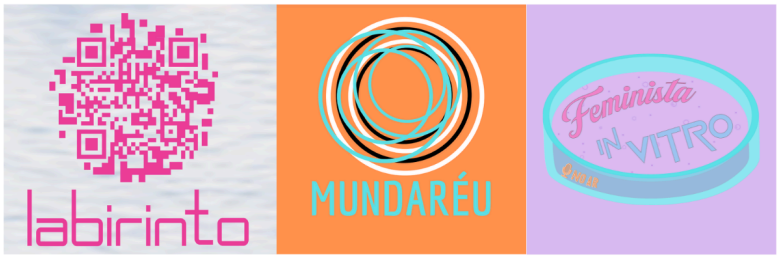

MUNDARÉU PODCAST
(Labjor/Unicamp)

Series "Feminista *In Vitro*"
Episode Feminist *In Vitro*

Transcription: Fernanda Mariath
Script : Fernanda Mariath e Daniela Manica

[Feminista *In Vitro* soundtrack]

Fernanda: Have you ever wondered how the medicines you take are tested? Experimental cell models play a crucial role in the development of biomedical technologies, including drugs and vaccines. What if I told you that it is possible to obtain cells from your menstrual blood that meet the main requirements for use in these models? Menstrual blood mesenchymal cells are abundant, easy to obtain, super resistant, and quick to grow. But they are hardly used!

Even though there are many menstruating bodies and women who don't menstruate, these cells are perceived as feminine. And that is a reason why it is said that menstrual blood cells can't be used as a model for research. At the same time, most of the drugs you see in the boxes at the pharmacy and in the hospital have only been tested on male cells. Scientists say that's okay, because everything that works on a male model will also work on our diverse bodies. If any human cell could become a model, a female cell could be used, could it not? The choice of which cells will be used in research is a very important part of science. But the choices scientists make in model selection are not always based on scientific reasons.

[Feminista *In Vitro* soundtrack]

Fernanda: Why does this happen? How have the models used in research been chosen? And does the sex of the cell really make no difference?

[Feminista *In Vitro* soundtrack]

Fernanda: In this podcast series, I, Fernanda Mariath, will take you from the inside to the outside of a cell. And starting with the organelles, the tiny little parts inside them, I'm going to tell you about menstrual blood cells and bring you feminist discussions in stem cell research. Let 's go!

[Feminista *In Vitro* soundtrack]

Fernanda Mariath: Hi! I'm Fernanda Mariath, a pharmacist with a master's degree in Scientific and Culture Dissemination. Also, I'm part of the Mundaréu Podcast, which focuses on telling stories about feminist Latin American researchers. As part of my dissertation, I produced the series "Feminista *In Vitro".* This series is already available in Portuguese on Mundaréu's website with a transcription in pdf. But, as part of this journey, I also did some interviews in English with Professor Sarah Richardson, the pHD student Hannah Cowdell, and Professor Malin Ah King. This episode is an audio collage of these interviews. I hope you enjoy it!

[Feminista *In Vitro* soundtrack]

Sarah Richardson: So I'm Sarah Richardson. I'm a historian and philosopher of science and a gender studies scholar. I'm a professor at Harvard University and I direct the Harvard GenderSci Lab which is an interdisciplinary collaborative community of feminist scholars who think critically and search about the sciences of sex, gender, sexuality and reproduction.

So, the GenderSci Lab is not a laboratory with pipettes, and with white coats, and big machines. We are a collaborative of researchers across the fields, from public health to genetics, to bioanthropology, to sociology, philosophy, and history of science. We come together because sex is not just a biological category. It requires all of these areas of expertise to understand its dynamics and its situatedness. And then the relationship between science which also is complex and gender systems requires a whole lot of different sophisticated ways of understanding knowledge systems, their histories and their functioning.

So the lab is something that I created to hopefully generate scholarship that bridges areas that are often not touching each other, that creates knowledge that is transdisciplinary, and asks questions that are often not asked because people don't have the tools to do it alone. I also wanted to train a new generation of feminist scientists, and we do that by doing research together. So it's developed into an amazing meaning space for young scholars who are interested in developing interdisciplinary skills in the study of the intersection between gender and science. And we publish in medical and scientific journals as well as in social science and humanities journals, and we build collaborative interdisciplinary teams around certain difficult topics.

[Feminista *In Vitro* soundtrack]

Sarah Richardson: Well, sex is one category through which we might capture variation. It is the case that in sexual species, sex determination is an important developmental pathway that can lead to different developmental programs unraveling on different time scales. And so, depending on the research, it may be valuable and important to track sex category and variation across and within the sexes.

There can be important, biomedically important, differences in those pathways. And so just like age, just like ecological context. There are all sorts of variables that standardly are considered when looking at variation in a particular sample. So sex is is a valid category for capturing that kind of diversity, but in many cases it may be too crude to capture the kind of variation that the researchers actually interested in. I think we need to build a conversation around being more precise about the mechanisms and variables that are of interest when we're tracking sex-related variation, rather than simply using sex categories, say male or female, men or women, as a crude proxy for that variation.

[Feminista *In Vitro* soundtrack]

Sarah Richardson: The short answer is that sex contextualism holds that what sex is and whether it is relevant to a particular research question, depends on the context. The context could include the species being used, the level of biological analysis, the pragmatics of the technologies and tools being used or the sample that is being studied or an artifact of the arrangements needed to model a phenomenon in the laboratory.

Sex contextualism can be contrasted with sex essentialism, which is the view that every bit of biological material from the whole organism down to its cells or organelles has a sex, a binary sex, either a male or a female simply because of its provenance from a sex body. Sex essentialism structures most biological research and biomedical research that touches on the question of variation across and among the sexes and genders. I offer sex contextualism as an alternative way of conceptualizing and interpreting findings about sex related variation to the implicit default sex essentialism that structures so much scientific research. Certainly sex contextualism embraces the idea that sometimes what we might call binary sex is appropriate to the question.

But to your question of what could the harm be? So when we work in binary sex essentialist way in biomedicine, there could be scientific harm that is misidentifying the precise mechanisms, pathways, variables and factors that are creating an apparent difference between the male sex category and the female sex category. These could be hormonal variance environmental factors, body size, and other features of body biology and environment that vary across contexts and across groups. One might also over homogenize what males are like and what females are like, missing a great deal of variation within each of those categories. So the harm for science is that you introduce an a priori assumption. That these are the right categories and so you create distortions in the way that you design the research and then interpret the findings. But there are harms beyond that as well and this includes reinforcing essentialist ideas about men and women, boys and girls, males and females.

So when we work in binary sex essentialist way in biomedicine, we may unwittingly contribute to a long history of sourcing the physiological, the biological, the hormonal, the body as the site, the causal site of the gender and sex disparities or inequalities that we see in the world. And that would be an error as well. There have been massive changes in gender systems and in the embodiment of maleness and femaleness over time that help us know that gender and sex have plasticity and context specificity. So, we could end up enforcing binary ways of understanding that contribute to stigma, stereotyping and inequality, not just for cisgender men and women but also for gender minorities, including people who

identify outside of the binary or are born outside of the binary. So to create an inclusive science and to counter the use of biology to reinforce gender stereotypes, it's very important for biomedical researchers to be aware of how they need to build an understanding of their scientific findings that doesn't travel into the world and unwittingly create those social harms.

So, as an example of sex contextualism in practice, let me just say that sex contextualism is both a descriptive theory and a normative theory. Meaning that sex contextualism describes what scientists do. They may believe that they are sex essentialists and that they are looking at binary factors. But actually when you look at it, they're looking at an operationalization of sex in a particular frame. So I think in stem cells, sex probably doesn't matter at many, many different levels of analysis and in many circumstances. And then, some sort of sex-related variable might matter in a very artifact way for the particular processes and technologies through which we make stem cells work for us in the laboratory. I think sex contextualism happens almost any time. Someone is looking at sex-related variables. And so then there's the normative idea of what sex contextualism asks you to do, which is to be very, very precise about the context that are and that are informing the construct of sex that is being produced through a particular material arrangement in the laboratory and to spell out how one is operationalizing sex. Are you looking at the genitals? Or are you looking at cells where you would just look at their chromosomal signature? Or are we looking at a whole mix of an array of factors not only in the chromosomes, but also perhaps the gender and sex related variables that are in a cell medium, for example.

So all of that specificity can help us understand the generalizability of any finding about what females are like or what males are like. And, I think it would be militative, it would improve practices to have greater reflexivity about how sex is in fact being operationalized, arranged and understood in a laboratory, which of course is always a model system. It's a limited idealized way of understanding a bigger problem in the world. It's simplified in short.

[Feminista *In Vitro* soundtrack]

Sarah Richardson: Ambien is of course a popular sleep drug that became some years ago a hallmark example used to argue for the need for studies of sex differences in the development of drugs,

particularly in the pre-clinical process of drug testing. Why? Because it was observed that there a larger number of women compared to men were having adverse drug events. Specifically, perhaps being drousier, after taking the drug, the next day. When the Food and Drugs Administration in the United States examined the situation, they noticed that it appeared that women cleared the drug more slowly from their systems. So for the first time in history, the US Food and Drugs Administration issued a dosage guidance for the drug Ambien, also known as Zolpidem, that has half of the dose for women compared to men. And for advocates of sex difference biology, this looked like it could be the tip of the iceberg.

Perhaps all drugs should have sex specific dose, they suggested. Look at this history of not examining sex differences, imagine the harms that could occur. Now, the story that I and my colleagues at the GenderSci Lab tell is the unravelling of that narrative in the subsequent years. So as it turns out, there's no relationship between clearance of the drug Zolpidem from the system and adverse events. There's no clear evidence actually of sex differences in adverse events in Zolpidem. And the reasoning behind this half dosage had more to do with the petition by a pharmaceutical company to somehow get a failing drug through FDA approval in the United States.

We argue that just assembling evidence in pharmaceutical research on the pharmacokinetics and dynamics of the drug we argue that the sex difference in drug clearance is in any case rendered non-statistically significant when body size or body weight is taken into account. Meaning that the dosage recommendation in the United States will underdose some men, or rather overdose some men, and underdose many women. And in fact, no other country has followed the US in this sex specific dosing for these reasons. So it actually ends up being a tale about the complexities of sex and that you really need to look for the source of the variation and in this case sex differences were overdone with potential harms. So actually the case of ambient is now being taught in medical schools not to show the importance of sex differences, but to show instead the follies of reasoning that can happen when one thinks in a two binary way about sex, which is a really lovely turn about and I'm glad that this case study exists to help people nuance and refine their thinking. Because after all, it certainly is alarming the idea that medical research hasn't been done on women or that there could be a class of drugs out there that is performing more poorly for women compared to men. And, there certainly is a history of androcentrism in medicine. But the flip side is not often considered as much, which is the harm that we can do when we over emphasize a crude category.

[Feminista *In Vitro* soundtrack]

Sarah Richardson: Well, I agree that it's difficult. Partly because the way that we have developed our biomedical research ecosystem is to focus on biomedical or biological pathways mechanisms and so on. And so to properly study the sex body, one needs to study it in its full embodied social context. You need a bio-social science. You need bio-social scientists, meaning that you need people who have training in the culturally and geographically specific performance of gendered embodiment at both the relational and individual level as well as the structural level, and people who understand bodies and their reactivity to these environments to fully parse patterns of variation across men, and women, and people of diverse genders and sexualities. So, that's my passion in the GenderSci Lab. We have to build people who have that flexibility of mind and actual rigorous training across these fields. People who can read widely, who can bridge across fields, and who can test and generate diverse hypotheses, social and biological and the combination of the two to understand the patterns that we see. So that's my hope that we will move away from the rigid biological essentialism that has structured much of the recent interest in women's health for example and toward this hybrid methodology and truly transdisciplinary field. I think that's exciting and we need a sex and gender science that invites in many forms of expertise, that acknowledges uncertainties, that is interested in variation and context, and that is accountable and ethical when it comes to making claims that can travel beyond the laboratory door to be taken up irresponsibly in the political and cultural realm.

[Feminista *In Vitro* soundtrack]

Hannah Cowdell: I'm Hannah. I'm a PhD student at the University of Exeter in the UK, and this is my second year of PhD research. I'm a PhD student at the University of Exeter, which is sort of in the southwest of the UK. It's quite a small university town, and I've been there for two years. Before that, I was at the University of Oxford doing a master's in Middle East Studies. So that's my kind of disciplinary background. I come from an area studies kind of perspective, and I did my undergrad at the University of Oxford as well. I was born in London and the south of London and Greenwich, but I grew up a bit south of London in a sort of smallish town.

So I work on basically, like, ontology of sex and gender in Lebanon, broadly speaking, and looking at particular sort of context of citizenship in which they come together or diverge. So, gender recognition cases are one of these contexts. But also looking at sort of more cultural contexts where gender non-conforming behavior is criminalized in some way. So, like, cross dressing, for example, or homosexuality, these are often, homosexuality is often considered in the context of gender in Lebanon, like the two, gender non-conformity and homosexuality, are often conflated, particularly in these kinds of judicial contexts.

My PhD project came into being because I was interested in a number of gender recognition cases that had happened in the kind of, like, mid 2010's. My background, as I said, is in Middle East Studies. I learned Arabic when I was an undergrad, and I kind of, like, through pursuing Arabic, I became interested in the kind of broader sociopolitical context of the Middle East and Lebanon in particular. And, Lebanon had these series of gender recognition cases in the 2010s where basically judges or magistrates in these cases had been making rulings which challenged some of the kind of conventions in previous gender recognition cases around, kind like of what would be sufficient levels of bodily changes in transgender patients to justify reclassifying their gender in straight state records. Like, previously, there'd been a very high kind of standard, I guess you might call it, for what kind of operations you needed to have for the state to be able to consider that you could be reclassified as a new gender. And this normally involved a kind of sterilization, what might be described as a full gender affirmation surgery, although obviously that's a questionable way of putting it. But these cases in the 2010s began to justify that. They banned a rule that patients had a right to privacy and that part of that was ruling that their gender could be changed before they'd had some surgeries, because the patients were already experiencing these kind of conflicts and encounters with state officials where they're kind of the way they presented visually didn't match their recorded gender on state documents. So I was interested in these cases and specifically the shift, and what had led to that shift in rulings when previously there had been these very strict restrictions on what kind of medical procedures you would have had to have to have your gender reclassified. But since I've started the project, it's broadened out to look more generally at the kind of medical authority and sex and gender and how that is operationalized in legal contexts.

[Feminista *In Vitro* soundtrack]

Hannah Cowdell: The presentation was basically about a small aspect of my research that I've been engaging with recently. So, basically, like, one of the things I've been trying to do with my research is find out more historically about how doctors in Lebanon sort of had authority over determining the boundaries of gender categories and sex categories. And one of the ways I wanted to do this was by looking at the history of medical encounters with people with variations in sex characteristics.

And, what I found was that actually there had been a lot of research done, medical research, in Lebanon on intersex conditions, from the mid 1960s until the mid 1980s. There's still research going on now, but there was, like, a particular kind of density of case studies that were done in this period, which was connected to a kind of interest in the genetics of sex development in Lebanon. And a lot of these Lebanese doctors had done training at John Hopkins University and published papers with doctors at John Hopkins, like Howard W. Jones, who was very involved with the gender identity clinic that was present at Hopkins at that time.

And, I was looking at these case studies, and they're really interesting sources because in some ways, they're very personal. You know, like, people tell their life histories to doctors, particularly in cases where their gender identity doesn't match the sex that they were assigned at birth. But I was interested in the fact that although they are very personal, a lot of that personalness in the paper gets taken out because the conventions of how medical case studies are written, obviously for good reasons, they're anonymized, but also they're made to conform to a particular kind of genre of medical writing that's very standardized. And part of that is the removal of the doctor from the context of the paper.

And you're just left with this kind of God's eye view perspective of the patient and their body and their experiences, this sort of sense of omniscience. And there's also no context in the paper about the sort of historical moment in which the patients were seen. And what's interesting about these papers is that they take place. Well, most of the research took place during the Lebanese civil war and at the American University of Beirut Medical Center, which was, like, one of the major emergency care centers during the conflict, and often at particular kind of flashpoints in the conflict, one of the only functioning hospitals.

So I was kind of interested in those absences in the texts and how we might kind of queer the medical conventions of the case to try and, like, bring some of this context back in. So that's kind of what my presentation was about. And, also looking kind of at how this medical research more broadly into variations in sex characteristics was tied to nationalist projects at the time around, sort of cataloguing genetic difference in Lebanon, which is something I want to look into further in my research, because there's very little information about this national genetic kind of cataloging project that was going on in

the 1970s and 1980s at this moment in the civil war, and a lot of funding was being directed to it. But we're not really sure at this point how it came into being.

And, then also I was talking a bit about how, because of the civil war context, a lot of the research was confined to Beirut, which has always been in Lebanon, where the densest concentration of doctors and medical care have been. Lebanon's a very small country. You can drive the entire length of the country, maybe 2 and a half, 3 hours. But during the civil war, the south of Lebanon became disconnected from the rest of the country because of Israeli occupation. So that was also something I was trying to bring into the reading of the papers and looking at an Israeli medical case study that happened simultaneously during this period of time.

[Feminista *In Vitro* soundtrack]

Hannah Cowdell: The chapter I've been writing at the moment, it's like looking at this period of time from the mid 1960s to sort of 1980 and 1990s, because this is like the period in which a lot of new-*ish* medical technologies for the kind of management of sex characteristics in some way became available in Lebanon. So, for example, the use of sex hormones to kind alter people's sort of hormonal balances in ways that change their secondary sexual characteristics, either in cisgender patients or transgender patients or patients with variations in sex characteristics. But also, like, genetic testing for sort of chromosomal differences and chromosomal sex. This was something that, like, started being used more regularly from the 1970s in Lebanon. And then I'm also looking at changes in surgical techniques. So, yeah, so this is the period that I'm particularly sort of focusing on at the moment because it's a fundamental shift in the way that doctors approach sex. But what's interesting, in some of the cases I'm looking at, the doctors have this sort of split kind of perspective when it comes to sex and gender.

So on the one hand, they have this medical understanding of this sort of layered concept of sex, where you have hormonal sex, chromosomal sex, anatomical sex, and they sort of treat these very kind of objectively in their papers with nuance and so on. And they're also interested in sort of pushing the boundaries of research in these things. So there are a number of gynaecologists from Lebanon who are involved in this medical research looking at chromosomal differences in sex and conditions like congenital absence of the vagina and things like that, and how analyzing someone's chromosomal sex might affect how you approach the treatment of that condition. But at the same time, there are a

number of autobiographies of doctors working in Lebanon from this time where they mention encountering patients with variations in sex characteristics.

And although they do these, you know, that kind of, like, I meant to kind of, like, medically determine what this person's sex is and justify treatment. So, for example, there's one case from a village in south Lebanon, where a doctor encountered a patient who had been raised as female, but identified as male and wanted surgery to basically give them a more masculine body. And the doctor does these tests and, like, finds out that the patient has XY chromosomes and that they have, you know, levels of testosterone that are more comparable to, well, they fall within the boundaries of what is considered male. And so this kind of provides the justification for the doctor then doing the surgeries that the patient wants. But at the same time, the doctor sort of talks about his own perception of the patient. And, he does this thing where he first refers to the patient as a woman and then as a man, but, he sort of describes the patient as, you know, like a very attractive woman and with sort of very glossy hair, which gets taken by the nurses to make wigs after the patient decides to cut. Although the doctors have this quote unquote scientific view of sex as something that's complex and multilayered and not necessarily obvious, their reactions to the patients are still very gendered, based on their kind of ideas about how masculinity and femininity, how they should be embodied or how they are embodied.

Gender and the sort of what might be considered the typical embodiment of sex associated with gender, like, definitely plays into how the doctors I'm looking at perceive the boundaries of male and female sex categories. So, for example, a lot of the hormonal management that they describe in their patients is to do with ensuring that the patient embodies sex in a way that doesn't trouble their gender. So they talk about cisgender female patients, for example, who have what they describe as excessive hair growth. But I mean, obviously, how do you determine what is excessive hair growth in terms of masculinity and femininity? There's a huge scale, but there's a gender-neck expectation in Lebanon, as there is in many places, that women are more hairless than men and things like that. So that's kind of one aspect that plays into it.

But another thing that I should mention that we can open up a broader discussion about is that, like, during this period of time, the 1960s until 1980s and Lebanon, the sort of, like, doctrine of gender neutrality that was developed by John Money at John Hopkins was kind of, like, the way that they would approach genital ambiguity in patients. So, if a child was born with what they would describe as a sort of inadequately sized penis, they would be more likely to assign the child as female. So there was this sense that, gender was somehow disentangled from sex or that there wasn't a biological basis for gender and

that, therefore you could assign a child as male or female based on what would maybe be surgically easiest to achieve if you were kind of altering the genitals of the child in some way. So that's definitely part of the context at the time. An idea that came from a sort of more psychiatric context and was being very practically applied by doctors, although this is shifting. Still, I read a case study recently, there's some testimonies from intersex individuals from Lebanon who had these kinds of experiences where doctors had made practical decisions about what was easiest for them in terms of sex assignment that didn't correspond with patients of gender identities later in life.

[Feminista *In Vitro* soundtrack]

Hannah Cowdell: This is something I'm still beginning to work with my research, but I think at least from what I've been doing so far, it's about kind of like, challenging conventions and structures around the production of medical knowledge, like, making things that are very normalized into something that's sort of somewhat strange and trying to kind of to read the sort of the subtext of these things and foreground that and in that way, kind of trouble how we think conventionally about medical research, for example. And also, like, in terms of sort of research methodologies, I think it's also a sense of thinking about, you know, how academia more generally is kind of implicated in replicating some of these structural injustices and thinking about how we can also sort of queer the research process through working differently, I guess. So one of the things that I'm hoping to do eventually with my research is, like, bring some of the historical research that I've done back to sort of individuals who might have more personal connection to these histories and sort of do workshops with them around that.

I think it's like, sort of the critical nature of queer theory is, I think, something that is beneficial basically within biomedical research because, we were talking about earlier, things like, sort of socioculturally dominant ideas about gender become embedded within medical research. So I think that, you know, a lot of the insights from queer theory about how these things are constructed and how we can trouble them are important because they have a very material impact on how biomedicine operates. Like, you were talking about your research with stem cells, you know, like a potentially useful source of stem cells is being avoided because of these gendered assumptions that queer theory would trouble.

[Feminista *In Vitro* soundtrack]

Well, I guess because of this, you know, a very normative aspect of biomedicine that we all encounter in our lives, because most of us, if we have any issues with our health, are going to engage with this kind of, like, western biomedical discipline in a personal perspective. And those of us with various identities or embodied experiences that differ from these kinds of sociocultural norms are going to encounter some kind of tension in these medical contexts because of the way that those assumptions are woven into medicine itself.

I think in some ways, queer theory is maybe closer to biomedicine than biomedicine is to queer theory because of the way that examples from the history of biomedicine are used to make arguments like that use queer theory. So, for example, like David Griffiths was saying earlier in the conference, intersex, people's bodies and their experiences with medicine have often been used to theorize sex with an academia, to kind of trouble the assumptions of sexual dimorphism.

I think there is some will amongst medical professionals now to kind of, like, question some of the dominant narratives or dominant norms within medicine in order to provide better care for patients. It's more inclusive, but, I mean, I think there is within medicine that adopting a queer perspective can bring you new insights, new ways of working, new treatment protocols, new kinds of ways of approaching natural phenomena. But I think that there's still some resistance, probably to kind of like, adopting that, given how entrenched, kind of like, the discipline of medicine is and its ways of working.

[Feminista *In Vitro* soundtrack]

Malin Ah-King: My name is Malin Ah-King. I was trained as a biologist and then I did my doctoral studies in biology. And after that I had steered towards working on interdisciplinary research on gender and biology. For example, I have questioned the notions of biological sex as binary and stable and showed the variability and sex determination among animals, for example, and there are lots of animals that sex change, for example. And then, I've also worked on scrutinizing gender stereotypes and heteronormative conceptions in theory and research in biology. As well as in biology textbooks. And I have also written a book about how perceptions about females have changed in evolutionary biology from how Darwin described them as females as passive and coy towards how the researchers now acknowledge that females do have active sexual strategies.

Well, since my work is trying to understand gender stereotypes and what gender controversies are in research. It's a way of trying to make science better. It's a way of trying to put light on perspectives that are perhaps ignored or forgotten and trying to make visible how these gender stereotypes or how gender bias is part of our science and how we can make science better through just acknowledging that and trying to make science better.

So I would say, with an example of how science had this perception of females being passive, then most of the research was done on the males and trying to understand their active strategies. And by doing that, and having these perceptions of passive females, we were ignoring what females were doing in all their strategies. So by making us aware of this gender bias, we can actually get a fuller picture of what is happening out there. I would say that is also better for the people, because what science is doing is also… And especially when it comes to questions about sex differences, what science says about sex differences also influences society and our perceptions about humans and ourselves.

[Feminista *In Vitro* soundtrack]

Malin Ah-King: My current research project concerns a controversy among evolutionary biologists over what sex differences are and how we can explain them. So, I'm trying to understand how this controversy has emerged and what the researchers are disagreeing about, and what the key points of disagreements are and what is at stake in this debate.

Well, so you are talking about evolutionary biologists. They work with a theory of how sex differences have evolved. So I have identified what the researchers are disagreeing about. So one source of disagreement among these evolutionary biologists is how big is the role of the size of the sex differences in eggs and sperm, how much the females and males are investing in their sex cells for further sex differences, how they behave, if they are competing among each other or if they are choosing the mate choice, for example.

Another one is a debate over recent gender-neutral models. So whether, so there has been a presentation of alternative models to these prevailing assumptions that the size of the sex cells are very important for how females and males behave. And this new gender neutral model says that individuals independent of what sex they have should choose mate choice and be chosen and be indiscriminated depending on environmental circumstances. So it's a model that starts out with an idea of sexes as

having very dynamic sex differences in how they choose. So and then this model has been criticized. One point of this agreement is the validity of these recent gender neutral models.

And a third point of this disagreement is the validity of the prevailing paradigm. So should we think that the prevailing paradigm is valid? Or should we… There has been a lot of feminist critique towards this prevailing paradigm including this assumption that the sex differences in size of the sex cells is very important. So there has been a lot of critique and calls for re-evaluating this paradigm.

I think it's very interesting. Nowadays we have learned so much about variability in sex and in sex differences, and, as I said, animals can often choose sex or in many animals change sex. So, I think now that we have gotten to know much more about the variability. It's interesting how the researchers themselves interpret this variability in different ways. Either as there are these general trends that males compete among each other and females often take care of the offspring. And then there are all these exceptions. On the other hand, other researchers interpret this as well, sex differences are dynamic. And so sometimes those two understandings clash. So I think this is a very interesting field. I'm interested in understanding what the different perspectives are and why they come to different conclusions.

[Feminista *In Vitro* soundtrack]

So I do have a feminist starting point. I think feminist critique of the natural sciences and how knowledge is produced is kind of at the core of what I'm trying to understand. So in this case in this controversy, the feminist critique was the beginning of the controversy it started out and the controversy and it has run through the whole controversy through the process of the controversy. So for me it's interesting to understand the role of feminist critique in the development of science. In the book I wrote about how perceptions about females have shifted, the feminist biologists have been really important in pushing both the criticism of gender bias within the field of these assumptions taken for granted about females being passive. And then, they have criticized that and they have changed how science works, and how basic assumptions about how all females are. So this critique has been very very important within the field. Although I also show that it's not only the feminist critique which shifts the perceptions about females towards viewing females as active. Sometimes it's a researcher who's working on a specific animal and just realizes well it doesn't fit with our theories. It's in this species females are really active in disrupting and mating or something like that.

One example is in bird research there has been this idea that most birds live in pair bonds and in pair formations, they bring up the offspring together. So then the females were assumed to mate with only the male, the social mate. And this was a general assumption until there was a new technology, the DNA fingerprinting, which we also use as parental analysis. So they started using that for birds as well in the end of the 1980s. So in the 1990s, there came a lot of studies showing that oh females actually mate with several males in most species. Even when they bring up offspring together with a male, a female would mate with other males as well. Sometimes just one or two but sometimes many. So there was a shift in our understanding of what females were doing. But at the start of this change in understanding of female multiple mating, the general understanding or the general explanation for this was that oh, it's the males who impose themselves onto the females. They coerced them. It's not a female strategy, it's a male strategy onto the female. Until there were feminist researchers who were criticizing this assumption and made investigations to try to understand. They put radio trackers onto the female and they followed the female in the field. They saw that females don't only mate with males who are coming into their territory, but instead they are seeking out territories of males with higher rank than their social mates. So the results show that the females were initiating these meetings. So this was an active female strategy.

[Feminista *In Vitro* soundtrack]

My analysis of the field is kind of an outsider perspective, but they're also feminists working within the field. And there has been… When I wrote about this history of shifting perceptions, I encountered several examples where feminist perspectives have been criticized in the field, and that they have met resistance. And, there is always this dilemma.

So, many people see feminist perspectives as something political which is outside of science. So, that is one kind of resistance that a feminist perspective doesn't have anything to do with science because science is value neutral and objective. But then historians of science have shown how who is doing the science and male dominated science often forms perceptions about males and females and how that is brought into the science. So science history has shown that who is doing the science actually has something to do with what kind of knowledge we gain from science. So, this feminist perspective is also part of the critique of this value neutrality and objectivity in science. And sometimes there is resistance to that and sometimes it's also well known among scientists. So, scientists themselves talk about how

their perspective is formed by the kind of theoretical tradition they work working in, and how somebody else's perspective is formed by the kind of animals they're working with. So they also understand how, what we call in feminist science studies, knowledge is situated by the researcher and lived experiences of the researchers and the kind of context, the historical context of those persons doing the science.

So I've encountered three types of reactions towards my work on feminist perspectives on science and that is some scientists are just not interested or open to that kind of perspective. So they're not communicating or not interested. And then there are a few feminist biologists who are very interested and very engaged in these kinds of perspectives themselves. And then I think the large majority of biologists are kind of interested and perhaps a bit skeptical but interested in what the gender perspective on science could be. So this is the biggest potential for communicating these perspectives with scientists. The biggest potential of changing people's views.

[Feminista *In Vitro* soundtrack]

Fernanda: Thank you so much for listening! See you in the future!