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Erin A. Cech[a]* and Tom J. Waidzunas[b]**

[a]*Department of Sociology, University of California—San Diego, La Jolla, CA, USA;*
[b]*Science in Human Culture Program, Department of Sociology, Northwestern University, Evanston, IL, USA*

While much is known about the experiences of women and racial/ethnic minorities in male-dominated fields such as engineering, the experiences of lesbian, gay, and bisexual (LGB) identifying individuals remain unstudied. Our article breaks this silence with an exploratory study of the ways LGB students at a major research university in the western United States both experience and navigate the climate of their engineering college. Based on interviews and focus groups, we find that both pervasive prejudicial cultural norms and perceptions of competence particular to the engineering profession can limit these students' opportunities to succeed, relative to their heterosexual peers. Nevertheless, through coping strategies which can require immense amounts of additional emotional and academic effort, LGB students navigate a chilly and heteronormative engineering climate by 'passing' as heterosexual, 'covering' or downplaying cultural characteristics associated with LGB identities, and garnering expertise to make themselves indispensable to others. These additional work burdens are often accompanied by academic and social isolation, making engineering school a hostile place for many LGB identifying students. This research provides an opportunity to theorize categories of inequality within engineering that do not have visible markers, and to consider them within a broader framework of intersectionality.

Keywords: Lesbian, gay, and bisexual engineering students; heteronormativity; passing; covering; professional culture; intersectionality

Introduction

Engineering practice is interwoven with social biases and forces of domination.[1,2] Research on social inequalities within engineering has addressed the experiences of women and racial/ethnic minority engineers, exposing how cultural biases foster chilly

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climates that hinder the success of these individuals. Several scholars have speculated that engineering cultures in the United States are *heteronormative*, maintaining a sharp distinction between two sexes and legitimating only heterosexual attractions and relationships as natural or acceptable.[3] However, the experiences of people who identify as lesbian, gay, and bisexual (LGB) are all but absent in literature about math and science-based professions in general and have never been documented in research related to the engineering profession specifically.[4]

Individuals who identify as LGB are enrolled in engineering programs, work in engineering jobs, and have leadership positions in the field, but little is known about their experiences. This article breaks ground with a study of LGB identifying students in an engineering college, and sheds light on the ways in which heteronormativity saturates this context and operates within it. This research also provides broader opportunities to better understand the co-construction of perceptions of professional competence and the stereotypes attached to social identities; to think about a *different kind of difference* than those traditionally discussed in the inequality in engineering literature, where marginalization is based on identity categories with markers that are frequently invisible; and to draw attention to the importance of intersectionality, attending to the particular experiences of people who occupy more than one marginalized identity category simultaneously, in understanding the experiences of under-represented minorities in engineering.

This article reports on interviews and focus group meetings with 17 LGB students enrolled in the engineering department at a major US college we call 'Gold University'. Students represent a variety of engineering sub-disciplines and educational levels, with variation across race/ethnicity, gender, and sexual orientation. Our research questions investigate (1) the climate these students experience vis-à-vis their LGB identities, (2) the coping techniques they utilize to navigate engineering school, and (3) the effects of this climate on their lives. As we investigate these questions, to the best of our ability, we take note of the ways in which people living within intersecting categories of race, sex, and sexual orientation have different experiences of oppression or exclusion.

We find that LGB engineering students face a heteronormative climate within the Gold University engineering college, a reputably 'apolitical' and 'meritocratic' space. Heteronormativity is fostered by general expressions of sexual prejudice, while norms specific to the engineering culture silence the concerns of LGB students. This climate pressures many LGB engineering students into both academic and social isolation. In order to succeed in the field, these students must compartmentalize their lives – a requirement that burdens them with additional academic and emotional work. Respondents must daily negotiate public knowledge of their personal lives in ways that their heterosexual peers do not. The next sections describe our theoretical groundings, methods, and results. Following that, we offer tentative conclusions.

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[3]Kitzinger, "Heteronormativity in Action," 2005, 477–78.
[4]The only publications we could find that mention this topic are visionary articles on LGBT equality issues in professional engineering; none are empirical research studies. See Predd, "The Gay Engineer," 2005; Riley, "LGBT-Friendly Workplaces in Engineering," 2008; Riley, *Engineering and Social Justice*, 2008.

Theoretical background

Diverse literatures inform our study design and help us interpret our results. Using the work of scholars examining engineering cultures and inequalities in engineering, we describe relevant aspects of the engineering climate that provide insights into respondents' experiences. Recognizing the heterogeneity within the category 'LGB engineering students', we draw on literature that theorizes intersections of multiple identities. Finally, we turn to literature on stigma to help us understand the tools students may use to cope with this climate, particularly the tactics of 'passing' and 'covering'.

Anti-LGB bias and the culture of engineering

Biases against people on the basis of sexual orientation have been theorized on multiple levels. 'Heterosexism' refers to broad structural and societal biases that disadvantage minorities associated with homosexuality. A key mechanism that reproduces heterosexism is 'heteronormativity,' the interpersonal and institutional enforcement of norms that create a strict male/female sex binary and designate heterosexuality as the only acceptable relationship form.[5] On the individual level, heteronormativity and heterosexism may take the form of 'sexual prejudice', prejudicial attitudes and behaviors expressed by individuals against people on the basis of their sexual orientation.[6]

Institutional and interpersonal biases that reinforce inequality in engineering have been theorized as 'chilly climates'; these climates and their effects for women and racial/ethnic minorities have been well-documented.[7] Based on the documented experiences of other historically oppressed minorities in engineering, we expect that LGB students also experience chilly climates. The mechanisms which underlie chilly climates can include general expressions of bias, as well as prejudicial norms of practice, interaction, and attributions of professional competence particular to engineering. While general expressions of bias against LGB people such as antigay joking can exist in any setting, the source of a chilly climate for LGB students cannot be reduced to these general expressions of bias: aspects particular to the culture of the engineering profession likely disadvantage LGB students as well.

Many engineering 'cultures' exist that vary by sub-discipline, work sector, region, etc., but there are broad, taken-for-granted assumptions about the profession – and who is an adequate or exemplar practitioner of that profession – that are historically rooted and nationally widespread.[8] These cultural assumptions are particularly prominent, and often explicitly stated, within the professional socialization process of engineering programs. Professional socialization, the process by which neophytes

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[5]Kitzinger, "Heteronormativity in Action," 2005, 477–78.
[6]Herek, "Beyond 'Homophobia,'" 2004, 16.
[7]See e.g. Leslie et al., "Women and Minorities in Science and Engineering," 1998, 262–5; Sandler et al., *The Chilly Classroom Climate*, 1996, 7–17.
[8]Downey and Lucena, "Knowledge and Professional Identity in Engineering," 2004, 397–9; McIlwee and Robinson, *Women in Engineering*, 1992, 19. While engineering cultures are varied and fragmented, we speak of an overarching "engineering culture" that includes hegemonic ideals about what it means to be a good engineer.

are inculcated into the norms, assumptions, and identities of a profession, makes engineering culture salient to even first-year undergraduates.[9]

Within this professional culture, broadly held stereotypes about social groups can be built into or 'co-constructed' with professional norms and perceptions of competence.[10] Biases against LGB individuals may be couched in the language and symbols of the profession and thus carry a valence of legitimacy. One ideology within the culture of engineering that is particularly salient to the treatment of LGB students is the so-called 'technical/social dualism'. Following Hacker, Faulkner theorizes the 'technical/social dualism' as an ideological separation between 'technical' activities and skills (such as design, science, and math-related activities) and 'social' tasks and skills (such as management, communication with other employees and clients, etc).[11] This dualism is a central part of the engineering identity: to be considered a competent engineer requires 'throwing oneself' into technical activities.[12] Importantly, this ideological dualism is a false distinction in practice: technical and social dimensions are components of all engineering work.[13]

Broadly, the technical/social dualism casts issues like the experiences of LGB students as 'social' or 'political' and thus irrelevant to serious discussions about the profession in classrooms, office hours, or study groups. The rendering of engineering as an 'apolitical' and 'technical' space, combined with the relegation of equality issues to the 'social' may marginalize LGB students and lead them to feel as though discussions of their particular circumstances are silenced. We discuss how these elements of culture and inequality within engineering frame the experiences of LGB students. By linking their experiences to previously documented patterns in the culture of engineering, we identify mechanisms by which a heteronormative climate is produced that may exist in other social settings in engineering beyond our particular study site.

Because LGB students fall within diverse intersecting identity categories, we cannot assume that they experience this culture identically. Considering inequalities along multiple dimensions of race, class, sex, and sexual orientation, third wave feminist scholars have shown how systems of oppression are interlocking and interwoven.[14] Hill Collins theorized a 'matrix of domination' to describe the organization of various intersecting oppressions, and the ways hegemonic forms of power appear across multiple intersecting identities.[15] We draw from gender and racial/ethnic minority literatures to suggest how students' positions within gender and racial/ethnic dimensions of these interlocking oppressions may lead them to experience the climate differently. We note that not all people who fall within these intersections experience stigma and oppression in the same way.[16] Understanding

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[9]See Becker, et al., *Boys in White*, 1961, 3–4; Dryburgh, "Work Hard, Play Hard," 1999, 666; Schleef, *Managing Elites*, 2006, 6.
[10]Tonso, *On the Outskirts of Engineering*, 2007.
[11]Hacker, "The Culture of Engineering," 1981, 140; Faulkner, "Dualism, Hierarchies and Gender in Engineering," 2000, 761–9; Faulkner, "The Power and the Pleasure?" 2000, 108; Faulkner, "Nuts and Bolts and People," 2007, 332.
[12]Faulkner, "Dualism, Hierarchies and Gender in Engineering," 2000, 763.
[13]Faulkner, "Nuts and Bolts and People," 2007, 331–2. See also Latour, *Science in Action*, 1987.
[14]See Combahee River Collective, "A Black Feminist Statement," 1982; Lorde, *Sister Outsider*, 1984; Crenshaw, "Mapping the Margins," 1991.
[15]Hill Collins, *Black Feminist Thought*, 1990, 18.
[16]Berger, *Workable Sisterhood*, 2004, 4.

intersectionality requires recognizing that these experiences are not unified or monolithic.

Considering the dimension of gender, scholars have argued that women as a group are disadvantaged in engineering. A particularly powerful dimension of this disadvantage is the mapping of the 'masculine/feminine' binary onto the technical/social dualism. This dualism has consequences for women, who face a cultural non-congruence between their gender and their engineering identity, threatening their stance as 'real' engineers and their reception as competent, skilled, and valuable technical workers.[17]

The mapping of a gender binary onto a technical/social dualism is consequential for the construction of heteronormativity, which relies on a strong distinction between genders as a basis for the very construction of heterosexuality.[18] But the ways in which a technical/social dualism may map onto a heterosexual/homosexual binary are not so straightforward. The social stereotypes pervasive in engineering (and elsewhere) of gay men as more 'feminine' than straight men and lesbian women as more 'masculine' than straight women becomes complicated for LGB engineering students. Our work sheds light on these complexities.

Racial stereotypes within engineering, such as those that construe Asian-Americans as highly 'technical' and African-Americans and Hispanic-Americans as 'nontechnical,' also contribute to misplaced perceptions of professional (in)competence.[19] When considering multiple intersections, understanding attributions of engineering competence can be complicated for categories such as Asian American lesbians or white bisexual men, as some aspects of identity may be stereotyped as 'social' and others as 'technical.' Thus, the analysis requires attending to the patterns in peoples' experiences of these intersecting categories.

'Passing' and 'covering' demands and tactics

To further understand the climate, as well as the strategies used by LGB engineering students to navigate this climate, we draw on sociological work on stigmatized identities. According to Goffman,[20] for a person who possesses a stigmatized identity, navigating a social world dominated by so-called 'normals' depends crucially upon whether signs of the person's stigma are visible to others. If signs are invisible, as is often the case for LGB-identifying persons, then a person may be required to adopt the strategy of 'passing', being careful not to reveal his or her stigmatized status to individuals who would apply stigma. Institutions and cultures may create 'passing demands' which require LGB persons to remain closeted.[21] For

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[17]Faulkner, "Dualism, Hierarchies and Gender in Engineering," 2000, 784–5. Faulkner has developed a related concept called the 'gender in/visibility paradox,' ("Gender In/authenticity and the In/visibility Paradox," 2009, 169), whereby the visibility of women's gender renders them invisible as engineers because women are not afforded respect for technical competence. While our data suggest that an analogous 'in/visibility paradox' may exist for out LGB engineering students who are visible as sexual minorities and subsequently made invisible as competent engineers, more research is required to theorize this concept and to fully disentangle it from the gender in/visibility paradox.
[18]Butler, *Gender Trouble*, 1999, 30.
[19]Bonous-Hammarth, "Pathways to Success," 2000, 95; Eglash, "Race, Sex, and Nerds," 2002, 53; Leslie et al., "Women and Minorities in Science and Engineering," 1998, 259.
[20]Goffman, *Stigma*, 1963, 48.
[21]Goffman, *Stigma*, 1963, 73.

example, the 1993 'Don't Ask Don't Tell' policy of the US Military required that LGB persons pass in order to keep their jobs.[22]

According to Yoshino, passing demands for LGB persons have been giving way to less stringent demands to participate in what Goffman calls 'covering' practices, attempts to minimize the obtrusiveness of traits associated with a known stigmatized identity. Goffman states, '[P]ersons who are ready to admit possession of a stigma ... may nonetheless make a great effort to keep the stigma from looming large'.[23] In the case of LGB persons, engaging in covering behaviors involves concealing and downplaying cultural markers typically associated with an LGB identity, including discussions of same-sex relationships, expressions of gay culture, or displays of same-sex affection.[24] LGB individuals, in other words, can use passing and covering tactics to negotiate the visibility of their stigmatized identity.

In situations where people are usually not able to conceal their status within a stigmatized group, as can be the case with race/ethnicity and sex, people within these categories may still experience covering demands. People of color are often pressured to conceal behaviors or displays associated with racial or ethnic subcultures. For example, African-Americans are forbidden from wearing a 'cornrows' hairstyle in many jobs.[25] Our examination of LGB engineering students is a particular instance of a different kind of difference than those generally studied in inequality in engineering literatures.

Methods

We conducted formal in-depth interviews and focus groups with 17 engineering students (11 identifying as gay, four as bisexual, and two as lesbian),[26] both undergraduates and graduates (13 undergrads; four grads). Some students within our 'bisexual' category utilize terms such as 'fluid' or 'queer' to describe their sexual orientation, which can include relationships with a partner of any sex.[27] Six of our respondents identified as Chicano or Latino, two as Asian, and the rest as white. Respondents were all students at 'Gold University,' a large, research-oriented and competitive public university in the western United States. Respondents frequently describe the climate of Gold University as 'typical' or 'unexceptional' compared to other research universities. Gold University has a lesbian, gay, bisexual, and transgender (LGBT) student center and a university-wide non-discrimination policy

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[22]Yoshino, *Covering*, 2006, 69.
[23]Goffman, *Stigma*, 1963, 102.
[24]Yoshino, *Covering*, 2006, 74–107.
[25]Yoshino, *Covering*, 2006, 147.
[26]IRB approval # 081258S. While this paper investigates the experiences of engineering students who identify as lesbian, gay, or bisexual (LGB), we might also have sought out other sexual minority groups such as transgender or queer. We decided to begin this investigation with LGB identifying individuals only to isolate sexual orientation as the category of interest.
[27]Many young adults have access to a broader range of categories to describe their sexual orientation and gender identity, and in some cases invent them or use no categories at all (Riley, "LGBT-Friendly Workplaces in Engineering," 2008). While we follow the conventions of current academic literature and political organizing by using the term 'bisexual' to refer to these students, it should be understood that many of them do not personally use this term. For a discussion of whether people with sexual interest in members of more than one sex should be grouped together within the category 'bisexual,' see Yoshino, "The Epistemic Contract of Bisexual Erasure," 2000, 370–77.

that includes sexual orientation. It is located in a region where public opinion on gay rights issues is roughly equally divided. Data were collected between January and December of 2008. Neither author is employed by nor affiliated with the engineering college at Gold University.

We conducted our research with the full and enthusiastic support of the Gold University engineering college administrative staff, including the Associate Dean. Despite this institutional support, many factors made our data collection quite challenging. First, unlike other minority groups in engineering, there were no student organizations, listservs, or administrative tracking of LGB student enrollment to help us locate respondents.[28] Additionally, we had to be sensitive to the fact that their very participation in our study identified students as LGB who might desire to remain otherwise closeted. An unusual challenge in our study was that this was the first time that many respondents had ever discussed their experiences as simultaneously LGB and engineers.[29] This meant that they had no standardized interaction scripts at the ready or dialog about 'LGB engineers' on which they could rely in moments of uncertainty or awkwardness. It also meant that we had to be extremely careful not to impose researcher-generated scripts onto our respondents. To the extent possible, we utilized respondents' own language when asking clarification questions.

We advertised our study by posting fliers around campus for 10 weeks, writing announcements on lecture-hall chalkboards, including advertisements in five of the weekly e-newsletters that go out to every engineering student, and sending a message to every person on a popular social networking website who indicated that they were engineering students at Gold University and were interested in same-gender relationships. We conducted formal interviews with each of our respondents, lasting between 45 and 90 min, at the campus location of the respondent's choosing. Interview questions were open-ended and we probed for more information where necessary and appropriate. Due to the sensitive nature of the topic, we offered respondents the option of conducting the interview in our offices or anonymously over online instant-messaging programs. Four respondents opted for a closed-door interview in the first author's office, but no one chose an online arrangement in lieu of a face-to-face interview. In our interviews, we asked students about their identities, their interactions with students and faculty, their views on the climate in the engineering program of Gold University, and their coping strategies.

Nine of the 17 interviewees participated in focus groups. For all respondents, this was the first time they were knowingly in a room with more than one other LGB engineering student, and it was the first time a few of them had ever knowingly met another LGB engineering student. The purpose of the focus groups was to facilitate discussion of the climate with multiple respondents at once, uncovering points of consensus and disagreement. Prefacing that students need not agree with one another or with us, we asked questions about climate in engineering school, the effects of climate, and their coping strategies.

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[28]By the end of our study, Gold University had initiated a student organization catering to LGB students in science and engineering fields.
[29]We broached the subject of sexual identity by asking, 'Do you identify with any particular sexuality category or categories?'

We employed a dual-pass coding strategy to analyze the data. In the first pass, interview and focus group transcripts were coded under three themes derived from our research questions: 'climate', 'effects of climate', and 'coping strategies'. Once the data were coded for these three basic elements, we analyzed data within each code to extract themes that emerged as patterns across respondents. For this article, we selected quotations that were exemplars of the various themes in our coded data, rather than extreme cases. If a theme is rare, we note it as such in the results section of this article.

As an exploratory qualitative study, we are able to richly depict specific experiences in the words of our respondents. While we cannot generalize our findings to all LGB students in engineering, our respondents provide a window into engineering culture at Gold University. As such, we attempt to tie our findings to broader cultural issues identified in engineering by other scholars in order to identify mechanisms by which these cultural elements become part of the climate that students experience. Additionally, we recognize that we received descriptions of the climate second-hand; we did not observe the day-to-day interactions that create this climate.[30] Despite these limitations, we believe that this study is a useful first step in understanding the experiences of LGB students in engineering, and the relationship between heteronormativity and engineering culture more broadly.

Results

Heteronormative climate in engineering at Gold University

We begin by documenting respondents' descriptions of the heteronormative climate they face at Gold University. They note a strong cultural dichotomy between heterosexuality and homosexuality, and the devaluation of the latter. They also describe circumstances where the particular cultural norms of engineering disadvantage LGB individuals.

General heteronormativity and anti-LGB sexual prejudice

One mechanism underlying the heteronormative climate in engineering at Gold University was the expression of epithets that were explicitly anti-LGB or that presumed the heterosexuality of the respondent. All but two respondents witnessed or experienced at least one instance of explicit anti-gay epithets within their engineering communities. Eric (graduate gay man) recounts his interaction with engineering students in his freshman residence hall:

> Four other guys and I were playing some sort of computer game, where you have these like macho fighting people with people without their shirts on or something. One was like, 'Oh, what turns you on, naked men fighting?' [In] the other remark, the word 'faggot' was said ... kind of an epithet thrown in to punctuate the sentence somehow ... I think just to prove their masculinity, they made a comment about how 'faggots do that' or something. It was very negative, hostile ... not just an empty, vacuous implication of the word.

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[30]Other studies (e.g. Faulkner, "Dualism, Hierarchies, and Gender in Engineering," 2000) have found concordance between the experiences described by individual respondents and independent ethnographic observations of organizational climate.

Although words like 'faggot' are not often heard in respondents' environment, all respondents noted that the remark, 'that's so gay' is used extensively by their classmates as a way to disparage people, things, or ideas.

When describing who is seen as the 'typical engineer', LGB engineering students pointed to the predominance of white heterosexual men. Lisa, a bisexual undergraduate woman expresses this:

> From my experiences in engineering, it is the stereotypical straight white male [who is the typical engineer]. To not fit these criteria, to be somewhat abnormal, somewhat strange, is a problem. If you can't take their sexuality seriously, then you can't take the person who is identifying as it seriously. Therefore, if you don't take someone seriously, why would you take their work seriously? (Lisa, undergrad bisexual woman)

Additionally, several gay men reported experiencing pressures to conform to a straight male breadwinner model: 'a girlfriend, a wife, a family with kids and be ordinary like everyone else.' This pressure is exemplified in a story Juan (undergraduate gay man) tells about the boss at his internship, who conveys heteronormativity in a way that emphasizes male sexual conquest:

> I'm 28 now, and [everyone is] expecting a wife, or a girlfriend … I show up at the Christmas party with this lady professor—a very good friend of mine—and my boss got a little drunk at the party. He gave a toast in front of everyone, congratulating me for 'boning my professor.' I was like, whoa, where did you get that idea? But I couldn't say no, because he's my boss. There were a few in the crowd who knew the truth, but no one said anything because he's the boss, and you don't contradict the boss.

Juan was considering coming out to his office just before this event, but after this powerful statement of heteronormativity, he did not get up the courage to come out to his co-workers for several more months.

We found evidence of a strong heterosexual/homosexual binary within the engineering culture. That is, while there is little tolerance for homosexuality, there is even less tolerance for students who do not fit into either the 'gay' or 'straight' categories:

> A lot of people don't understand, I think a lot of them are confused by bisexuality … thinking that bisexual people are really slutty. I am weirded out by the fact that my colleagues would speculate about that, which I know has happened. In some ways, I'm more comfortable with them thinking that I'm a lesbian … (Sara, grad bisexual woman)

Sara found that her classmates did not deal well with her ambiguous position in the heterosexual/homosexual dichotomy, and Sara is even willing to tell others she is lesbian to avoid reactions to that ambiguity. We suspect that students avoid a bisexual identity because it is less culturally legible than a gay or lesbian identity.[31] Students already trying to assimilate into the engineering profession find that the stereotypes and uncertainties around a bisexual identity are difficult to deal with, as is expressed in Sara's concern that she will be perceived as 'slutty.'

Biased epithets generally emanate from students' peers and from internship workplaces rather than faculty members or teaching assistants. Respondents said

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[31]For a discussion of reasons why bisexual people may deny a bisexual identity, see Yoshino, "The Epistemic Contract of Bisexual Erasure," 2000, 430.

their interactions with faculty are strictly 'professional', never straying from topics related to engineering, exams, or homework assignments. However, no respondent said he or she would be comfortable approaching engineering professors with concerns related to their LGB identities.

Engineering-specific biases against LGB students

Beyond general statements of heteronormativity and anti-LGB bias, students described climate issues particular to the culture of engineering (at least as it is manifested within Gold University), where discrimination or exclusion is couched in the language or cultural ideals of the profession. This is problematic for LGB students, as the use of engineering language and symbols gives these biases a valence of legitimacy that blatant anti-gay epithets do not have.

   Lisa describes an example of when a heteronormative statement was couched in *technical* engineering language:

> One of my friends who is a mechanical engineer was describing the body as a mechanical engine that only functions under various strains and stresses and relationships. And he didn't think that gayness was one of those relationships ... basically, 'the man is the plug and the woman is the outlet and if there are two plugs, how is [anything] going to charge?' (Lisa)

Lisa's friend invoked a rationale for heterosexuality that evoked technological imagery – a rationale that uses the exalted 'technical' side of the technical/social dualism to shore up the dominance of heterosexuality and dismiss homosexuality.

   There was also a sense among respondents that the more 'technical' or 'hard' a subfield of engineering is stereotyped as, the less tolerant it is of those who identify as lesbian, gay, or bisexual. When asked to rank engineering degree programs from most to least tolerant of LGB individuals, respondents consistently ranked biological and chemical engineering departments as the most tolerant and electrical and computer engineering and computer science with average tolerance. Mechanical, aerospace, civil, and structural departments were perceived by respondents to be the least tolerant fields:

> In all these different facets of engineering, mechanical is held up as *the* engineering field, because it's practical, hands-on, it's where it all kind of stems from. It seems like, the more hands-on you get, the more practical it seems, the more it seems like ... there's less openness to having deviations from the standard, normal male-dominated field. (Lisa)

There is reason to believe that this tolerance ranking may be accurate: students in bioengineering and chemical engineering reported less difficulty, both in the specific examples they offered and their overall assessment of the climate, than the students in aerospace, mechanical, and structural engineering.[32] More research is needed to understand how heteronormativity and sexual prejudice may operate differently across subfields, and how these may be contingent on departmental and institutional cultures.

   Furthermore, the technical/social dualism within the culture of engineering largely relegates issues of justice, politics, social consciousness, and identity to the

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[32]To protect their confidentiality, we do not specify the degree affiliations of our respondents.

'social' realm, deeming them 'irrelevant' to core 'technical' engineering work. As a result, many issues that our respondents privately find important are deemed inappropriate issues for consideration in engineering-related circumstances:

> It's just a different way of communicating with engineers than with all the people I tend to hang out with ... You don't talk about your feelings, you don't talk about the world and what's happening in it, you don't talk about [gay marriage legislation] or the election ... I wish there was more of that in school, more about the consequences of technology, the history ... Really, we're just doing the technical stuff. (Becky, undergrad lesbian woman)

> There are things that people don't talk about in engineering, like being strong, or being open ... Anything out of the ordinary, people just don't talk about. It's like this *cloud* ... if it's not engineering-related, it's pushed to the side and not talked about. (Dale, undergrad gay man)

This is problematic for some, like Wendy (undergrad bisexual woman) and Guy (graduate gay man), who show deep interests in social justice issues as a result of their experiences as LGB engineering students, but feel that their interests are ignored at best and criticized at worst.

Issues of sexual orientation in particular are relegated to the 'social' and considered 'irrelevant' or 'inappropriate' topics of conversation in the engineering climate:

> They don't say anything toward sexuality, especially in engineering; it's not a humanities course where you discuss what Plato would have thought of it. It's like, you're there to study math and science ... It just doesn't seem relevant. (Wendy)

Although many respondents stated similarly that issues of sexual identity are considered 'irrelevant' within engineering, there is a clear sense that taking sexual identity issues out of the realm of discussion does not create a safe, welcoming environment. Instead, by making sexual equality an irrelevant topic of conversation, discussions of power, discrimination, and hostility are also considered irrelevant. This relegation of issues of sexuality to the 'social' upholds 'technical' aspects of engineering as objective and neutral (though they are in fact no less prone to bias, no less steeped in culture and politics than the social aspects). In this way, the technical/social dualism becomes a mechanism by which the unmarked category of heterosexuality becomes legitimated.

> In my department, [the issue of sexual identity] is sort of invisible. I think most of them are straight dudes who don't really think about the existence of people who are not like them. I think they have so much privilege that they can't understand what it's like for people who don't have that privilege and they think like other people getting privilege is taking it away from them. (Sara)

> Everyone in this field is presumably straight ... if you're one of the 'good old boys,' you're among your own. You don't have to worry about having your rights taken away. You have the power. *You dictate what rights other people have*. And no one's opposing you ... Like, 'I'm straight and I'm white and I'm male and that's the way we all are and there's no danger that anyone else might not be that way.' (Eric)

Sara and Eric show a keen awareness of the power dynamics of not being part of the unmarked category of heterosexuality. There is *power* in the presumption of straightness: power of having the 'right' sexual orientation, power to make others 'invisible' and power to 'dictate what rights other people have.'

Gender intersections and the technical/social dualism

The technical/social dualism is an important factor in understanding gender inequality in engineering, but the mapping of the technical/social dualism onto notions of 'masculinity' and 'femininity' is not straightforward when considering LGB identities. Within the culture respondents describe (and in the United States in general), notions of gender tend to be conflated with notions of sexual orientation, such that male homosexuality is popularly understood as 'effeminate' while female homosexuality is understood as 'masculine'.[33] With regard to attributions of technical competence, gay men felt that homosexuality put them at risk for being discredited compared to straight men:

> I mean, stereotypically, gay men are hairstylists and fashion designers ... like, the people who act in the most stereotypically gay fashion have more non-technical jobs. Or maybe it's the other way around, and people are expecting gay men, like, there's no way you could be acting like that in a technical position ... (Brian, gay man grad)

But for women, the story is quite different. Because lesbian and bisexual women are perceived as more 'masculine' than straight women, respondents explained that lesbian women may be perceived as more competent engineers than straight women:

> I guess there's this assumption that, 'oh, you're a lesbian, you're kind of butch, you are definitely kind of more guy-ish, so it would make sense that you are an engineer, because guys are engineers' ... I think, for straight women, it's like, 'oh, you're pretty, you would want a social type of major.' ... Because I'm not a stereotypical female, it's ok for me to be an engineer. I'm smart enough, I'm able enough. I do think people see lesbians in engineering as more capable than straight women ... [For] gay men, I think it's the opposite. They're seen as more incapable than straight men. (Becky, lesbian woman undergrad)

> I mean, queer women are already seen as being more masculine than straight women, in some sense they are seen as more manly, and so that squares more with the 'manly' field they're working in. (Eric)

Although lesbians' technical competence is held in higher esteem than that of heterosexual women, this positive attribution is overshadowed by the overall heteronormativity of the climate (see for example Sara's comments on page 18 and Lisa's quote on the previous page), and women still face a cultural incongruence between their gender and perceptions of them as 'real engineers'.[34]

Experiencing intersections of race/ethnicity and sexual identity within engineering

To better understand the relationship between race/ethnicity and sexual identity for students of color, we asked them whether they identified more with their racial/ ethnic or their sexual identity within the engineering school context. Two students identifying as Chicano claimed that they identified more with their racial/ethnic identity in such a context:

> I feel that all the labels work to make me feel more isolated as a minority ... [I] guess [I]'d say that being [C]hicana carries across to a greater degree ... I realize my sexuality can be a challenge for some to understand and a joke for others ... Chicana applies to

[33]Nardi, "Anything for a Sis, Mary," 1999, 1.
[34]Faulkner, "Gender In/authenticity and the In/visibility Paradox," 2009, 169.

me more in the engineering societies … [I] can identify with other [C]hicanas and [C]hicanos and it helps me connect with more people to study with from that vantage point. (Lisa)

I want to say my sexual orientation because it is just that important to me; however, truthfully, it has to be my ethnic identity within the engineering school context because my physical appearance is the most prevalent, especially when I make first impressions. Also, I can relate more with other students of color like myself (ie. [M]exican/ [C]hicano) than with LGBT students or (LGBT students of color) since there are not many of us within engineering. (Steven)

But for Latina engineering student Becky, when asked which aspect of her identity is most important, she claimed, 'The one that always sticks out to me is being a woman. I feel like within the engineering school I have to put forth more effort to get myself noticed and/or heard'.

While race/ethnicity is more salient in engineering contexts than sexual orientation for Steven and Lisa, this was not the case for Dale, an Asian American undergraduate engineering student. Dale identifies more strongly with his sexual orientation than his race. Although the Chicano students above described race as being an identity around which they could socialize with other Chicano engineers, these students described strong sentiments against expression of gay identity from this racial/ethnic group that they attribute to the religiosity of the Chicano community. While much more work needs to be done to understand these intersections, this analysis points out ways that communities and organizations that have been traditionally important for marginalized people in engineering can create burdens for LGB students even as they provide resources to them.

Passing and covering demands

LGB individuals in our study often feel pressure to 'pass' as heterosexual or to 'cover' cultural markers of their sexual identity in certain social settings. We see that many respondents experience a climate that demands both passing and covering. For example, several people – including an ex-marine who took an honorable discharge when he came out as gay – made a direct parallel between the climate for LGB identifying people in engineering and the US Armed Forces policy of 'don't ask, don't tell' which requires LGB people to 'pass' as heterosexual.

Eric's responses illustrate the pressures he faced to pass as straight:

Before I was out … I happened to laugh in a very gay way and [another student] mocked my laugh in the same kind of gay way that I laughed and then asked me, with obvious hostility, 'are you gay?' Other people were around him at the same time. And I said, 'no,' I was not gay. (*respondent looks visibly uncomfortable at this point; he grimaced as he said this line, tugged at his shirt, shifted in his seat between 'no' and 'I was not gay.'*) Fortunately, the conversation ended there, but he really hurt me by that. He made me feel unsafe, and denigrated based on my sexuality. I never forgave him for that. (Eric)

Eric confided that he was just coming out to himself at this stage in his life, and fear of this type of interaction pressured him into passing for another year and a half.

While only two students described themselves as 'completely out,' all but David (undergrad gay man) and Pete (undergrad bisexual man) were out to at least a handful of their engineering classmates. Although they did not feel demands to pass with those who were aware of their sexual identity, respondents often experienced

distinct demands to 'cover' their sexuality. Once Eric came out to a few of his lab-mates, he noticed a double standard in sharing the details about his dating life:

> People are accepting [of me as a gay man] up to a point. They're fine with you being gay, but they don't want you to talk about having a boyfriend. They're fine in the abstract, but let's just not go there. And the fact that they talk about their girlfriends in the lab I find kind of hypocritical.

Lisa, after coming out to the principal members of her chapter of the Society of Women Engineers (SWE), was explicitly asked to cover her sexual identity:

> If it comes up, it comes up. In SWE, I tried not to make it come up, because many women were uncomfortable with it. Like, we never discussed whether someone in the group is gay because everyone is assumed not to be. I did come out to the president and the vice president, and they're like, 'that's cool ... just keep it to yourself.' There's this stereotypical view that oh, she's a lesbian, so she'll try to hook up with everyone else, especially in a group like SWE that is all women.

Because of the discomfort created as a result of this exchange, Lisa eventually left SWE. Lisa's experience points to her challenging location at the intersection of gender and sexual identity: her sexual identity marginalizes her within an organization that is supposed to ease her marginalization as a woman in engineering.

Overall, respondents felt that the climate's heteronormative pressures hovered just below the surface of political correctness; such blatant statements of heteronormativity occurred only occasionally. However, just because other students, faculty members and co-workers 'behaved themselves' most of the time does not mean that respondents did not find the climate to be marginalizing. This was particularly well expressed in a conversation during the first focus group. These respondents made a distinction in the shades of meaning between having a 'tolerant' environment and 'being tolerated' by others in the environment.

> INTERVIEWER: So, is engineering 'tolerant,' then?
>
> ERIC: To me, it seems that you are *tolerated*, but you are not fully embraced ... .
>
> DAVID: Yeah, if we use the word 'tolerant' then people might think it's all OK.
>
> ERIC: Yeah, gays are tolerated. As opposed to an environment that is *tolerant*, gays are *tolerated*.
>
> JUAN: Yeah, 'toleration' is definitely not *acceptance*. You can tolerate someone working with you, but you are not accepting.

The difference is subtle but important, as 'tolerant' is a term used to describe the passive and neutral quality of an environment, while 'being tolerated' implies a hierarchical relationship that is not the same as complete acceptance.[35] We next describe the tactics that respondents use to navigate the heteronormative climate of

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[35]Jakobsen and Pellegrini trace the origins of the concept of 'tolerance' to colonial laws governing religious participation as 'religious tolerance,' and they argue that embedded within the concept is a necessary reliance on a hierarchical relationship between the tolerated and some dominant tolerating entity. Despite the optimistic efforts to 'teach tolerance' in opposition to hate, the authors claim that working within this conceptual framework falls short of the democratic ideals of honoring freedom and equality. See Jakobsen and Pellegrini, *Love the Sin*, 2003, 45–73.

engineering and then discuss the impacts these circumstances have on the LGB engineering students.

Tactics LGB engineering students use to navigate the climate

Passing and covering tactics

Our respondents are social actors skilled at navigating this climate, relying on several creative tactics that include passing, covering, the achievement of expertise, and living compartmentalized lives. The use of 'passing' tactics enables gay men in particular to occupy the privileged status of a heterosexual man, rendering invisible their stigmatized identity. These tactics include discussing their relationships without using gendered pronouns or simply lying about their sexuality to their classmates. As David, Pete, and Juan recount, the pressures of passing are often preferable to the pressures of dealing with the negative reactions of colleagues:

> If I tell them something they are uncomfortable with, it might throw off the whole team thing. Like, if we're in a lab group and we have to collaborate together, I feel like maybe they won't take my ideas seriously, or maybe they'll collaborate without telling me about key details or something like that, or maybe I'll be assigned to the menial tasks while they'll do the design part ... (David)

Like David, Pete's decision to pass among the engineering students is based on his fear that coming out would harm his ability to be taken seriously in engineering, now and in the future:

> If you're in Aerospace [engineering], you don't get to know at all. If you know anyone who is in aerospace engineering, you don't get to know. I don't want it ever to affect me, and I do feel it will.

Although less closeted than Pete, both Sara and Lisa mentioned their lengthy contemplations before sharing their sexual identity with engineering classmates. Juan describes a passing tactic he implements in social situations, such as departmental functions, where heteronormativity is particularly salient:

> I make a disclaimer. If I bring [my boyfriend] along, I will say, 'by the way, this is important,' and then he knows that we are to be just friends. Unless he gets the OK from me. [This happens for] anything professional, or anything engineering-related.

Not only does Juan have to skillfully enact his passing tactics in engineering social events, he must convince his partner to fully enroll in these passing tactics as well.

Among covering tactics, the most popular is the use of humor. By joining in with or initiating (often self-deprecating) banter about gays and lesbians, students are able to foster a certain interpretation of themselves or their situations that mitigates tensions and ease social interactions. Wendy joins in the banter when her classmates 'give her shit for being gay'. Although it forefronts issues of sexual difference, humor codes sexuality as explicitly part of the 'social' and thus not threatening to the 'technical' routine of engineering. It is, essentially, a signal to respondents' colleagues that they are complying with the relegation of sexuality to the 'illegitimate.'

> Sometimes I'll crack a joke, just to get it over with, so if they had any doubt they can just stop thinking about it. I'll make fun of gays myself, just to get it over with. Or, I'll act gay myself, I'll say 'oh, you look cute today,' or something, so they'll think I'm joking. And they laugh at it. And that way, if I ever do actually say something like that they'll think I'm still joking. (Juan)

Juan's use of humor seems to break the tension within his study group and allows the social interaction to proceed. Although outside the scope of this study, such self- or group-deprecating humor likely comes with its own psychological effects on students.

Particularly for men, whose engineering competence is undermined by stereotyped links between their sexual identity and the 'non-technical', respondents navigate the climate they encounter by garnering *expertise* and *indispensability* by working extremely hard academically. Once achieved, respondents utilize expertise and indispensability to subvert negative aspects of their climate. Specifically, when they are in a position of expertise, they have more control of the environment, and more freedom to come out (although this credibility must be continually re-established).

Two graduate student men are more comfortable revealing their sexual identity to the undergraduates they teach rather than their graduate student peers because they occupy a formalized 'expert' role in relation to the former. In a focus group exchange:

> BRIAN: ... when I'm TAing, I feel compelled as a TA to make it clear that I'm gay ... I'll sort of give hidden clues that I'm gay and I know the material and I'm teaching you guys this, and you'll have to deal with this.
>
> JUAN: Like what signs?
>
> BRIAN: Like, I'll wear a t-shirt, I'll be more swishy than normal. I feel pressure to show there is a gay presence here and you can be gay *and* a graduate student.
>
> ERIC: Ya, I feel more comfortable outing myself if I have the upper hand. And an authoritative role. If I can leverage something and impress someone, then I feel like I have the capital saved up and then I can spend it by outing myself.

Because Brian and Eric 'know the material' and are in an 'authoritative role', they are more comfortable disclosing their sexual identity. They also feel compelled to do so as a representation of competent engineering graduate students who 'just happen to be gay'.

Although they do not yet occupy formal positions of authority, the under-graduate LGB students achieve indispensability by honing their engineering expertise. Isaiah (undergraduate gay man) illustrates similar uses of expertise as a way to subvert hostility:

> ISAIAH: [My classmates] see me as a good resource. And I think, for me, that outweighs the fact that I'm gay ... They don't care, they got a good grade with my help.
>
> INTERVIEWER: If you weren't as strong of a student, do you think the climate would be more of a challenge for you?
>
> ISAIAH: Yes. Yes. Definitely. It's within yourself to move on and keep going, because you know that there are these students that won't accept you ... If you're not strong

enough, that's when you don't make it through engineering, and you switch into English or something.

Although students utilize their expertise to help them navigate the climate, we show below how this academic expertise is hard won. Heterosexual students are not similarly burdened by virtue of their sexual orientation to achieve indispensability and expertise in order to be accepted by their peers.

Living compartmentalized lives

As an adjunct to covering and passing, another tactic students use to navigate their climate is to live 'compartmentalized lives', the maintenance of boundaries between their engineering work and their social lives. This compartmentalization is not necessarily required of straight engineering students, whose classmates often form the core of their friend groups and who are able to pass seamlessly between their personal lives and professional lives while on campus. Eric noted above that his heterosexual male labmates' ability to talk openly about their girlfriends, while he was pressured to cover, is 'kind of hypocritical'.

Many see this compartmentalization as a sacrifice and others see it as desirable (Ryan, undergraduate gay man, advised others at the focus group to use this tactic: 'they are separate, the private and personal life; within your workgroup, you don't talk about your personal life ... keep it professional'). But all saw this burden of additional work as necessary for success in engineering.

This compartmentalization impacts more than just what topics of conversation are appropriate in engineering contexts; students feel that whole parts of their identity have to be 'checked at the door' of their engineering lives:

> When you got into a professional engineering environment, you leave your private self at home, and you keep it all professional, and when you leave that environment, you can go back to your private self at home. (Lisa)

Effects of the climate on LGB students

The climate just described and the effort required to navigate this climate have significant impacts on the students we interviewed. Passing, covering, living compartmentalized lives, and achieving indispensability require tremendous amounts of emotional work, including hiding, lying, and isolating oneself from engineering peers. Steven notes 'the agony, the stress of constantly trying to portray a certain image of myself and hiding who I really am ... I can't live like this forever!' Sara also speaks to the difficulties of emotional work:

> If you come out to someone, if they don't like it, then *they* have to deal with it. But if everyone just assumes you're straight, then it becomes *your* problem. You have to worry about how other people will react if you come out to them. Definitely there are times when I just don't want to deal with ... ugh. Even if the other person isn't going to be hostile, I don't know if I want to deal with people's changing perceptions of me, or what they are going to ask. Even if they are cool with it, their idea of you changes ... (Sara)

In addition to this emotional labor required of LGB students, they often face extensive identity work and social and academic isolation.

The burden of identity work

The professional socialization process in engineering education presents students with the challenge of reconciling their new professional identities with their sense of self.[36] This is particularly challenging for LGB individuals, who must reconcile conflicting expectations of their sexual, professional, racial, and gender identities. For example, the social location of gay men engineering students sits between two conflicting, 'mutually exclusive' stereotypes of gay men and engineers. Gay men must negotiate others' perceptions of them based upon these stereotypes and their own senses of self.

> I'm more of a stereotypical engineer than I am a stereotypical gay person. I'm not good with people, I'm not effeminate. The only thing I have in common with that stereotype is that I like someone of the same gender … I probably have the hardest of two worlds … they are very conflicting. (Jonathan, undergraduate gay man)

> What is threatening as an engineer and being gay is that it's so contrary to the typical gay stereotype. The assumption that gay guys are art majors or music majors, fashion designers, or what not. Just really effeminate all around, which I never thought was me … But, I don't think I am a stereotypical engineer, either. The stereotypical engineer is good at math, not that emotional, really logical, they're just personally inept at times. I'm breaking the stereotypes. (Mark, undergraduate gay man)

Both Jonathan and Mark express frustration at the seeming mutual exclusivity of the engineering and gay male stereotypes, and they struggle to find their own identity among those stereotypes. Sara provides another point of view:

> When you're a minority, and especially when you are a discriminated-against minority, it would be great if I wouldn't have to worry if my professors were weirded out because I brought my girlfriend to social hour. If you're queer, just getting to that point … is a lot of work … It's just really hard to be isolated somewhere where people just don't understand what you had to do to get where you are in your life. (Sara)

Sara suggests that contending with stereotypes of intersecting gender, sexual, and professional identities creates similar reconciliatory challenges for women.

Social and academic isolation

The climate that LGB students in engineering face is also socially and academically isolating. Brian feels he is 'different than everyone else' he sees around him, and Jonathan fights to avoid being labeled as 'that gay engineer' by his peers. David provided a poignant example of this social isolation:

> There's this division between most of my engineering friends and myself … some people who were my friends from first year in engineering, they all live together. I would love to be a part of both worlds. Well, I *am* a part of both, but I would love to be their friends as well …

Because David is passing as straight in all engineering contexts, he does not participate in many of the social activities with his engineering classmates. As a result, his friendships have suffered and he feels increasingly socially isolated

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[36]Cech, "Dilbert in Stilettos," 2007, 38.

from his engineering peers. He draws a contrast between this and the other engineering students in his class who spend '24/7 together in the library' studying.

Steven, like Lisa, left a student organization as a result of the hostility he felt within it:

> When I left [professional engineering minority organization] I was part of the board. We were helping to put on a safety conference and we were asked to put on a workshop for the centers on campus. There's the multicultural center, the LGBT resource center, and the Women's center. Some of them made remarks like, well then, maybe we shouldn't ask for money [to put on the conference], then. They were really against it, making jokes and laughing. It made me be like, 'Ok, then, why am I here?' They were making me really uncomfortable ... so I just left. (Steven)

Student organizations can be vital to the success and inclusion of ethnic minorities and women. Steven and Lisa felt isolated because of their sexuality from professional organizations whose purpose is to support marginalized students.

Lisa explains that a gay man who is a friend of hers faces rather extreme academic isolation because of his need to pass as straight among his engineering peers:

> With some engineers who are not straight, it seems that ... they're trying to do the work all by themselves and they're missing out on opportunities to learn from others. They isolate themselves from other engineering students because they're trying not to draw attention to their sexuality. One of my friends ... doesn't do group study, he likes to hole himself up in the library and keep to himself. He worries that if he interacts with these people, they might find out he's gay, and they will not want to hang out with him or talk to him. (Lisa)

Because of this academic isolation, and the vital importance of group work for success in engineering, students like the one Lisa describes have to work much harder to succeed in school than their classmates who are well-integrated academically.

Juan also speaks to the need to work harder academically than his straight peers, and to both the social and academic isolation that can arise in the engineering climate:

> It's like the military, like I have to give 110%. Last quarter, I had this study group, and I think two of the guys feel very threatened that I'm gay ... every time we go into a study room or something like that, they'll try and find a seat the farthest away from where I'm at. And, they'll talk to me about nothing but structural engineering. They'll still meet with me, but they wouldn't want anything to do with me outside of work ... And, even though I have tough questions, I feel like I can't ask *my* questions because of those two students ... I really don't want them to see me as gay *and* stupid.

These experiences are not Juan's alone. This culture burdens LGB students with substantial social negotiation work such as living compartmentalized lives and identity management. Students are isolated both socially and academically as a result of this climate, and the navigation described above requires a tremendous amount of both emotional and academic labor.

Anxiety over future job security

As a final effect of this climate, we find that the LGB students are deeply anxious about their future careers once they leave the supposedly 'liberal world' of academia. All respondents said that their sexuality might have a negative impact on their job security in the future under certain circumstances.

> I could see it when there's going to be management people or upper people who are going to look at me and see me as just a gay guy, and they might judge me because of that. And, I might have to work against that; it would be an uphill battle. (Kevin, undergraduate gay man)

Sara imagines similar possibilities when looking for jobs in academia:

> I don't even know what I'm going to do if I'm dating a woman when I'm looking for jobs. In terms of what I would do with being out while I was looking for a position. Applying for a faculty position while I was out would be incredibly difficult … I think it would definitely have an impact on whether or not I got hired.

Lisa suggests other mechanisms by which her job security might be threatened, ways that are less easily refuted through discrimination legislation:

> [Organizations] have this whole thing that you won't be discriminated against. If I got fired, it wouldn't be under the pretense that I'm gay; I would most likely be fired because I screwed up *because* I'm gay. Like, if I was sent to another country where they weren't accepting of homosexuality, and I started to be free to act as I choose, then they would be like, you screwed up the sale and our relationship with the customer … I'm sure that it would come around to me in a way that I could not take legal action against the company.

It is tempting to recast these speculations as the naive fears of students nervous about securing a job in a tight economic market, but there is reason to suspect that their perceptions of the labor market might be quite accurate. For one, part of their education process is their professional socialization into the engineering profession, complete with expectations about what the engineering profession is like outside of school. Juan's experiences in his internship also give us pause:

> I came out to my office little by little … *and then my internship came to an end.* They didn't 'fire' me, but they said, 'sorry, we're out of work.' I was like, wow, after a year and eight months, you suddenly run out of work? Maybe it was because I came out that I got fired, maybe it wasn't, but … .

If our respondents experience potentially discriminatory treatment as interns, it is likely that the climate issues described here extend far beyond the reaches of academia and are found at least to some extent in the engineering labor force.

Conclusion

This study examined the experiences of 17 engineering students who identify as gay, lesbian, or bisexual in a large, competitive, public university in the western United States. To our knowledge, this is the first sociological examination of its kind. While experiences vary across a 'matrix of domination', we find that engineering students in our study who identify as LGB have many experiences in common. These students

experience an oppressive climate where homosexuality is overtly devalued and students face a range of heteronormative sentiments and actions. In addition to these general biases, students described disadvantages that are particular to the cultural norms and perceptions of competence within the engineering profession. Respondents also face many passing and covering demands. Perhaps most problematically, cultural norms relegate discussions of LGB issues to the realm of the 'social'. As a result, the unmarked category of heterosexuality is legitimated and imbued with power, and LGB engineering students' concerns are silenced. In short, these testimonies suggest that, due to this climate, LGB students do not have access to equality of opportunity within this engineering school.

While these patterns are common across the LGB students in our sample, we find differences within the matrix of domination. For men, heteronormativity is sometimes couched in the technical language of engineering and stereotypes of them as 'feminine' undermine their perceived technical abilities. While lesbian women in engineering may be stereotyped as 'masculine', we find that this does not work to their advantage because of the overall heteronormative climate and the general biases against women. Bisexual students face a strict heterosexual/homosexual dichotomy, as there are particular stereotypes of bisexuality to contend with. When considering race/ethnicity, Latino men and women tend to find their racial/ethnic identity more salient in engineering contexts, while this was not the case for Asian American respondents. In these cases, attention to the negotiation of stigma on the basis of the visibility of markers is important for understanding these experiences.

LGB students rely on tactics of passing and covering, compartmentalization, and achievement of expertise and indispensability to navigate the climate they experience. Both the climate and its navigation have a significant impact on these students: they must expend tremendous amounts of emotional and academic labor and these circumstances isolate them from their peers both socially and academically.

While we cannot generalize this research to other US engineering schools or the engineering workforce, we have attempted to identify several mechanisms by which engineering culture can lead to LGB students' personal experiences of marginalization and isolation. To the extent that the culture we document exists in other settings within the engineering profession, some of the mechanisms we identify may accompany that culture. For instance, in settings where a technical/social dualism is salient, it is likely that issues related to LGB equality will be relegated to the 'social' and be considered less legitimate than 'technical' issues. Gay men, along with women and members of racial/ethnic minorities, may also feel their competence undermined by the prominence of this dualism. This co-construction of LGB biases with the culture of the profession has important consequences: unlike formal discrimination, which may be responsive to social activism on behalf of LGB communities, these profession-specific biases may linger long after changes in law and policy to disadvantage LGB individuals in engineering.

This research makes contributions beyond the scope of LGB students. First, we examine a different kind of difference in relation to previous work on inequalities in engineering. Our research, with its theoretical basis of 'covering' and 'passing', investigates a situation in which people are marginalized on the basis of an identity category with markers that can be made invisible. Other forms of difference which may be investigated with these tools include religion, some forms of disability, and citizenship. Second, it points to the importance of studying intersectionality when

investigating inequalities in engineering. Further research on inequalities in engineering should consider how sex and race categories encompass people with often very different experiences depending on their location within interwoven dimensions of oppression. We also hope that further research on gender and sexuality in engineering will look closely at the experiences of people in the profession categorized as 'transgender', and will further explore the issue of gender non-conformity.

What can be done to improve the experiences of LGB students at Gold University? Several respondents applauded the idea of a local chapter of oSTEM, an organization for LGBT students in science, technology, engineering, and math, where students who are questioning their sexuality can gather in a space where neither engineering stereotypes nor gay stereotypes are dominant, where they can discuss issues pertaining to the climate just described, and where there might be opportunities to invite LGB engineering practitioners as guest speakers.[37] Respondents also suggest that having visible and out gay faculty members and industry role models would provide much-needed mentoring opportunities.[38]

Furthermore, increased awareness of the needs of LGB students can be useful in shaping campus policy, campus organizations, and campus culture. Students urge that formal policies against sexuality-based bias be firmly in place in universities and that faculty and students be educated about them. These policies could also be extended to professional organizations related to engineering education (such as the American Society for Engineering Education) or within the engineering profession in general.[39] Moreover, the promotion of in-house organizations for LGBT engineers or national organizations such as NOGLSTP is vital.[40] Most importantly, engineering programs, organizations and their constituents should encourage dialog about heteronormativity, in the same way they are beginning to encourage discussions about gender and race/ethnicity. Recasting the problem of hetero-normativity as a legitimate topic of conversation in engineering (and not merely 'political') can begin to ameliorate this problem within engineering cultures.

While this project opens up more questions than it answers, it is a first step toward understanding the experiences of an unstudied demographic group of engineers. Our future research will explore LGB engineering professionals' experiences in industry and academia, allowing for a comparison between the climates in engineering school and engineering work. Further research is needed on the nuanced differences between the experiences within engineering sub-disciplines and on how the LGB issues documented here intersect with other dimensions of marginality such as gender and race/ethnicity. We hope that this project will

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[37]More information on oSTEM, "Out in Science, Technology, Engineering, and Math," can be found at http://www.ostem.org/

[38]MentorNET has recently implements an LGBT section, where LGBT students can seek mentorship from LGBT scientists and engineers in the workforce. See Riley, "LGBT-Friendly Workplaces in Engineering," 2008, 21.

[39]The American Society for Engineering Education "Statement on Diversity" reads, 'ASEE believes that regardless of gender, age, race, ethnic background, disability, or national origin all individuals must be provided with equality of opportunity to pursue and advance in engineering careers.' Notably missing is the human diversity dimension of 'sexual orientation,' among other possibilities.

[40]National Organization of Gay and Lesbian Scientists and Technical Professionals (NOGLSTP): http://www.noglstp.org.

encourage sensitivity to the issues faced by these students, and that it will contribute to ongoing efforts to make the profession a welcoming place for *all* qualified individuals.

Acknowledgments

Bibliographies

American Society for Engineering Education. "ASEE Statement on Diversity." http://www.asee.org/about-us/the-organization/our-board-of-directors/asee-board-of-directors-statements/diversity, 1999. Adopted 31 January 1999. Accessed 24 October 2010.

Becker, Howard S., Blanche Geer, Everett Hughes, and Anselm Strauss. *Boys in White: Student Culture in Medical School*. New Brunswick, NJ: Transaction Books, 1961.

Berger, Michele T. *Workable Sisterhood: The Political Journey of Stigmatized Women with HIV/AIDS*. Princeton, NJ: Princeton University Press, 2004.

Bonous-Hammarth, Marguerite. "Pathways to Success: Affirming Opportunities for Science, Mathematics, and Engineering Majors." *The Journal of Negro Education* 69, no. 1–2 (2000): 92–111.

Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. New York, NY: Routledge, 1999.

Cech, Erin A. "Dilbert in Stilettos: The Character of Deterrents Facing Women in Engineering." In *Gender and Engineering: Strategies and Possibilities*, ed. Ingelore Welpe, Barbara Reschka and June Larkin, 35–50. Frankfurt: Peter Lang Press, 2007.

Combahee River Collective. "A Black Feminist Statement." In *But Some of Us are Brave*, ed. Gloria Hull, Patricia Bell Scott, and Barbara Smith, 13–22. Old Westbury, NY: Feminist Press, 1982.

Crenshaw, Kimberle W. "Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color." *Stanford Law Review* 43, no. 6 (1991): 1241–99.

Downey, Gary L., and Juan C. Lucena, "Knowledge and Professional Identity in Engineering: Code-Switching and the Metrics of Progress." *History and Technology* 20, no. 4 (2004): 393–420.

Dryburgh, Heather. "Work Hard, Play Hard: Women and Professionalization in Engineering – Adapting to the Culture." *Gender & Society* 13, no. 5 (1999): 664–82.

Eglash, Ron. "Race, Sex, and Nerds: From Black Geeks to Asian American Hipsters." *Social Text* 20, no. 2 (2002): 49–64.

Faulkner, Wendy. "Dualism, Hierarchies, and Gender in Engineering." *Social Studies of Science* 30, no. 5 (2000): 759–92.

Faulkner, Wendy. "The Power and the Pleasure? A Research Agenda for 'Making Gender Stick' to Engineers." *Science, Technology, and Human Values* 25, no. 1 (2000): 87–119.

Faulkner, Wendy. "'Nuts and Bolts and People': Gender-Troubled Engineering Identities." *Social Studies of Science* 37, no. 3 (2007): 331–56.

Faulkner, Wendy. "Doing Gender in Engineering Workplace Cultures II. Gender In/authenticity and the In/visibility Paradox." *Engineering Studies* 1, no. 3 (2009): 169–89.

Goffman, Erving. *Stigma: Notes on the Management of Spoiled Identity*. Englewood Cliffs, NJ: Prentice Hall, 1963.

Hacker, Sally L. "The Culture of Engineering: Woman, Workplace and Machine." *Women's Studies International Quarterly* 4, no. 3 (1981): 341–53.

Herek, Gregory M. "Beyond 'Homophobia': Thinking About Sexual Prejudice and Stigma in the Twenty-First Century." *Sexuality Research & Social Policy* 1, no. 2 (2004): 6–24.

Hill Collins, P. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. New York, NY: Routledge, 1991.

Hughes, Thomas P. *American Genesis: A Century of Invention and Technological Enthusiasm*. Chicago, IL: University of Chicago Press, 1989.

Jakobsen, Janet R., and Ann Pellegrini. *Love the Sin: Sexual Regulation and the Limits of Religious Tolerance*. New York: NYU Press, 2003.

Kitzinger, Celia. "Heteronormativity in Action: Reproducing the Heterosexual Nuclear Family in 'After-Hours' Medical Calls." *Social Problems* 52, no. 4 (2005): 477–98.

Latour, Bruno. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, MA: Harvard University Press, 1987.

Leslie, Larry L., Gregory T. McClure, and Ronald L. Oaxaca. "Women and Minorities in Science and Engineering: A Life Sequence Analysis." *The Journal of Higher Education* 69, no. 3 (1998): 239–76.

Lorde, Audre. *Sister Outsider: Essays and Speeches*. Trumansburg, NY: Crossing Press, 1984.

McIlwee, Judith, and J. Gregg Robinson. *Women in Engineering: Gender, Power, and Workplace Culture*. Albany, NY: State University of New York Press, 1992.

Nardi, Peter. "'Anything for a Sis, Mary': An Introduction to *Gay Masculinities*." In *Gay Masculinities*, ed. Peter Nardi, 1–11. Thousand Oaks, CA: Sage, 1999.

Predd, Prachi Patel. "The Gay Engineer: Tech Companies are Increasingly Accepting of Gays and Lesbians." *IEEE Spectrum* 42, no. 2 (2005): 47–8.

Riley, Donna. "LGBT-Friendly Workplaces in Engineering." *Leadership and Management in Engineering* 8, no. 1 (2008): 19–23.

Riley, Donna. *Engineering and Social Justice*. San Rafael, CA: Morgan and Claypool, 2008.

Sandler, Bernice R., Lisa A. Silverberg, and Robert M. Hall. *The Chilly Classroom Climate: A Guide to Improve the Education of Women*. Washington, DC: The National Association for Women in Education, 1996.

Schleef, Debra J. *Managing Elites: Professional Socialization in Law and Business Schools*. Oxford, UK: Rowan & Littlefield Publishers, Inc, 2006.

Tonso, Karen L. *On the Outskirts of Engineering: Learning Identity, Gender, and Power via Engineering Practice*. Rotterdam, Netherlands: Sense, 2007.

Yoshino, Kenji. "The Epistemic Contract of Bisexual Erasure." *Stanford Law Review* 52, no. 2 (2000): 353–461.

Yoshino, Kenji. *Covering: The Hidden Assault on Our Civil Rights*. New York, NY: Random House, 2006.