

Podcast Script

INTRO: Setting the Scene

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Lissie: Welcome back to *EE&L*, a podcast of first year grad students studying sociology at the University of Pittsburgh. I'm Lissie.

Evan: I'm Evan.

Elisa: And I'm Elisa.

Lissie: Today is our final seminar discussion for "SOC2403: Knowledge and Society." We've spent the last fifteen weeks deconstructing the field of brain sciences in relation to gender and sexuality—moving from the early "hardwiring" theories to the modern debates on plasticity and mosaicism.

Evan: And I think the biggest takeaway for all of us wasn't just about the *data*—it was about the *containers* we put that data into. We started the semester thinking we'd be analyzing sex differences, and we ended up analyzing the sociology of science itself.

Elisa: Exactly. We realized that neurosexism isn't just about bad actors; it's about a fundamental flaw in the research paradigm. We learned that the questions scientists ask are often more telling than the answers they find.

Lissie: So, for this final discussion, we aren't just summarizing the syllabus. We are interrogating the three biggest gaps or structural failures that we see remaining in the field.

Evan: I'm going to kick us off by discussing the "Binary Complex." We need to talk about how the field's ontological commitment to a strict Male/Female binary creates a framework that renders trans and nonbinary lives scientifically illegible.

Lissie: Then, I'm going to move us to the "Diversity Gap." I want to critique the "White Default" in neuroscience—specifically how the field uses a narrow, Western slice of humanity to make universal claims, and how we misuse genetics to biologicalize racial inequality.

Elisa: And I'll close us out by looking at "Epistemic Injustice." I want to break down how our specific research paradigms—particularly Western ways of knowing—prioritize the machine over the human, and how that inflicts harm on marginalized communities.

Lissie: It's going to be a heavy discussion, but a necessary one. Evan, get us started on the binary.

SEGMENT 1: The Binary & Trans Identity (Evan)

Evan: So, let's get right into it. Clearly our society thinks about gender in terms of a strict binary. Based on the readings from this course, neuroscientists tend to think this way too. There are two debates in the neuroscience world that display binary thinking. First, there is the gender differences hypothesis versus the gender similarities hypothesis.

Lissie: This is the classic "Men are from Mars" debate we saw all semester.

Evan: Exactly. Scholars in favor of the gender differences hypothesis theorize that there are many, large differences between male and female psychology. In her 2005 article, Hyde argues instead for the gender similarities hypothesis, which suggests that there are small differences between males and females in their psychology. Hyde's meta-analysis ultimately finds that "78% of gender differences are small or close to zero" (582-586).

Elisa: Which is a huge blow to the biological essentialists.

Evan: It is. These findings suggest that there is no biological basis for traditional gender roles. But Cahill, in his 2014 article "Equal ≠ The Same: Sex Differences in the Human Brain," argues that "anti-sex difference" scholars are wrong because they assume that those small differences do not have practical effects. For the record, I think Cahill is wrong and Hyde is closer to the truth. However, this whole debate is framed in very binary terms. Males and females or men and women. The scholars in this debate also tend to use the terms gender and sex interchangeably. This academic debate is about how similar or how different men and women are, but it does not account for transgender or nonbinary people. I think there is an implicit assumption that the men and women in these studies are all cisgender and there is no mention of nonbinary people at all.

Lissie: It's almost like the "file drawer problem" but for people. If you don't fit the binary, you don't even make it into the hypothesis.

Elisa: Right. Even Hyde, who is more progressive in arguing for the gender similarities hypothesis, is still arguing within the framework of two distinct groups. It challenges the magnitude of the difference, but not the categories themselves.

Evan: Exactly. I mentioned that there are two debates in neuroscience that demonstrate how the field views gender in terms of a strict binary. I call this debate the sexed brain model versus the mosaic brain model. I borrow the term mosaic brain from Joel and colleagues' 2015 article. I think this second debate is more interesting. Essentially, neuroscientists cannot agree if there are two categories of brains, male and female brains, or if there are only human brains with mosaics of attributes that do not fit neatly into male and female categories.

Lissie: This was one of the papers that really changed my perspective on the whole course.

Evan: Me too. Proponents of the sexed brain model argue that human male and human female brains have structural and observable differences that influence different behaviors in men and women. There are different versions of the sexed brain argument, but they all agree on this premise. The mosaic brain concept comes from Joel et al.'s 2015 paper and Joel's 2014 essay. She argues that most individuals have a unique mosaic of characteristics and so most humans have an intersex brain made up of typically male and typically female characteristics. In other words, some brain characteristics are more common in males and others in females, but individuals have a unique combination of these characteristics. Can the mosaic brain model account for nonbinary identity? Or does it still reinforce binary thinking?

Elisa: That's the key question. If the mosaic is still composed of "male tiles" and "female tiles," aren't we still trapped in the binary?

Lissie: But at least it allows for a mix. It destroys the idea that you have to be all one thing.

Evan: I think the general public tends to buy the male brain versus female brain model. They think in dimorphic terms as if there is little overlap between male and female brains. Even in progressive spaces these ways of thinking sometimes persist. For example, some trans activists might say someone has "a female brain in a male body" to describe what being trans means. The underlying assumption of this statement is that there is such a thing as a female brain and a male brain, and those two things are distinct categories of brains and therefore distinct categories of people.

Elisa: It's a double-edged sword. That argument helps people accept trans identity because it sounds "biological" and "real," but it relies on the very binary science we are trying to dismantle.

Evan: Right. The mosaic brain model shows, because sex differences in gender are not "highly dimorphic" or "highly internally consistent," there is no evidence for a biological basis to gender. This means that, as Joel says, "gender is not something people have, but rather something people do." This is similar to the idea of doing gender from sociologists West and Zimmerman in their 1979 article "Doing Gender." By doing gender they mean that people perform gendered expectations based on cultural norms. More famously, it is also very similar to Judith Butler's work and their idea of gender performativity. This performative view of gender means that it is impossible to diagnose gender identity, because gender is a social process and not a biological feature.

Lissie: But this is where the tension lies, right? If gender is just a performance, how do we validate the deep, internal, unchangeable feeling of being trans?

Evan: Right. This view of gender identity clashes with many trans people's understandings of their own transness as something they were born with. But if transness is an inborn characteristic, where is it in the brain? If all brains are intersex and most people contain a mosaic brain of male and female characteristics, then the wrong brain in the wrong body understanding of trans identity based on the sexed brain model is

faulty. The wrong brain in the wrong body also only works for trans people who identify within the binary categories of man and woman. The brain mosaic model might be a better way to understand trans and nonbinary identity. Every individual has their own unique combination of brain characteristics and for some people that brain mosaic—in combination with environment and experiences—creates a person who does not identify with their sex assigned at birth. What do we think? Does the mosaic brain model and gender performativity theory help us understand trans and nonbinary identity?

Elisa: I think it does. It moves us away from searching for a "Trans Brain" region—which feels like 19th-century phrenology—and moves us toward a systems approach. It allows transness to be a complex emergence of biology and society, rather than just a "switch" that got flipped the wrong way.

Lissie: It validates nonbinary people too. If the brain is a mosaic, then a nonbinary identity is just as "biologically supported" as a binary one. It's just another unique pattern of the mosaic.

Evan: I agree. Next, I want to briefly talk about how I conceptualize gender identity. Fausto-Sterling, in her 2012 book *Sex/Gender: Biology in a Social World*, outlines a contextualist framework of sexuality. She outlines four tenets to frame a contextualist approach to studying human sexuality. First, she assumes there is an "underlying physiology" to sexuality. Second, experiences affect the underlying physiology and the underlying physiology affects experiences—ultimately it's a two way street between lived experience and physiology. Third, sexuality must be understood throughout the whole life from infancy to adulthood because a person's current sexual expression is partially dependent on their past sexual expression. Fourth, researchers should embrace the "complexity and contextual nature of desire."

Lissie: I love Fausto-Sterling because she refuses to let us choose "Nature OR Nurture" and instead forces us to take on "Nature AND Nurture."

Evan: Yes! I think these four tenets work well for gender identity as well. The mosaic brain concept could help explain the "underlying physiology" of gender identity, for example perhaps certain combinations of characteristics in the brain in combination with certain environmental and experiential circumstances causes someone to be trans or nonbinary. I think that combination of characteristics is likely very varied among individuals. In other words, I do not think there is necessarily a single type of "trans" or "nonbinary" brain. Physiology affects social experiences, and social experiences affect physiology.

Elisa: That is such a crucial distinction. It protects us from eugenics, honestly. If there isn't one "trans brain type," you can't test for it and you can't try to "cure" it.

Evan: That brings us to the elephant in the room. We are currently facing a very virulent anti-trans movement in the United States and across the globe. The movement has many different wings and factions, but in America three things come up over and over again. Bathrooms, sports, and children. In 2016, North Carolina passed the infamous bathroom bill that stated that everyone must use the bathroom matching their sex assigned at birth. By 2021, there were about 250 anti-trans bills introduced in state

legislatures across the country. According to Pew Research, between 2022 and 2025, Americans' views shifted significantly against trans people, and this is true not just among republicans, but among democrats and independents as well. For example, in 2022, 20 percent of democrats and 41 percent of independents said they favor laws that require trans people to use the bathroom that corresponds with their sex assigned at birth. This means they want trans women to use the men's bathroom and trans men to use the women's, which is absurd. In 2025, 25 percent of democrats and 49 percent of independents favor anti-trans laws. Many anti-trans state laws target trans athletes and trans children's access to healthcare. Additionally, right-wing pundits spend their limited time on Earth spewing nonsense about trans people indoctrinating children. In the face of this backlash, I sympathize with those who seek legitimacy in their identity from science. This leaves us with the question of what arguments and what actions we need to make to protect trans and nonbinary people's liberties.

SEGMENT 2: The Diversity Gap (Lissie)

Lissie: That desire for legitimacy from science is a double-edged sword, especially when you realize that the science we are appealing to was never built to include us in the first place. If Evan just deconstructed the *gender* binary, I want to pivot to the *racial* void in the field.

Elisa: You're talking about the "White Default."

Lissie: I am. But I want to go beyond just saying "there aren't enough Black participants." I want to talk about how the entire *ontology* of the "Human Subject" in neuroscience is racially coded. We have to start with the history. Y'all remember reading Gilman a few weeks ago?

Evan: You mean the excerpt from *Women and Economics*?

Lissie: Right. So check it out: history treats Gilman as a feminist pioneer, but after reading more of her work I noticed her text is saturated with anxiety about the "advancement of the race." And she didn't mean the human race; she meant the white race. She, like **Darwin** in *The Descent of Man*, operated on a "scala naturae"—a ladder of nature.

Elisa: Where the white European male is the "adult" of the species, and everyone else is a developmental stage behind.

Lissie: Exactly. And while we don't say that out loud anymore, that structure is baked into our methodology. Neuroscience frames itself as the study of the human brain—singular, universal. But who is the universal human?

Evan: The WEIRD population.

Lissie: Yes. Henrich, Heine, and Norenzayan famously coined this: Western, Educated, Industrialized, Rich, and Democratic. This is a tiny slice of humanity—mostly 19-year-old white undergrads. But in fMRI studies, we treat their brains as the "Standard Model."

Elisa: So if a brain doesn't look like a white undergrad's brain, it's seen as a deviation?

Lissie: It's seen as "noise" or an anomaly. But the bigger problem arises when researchers *do* try to study race. They usually do it without any sociological literacy, and they fall into what Victoria Sork (1997) calls the "Genetic Trap."

Evan: This was the Quantitative Genetics paper with the heavy theoretical stuff.

Lissie: It is, but it's crucial. Sork explains that when we measure a trait—like aggression, or IQ, or cortical thickness—we are measuring Phenotypic Variance (V_p). The classic formula is $V_p = V_g + V_e$.

Elisa: Phenotype equals Genotype plus Environment.

Lissie: Right. But here is where neuro-racism happens. When researchers compare a Black cohort and a White cohort, they often assume that the environmental variance (V_e) is uniform. They assume that because the subjects are in the same lab, or the same city, the environment is "controlled."

Evan: Which completely ignores the physiological reality of systemic racism.

Lissie: Exactly. We know that racism isn't just a feeling; it's a biological event. Chronic stress dysregulates the HPA axis, floods the brain with cortisol, and changes the structure of the amygdala and hippocampus. So, if V_e (Environment) is different for Black and White subjects, but the researcher *assumes* it is zero, they mathematically force all that variance into the V_g (Genetic) column.

Elisa: So they "discover" a genetic racial difference that is actually just a map of social inequality.

Lissie: Precisely. They are scanning the *scars* of racism and calling it the *biology* of race. This is why Sork emphasizes the norm of reaction.

Evan: Can you define that?

Lissie: The Norm of Reaction describes the pattern of phenotypes an individual genotype produces in different environments. It means there is no fixed nature. A gene that produces Height X with good nutrition might produce Height Y with poor nutrition. If you don't know the environment, you know *nothing* about the gene.

Elisa: And since we live in a society where Black and White environments are fundamentally stratified...

Lissie: ...Then any claim about racial brain differences that doesn't account for the norm of reaction is junk science. It's what Sork calls the fallacy of Heritability. Heritability is a population statistic, not an

individual trait. You cannot use it to say "This group is genetically less intelligent." But neuroscience does this all the time by biologicalizing poverty and trauma.

Evan: It effectively absolves the state. If the gap is in the amygdala, we don't need to fund schools or fix housing.

Lissie: It is the ultimate tool of bio-political control. We are using high-tech machines to validate old-school prejudices. We need to stop asking "How are Black brains different?" and start asking "How does the brain embody the injustice of the world?"

Evan: So the lack of diversity is both a social justice issue and a scientific quality issue.

Lissie: 100%. A non-diverse science is a bad science. It produces data that is fragile, non-universal, and biased toward the people who are already in power.

SEGMENT 3: Research Paradigms & Epistemic Injustice (Elisa)

Evan: That phrase "biased toward the people in power" leads perfectly to what Elisa wanted to cover regarding Epistemology.

Elisa: At the core of all the things we have talked about are specific questions about the very nature of scientific research and what counts as "legitimate" knowledge and what doesn't. I particularly found Shawn Wilson's 2008 "Research Is Ceremony: Indigenous Research Methods" a relevant source for really understanding what composes research paradigms.

Lissie: What does he say makes up a paradigm?

Elisa: He explains that the key aspects that make up a research paradigm involve four things: ontology (understanding of the nature of being), epistemology (understanding of knowledge and how it is built), methodology (the systems through which answers are sought), and axiology (understanding of the role of value). They all work together to mutually inform each other.

Evan: So it's not just about the "method," it's about the whole worldview.

Elisa: Exactly. Even if we are not purposefully thinking about these, they each play a key role in shaping the questions we ask, the methods we use, the theories we make, the answers we find, and the claims we make. These dynamics are present and shown in the very biases of research itself by focusing on purely Western views of the world, with White western participants and experiences being prioritized over others.

Lissie: And that prioritization creates a hierarchy of truth.

Elisa: Understanding the different components of a research paradigm, we can now talk about epistemic injustice and what happens when only some perspectives are valid and legitimate while others are not. Fricker's 2007 paper on epistemic injustice defines it as the harm to individuals and communities that can come from specific forms of knowledge and practices for knowledge. There are many types of epistemic injustice, but I want to focus on two types that are particularly salient in the type of research we have engaged with in this class.

Evan: Break those down for us.

Elisa: First is contributory injustice: when the biases of knowledge gatekeepers and researchers result in the prioritization of dominant epistemic resources over alternative ones, excluding whole groups and their forms of knowing (Kristie Dotson 2012). The second type is testimonial injustice: when the biases of knowledge gatekeepers and researchers result in minimization and delegitimization of a speaker's credibility (Kristie Dotson 2012). The way we as researchers prioritize certain knowledge and voices is shaped by the paradigms we research under, and when taken lightly can very easily lead to epistemic injustice. This matters because it impacts how governments, institutions, and even other individuals relate to each other and their own identities and realities.

Evan: Okay.

Elisa: So let's actually put all of these terms that I just threw at you into context through an example. I want to look at Ponseti et al.'s 2009 study, "Assessment of Sexual Orientation Using the Hemodynamic Brain Response to Visual Sexual Stimuli." This study essentially compares the measurement of sexual orientation in cisgender men via Functional Magnetic Resonance Imaging (fMRI) and "phallometric response"—which is basically measuring erections.

Lissie: I remember this one. They were trying to use brain scans to prove sexuality.

Elisa: Yes. Part of the argument made is that based on showing sexual images to the study participants and measuring the blood flow response in the brain, they can efficiently determine the sexual orientation of the man as well as pedophilic tendencies. In the discussion part of the paper, they state: "In summary, we argue that automatic classification of brain activity triggered by preference specific sexual stimuli in heterosexual vs. homosexual males is as accurate as phallometric classification in pedophiles vs. heterosexual males. Measurement of brain activity is much less intrusive and much faster than phallometry" (1633).

Evan: That is... a terrifying sentence.

Lissie: "Automatic classification" of identity. It's dystopian.

Elisa: Okay, so there are a lot of ethical and otherwise implications with this study and the suggestion that the authors make, but let's break this study down in terms of research paradigms and epistemic injustice.

Since we don't have all the time of the world I am going to be brief in my connections, but hopefully it will help us better dissect the forms of thinking and knowledge that guide this study.

Elisa: Starting with the ontology of the study there is a focus on the material world and the biological, with sexuality being approached from a physiological perspective. The authors of the study write it in a way that assumes the nature of sexual orientation as something inherent and quantifiable, with an objective reality that can be quantified via neuroimaging techniques of the very biology of people.

Evan: And the epistemology?

Elisa: The epistemology of the study is centered around the concept of knowledge as something that must be seen and measured in order to be valid, and as such that which is measurable is real and that which is not then must not be. It is also based on a very Western epistemology, with an understanding of sexuality that is very binary (you either are or you are not).

Lissie: And the methods follow that.

Elisa: Right. In terms of the methodology, they essentially are using two different measurable responses (both related to blood flow) to visual stimuli: erectile response and the blood flow as shown by imaging scans in the brain. Finally, when it comes to the axiology of the study, we can start by the assumption being made that sexual orientation (and possibly pedophilia) should be measured biologically and neuroimaging is an accurate and objective form of uncovering "scientific truth" about sexuality.

Evan: It feels like they completely ignore the ethics of why they are doing this.

Elisa: Among the ethical red flags that pop up in this study, a central one is the risk of pathologization and misuse, especially when used in the way that the authors suggest, as well as the assumption that sexual orientation and attraction are equivalent, binary, and rigid in ways that over-simplify them. Under the guise of neutrality and scientific objectivity, the very assumptions leading to the study are attempted to be taken as only logical and natural.

Lissie: It's that "view from nowhere" again.

Elisa: With a good grasp of the study's research paradigm, we can actually trace the webs of epistemic injustice that lie within the study's assumptions, approaches, and conclusions. I want to start with testimonial injustice, which I think is actually a big downfall of this study and adds to the ethical concerns raised by it.

Evan: How so?

Elisa: Within the research paradigm, images are important and capable of portraying objective truth (without really fully acknowledging how an image only conveys as much as is interpreted by the viewer). There is nothing inherently wrong with seeing to believe, but it is the prioritization of it over the

participant's self-determination that might be problematic. Especially, if methodologies of biological determination were to be taken up for state-led initiatives and the likes, it can very much have impacts beyond those in the study itself.

Lissie: You mean like legal cases?

Elisa: Exactly. This assumes that the machines used in the process are capable of discerning reality beyond what one might even know of oneself, even though we know that arousal does not always equal sexual orientation or even attraction. We are prioritizing images made by a machine because we believe it to be more accurate and capable of finding the truth than the very people we are trying to understand.

Evan: It invalidates the subject entirely.

Elisa: If a test participant was to self-identify as homosexual, has had mainly homosexual relationships, and lived as a homosexual man his whole life, where imaging results show the contrary, what happens? If the image is prioritized over the self-report, valuable information can be omitted. On an even higher stakes example, chemical castration has at multiple periods in time across the world been brought up as a possible punishment or in some cases it is framed as a "cure" for pedophilia.

Lissie: That's where this gets dangerous.

Elisa: Regardless of our feelings about it, if they were to try to determine who is a pedophile in order to do the procedure, it could have devastating effects due to how interpretation factors into the analysis of the images. We see men of color especially get convicted wrongfully for sex crimes all the time.

Evan: And that leads to the second type of injustice.

Elisa: Contributory injustice might feel a bit more abstract, and we are going to have to make some assumptions since the study does not provide information on the demographics of the participants when it comes to race, nationality, immigration status, ethnicity, or anything alike. So we know the epistemology that the study is based on is one that understands sexuality and humanity under a binary scope, and that in itself creates a conflict in that it can not be generalized beyond that world view. This excludes by default any possibility of sexual fluidity, or even asexuality, bisexuality, or any other that does not fit within gay or straight. The researchers are all White, American, Cisgender men and that has an impact too, they interpret results through their view, which goes back to what we have talked about in the importance of having diverse voices doing the actual research.

OUTRO: Conclusion

Lissie: We have covered an immense amount of ground today. We've critiqued the ontology of the binary (Evan), the methodology of the racial gap (Lissie), and the epistemology of the image (Elisa).

Evan: And if there is a common thread, it's that good science cannot exist without good sociology. You cannot measure the brain if you don't understand the society that shapes it.

Elisa: Exactly. We need to move toward what we've called Critical Neuroscience. We need to realize that our tools—the fMRI, the survey, the p-value—are not neutral. They are methods of knowledge production, to use Shawn Wilson's term. And right now, those methods are excluding too many people.

Lissie: I keep coming back to Fausto-Sterling's call for complexity. The future of this field isn't in finding better ways to categorize people into boxes. It's in understanding the dynamic systems—biological, social, environmental—that make us who we are.

Evan: And that requires a shift in power. As we discussed, we need to democratize the lab. We need trans principal investigators, we need Black neuroscientists, we need indigenous methodologists.

Elisa: We need a science that doesn't just extract data *from* marginalized communities, but builds knowledge *with* them.

Evan: Until then, we have to keep asking the hard questions. We have to keep asking: "Who is this research for? And who does it leave behind?"

Lissie: That's the work ahead of us. Thank you both for this semester, and for this conversation.

Elisa: Don't believe every headline you see.

Lissie: Thanks for listening.

[Sound effect: Outro music fades in]