Heteronormativity – the belief that people fall into one of two distinct genders, with complementary roles in life and intimate relationships – is often at odds with scientific research of animals, particularly humans. For many LGBTQ people working in STEM, a perceived heteronormative culture encourages them to hide their orientation and/or gender identity from their coworkers, fearing backlash or isolation. In this salon, we will discuss both the science of homosexuality and gender, and the cultural issues that many LGBTQ people in STEM experience.

**Biology of homosexuality**

Decades of research has sought to characterize a “gay gene,” or some other singular determinant of sexual orientation. Most scientists now hypothesize that sexual orientation is determined by a combination of genetic, hormonal, and social factors. A few examples of current data are described.

* A 1991 study found matched sexuality in 52% of monozygotic and 22% of dizygotic twins were concordant for homosexuality [1]. This finding has been inconsistent in replication
* In a 2010 study of all adult twins in Sweden (>7,600 pairs) [2], biometric modeling was used to estimate the explained variance of sexual orientation:

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| --- | --- | --- | --- |
| **Sex** | **Genetics** | **Shared Environment** | **Individual Environment** |
| **Male** | 34-39% | 0% | 61-66% |
| **Female** | 18-19% | 16-17% | 64-66% |

* + Twin studies are regularly criticized for self-selection bias where homosexuals with gay sibs are more likely to volunteer, but the studies consistently suggest that genetics alone are not sufficient to explain homosexuality
* Multiple linkage studies have implicated the distal region of Xq28, but the strength of association has been inconsistent [3,4]. Multiple autosomal sites have also been implicated in genome wide linkage studies, but inconsistently and usually shy of significance [5].
* Epigenetic studies have shown both skewing of X chromosome inactivation in mothers with gay sons (23% for two gay sons, 13% for one gay son, 4% for none) [6].
* The odds of a man being gay increase by 33% for each older brother he has, with it hypothesized that male-specific antigens can induce increased *in utero* immune responses for mothers with subsequent male pregnancies [7].
* A putative human pheromone found in male sweat (4,16-androstadien-3-one) increased activity in the hypothalamus of homosexual men and heterosexual women, but not heterosexual men [8].
* A range of studies have examined structures of brains looking for morphological differences between homosexual and heterosexual people; no anatomical differences have been consistently reproduced, and there is concern that many of these studies predominantly rely on postmortem brains of AIDS patients.

Multiple hypotheses have been proposed to explain homosexuality, and generally rely on kin selection:

* A 2004 study found that female relatives of homosexual men tend to have more offspring than those of heterosexual men [9], such that alleles associated with higher fecundity may offset reproductive costs of homosexual kin.
* The “gay uncle hypothesis” posits that people who themselves do not have children may increase prevalence of their family’s genes by providing resources such as food, supervision, defense, etc. In a 2010 study, this hypothesis was tested in Samoa where “fa’afafine” (men who prefer other men as sexual partners) are accepted within the culture as a third gender category, and fa’afafine reported they were more interested in helping kin and less interested in helping non-familial children [10].

Questions:

1. Should we study the biological basis of homosexuality, and does having a biological explanation provide justification for discrimination?
2. Are there aspects of your research that are heteronormative?
3. If so, how might aspects of kin selection and/or less restrictive assumptions alter how hypotheses are generated in a biomedical context?
4. While there isn’t really a continuing search for a “gay gene,” how do we as scientists balance reductionist vs exhaustive thinking when studying complex biological/social phenomena?

**Representation of LGBTQ people in STEM**

The overwhelmingly majority of scientists are politically left leaning (only 6% poll as Republican [11]). Likewise, LGBTQ causes have generally broad support: using gay marriage as a proxy, a recent Gallup polls shows support from 64% of all Americans, and >70% of support from Democrats and Independents [12]. Both academic communities and the tech industries are eager to highlight their efforts to have safe spaces, participate in annual Pride parades, etc., LGBTQ are both underrepresented and less likely to disclose their orientation/gender to colleagues. For example, LGBTQ people in STEM-related federal agencies are less abundant (~20% fewer than expected), and simultaneously less likely to feel valued and supported as professionals compared to LGBTQ people in non-STEM-related agencies [13]. While women and racial minorities also struggle with equality and professional advancement in STEM, a unique aspect of LGBTQ people is that it is often possible to hide their orientation/gender, and a 2015 study estimated that 43% of LGBTQ people in the STEM workforce are closeted [14]. While this may prevent some professional backlash (either real or perceived), a large body of research exists on the problems associated with potentially such internalized homophobia/transphobia, and includes elevated risk of depression, eating disorders, isolation, drug use, and suicide.

We are attaching an excellent 2015 New York Times piece by Dr. Manil Suri, a novelist and professor of Mathematics at University of Maryland Baltimore County (UMBC). His op-ed highlights many important studies as well as several anecdotes that both Dr. Suri, his partner (a civil engineer), and other LGBTQ colleagues have experienced over their careers. A major argument in the op-ed is that STEM (and particularly engineering) places a high premium on conformity: there is often a fairly regimented career path people are expected to take, there is often pressure to reach a consensus hypothesis, and there is often an unhealthy commitment to the profession. This pressure to conform discourages sharing of personal details (a young mathematician at a prestigious research institute asked “don’t tell anyone in my department I own a piano”), and is doubly problematic for LGBTQ people who are likely assumed to be heterosexual and cisgender.

Questions:

1. Is STEM overly “goal oriented” such that it discourages non-work-related interpersonal conversations?
2. How strong do you feel there is pressure to conform to a particular archetype in STEM?
3. If conformity is desired, do events such as Pride parades creating false stereotypes that might encourage further retreat from open dialogues in STEM work environments?
4. What are possible strategies to combat heteronormativity in science? And whose responsibility should it be to address these issues?
5. If kin selection and all other evolutionary theories for possible adaptivity for homosexuality were refuted, would homosexuality be classified as a disease? How do we balance our scientific and personal philosophies for defining individuality versus pathology?

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