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The Island of Other: Making space for embodiment of difference in engineering

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In recent years the ASEE Exhibit Hall has featured a Diversity Booth containing displays from several organizations including a number of professional societies representing racial and ethnic minorities in engineering, the Society of Women Engineers, and the National Organization of Gay and Lesbian Scientists and Technical Professionals. In a sea of white straight male able bodies roaming the hall, this “Island of Other” reveals a commitment to creating a noticeable presence for diversity at ASEE and the possibility for multiple subaltern identities coexisting in one location, both an acknowledgement that bodies might express more than one identity and an opportunity for organizing and building solidarity. At the same time it necessarily cordons off space for the Other. What is the nature of this space, and what does it mean for some body to cross its boundaries, in either direction, as an ally or as a member of one or more of the identified groups? What does it mean that in 2012 there was no expressed space for disabled engineers on this Island, or elsewhere at ASEE?

Using queer theory and disability theory, I seek to uncover the meaning of bodily experience on and off the Island of Other and in STEM more broadly. By exploring what identities and what bodies are rendered visible (or alternatively audible, palpable: perceptible) -- and under what conditions -- we begin to understand how identities matter, and how bodies matter, in engineering and in engineering education.

This exploration of bodily experience will include an interrogation of engineering’s heteronormativity: How are engineering and “nerd” masculinities constructed as heteronormative? In what ways is the body denied, contorted, and taken apart to fit these ideals through engineering epistemology and practice? How is the struggle for LGBT inclusion and equality in engineering constrained by these norms, and how can queer bodies work to disrupt this ordering? Do disabled bodies disrupt in a different way?

What lessons from this analysis can be brought to bear on the Island of Other to conceive of new meanings of access for queer bodies and disabled bodies and other incarnations of diversity in engineering? What role can engineering play, and how does engineering need to change, to take a positive role in access, inclusion, and justice?

Introduction

Despite the growth and success of their political movements in the last 50 years, including critical policy changes affecting higher education, the marks of the LGBTTIQ¹ movement and the disability movement are often barely discernible in engineering and engineering education. Each movement established active organizations through the auspices of the American Association for the Advancement of Science (AAAS) in the 1970s and 80s,^{2,3} but most

engineering educators have so far taken little notice, even though these organizations have developed resources and targeted communications strategies for the engineering community,^{4,5} and engineers are active members of these groups.

This paper examines what it is about engineering that makes its able-bodied heteronormativity (or heteronormative able-bodiedness) so unrecognizable, even after decades of organizing in society at large and in the profession specifically. What can this examination tell us about the construction of privilege in engineering along other axes of difference such as race, nationality, or gender, or less recognized categories like age or class? What can Queer Theory and Disability Theory offer the engineering education community as it seeks to understand these questions and develop a praxis of resistance to able-bodied heteronormativity?

I come to this work as a queer able-bodied white woman from a middle-class background. I am neither a queer theorist nor disability theorist but am interested in discovering what engineering educators can learn from these areas of scholarship for diversity efforts within engineering.

Language. It seems important to provide first some introduction to terminology for the ASEE community. The term *disability* is commonly used to describe both the movement for disability rights and the critical lens of analysis developed in Disability Studies. A key concept in Disability Studies has been a critique of medicalized narratives of disability and the emergence of new narratives that articulate the ways in which social structures and infrastructures create disability, limiting access of people with impairments to any number of activities from social interaction to participation in engineering education. The use of the term as an identity label, as in “Disabled Person” or “People with Disabilities” is contested, as some do not identify with the term and prefer to identify in terms of particular impairments or conditions they experience. The social model of disability is itself critiqued within Disability Studies⁶ for the ways in which some activists have interpreted it; if infrastructure designed by able-bodied people has created the oppression of disabled people, then some argue there is no room for able-bodied people in the disability movement. Insofar as the social model might have led to essentialism of disability, as well as a problematic dynamic around who counts as disabled, it can work to the movement’s detriment.

Lisa Loutzenheiser⁷ explains that *queer* can mean many different things – it refers to an analytical lens, a less specific label for sexual orientation than lesbian, gay, or bisexual might indicate (which can signify a critique of these labels as too rigid, or merely a discomfort with using them), or a political identity that embodies structural critique of not only heteronormativity but also of economic and political systems and hierarchies of race, class, gender, religion, nation, ability, and more (which in turn shape heteronormativity). Queer is a reclaimed term that has been historically used as a violent epithet (“smear the queer”); thus its use calls attention to difference and signals toward a non-assimilationist stance. Queer politics is non-normative, even as the mainstream LGBT movement might seek to emphasize the likeness of LGBT people to straight people in its quest for equal rights.

Heteronormativity refers to societal expectations of particular behaviors and physical presentations that fit a stereotypically heterosexual framework. It is distinct from *homophobia* or *transphobia*, which refers to an attitude or practice of fear and hatred of LGB or T people. Heteronormativity can manifest in different forms in different cultures and subcultures, as expectations for sexual and gender expression may vary. For example, in popular culture representations of nerds (see, e.g., the 1984 film *Revenge of the Nerds*⁸ or the recent hit television series, *The Big Bang Theory*), male nerds seek dates with women as a central story arc, and these displays of heterosexual longing and struggles for female attention is a hallmark of nerd identity (and as discussed later in this paper, a key element in defining hegemonic forms of both masculinity and femininity in engineering).

Why these two categories of identity? This paper focuses on queer and disability together for several reasons. First, these are two categories (but not the only two categories) that were conspicuously absent from the Island of Other. While underrepresentation of people with disabilities is well documented,⁹ no one has systematically studied representation of LGBTQ people in engineering, and underrepresentation would be difficult to ascertain given the difficulties with national estimates of the LGBT population.¹⁰ At the same time, given how few LGBTQ people are out in engineering, we might broaden our understanding of underrepresentation to incorporate the dynamics of invisibility -- a problematic term from a disability perspective, but one that applies to people with “hidden disabilities” as well as LGBT people. When subaltern status is not readily detected, individuals must make decisions about the safety of coming out or revealing their status. Not having a safe environment in which to reveal one’s self then creates a different kind of underrepresentation not currently tracked in engineering.

Second, the idea of embodiment links queer and disability on a theoretical and experiential level. Sociological scholarship on embodiment demonstrates how bodies are socially constructed and subject to political constraint.¹¹ The experience of being queer and the experience of being disabled are both lived through bodies and can be theorized using sociologies of embodiment. Heterosexism, homophobia, and ableism are political forces that construct bodies in particular ways and thus these isms are enacted upon -- and experienced within – bodies, as is heterosexual and able-bodied privilege. Engineering, in its adoption of mind-body dualisms as part of its construction of objectivity, is able to ignore these experiences or render them unrecognizable. Theories of embodiment in Queer and Disability Studies can confront this disembodiment and uncover how it supports heteronormative able-bodiedness.

To understand how heteronormativity is enacted on the body, consider how homosexuality was constructed as an illness by medical and mental health experts, leading to immeasurable suffering among LGB people. The LGB movement has historically distanced itself from disability in an attempt to de-medicalize the construction of homosexuality. However, in recent

years, owing in part to trans and intersex activism, there has been increasing recognition of important linkages between queer and disability in both theory and practice, suggesting that a better strategy might have been to confront ableism and homophobia together.¹²

These theoretical linkages form another basis for shaping a paper around these identities' relationship to engineering. Robert McRuer¹² has articulated key connections between queer theory and critical disability, which can be used to illustrate how ableism and heteronormativity construct each other. Both queer and disability theory have analyzed the social construction of LGBTTIQ people and people with disabilities as a minority, identifying structural forms of oppression in society that cause LGBTTIQ or disabled people to not fit the norm, and not to have access to certain institutions, privileges, or social transactions as a result. Both disciplines avoid essentialized or medicalized identities and instead interrogate the assumed "naturalness" of able-bodied heterosexuality. Both seek to view LGBT people and people with disabilities as subjects rather than as objects of study in the sciences or social sciences. In this way both disciplines pay careful attention to the kinds of metaphors used to describe both queerness and disability. Being critical of discourses about diversity and inclusion, as well as descriptive language of queer and disability opens new possibilities for access. McRuer further argues that we must resist conceptions of disability as tolerance that merely reinforces able bodied heterosexual privilege, and instead conceive of meaningful access for both queer and disabled people.

Within ASEE there has been far more research on disability than queer or LGBT topics. Searching ASEE proceedings for "disability" turns up over 800 articles (roughly the same number as for the exact phrase "women and minorities") – some focus on educating disabled engineering students, others focus on universal, adaptive, or assistive technology design, and others merely mention disability in a laundry list of diversity categories. LGBT is a different story, with less than 100 total papers, and less than 10 discuss LG (and sometimes BT) students outside of diversity category lists. Only one paper deals exclusively with the topic of LGB student experience.¹³ To be clear, these numbers indicate little about how far we have come in addressing sexism, racism, ableism, or heterosexism. It is nonetheless important to note how both queer and disability remain categories at the margins in discussions of diversity in engineering (even as diversity discussions themselves, in turn, remain at the margins of engineering), with each marginalized differently.

This paper explores these marginalizations, beginning with a focus on last year's Diversity exhibit at ASEE. Then I will use ideas from Queer and Disability theories to identify the particular ways in which able-bodied heteronormativity constructs queer and disabled Others. I close by considering how we might conceive of new meanings of access for queer bodies and disabled bodies and other incarnations of diversity in engineering.

The Island of Other

In the 2012 ASEE Annual Conference Exhibition, DuPont sponsored a central location that housed diversity groups in engineering. Professional organizations for women and minorities were present, as well as the National Organization of Gay and Lesbian Scientists and Technical Professionals (NOGLSTP). This was NOGLSTP's third year at ASEE, and the second sponsored in the DuPont diversity center. However, absent from this center were any organizations or individuals representing engineers with disabilities.

Having a central location for diversity groups in engineering, and placing it front and center in the exhibit hall (it was not in such a prominent location in 2011) makes a statement. It builds awareness and demonstrates a certain type of commitment to or valuing of diversity. It creates opportunities for coalition building across the different diversity organizations and makes room for the reality that people may belong to more than one of the identity groups represented.

NOGLSTP would not be able to fund its presence at ASEE without sponsorship from DuPont, so this conglomeration is what enables LGBT people in engineering to have a presence on the exhibit floor at all. And NOGLSTP's presence is not universally well received, as some passersby make comments challenging their presence, as in "I don't care what you do in bed, but it doesn't belong here." For some ASEE members, the LGBT movement and LGBT people are reduced to a sex act. And so the diversity center provides some safety, as these comments are made within earshot of others, making it more difficult to harass NOGLSTP representatives outright. But this kind of reception reveals something about the nature of engineering's heterosexism and begs the question: Why are queer bodies sexualized (and therefore construed to have no place in a professional setting) while non-queer bodies are considered appropriately non-sexual by default?

The most common reaction to NOGLSTP's presence on the ASEE exhibit floor has been for conference-goers to not notice, or perhaps willfully ignore NOGLSTP. Very few non-LGBT people approach to ask how they can be an ally in engineering education, despite most campuses having a "safe space" campaign where faculty are asked to post stickers on their doors marking their status as ally to LGBT students. The low traffic leads to a situation in which interactions with closeted or partially closeted LGBTTIQ ASEE members are strained and awkward. They will not approach NOGLSTP for fear certain colleagues might see them and identify them as LGBTTIQ. Some exchange furtive glances with NOGLSTP representatives, or approach NOGLSTP once they have ditched their colleagues and have determined it is safe. It is deplorable that in 2012, LGBTTIQ ASEE members do not feel safe to approach a booth that is at ASEE to offer them professional support. How does such a climate obscure recognition of LGBTTIQ people in our midst?

While queer bodies were on the line in the diversity exhibit, disabled bodies were not recognizably present on the Island of Other during my visits, even though some were present

around the exhibit hall. What would it be like if there were an organization representing engineers with disabilities on the Island? Would most able-bodied people look past or through them, or would they ask how they can be an ally?

Lisa McLoughlin¹⁴ identified a form of “spotlighting” in which marginalized groups are made to feel uncomfortable because attempts to help them single them out, while they are already singled out by overt and tacit bias acts in engineering education. Indeed this is what is happening on the Island of Other, where diversity is literally on display. At the same time it is unclear what an effective remedy would be for this problem. While spotlighting on the Island of Other might reproduce a kind of marginalization, it is not the source of that marginalization. The reasons people do not want to be seen as Other in engineering, and desire to assimilate, point back to how engineering constructs its white, hetero, middle-class, traditionally aged, male norm. It goes back to the construction of knowledge itself, where “soft” fields that might provide understandings of identity are devalued.

McLoughlin is also pointing to a critique of identity politics which is a strong thread in Queer Studies and also a significant stream in the Disability Studies literature. Jill Humphrey makes clear in her critique of the social model of disability⁶ that the exclusion of non-disabled allies (and those with marginalized less visible disabilities such as learning or mental health disabilities) is detrimental to the disability movement because of missed opportunities for coalition building across groups (e.g., educational policies simultaneously impact poor people and disabled people). The Island of Other at ASEE enhances the marginalized status of those on the island (women, people of color, and LGBT people) and at the same time devalues other types of oppression (disability, age, national origin, class status, etc.). It simultaneously suggests there are linkages between the types of oppression represented on the island and denies linkages to other forms. Thus important ways of thinking about diversity are erased along with the people in the off-island groups.

We need to start thinking about diversity in new ways. We have to get past the question of “why so few” and turn instead to relationships of injustice that continue whatever the numbers happen to be. Avery Gordon¹⁵ critiques constructions of diversity in corporate America that strive to create a collection or celebration of different types of people without considering the power and privilege associated with the unnamed normative identity (white, male, straight, etc.). Some find safety in the Island of Other; for others, the Island is unsafe because hiding or dis-identifying is the safest strategy for them. And for yet others, the Island does not even offer refuge for their type of Other. Improving the Island by making it more inclusive or less in the spotlight may help a few, but this strategy is limited at best.

I do not want anyone to blame diversity groups and their allies for this “Island of Other” phenomenon. Rather the same conditions that marginalize anyone outside the white straight able-bodied white-collar *cis*-male norm are the same forces contributing to the creation of the Island – after all, we don’t have an Island of Other around textbook publishers and non-publishers

because a vendor sets up a booth. At the same time the problematic experience of the Island of Other points to new ways of conceiving diversity in engineering that can be used by diversity groups to push past our current models that are not working well. We have to attend to the structural problems creating dynamics of power and privilege around difference in ASEE and in engineering more broadly. As a place to start, I will next examine these dynamics in relation to embodiment and disembodiment in engineering and engineering education.

Normative Embodiment and Disembodiment in Engineering

As noted in the introduction, Queer Theory and Disability Theory can offer new structural critiques of engineering. Here I take up two questions raised in my analysis of the Island of Other: Why are queer bodies sexualized and non-queer bodies considered asexual? What allows the non-recognition, the imperceptibility (“invisibility”) of queer and disabled bodies to continue in engineering? Understanding embodiment and disembodiment in relation to able-bodied heteronormativity in engineering can help answer these questions. If bodies bring or deny privilege, how do we understand what constitutes transgression?

While Queer Theory has scarcely been applied in engineering contexts, some feminist and anti-racist science and technology studies (STS) scholars have contributed analyses of gender, race, and class in engineering culture, describing able-bodied heterosexuality as part of normative masculinities in engineering. Tanya Paulitz¹⁶ notes that it is important to recognize multiple masculinities at work in engineering – there is not a single normative masculinity but rather different masculinities can be identified in different institutional contexts, geographies, and time periods. Moreover, masculinity is also raced, classed, and laden with other intersecting identities. Here I am interested in identifying the heteronormative and able-bodied norms embedded in several different performances of masculinity described by various scholars.

Embodied and Ableist Engineering Masculinity

Lisa Frehill’s¹⁷ historical account of masculinity in US engineering from 1893-1920 argues that as mass production took hold in the US, a new type of hegemonic masculinity emerged, that of the rugged outdoorsman, typified by President Theodore Roosevelt:

Roosevelt represented what engineers aspired to be. Roosevelt was a successful man of science who had overcome personal physical hardship (i.e., asthma) to be as comfortable wielding political power as he was taming the wilderness or leading the “Rough Riders” in a charge up San Juan Hill. (389)

Engineering seized on this model in recruiting students to the profession and its invocation helped to construct engineering as masculine profession in that time. Drawing on military tradition, engineering educators advocated for the incorporation of outdoor activities like camping and athletics to develop the discipline required of engineers. Frehill explains that a white middle class masculinity marked by these more leisurely forms of physical activity was

advocated over and against manual labor in a shop, which was associated with the working class. She quotes from a piece designed to recruit boys to engineering:

Engineering appeals to boys because it requires a vigorous, active life which includes much adventure and hardship. The latter may not appeal to his mother, but a healthy boy loves to test his endurance and measure his courage and strength with full-grown men. And in engineering he can find his fill. (397)

Physical strength and ability, as a mark of manliness, becomes the norm for engineering students and thus works to exclude those outside this norm, which would include men who did not meet these physical requirements as well as women.

Disembodied Masculinities

By the end of the 20th century, engineering no longer adhered to the rugged outdoorsman ideal, and engineering masculinity had shifted toward an ideal grounded in abstraction and disembodiment. As Sally Hacker¹⁸ put it,

The new work was soft, clean, and required mental skills alone. Now masculinity had to be redefined, its source abstract knowledge. At least this knowledge kept them superior to the mechanic, the semi-skilled, the unskilled, and especially to women. (45)

Hacker applied Foucault's theories of the body to engineering education, drawing on similar themes as contemporary and subsequent queer theorists. In her participant observation of engineering undergraduates, she described a disciplined denial of the body:

everything we learned to value, the lifestyle we came to desire, the prestige, income, and status over others, all were perceived possible only by passing the tests. This daily experience required control of sensuality, the emotions, passion, one's very physical rhythms. As Foucault would say, it is indeed inscribed on the body. (56)

Like Frehill, Hacker goes on to articulate the linkages between the kinds of discipline required in engineering and military culture.

Gary Downey and Juan Lucena¹⁹ also describe the toll of rigid narrow discipline in engineering on a student who forsakes her love of dance in order to pursue her degree. In their ethnography of three engineering students, they reveal how each one expresses a sense that engineering demands a kind of abandonment of certain aspects of who they are. However, this forsaking the self is required of subaltern identities, not of dominant ones. Students do not report leaving whiteness or maleness at the door, heterosexuality, able-bodiedness, or middle-class values.

Wendy Faulkner²⁰ describes a type of engineering masculinity that links the technical with the masculine and the social with the feminine:

“For example, the nerd stereotype is of men who are passionate about technology but a-social; the fact that these two are posited as *mutually exclusive* – to be technical is to be not-social – is one of the more powerful symbolic ways in which engineering appears gender inauthentic for women, given the strong association of women/femininities with caring about people.”

Faulkner goes on to describe this technical component as very hands on or in the words of one of her participants, “nuts and bolts.” While these “nuts and bolts” (a heteronormative coupling) are physically real, not abstract, they nonetheless are disembodied, located in opposition to “people” oriented tasks.

LGBT people transgress gender norms; some claim their gender identity contrary to that dictated by society, while others refuse to conform completely to one set of gender norms and expectations (same-sex attraction being one type of gender transgression for LGB people). Overlaying this dynamic on the technical-social dualism in engineering produces a complex array of possible power relations, places of fit and places of discord, that would merit study on its own, far beyond the scope of this paper. The disruption of gendered dualisms and the insertion of queer bodies both set a path of possibility for queering engineering and help explain the strong will in engineering to deny queer bodies’ existence.

Disembodiment of science and engineering takes a different shape when it comes to disabled scientists and engineers. Hélène Mialet²¹ analyzed representations of physicist Stephen Hawking and showed how these render him disembodied:

We glorify him because he has transcended the conditions imposed on him by his own body, while the prevailing ideology promotes a scientist without a body or self-awareness. For the epistemologist, Stephen Hawking is not disabled: he has become a perfect scientist, a man without a voice, a machine, an angel.

Similarly, references to Hawking as “a great mind” seek to separate one body part of value from the rest of his body, devalued for its disability. All science needs is his mind. And so it is that when a recent science PhD I know, who has a spinal cord injury, made a decision to work for an adaptive sports equipment company, a professor he worked with told colleagues that he had “left science.” By attending even obliquely to his bodily state, even via an organization steeped in science and technology, discovery and invention, he was perceived to have crossed a disciplinary boundary with permanence and irreversibility.

The response to disability, sexual orientation, and gender identity in science and engineering is to render the body insignificant: *it does not matter*. The instinct to look away, to pretend it isn’t there, to make it invisible (imperceptible), is a goal that many people mistakenly perceive as inherently welcoming. And yet, this denial of the body has serious consequences for both queer and disabled engineers. The notion of ignoring bodies in order to presume a level playing field

reinforces able-bodied heteronormativity; if you do not acknowledge different bodies you can not account for them and create meaningful access.

Thus the very presences of queer and disabled bodies constitute an act of transgression by disrupting the narrative of disembodiment. This produces the reaction to NOGLSTP on the Island of Other (you are sex and there is no place for sex here), or the reaction to the recent PhD (if you do not transcend your body a la Hawking you are not doing science).

Sexualized and Hyper-strong Engineering Masculinities

Not all engineering masculinities are disembodied. Here I explore several instances in which embodied masculinities are constrained to particular performances of (hetero)sexuality and able-bodiedness—ones infused with strained gendered power relations and physical violence/dominance.

When I was an undergraduate at Princeton, a form of the “engineers’ cheer” was in wide circulation:

*Demosthenes, Thucydides, the Peloponnesian War
A squared, B squared, H₂SO₄
E to the x! E to the x! E to the x, dy, dx!
Cosine, secant tangent, sine
3.14159
Label the axes y and x
To Hell with football, we want sex.*

That this would be the call of the engineer speaks to an identification with both technical prowess and sexual desire, and a disidentification with a football-jock sort of hegemonic masculinity. That engineers might not conform to prevailing normative masculinities creates an opening for resistance to those masculinities, but this resistance quickly takes the form of claiming a new type of male power associated with the technical and marked by often awkward pronouncements of heterosexuality.

Karen Tonso's²² ethnography of engineering students in the 1990s depicts male engineering students snickering at a female professor's unintended phrasings taken as double entendres: as in “team members” “team mates” and “play with your graphics.” Able male heterosexual bodies garner attention through these performances of masculinity, which serve to further marginalize those who do not fit this mold. Female students do not titter along with amused male students but instead fidget in their chairs, eyes downcast.

At the same time, Tonso reports that the discourse in the classroom and in ethnographic interviews with professors tended toward ableist athletic and militaristic or violent metaphors: jumping to reach a target, clearing hurdles, or a professor describing how he “had to beat the hell out of [a student team] about 50 times during the semester.” Hacker¹⁸ similarly describes aspects of engineering education as a physical ordeal:

I finished one calculus exam and followed a young woman out the door. She threw up in the bushes. I walked her across the street. “It happens all the time,” she explained, “happens to a lot of the students, [but] you get used to it.” Another said, “I may have been superior, but I hope I’m never that miserable again.” (41-2)

A hyperviolent, hypersexual, and racist masculinity is performed in electrical engineering with the (hopefully declining) use of the following mnemonic for resistor color codes: “Black Boys Rape Our Young Girls but Violet Gives Willingly.”²³ Çengel and Boles’ popular thermodynamics textbook uses a heterosexist and awkward analogy around finding Mr. and Ms. Right to describe ideal processes.²⁴ Even our language around “male” and “female” hardware is inherently heterosexist (and reinforces a gender binary). Some may find that observation over the top; clearly if that were the only remnant of heteronormativity it would be insignificant, but the fact is that heterosexism is as pervasive as the presence of these hardware “couplets.” The point here is not to correct language or behavior of individual straight and *cis*-gender people, although that would save LGBTTIQ people a significant amount of pain... but just as changing the resistor mnemonic to “Bad boys rape our young girls...” doesn’t remove racism from engineering, we need to look at this problem structurally and focus on dismantling and resisting heteronormativity and ableism.

Cech and Waidzunas¹³ interviewed LGB engineering students in the late 2000s and collected the first ever description of the impact of heteronormativity on LGB students in engineering. LGB students reported a sense of isolation and a need to compartmentalize their lives, performing extra work in order to manage and protect their identity, either passing as heterosexual or covering up expressions of their LGB identities in the company of other engineers. While hate speech was relatively rare in this study, some of the most overtly homophobic comments were understood by those who experienced them to be related to a need for male peers to prove their masculinity to each other.

Sexualized and hyper-able or violent forms of masculinity bring attention to those who do not laugh at the jokes, those who question the metaphors or do not relate to them in the same way as the hegemonic group. This explains both why diversity groups might deem it necessary to cordon off an Island of Other and why doing so does not begin to break down hegemonic normativities.

Subaltern Masculinities: Black Nerds, Female Nerds, Gay (sexy) Nerds

Ron Eglash²⁵ gives us some insight into the construction of alternative masculinities in his examination of representations of Black nerds, Asian hipsters, and women nerds, each playing against stereotype. He simultaneously views nerd masculinity as an exclusionary tool and as a leaky device that cannot effectively keep out nerds that don’t fit the white male mold. He reviews previous work in science and technology studies that affirms disembodiment of nerd-dom, with a sort of tradeoff between pleasures of the body and technological prowess.

Eglash contrasts the abstractions in computer science that are part and parcel of nerd masculinity with masculine technologies that “tend to involve physical labor (guns and tools), subduing nature through force (trucks and tractors), and physical violence (swords and shields)” (51). He concludes that “the opposition between the more abstract technologies and normative masculinity keep nerd identity in its niche of diminished sexual presence” (52). It is important to note here that nerd identities are only one possible type of engineering identity and that in fact many engineering identities might fall more in line with less abstract and more physical technologies in construction or military applications.

Eglash locates this abstract/physical dichotomy in racism as well, noting how Blacks are often portrayed in Primitivist terms (too physical, sexual, “close to nature”) while Asians are often portrayed in Orientalist terms (Too abstract, unemotional, and less sexual). These racisms construct Asians as nerds and Blacks as anti-nerds. “It is precisely this racialized intersection of technology and personal identity which functions as a selective gateway to technosocial power” (57).

Eglash is ultimately interested in masculinities that defy these norms, in what he calls the “limits of social transgression and the promise of reconfigured technocultural identity” (60). He documents multiple examples of Black nerds and Asian-American hip hop artists, setting forth possibilities for resistance against stereotype and formation of alternative ways of being. However, he notes that one of the limitations of this “technocultural identity reversal” is the problem of the “unmarked signifier” where hegemonic identities (white, male, straight, *cis*-gender, able-bodied) resist recognition and thus members of privileged groups do not need to perform in any particular way in order to affirm their identity. By contrast, Blacks or women as subaltern groups who do not fit nerd stereotypes have to perform additional work in order to be received as nerds. For example, while a Black nerd might explode one’s notion that Blacks can’t be nerds, the performance of Black nerditude must, in order to be accepted, reaffirm notions of nerds as uncool. A Black nerd that is too cool is read as not a nerd.

Eglash’s analysis illustrates the complexities of identity in showing that subaltern groups do not face identical challenges: extra work is not required of Asians to establish nerd credibility because of the compatibility of nerd characteristics with Orientalist assumptions. Racism is still operating, but here its structures reinforce rather than work against the acceptability of Asian nerd-dom.

With this theoretical background we can examine one example of gay nerd masculinity, as developed by gay comedian Jonny McGovern (aka “the gay pimp”), who appears on LOGO’s *The Big Gay Sketch Show*. To contextualize the meaning of his work it may be helpful to think of McGovern as perhaps analogous to *Saturday Night Live*’s Andy Samberg in producing comedic music videos. In his 2011 video *Sexy Nerd*²⁶ the sexy librarian trope is refashioned in gay culture with male nerds as the object of McGovern’s desire: “I never had a pocket protector get me erecter.” The song runs through stereotypes of gay masculinity that the singer (who is not

himself a nerd) rejects (“I don’t need no club queen hopped up on the party scene”; “I don’t need no Broadway diva singin’ me shit from Evita” etc.) in favor of a new type: the sexy nerd. In the video, white gay built young nerds with hairless bodies, donning tightie whities and black glasses frames, create a discordant image against lyrics like “yo skinny ass is somethin’ that I gots to have” and “I don’t need no muscle jock in the gym around the clock.” The men in the video, some of whom are Andrew Christian underwear models, clearly are spending a great deal of time in the gym, and could not be accurately described as “skinny.” These are able-bodied (and in fact exceptionally muscly) men, save their (corrected) visual impairment which is to some extent fetishized: “take your clothes off, but leave your glasses on.”

McGovern is putting forward a new type of gay masculinity – that of a gay nerd. This challenges gay male stereotypes in both LGBT and straight society. In this community, or at least in this video, what makes the gay nerds “Other” is not their gayness but their nerdiness. They are welcomed with open arms –quite literally. This welcome does seem to come at other gay men’s expense – the Broadway Diva, the Club Queen, the Leatherman and the Muscle Jock all lose out to the Sexy Nerd. One might be concerned that these other gay men are rejected for being “too gay” and McGovern has opted for the more “straight acting” nerd. Certainly their fashion sense defies gay stereotypes. But the Sexy Nerd overcompensates by fitting perfectly the hegemonic ideal of gay desire. So much so that in the comments section on multiple websites where the video is posted, many conclude (Based on body type? Dancing ability?) that none of the actors are nerds; in meeting the ideal of the Gay body they lose Nerd credibility.

Still, the oddity of the sexy nerd that makes him the subject of this video reinforces notions that gay men don’t belong in engineering – it is, after all, the incongruity that makes this funny -- even if the video is simultaneously working toward making gay nerds sexier to the community. It’s obvious that McGovern isn’t serious, so we are left somewhere between a celebrated fantasy of a sexy gay nerd and a sense that we should be laughing at the idea that nerds of any kind can be sexy – how absurd!

Has McGovern recast engineering masculinity into a new gay type? If so, it is clearly white and able-bodied – all that has really changed is the gender of the object of expressions of sexual desire – the expressions themselves remain as awkward as in heteronormative sexualized engineering masculinity. Or if the starting place was the sexy librarian trope, all that has changed is the gender of sex object, and his profession, to something more normatively masculine.

In some ways the bad double entendres in McGovern’s lyrics seem to echo the snickering of Tonso’s engineers: “I need a man to sit on my laptop and open my download.” “I’ll plug in my USB, then you can do me” etc. But here, the context and relations of power are different. These seem more expressions of desire met with mutuality than the acts Tonso describes, which are more about staking claims to male power using sexuality.

I suspect that showing this video at ASEE or in the company of straight engineers would be to commit a major transgression. The biggest reaction would likely be to the video's overt sexuality, a violation of the ideal of disembodied hegemonic masculinity, even as displays of sexualized heteronormative masculinity are routinely permitted.

Sexualized heteronormative femininity is also permitted, and even used in the service of promoting women in engineering. The Nerd Girls trailer²⁷ shows young female able-bodied engineers donning pink capes and black glasses, heavy makeup and stiletto heels; these women conform to hegemonic feminine beauty ideals and body types in much the same way as the sexy nerds (though there is greater racial diversity). The Nerd Girls do a project involving a doggie door for a pet owner described in the voiceover as "handicapped" reinforcing stereotypically feminine ideals of helping others. The end user / client is not shown -- perhaps the ultimate disembodiment -- while the female engineers' bodies are emphasized through their dress.

One Nerd Girl makes very clear that not just she, but in fact engineering "girls" in general, are heterosexual: "Sometimes boys are intimidated by girls being engineers but I don't care. I think engineering girls demand more confident guys." Perhaps the women need to overperform normative gender and sexuality in order to compensate for the gender transgression of being a female engineer. Foor and Walden²⁸ observed such a dynamic in their analysis of an Industrial engineering program, where "weakened borders" have allowed the entrance of women, but with pressure to conform to archetypally feminine and heteronormative roles of wife and mother.

Underneath all these representations in popular culture is a reality that gay engineers (also lesbian, bi and trans engineers, intersex, two-spirit, and questioning engineers) do have sex. Some of that sex is happening in same-sex marriages and domestic partnerships, or monogamous dating relationships, and, as with heterosexuals, some is not. That one of the top gay cruising spots for decades in Pittsburgh has been a men's room in the Chemical Engineering building at Carnegie Mellon is testament to the fact that there *are* gay nerds out there. Not just the kind palatable to heteronormative ideals, but also queer ones that meet up for sex in bathrooms. Known as "MENU" because someone wrote a "U" after the word "MEN" on the door to help identify it (cruising is about discovering what's on the menu), the site has been written up in gay travel guides and cruising websites.²⁹ Does the site's location in an engineering building on a tech campus add to the sense of transgression or naughtiness, and if so, what can that tell us about engineering's relationship to queer communities?

Conceiving New Meanings of Access for Queer and Disabled Bodies in Engineering

What these studies of masculinities in engineering reveal is that sexuality, and bodies themselves, are made to disappear under hegemonic masculinities of disembodiment. This does not create a default position of equality but instead a false sense that "everyone is the same" and "there are no differences." In other words, bodies don't matter. It's not just bodies that are ignored but also the power and privilege assigned to white, able, heterosexual, male, *cis*-gender bodies.

Alternatively, engineering masculinities that produce some form of embodiment do so subject to constraint, producing hypersexualized or hyperphysical mythologies of masculinity or femininity. These enact power and privilege in tangible and overt ways.

The Island of Other is a response to marginalization, and it disrupts both the enactment and the ignorance of power and privilege at work at ASEE and in engineering. But it also reproduces marginalization by leaving some bodies off the island and enacting conceptions of diversity as a collection of people rather than as resistance to power and privilege, in which all may participate.

What lessons from this analysis can be brought to bear on the Island of Other to conceive of new meanings of access for queer bodies and disabled bodies and other incarnations of diversity in engineering? What role can engineering play, and how does engineering need to change, to take a positive role in access, inclusion, and justice?

While having a presence may be a necessary starting point, as a representative from NOGSLTP observed last year, it is not enough for queers to appear only on the exhibit floor. This session emerged from that conversation and is an attempt to move us to a position in which we might talk about queering engineering. The literature in feminist science and technology studies, from critiques of science and engineering epistemologies to analysis of how science constructs LGBTI bodies, can provide a place to start.³⁰⁻³⁴

The lesson we must draw from the lack of progress on diversity in engineering is that we need to try something different, and what has been missing all along has been systemic critique. Many of the inclusion strategies employed to date focus on increasing numbers, focusing on role models, and documenting and sharing contributions of engineers from marginalized groups. This has been the approach for women, minorities, disabled people, LGBT people, and others. But as Lautzenheiser⁷ observes, “lack of analytic depth in relation to the systemic... [results in] often an Othering, which separates out the bodies in question, but does not question their relation to the dominant.”

Beyond the Island of Other lies the work of queering engineering thought and practice, and creating universal access within it. Engineering views disability along medical lines at best – see for example NAE’s Grand Challenge description for *Reverse Engineer the Brain*.³⁵ It advocates artificial intelligence to address “brain disorders” and enable “crippled people” to walk. It will be difficult for engineers not to see disabled people as having problems that need fixing or curing, and so we must begin to teach the social model of disability as antidote to that, acknowledging its limitations and safeguarding against its pitfalls.⁶ We need to ask how brain disorders are defined, and by whom, and think critically about why we would maintain infrastructure that demands such conformity to a walking norm that we would rather re-engineer someone’s brain than include curb cuts or create universal entrances without stairs.

In this example we see how universal design and adaptive or assistive technologies can exist in some tension. One focuses on reducing those obstacles that disable people with particular

impairments, while the other makes it the disabled person's responsibility to modify their own life or person to adapt to disabling infrastructure. Each approach can be appropriate in different contexts, but it is essential for engineers to understand the power relations involved. Universal design and adaptive technology design should not be taught as "special topics" but as part of mainstream design education, as one would teach engineering economics or technical performance. Power issues in assistive and adaptive design can be addressed to an extent with meaningful participation from users; Dean Nieuwsma's comparative account of different approaches to design and social justice is helpful here.³⁶

This universal design approach may lead us to rethink other ways in which engineers design infrastructure with inequalities built in. STS scholars and others have identified racist technologies from the Caravel³⁷ designed to transport slaves, to bridges that keep poor and black people from the suburbs³⁸ to cameras that can't see people of color or think Asian eyes represent someone blinking.³⁹ What would anti-racist, anti-classist, anti-ageist, and non-heteronormative technologies look like?

Making the culture of engineering accessible means addressing heteronormativity and ableism at a structural level. One change that seems superficial on one level, but has structural effects because it can change our thinking is to change our language, making us sensitive to heterosexist and ableist assumptions. Many ableist terms are commonly used in queer circles like increasing visibility, ending silence, finding voice, being heard – these need to be replaced. Words that describe disability pejoratively as in "blind" "lame" and "retarded" as well as long abandoned terms like "handicapped" or "crippled" have no place in engineering education. Here I have sought to use alternate language, and occasionally use the ableist language alongside its alternatives to point out how one can replace language.

What would a truly accessible engineering lab, classroom, or curriculum look like? We are only at the beginning here, but work on queer pedagogy⁷ and disability pedagogy⁴⁰ offer some directions. First, making engineering into something that is not a physical ordeal (either metaphorically in our language or literally in our assignment of fatigue-inducing workloads) would be a best practice to assist both LGBT and disabled students. Tests under time pressure disadvantage learning disabled students and students with anxiety disorders; while they can and often do seek ADA accommodations, universal design might suggest alternative testing methods, or alternative assignments to testing. Requiring accurate reading of charts and tables makes no sense for students with visual impairments, yet we continue to produce textbooks where these methods are the only way to access critical information. Considering some of these changes in high-stakes venues, and the arguments against them – what would people say if we tried to make the Fundamentals of Engineering Exam universally accessible? – might bring us to a conversation about deeply held values in engineering related to rigor, meritocracy, and the meanings of diversity.

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