involved in the perpetuation of the cultures within both fields. Are they cognizant of the particular microinequalities that women experience? Does the relatively high proportion of women working in the life sciences coincide which men in this field being more aware of and sympathetic to the experiences of their women colleagues? These questions that focus on men's perceptions of their STEM workplaces are largely absent from the literature. In the penultimate section of this chapter I analyze men's perceptions of gendered barriers to advancement in their fields.

I argue that men in the sample perceive their fields as meritocracies in which workers are all justly rewarded for their professional skills regardless of their individual characteristics. What's surprising in this finding is that both life science and technology men view their fields in this way. Despite the fact that women occupy almost half of life sciences positions but significantly fewer executive positions and the

fact that there are strikingly few women throughout the entire technology sector, men from both fields in the sample view their workplaces as essentially gender blind in terms of hiring and promotion decisions. This perception of a field-wide meritocracy elides the documented and perceived patterns of inequality that women report within both fields.

Men in both fields evince an almost opposite pattern to that of the women in their perceptions of whether or not their fields are structured in ways that prevent women from entering or advancing. This incongruity between men and women's experiences within the same fields is a common theme throughout this research and is present in the previous two chapters on impression management through emotion control and attire. The mismatch between the gender distribution men observe overall and their perception of barriers to women's career progress is stark. While the majority of men in life sciences and technology agreed that women are underrepresented in their fields and in particular positions, these men also overwhelmingly perceive their fields as gender-neutral. Some of these men also believe that women receive preferential treatment in hiring and promotion decisions in their fields. They do not attribute the overall dearth of women in technology or the dearth of women in executive life science roles to cultural and social structures within their fields.

Men's responses echo the women in the sample in terms of perceptions that women cluster in particular departments or positions within their organizations. Software developers, such as Terrance, make note that while software development is male-dominated, women in the field tend to cluster in testing and quality assurance positions. The responsibilities for developers in these positions are to ensure that

coding processes are established and meticulously followed and to test existing code for bugs. QA and testing are essential parts of the software development process, but both positions are minimally creative support roles. QA and testing developers spend their days evaluating original code created by other developers. The men in the sample acknowledge that the creative role of the developer is male dominated and more likely to be associated with men; however, they characterize this association as coming from the fringes or outside the field instead of within the developer community itself:

> So this is all within the field, but if you have to be on the outer edges of the field in kind of that middle management layer where you have to interact with upper management and with other departments, they will probably respond more to a male programmer than a female programmer just because it's kind of viewed that way. Programming—it's such a guy nerd kind of thing, that I think a female programmer, outside of the programming world it's still such an anomaly that I don't know if it would be viewed as strong, so to speak.
>
> (Daniel, software developer, asian)

Daniel goes on to argue that within the programming community it is understood that women are equally talented as men and can also create good code, but this excerpt from the interview alludes to a broader stereotype among management and those outside of software development that women are tokens or "anomalies" in these positions and are therefore not routinely recognized for their coding abilities. However, many more men perceive a complete absence of obstacles for women interested in entering and persisting in the two sampled fields rather than the persistence of stereotypes that cast their abilities in doubt.

Men in both fields cite the fact that they know women in senior positions in their workplaces as evidence that bias against women is not an ongoing issue in their

field. David, a senior life scientist, exemplifies this viewpoint that barriers to women's advancement do not exist:

> I don't see any, no. I can name lots of females that are in positions at many different levels above me. One of our VPs of drug safety is a woman. She's incredibly bright, competent, and she's probably a role model to others. And there's a lot of other women up the chain of command. So as long as they have the right education, training, expertise, and motivation, I think that the sky's the limit for them.
>
> (white)

Nicholas, a young data analyst, makes a similar case for the existence of equal opportunities for women's advancement in technology:

> I mean my boss is a woman and she's a senior level director, and there are other senior level directors that are women. And I work really closely with the accounting manager and the controller, and they're both women as well. They do really well for themselves. They're really well respected as well.
>
> (white)

Obviously the workplaces for each participant in the sample will have variations in the number of women in leadership positions. But the large disparity between most men and women's perceptions is a surprising finding. With few exceptions, women in the sample point out an evident dearth of women's representation in senior executive positions as further evidence that their field continues to pose barriers specifically to them.

Men's assessment that women are well-represented in leadership positions in their field is bolstered by a second perception unique to only the men in the sample. They contend that women are actually favored in promotion decisions because they are frequently underrepresented in leadership roles. The two contrasting perspectives among men—that women are not significantly underrepresented in senior positions and

that women are preferred for these positions because so few apply for them—helps explain why men might be less sympathetic to workplace interventions that aim to recruit more women into leadership positions.

Men in the sample suggested that there is a widespread preference for women in open positions due to their scarcity in applicant pools for leadership positions.[5] This purported preference adds weight to the impression that women are not at any disadvantage when vying for positions:

> When we advertise for positions, depending on the level of position that we advertise, we get more male applicants. So, there just aren't that many [women]. We look for them because we recognize that this is a problem in the field. So if you want to call it affirmative action or whatever you want to call it, there's a certain level of that going on, sort of subconsciously and maybe even at some level consciously, but we'd never admit to that because it's not necessarily legal.
>
> (Kevin, life science VP, white)

Kevin is in a very senior position. So he possess a unique vantage point and career experience from which to reflect on whether or not there may be a structural issues preventing the recruitment of women into higher level positions. He confides that candidates who are women are actually given priority in hiring decisions. But even young software developers perceive a general preference towards hiring women, all things being equal:

> It does feel like an equal playing field, but women are pretty scarce. So, actually if anything, if there's an equally qualified woman, it's almost

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[5] While I could not verify whether women were given preferential treatment for hiring in the organizations in the sample, there is some experimental evidence that scientists prefer female applicants for tenure-track faculty positions over equally qualified male applicants (Williams and Ceci 2015). However, this finding is based on hypothetical academic hiring scenarios rather than actual hiring decisions. Additional studies are needed.

> like an equally enthusiastic woman for a position, it could actually be a benefit because it is a predominantly male industry so employers and teams would want a woman to add a little diversity to the team.
>
> (Daniel, software developer, asian)

Daniel recognizes that hiring more women would create a desirable diversity advantage for an employer because the overall demographics of his field tip in men's favor. But he still conceives of the hiring process as an equal playing field in which an equally qualified woman man or woman would not be accorded any advantages or disadvantages based on their gender.

Other men concur that a job candidate's gender is not a consideration when managers make hiring decisions:

> I think it's pretty even in terms of like if there's a candidate that's female and there's a candidate that's male, there's not going to be a preference of one over another just based on gender. But I think there's just fewer women that come into the field, and that starts in elementary school.
>
> (Brian, research life scientist, white)

The perceptions that candidates are hired based on skills, that life sciences and technology workplaces are gender neutral, and that women are frequently afforded advantages in hiring decisions are prevalent among the majority of men in the sample. These perceptions among men are connected to a set of explanations among men that a lack of gender diversity in both fields is the result of women's individuals choices to not pursue these fields of study.

When men in the sample identified causal mechanisms for women's underrepresentation in their fields, they most frequently designated supply side dynamics as the main contributor. Men in both fields contend that the historically low proportion of women individually choosing to enter their fields has lead to fewer

women in leadership positions and in their workplaces in general. The present dearth of women in leadership positions in these fields is explained as a reflection of the lagging number of women making their way into industry positions over the last few decades. Jeffrey's explanation exemplifies this conclusion:

> I think the people who end up doing the kinds of things I do tend to have strong math backgrounds, math aptitude, physical sciences, engineering. And I think you just look at the numbers, the numbers of people choosing to go into those, getting that training. It seems like there's just more men getting that training than women.
>
> (technical senior scientist, white)

Mirroring Jeffrey, Brian reiterates a comparable point: "I think it just goes back to a much earlier stage where there's just fewer women in science and math and that just fewer of them enter into the field" (life science research scientist, white). Both of these men's comments align with the "leaky pipeline" hypothesis that attributes women's lack of representation in a given field to a scarcity of qualified women candidates rather than social and cultural structures that make it difficult for women to enter and persevere.

Other men explain that the industry itself does not have a problem with bias against women; rather, women who are considering a career in STEM are likely to anticipate the potential for bias against them and thus choose not to pursue a career in the field. Charles, a life sciences engineer, comments that he believes that women are preventing themselves from entering his field:

> I think the biggest barrier to advancement is just the lack of a kind of a mentor and kind of a track record. Especially on the engineering side, it tends to be male dominated, and so I think the very fact that it is male dominated tends to be self-perpetuating to a certain extent. So I think that's the biggest barrier is more not that women actually would be

> treated differently, but they're afraid that they might be so they may choose other fields instead.
>
> (white)

Charles' perspective on the issue of gender imbalances in his field begins with the statement that women lack adequate mentors. But he shifts his explanation to that of a lack of initiative on the part of women considering his field. He explains that the most significant barrier to women entering into his field are women's collective fears of potentially being discriminated against while working in a male dominated field. Rather than structural barriers, Charles identifies internal fears and expectations among individual women as preventing them from choosing engineering as a field of study. According to Charles, women's fear of discrimination creates the false impression that there is actual discrimination against women in engineering. This particular characterization justifies the preponderance of men in engineering by focusing on women's personal failings and inability to see past stereotypes. Women are voluntarily opting out of science careers in favor of others.

Finally, when reflecting on the specific disadvantages frequently cited by women in the sample, some men explained away these perceptions by pointing out that what women in the sample describe and experience is what their field looked like in the past, but it does not characterize the reality of the field today: "If you asked me that question 10 years ago or 20 years ago or something, like a long time ago, maybe. But as of now, I don't see a whole lot" (George, software developer, asian). George relates that his field no longer discriminates against women and suggests that such discrimination was not pervasive even in the field's distant past.

These findings among men are especially illuminating given the limited research thus far on men's perceptions of cultural and structural barriers within STEM fields. The findings also help to explain men's collective responses in the few existing surveys that measure technology employees' perceptions of their workplaces. A recent survey of over 140,000 technology workers, for example, finds that 80% of men compared to 40% of women believe there is equal opportunity for both men and women in their workplaces. Just 13% of men agree that there is bias against women in technology companies (PayScale 2016). [6] Other annual surveys of Silicon Valley CEO's and CTO's find that men are almost nine times more likely than women to perceive their field as a meritocracy, and 80% of women believe that competence is not the primary route to success (Lafrance 2016). Recent studies have captured the behaviors and discursive practices that women use in academic STEM in order to navigate male-dominated workplaces and establish cultural solidarity, but these studies do not capture the perspectives of industry scientists and those of men specifically (Bird and Rhoton 2011). In addition, studies are often more concerned with the men's exclusionary behaviors rather than their impressions of gendered barriers within their fields (Blickenstaff 2005, Bystydzienski and Bird 2006, Rosser 2004).

The findings in this study that men perceive their fields as gender neutral, free of gendered barriers to advancement, and in some respects more favorable to women than men are important for explaining the persistence of gender inequality within these fields. Most men in the sample perceive their workplaces as meritocracies in which

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[6] A mere 5% of men in this particular survey reported that they believe their own workplace has a problem with gender discrimination.

individual issues are framed as personal failings rather than the results of social and cultural structures.[7] This finding is particularly surprising given the large demographic differences within the two sampled fields in this study. Despite the significant dearth of women in technology workplaces, men sampled from these organizations perceive unique advantages and no significant barriers for women working in this field. Men in life sciences largely share their technology counterparts' perspective even though women are acutely underrepresented in leadership positions within their field. It stands to reason that if men perceive their workplaces as fundamentally different than their women colleagues, men are less likely to alter their workplace culture or support structural initiatives that promote gender diversity and inclusion. This perceptual gap between men and women also helps explain why women frequently report feeling isolated from their men colleagues.

Conclusion

To summarize the preceding findings, life scientists report that they recognize that very few women occupy top leadership positions in their organizations, but they do not point to specific cultural or structural interventions that would rectify this disparity or that help them personally overcome this imbalance. Women life scientists use impression management in order to signify that they are capable leaders deserving of promotion in response to the perception that few women ever break through the glass ceiling within their field. Women in technology, in contrast, identify a field

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[7] Cech and Blair-Loy (2010) find that a sizable proportion of women executives in STEM also rely on meritocratic explanations for explaining women's slow advancement in these fields.

culture and interactions with colleagues that frequently make them feel like outsiders in their field. These technologists engage in impression management to demonstrate solidarity with a masculine culture that frames them as outsiders. In addition, men in both fields perceive their workplaces as gender neutral meritocracies in which barriers to women's advancement do not exist.

In both fields women perceive that they have only a limited range of individual-level tools with which to navigate these sources of bias in their workplaces. Thus the glass ceiling in life sciences and the chilly climate for women in technology create the perception for women in both fields that individual impression management strategies are necessary for persistence and advancement. Given these findings, I argue that men's perceptions of their fields further disadvantages women. Additionally, insights from relational theory illuminate why women in both fields frequently rely on individual impression management strategies rather than collective workplace interventions.

The findings on men and women's disparate perceptions of their field reveal that women are uniquely disadvantaged in terms of collectively addressing the gendered inequalities they experience in their workplaces. The evidence gathered in this study indicates that men who share the perspective that women face gendered barriers to advancement are few and far between. Without a substantial group of men allies that share a similar perspective, women lack a potential broader workplace support system from which to mount a meaningful challenge to the structure of their organizations. Indeed, research on STEM academics demonstrates that women more often address discrimination and microaggressions on an individual level through

company HR representatives or through negotiations with direct supervisors than through employee affinity groups (Rhoton 2011). The dearth of allies for women further isolates them in their workplaces in more subtle ways as well.

The lack of men who share women's perceptions further supports impression management activities among women because men's shared perspective that their workplaces are gender-neutral or woman-promoting puts the onus for change upon women alone. Men largely deny the existence of gendered barriers for women in their field or they perceive specific advantages that women have over men in their workplaces. There is an assumption among the men in this sample that both fields are in fact more favorable to women than men. Taking this particular framing of these workplaces at face value, if women are experiencing difficulties managing cultural fit or achieving top level positions, then it is women who need to change in order to succeed and not workplaces themselves. Women's lack of advancement is implicitly framed as an issue of women collectively being unable or unwilling to put in the effort to succeed in their workplaces. Conceptualizing STEM workplaces as gender-neutral meritocracies precludes efforts to implement broad structural and cultural interventions.

Indeed, these findings support prior research demonstrating that women frequently use a discourse of individual choice to explain personal experiences of gendered disadvantages (Simpson et al. 2010). Conceptualizing STEM workplaces as gender-neutral meritocracies precludes efforts to implement broad structural and cultural interventions. In addition, previous research finds that in organizations which promote themselves as meritocracies managers are more likely to favor men over

equally qualified women (Castilla and Benard 2010). This "paradox of meritocracy" in which managers believe they are being objective and thus do not interrogate their own biases can be linked to the responses among men in this study. These men frequently claim that hiring and promotion decisions are entirely meritocratic, suggesting that their employers' organizational cultures promote meritocratic values and beliefs.

Women in the sample do not typically share the view that their fields are gender-neutral meritocracies that are more favorable to women than men; nonetheless, they rely on individual impression management strategies as flexible individual solutions to the personal difficulties they experience in their positions. These individual strategies enable women to adapt their professional image, which is crucial for establishing cultural fit and professional credibility. But these strategies ultimately elide the structural and cultural barriers that collectively slow their progress and create the impetus to engage in impression management to begin with. Impression management may be shared across women in the sampled fields. However, each woman who engages in it does so ultimately on her own continuously either through deciding on particular workplace attire to wear or avoid or through deciding which emotions to reveal and conceal from colleagues on a daily basis. While women are able to exert limited agency around their impression management strategies by avoiding those that minimize feminine embodiment, they ultimately engage in these strategies because of workplace cultures and interactions that cast women as outsiders in their own field.

Women also have access to a very narrow repertoire of impression management strategies from which to draw upon. They can make the decision to figuratively

disguise themselves as men by downplaying the feminine self presentation styles that colleagues and supervisors interpret negatively. Or they can selectively embrace feminine self presentation styles, but in doing so they risk backlash effects in the form of not being considered effective leaders, not having their opinions heard, and not having their work taken as seriously as their men colleagues. In both cases women must walk a narrow line between failing to do femininity and failing to enact a normative professional identity. Both of these individual-level strategies ultimately entail losing aspects of identity, body, and personal authenticity for the sake of cultural conformity.

Insights from relational theory further explain the findings in this chapter in regard to the role that culture plays in curtailing agency and social action for both women and men. As discussed at the beginning of this study, relational theory conceptualizes agency as inseparable from the dynamics in which it is embedded (Emirbayer 1997). In addition, culture can constrain and enable social action (Emirbayer and Goodwin 1994). Both men and women in this study adhere to a common hegemonic discourse of individualism which circumscribes particular forms of agency and opportunities for structural change. This individualism discourse traps both men and women in a shared impoverished cultural understanding of inequality within their fields.

Women's individual strategies for self presentation and men's adherence to meritocratic perspectives of their workplaces are both reflective of the individualism that saturates these fields. Men perceive their workplaces as valuing individual workers based on their merit. They do not distinguish broader cultural and social structures that

perpetuate inequality for women and minorities in their fields. Women in the sampled fields struggle to be seen as professionally capable, and in doing so they rely on individual strategies in order to overcome perceived structural barriers. Both groups in turn experience shared difficulties seeing past the individualistic frame that undergirds both perspectives. I consider the implications of the supremacy of the individualism frame in the sampled fields in the following conclusion to this study.

CHAPTER 7: CONCLUSION

This case study investigated how women and men in private sector STEM organizations engage in impression management strategies in order to establish their expertise and belonging. It explored the lived experiences of life scientists and technologists by focusing on how they establish their professional identities among colleagues and the cultures embedded in their workplaces. I demonstrate that these strategies primarily center on attire and emotional expression. The impression management strategies are also embodied and vary by gender in often striking ways. Women in both fields, despite their divergent gender distributions, engaged in many more intentional strategies than men in both direct report and managerial positions. This additional and largely invisible labor is difficult for women to achieve and burdens both their professional development and their accomplishment of professional identities.

The following section briefly summarizes my findings in further detail. Next, I discuss the implications of the findings, focusing on how body work is hidden in plain sight in STEM workplaces and is patterned by gender. In addition, I clarify how impression management among women is especially onerous and contributes to their attrition from STEM careers. I then offer policy recommendations for addressing gendered processes of exclusion in STEM that are based on the research findings. These recommendations focus on de-emphasizing gender associations within both fields. Finally, I reflect on the limitations of this study and propose avenues of future

research on gender, body work, and organizations. This research agenda highlights the benefit of exploring the intersection of biases that target physical appearance.

Impression Management and Individualism in STEM

Life scientists and technologists associate their workplace clothing choices with their professional identities. Gender schemas influence this presentational labor in that women in more hard skills or male dominated positions perceive the need to carefully manage feminine self-presentation styles and clothing that accentuates feminine embodiment. These women encounter difficulties conforming their attire choices to appearance expectations that privilege men's bodies. These self presentation strategies are also undertaken in service of establishing belonging in the field. Presenting as more stereotypically masculine or more stereotypically feminine has consequences for women's claims to professional competency in ways that men do not experience. Women perceive their attire choices in these positions as directly influencing whether or not colleagues accept their knowledge and expertise. This additional presentational labor has been identified in previous research on graduate chemists in training and service sector workers (Hirshfield 2011, Leidner 1993); however, I extend these findings into the working lives of private sector advanced degree holding STEM professionals working in fields that do not have uniform dress codes.

My findings also demonstrate that STEM work and workplaces are filled with emotional interactions and conflict that routinely demand control over emotional expressions. I contend that STEM professionals carefully manage their emotions according to normative feeling rules in order to proceed into and excel in leadership

positions. I found that emotion control is gendered in different ways for women in junior and senior positions. Women's leadership capabilities are doubted, they lose the trust of their colleagues, and they experience perceptual penalties if they express anger or sadness in ways that men do not. In response to these perceptions, women frequently eliminate all emotional expressions in their leadership styles in order to avoid gender stereotypes that couch them as innately weak emotion managers. In contrast, men in the sample routinely incorporate anger and sadness into their leadership styles without any perceived negative consequences. These findings reveal how STEM professionals engage in emotional labor that is bound up with gender schemas.

Furthermore, the results of the study establish that life scientists and technologists view their work as gender neutral, and men in both fields view their workplaces as meritocracies that are gender neutral or at times biased towards hiring and promoting women over equally qualified men. In contrast, approximately half of the women sampled from life sciences and over two thirds sampled from technology identify specific different gendered barriers that limit their collective advancement into executive positions. These perceptions differ between women in technology and the life sciences, which indicates that field culture differences are salient for shaping these perceptions.

Finally, both men and women rely on a discourse of individualism to frame their experiences of their workplaces. This shared discourse of individualism limits agency in particular ways. It restricts women's choices for managing professionalism and belonging to individual impression management strategies. The onus is on them to conform their self presentation practices to the masculine norm. For men, the discourse

of individualism frames workplaces as gender neutral meritocracies in which bias against women is rare and all workers are fairly rewarded on their individual merits. It also obscures the collective advantages that white men enjoy as the dominant members in these fields. Men are more likely to have more seniority, power, and influence than their women colleagues. This individualism frame constrains the potential for collective organized efforts that would lead to structural changes in life science and technology workplaces.

Routine Body Work in the Lives of STEM Professionals

Participants in this study describe their detailed engagement with body work although they do not directly use this analytic concept to describe these activities. Both forms of impression management identified in the study, attire and emotional, are examples of job-related body work. Professional attire is quite obviously related to managing one's professional image, but I find that the body is also incorporated into the controlled displays of emotions among the participants in this study. The body serves as a surface upon which emotional labor is expressed. These findings have significant implications for understanding how work on the body is incorporated into STEM workplaces. By engaging in these particular types of labor that alter bodily and emotional appearances, STEM professionals are not merely expressing their personal preferences. They are actively establishing their professional images and reflecting on how these managed images or "personas" (Ibarra 1999) will be externally validated among colleagues and supervisors.

This evaluative process is subject to the influence of gender schemas that bias interpretations of capabilities. Women who work in hard skills positions in both fields engage in additional forms of body work in order to achieve belonging. And women in the sample who move into manager positions perceive the need to engage in careful emotional labor in order to establish their leadership capabilities. Coupled with vague pathways to promotion, women are encumbered with labor that their men colleagues can largely ignore without any perceived repercussions.

Comprehensive studies of impression management in scientific workplaces have been scarce. My findings reveal a previously unexplored source of difficulty for women in STEM as they reach the mid-career point where their attrition is highest. The intentional and evaluative aspects of body work that I identify in this study are also important because this labor is routine in the workplaces I sampled but formally unacknowledged in STEM fields.

The STEM workplaces included in this study have few or no official policies regarding employee self-presentation despite the fact that participants identify their body work strategies as crucial for maintaining the appearance of professionalism and credibility in their positions. Indeed, many women in hard skills occupations, like software developers, carefully attend to how their attire influences their colleagues' impressions. Yet men in these same positions describe their appearance as the least significant part of their jobs. STEM professionals are laboring to meet a perceived informal standard that is gendered. The stereotype that STEM fields objectively reward workers on merit alone and regardless of individual characteristics contradicts the nuanced impression management labor that occurs in these workplaces. The highly

informal nature of impression management in STEM workplaces makes it largely invisible in many ways.

In addition to dress and emotional conduct standards not being formally recognized or rigorously enforced in STEM workplaces, impression management strategies to meet these standards are also experienced as and occur at the level of the individual. The outwardly individual nature of this labor—the fact that attire selection and emotion management appear as individual preferences—obscures the social basis of these strategies. Impression management strategies are developed through years of learning from academic and industry colleagues and mentors. Women in the sample developed their professional wardrobes by emulating their mentors who are women and through advice from academic advisors who are women. As demonstrated in the data, accumulated negative interactions with colleagues additionally shape these strategies. Thus this study identifies how the use of attire and emotion control as a means of negotiating professional credibility and belonging are patterned and shared among women in the sampled fields. These findings help to further clarify how the bodily aspects of STEM fields are not merely "handed down" through culture or structure; rather, they are the products of continual interaction (Gimlin 2007).

This study also contributes to answering lingering questions in the study of the body and paid labor. Namely, it reveals the extent to which individuals consciously reflect on and set limits for their body work practices in relation to workplace bodily requirements (Gimlin 2002, Gimlin 2007). The impression management strategies in

this study demonstrate reflexivity among many STEM professionals.[1] Women grapple with the difficulty of masking clothing and emotional expressions negatively associated with femininity in exchange for those associated with masculinity and professional credibility. Engaging in these practices unavoidably requires sacrificing parts of these women's gender identities and particular characteristics of their bodies (Haynes 2012). These sacrifices may further account for women's reported lower professional role confidence, which is pronounced in male dominated fields like technology and engineering (Cech 2015).

Lastly, the preponderance of women engaging in impression management across positions in the sample emerges as a reaction to gendered cultures and structures in both industries. This activity is a subtle mechanism that contributes to gender inequality within these fields. While the data in this study does not directly demonstrate it, women who expend their mental energy on achieving credibility among their colleagues through impression management are likely spending less time on other activities that may more productively further their workplace performance. Moreover, this presentational labor remains equally important for women in senior level leadership roles.

Impression management labor is inherently unpaid and performed with considerable effort and contemplation. Women consistently share the difficulty and

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[1] Acting reflexively "requires individuals to consider carefully or meditate on their actions and their likely effects prior to behaving" (Martin 2006:260). In this study participants carefully considered the gendered signals their embodied clothing choices and emotional expressions might communicate to others before they acted.

strain of navigating narrow clothing choices and emotional expression opportunities. Choosing clothing that communicates a desired level of professionalism is never an obvious choice because these choices carry risks that are unique to women in these fields. These professionals are spending valuable time considering whether or not their attire will appear too "feminine" and thus invite scrutiny of their abilities during important meetings and presentations. Promotion decisions depend on managers' judgments, often biased, of whether or not a direct report has the skillsets and the executive presence to occupy a leadership position. Because executive presence is closely linked to masculinity and men's bodies, the findings demonstrate that men are largely unconcerned about whether or not they appear as capable leaders.

Women also struggle to suppress all physical manifestations of anger and sadness in their engagements with direct reports. This emotional blunting is not only psychologically difficult to accomplish in workplaces that are routinely emotional, it also limits the range of effective leadership behaviors that these women can employ in their supervisory positions. It is less surprising then that women are leaving fields like technology at twice the rate of men and are identifying the culture of their workplaces as the primary reason why they are leaving (Hewlett et al. 2014, Pluralsight 2016). Engaging in these types of impression management strategies in order to earn the respect of their colleagues is an additional burden that women alone carry into these workplaces. This finding is valuable for scholars studying the relationship between gender inequality and impression management in other workplaces as well.

Implications and Policy Recommendations

My analysis of the data shows that the popular refrain that women should combat gender bias and structural inequalities in their workplaces by "leaning in" to their careers is misguided at best. Altering individual behaviors has little effect on the gendered cultures and structures that marginalize women in STEM workplaces. This study reveals that while women at all levels of STEM work very hard to engage in impression management strategies designed to resist broad gender schemas, their success is limited in the short term and personally problematic in the long run. This is because cultures continue to perpetuate the very biases that impression management strategies are intended to combat.

Field cultures transcend individual organizations and professions in meaningful ways. My findings are consistent across organizations of various sizes, geographic locations, market specializations, and occupations. Life sciences and technology professionals working in large or mid-size firms describe strikingly similar experiences and perspectives on the cultural expectations within their fields.

Field culture remains salient for STEM workers. Therefore, focusing on eliminating gender bias within the curriculum of undergraduate and graduate programs that socialize future STEM professionals will need to be supported by initiatives at the field level as well. For example, both fields in this study can better highlight their affinity to diversity and inclusivity through public education campaigns that emphasize the universal human benefits of pharmaceutical advances and technological innovations. De-emphasizing any association of these fields with men and particularly men's interests is important for helping women see themselves as potential contributors (Cheryan et al. 2009, Cheryan et al. 2013). These recommendations align with recent

studies that identify masculine disciplinary cultures, such as in computer science, engineering, and physics, as a primary factor that decreases women's interest and participation (Cheryan et al. 2016, Simard et al. 2008).

Yet this study also demonstrates that certain professions within life sciences and technology are particularly challenging for women in terms of establishing professional image and a sense of belonging. While I draw on similar experiences among men and women working in diverse management and research occupations, women in the sample who work in positions that are particularly male dominated or that involve hard skills mastery engage in more intentional self presentation strategies. This second finding indicates that curbing the negative experiences described in the study will require interventions that target both broader stereotypes around particular occupations (e.g. software development as "nerdy" and masculine) and those that characterize STEM disciplines as unwelcoming to women in general.

In addition, the finding that the absence of formal dress codes can in fact exacerbate perceptions of marginalization and body work for women in male dominated positions has implications for how organizations design their standards for professional conduct. The lack of dress codes for software developers, for example, corresponds with women engaging in more labor to minimize their feminine embodiment. This "gender pressure" is much more subtle, as is often the case for women compared to men given that women are afforded a wider range of acceptable gender performances (Williams 2000:246). Therefore, organizations should evaluate and measure whether their dress and conduct policies are effectively creating the perception that all presentations styles are equally valued. These organizations should

also conduct comparable evaluations of their emotional climates. By identifying gender bias in how shared emotional expressions are interpreted, organizations can recognize and normalize an expanded range of emotions for both men and women. Actively broadening rather than stigmatizing emotion in the workplace enables professionals to bring their full human selves to their jobs.

The difficulties for women specifically identified in this research demonstrate that even if more women than men are graduating with degrees in a field and that field is not broadly associated with a particular gender, such as the life sciences, there are still gendered processes of exclusion that exist across organizations in the field. Fields that appear to be more welcoming to women can still possess glass ceilings, sticky floors, and gendered cultures that pose barriers to advancement for women. Thus organizations will need to not only implement critical mass approaches to gender diversity through numerically increasing women's representation in top positions, but they should also implement cultural and structural changes as well. More inclusive cultures would also increase the likelihood of women's persistence in these fields by signaling their belonging rather than their exceptionalism.

Recruiting departments in technology and life sciences can also benefit from expanding their conceptualizations of diversity by relying less on cultural fit criteria in hiring and promotion decisions. Ensuring that these decision making committees for positions at all levels include candidates from diverse backgrounds will contribute in part to the erosion of male-only executives teams. Individual experiences built up over time confirm or disconfirm gendered belief systems. In order to alter these systems in meaningful ways, individuals must experience workplaces in which men and women

are equally valued and evaluated regardless of how they choose to dress or interact with their colleagues.

Limitations of this Study and Avenues for Future Research

In this empirical case study I identified particular gendered impression management practices among private sector STEM professionals working in life sciences and technology organizations. Certain limitations are inherent to this particular research design. While I attempted to draw on a larger sample of men and women in technology, women working in senior positions in this population were particularly difficult to access. In addition, I was not able to directly observe the workplace interactions relayed in the interviews due to the fact that STEM organizations that I approached for this research denied me direct access to their workplaces. I was told on more than one occasion that my access was not permitted out of a fear that if I identified any gender discrimination in these workplaces, then I would be creating opportunities for employees to sue their employer. Therefore, my conclusions are drawn from narrative accounts of participants' collective experiences working in STEM.

The findings I draw from the sample of 45 life scientists and technologists also cannot be definitively generalized to all STEM fields without further comparative research that includes larger representative samples. However, despite the fact that this study uses a non-random qualitative sample, I noted consistent patterns by gender and level, with notable consistencies across fields. The strength of the findings that extend across both fields in terms of how STEM professionals navigate credibility as well as

the similar professionalization and education pathways STEM professionals experience lends support to the argument that these processes are not unique to the two sampled fields. Some of the gender strategies I identify have been found in engineering workplaces (Dryburgh 1999, Faulkner 2009, Hatmaker 2013, Miller 2002, Miller 2004). None of the individuals in the sample characterized his or her impression management strategies as somehow exceptional or out of place within the field. Indeed, the fact that I found that women in life sciences, a field with the highest proportion of women, still regularly engaged in impression management activities that downplay feminine embodiment suggests that other STEM fields with proportionately more women are equally likely to produce these behaviors.

This study also does not account for all of the diverse backgrounds of STEM professionals employed in life science and technology fields. Rather, the sample is skewed towards white and Asian men and women who, with few exceptions, identified as heterosexual. This outcome is due to the fact that non-Asian minorities are highly underrepresented in both of these fields.[2] The design of this study therefore primarily captures the experiences of white and Asian men and women. My sample of life scientists is 72% women, 83% White, 8% Asian, 5% Hispanic, and 4% Middle Eastern/Arab. My sample of technologists is 55% women, 70% White, 20% Asian, 10% Black. This combined sample reflects broader patterns in both fields. However,

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[2] In the life sciences women represent 48% of the workforce. This population has the following racial and ethnic composition: 70% White, 19% Asian, 3% Black, 7% Hispanic, and 1% more than one race. In technology women represent 24% of the workforce. Looking at this population by race and ethnicity, 65% of technology workers identify as White, 22% identify as Asian, 6% identify as Black, 5% identify as Hispanic, and 2% identify as more than one race (NCSES 2016).

the demographics of the sample is also a result of the initial research design in that this study focused on gendered processes of exclusion and exclusion as well as gender schemas in STEM. Obtaining an equal number of men and women in junior and senior positions and in both industries was a high priority.

Given these limitations, more research needs to be conducted on the ways in which race, sexuality, disability, and class intersect to shape the experiences of STEM professionals. For example, Alfrey and Twine (2017) explore how racially privileged women in technology who do not identify as heterosexual are better able to gain acceptability among their male peers in ways that minority women cannot. Similarly, Williams et al. (2014b) demonstrate that STEM women of color experience different patterns of bias than their white colleagues. We also do not know how multiracial STEM workers might use impression management in flexible ways in order to resist intersecting forms of bias. Furthermore, researchers should explore how workplaces create dress codes that specifically account for and include LGBTQ workers who do not identify within the gender binary. This step is especially relevant for trans or transitioning STEM workers who must navigate the informal and often unequal dress standards discussed in this study (Schilt 2011).[3] Exploring how workers from diverse backgrounds and positions are able to actively resist body work norms would better our understanding of embodiment and gendered processes of exclusion in the workplace.

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[3] Schilt (2011) finds that female-to-male transsexuals are perceived as more authoritative and more competent in their positions after they transition. They also receive more respect and recognition for their work.

Additional research is also needed on how the gendered body work identified in this study is linked to other intersecting forms of bias in STEM, particularly those that target disabilities, physical appearance, and bodies. For example, I found evidence of ageism and bias against pregnant women among technologists and life scientists in the sample. Bias against pregnant women in STEM is an especially relevant phenomenon because pregnancy is an equally subtle form of embodied labor that is unique to female bodies (Gatrell 2008:51). It regularly occurs in concert with paid labor. Women working in technology startups and smaller firms described difficulties negotiating their workplace responsibilities and maternity leave as well health complications while they were pregnant. Pregnancy labor is rarely viewed as labor at all; rather, it's perceived as a natural ability that women do not need to accomplish (Miller 2005). Furthermore, pregnant women face enhanced scrutiny such that they are expected to make efforts to conceal the bodily aspects of their pregnancy in the workplace. STEM women are likely compelled to downplay their pregnant bodies even further while working in domains where male embodiment is the norm.

We also know that women in different positions of power, with different resources, and with different social networks in an organization enact different gender strategies (Bird and Rhoton 2011). This study refines these findings by pointing out the embodied aspects of these diverse strategies. Additionally, women do not universally share similar perspectives on the sources of systemic inequalities that are present in their workplaces. Aligning with the individualism ideology present throughout this study, Cech and Blair-Loy (2010) find that 40% of a sample of seasoned women professionals in STEM eschew structural justifications for gender inequality in their

field in favor of meritocratic or human capital ones. Further research should interrogate the context in which individuals are more likely to form networks across these perceptual and positional divides in order to challenge structural and cultural gendered barriers to advancement.

Finally, less scholarly attention has been directed toward how men engage in embodied impression management strategies.[4] This study has illuminated some of these practices among men in two STEM fields, but more research is needed in STEM subfields and other professions. Research into men's body work is essential for understanding why certain field cultures continue to valorize masculine forms of embodiment and self-presentation over others. Interrupting these routine gendered practices at the level of interactions is a productive means by which to promote gender equity and inclusivity more broadly (Ely and Meyerson 2000).

Preliminary Indicators that Industry is Shifting

Companies with diverse teams perform better, and organizations with more women on their boards are ultimately more profitable (Carter and Wagner 2011, Joy et al. 2007). These correlations exist because it is often the case that the organizational processes which create gender inequality also hinder organizational effectiveness (Ely and Meyerson 2000). Critical business innovations require a diversity of perspectives and opinions. These insights make increasing diversity within technology and life science fields a priority for the sake of fairness but also an economic imperative: having a diverse workforce is a key competitive advantage for every organization.

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[4] See Casanova (2015) for a recent notable exception.

However, many organization perceive workplace diversity as one of many other competing business goals to be achieved. Managers often fail to benefit from bias training because they perceive the training as targeting them as a problem rather than as a solution to diversity issues.

Organizations have always created metrics and goals around important problems they wish to solve. However, in the rush to deliver the highest quality products or services to customers in the least amount of time, clear, measurable diversity and inclusion metrics do not frequently factor into long term business plans. Many STEM companies have only recently begun to measure and create diversity goals within hiring and promotion decisions.

Many of the initiatives currently being implemented have yet to bear any fruit. In technology the last two years of unconscious bias training and efforts to seek out under represented candidates through alternative recruiting channels in some cases have led to less than a 1% increase in the representation of minority groups (Williams 2016). A recent meta-analysis of diversity programs also suggests a worrisome backlash effect that's created when companies implement only one or two interventions as part of their diversity and inclusion efforts (Dobbin and Kalev 2016).

There are signs, however, that perspectives are slowly changing for at least one of the two sampled fields in this study. Part of a young and rapidly evolving industry, technology workplaces in particular are uniquely positioned to eliminate the gendered processes identified in this study and serve as role models for other industries. Startups that become industry frontrunners have embraced innovative office arrangements, workplace structures, and work/life accommodations. Many of these innovations, such

as wellness classes and unlimited parental leave policies, have migrated into other dissimilar industries. Leading companies in technology have created chief diversity officer positions as part of their efforts to establish diverse and inclusive workplaces. In addition, the bleak technology workplace diversity reports released in the past few years have generated a thriving network of technical recruiting firms that are innovating gender and race blind interviewing methods. These new organizations are at the vanguard of eliminating bias in hiring and promotion decisions in the field. Their methods can be productively translated to other industries with similar needs.

There's a recurring affirmation in Silicon Valley that technology companies set out to not just create products that solve particular problems but to improve society and create more egalitarian relationships.[5] Technology can be a forerunner for this idealistic future in which software facilitates social justice. These organizations can nimbly create truly diverse workplaces where professionals are members of an inclusive community judged by a consistently applied set of standards of excellence. Life science organizations can also embrace the field's unique popular representation of being more gender egalitarian than other STEM fields by promoting women and minorities into its upper echelons. In addition, life sciences companies can highlight the fact that they pioneer targeted medical breakthroughs that address the diversity of the healthcare marketplace.

Histories of STEM fields demonstrate that the gender associations attached to these fields ebb, flow, and can rapidly shift under certain social and economic

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[5] Technological disruption, creating innovative products or services remake established relationships and markets, is the stated goal of countless technology startups.

conditions (Kalev et al. 2006). Computing work is neither masculine nor feminine. It combines technical expertise with artistry, and it is ultimately a complex activity that appeals to both men and women. In comparison, the life sciences, with their outsized proportion of women degree holders, are already held up as a paragon of women's contemporary triumph over gender bias in science. Yet this and other studies demonstrate that the culture of life sciences workplaces is not free from the influence of gender schemas that make it difficult for women to persist. These schemas prevent women from using their talents and exceling to their highest potential. It's important to remain critical of claims that gender and racial equality have been achieved based on interpretations of demographic trends alone. Assuming fields are free from gendered processes of exclusion without investigating the perceptions and experiences of professionals within those fields further elides the more subtle and entrenched gendered processes uncovered in this dissertation.

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