



Lab Meeting

Four Interviews with Scientists on “Science Out of Feminism”
*Introduced by Rachel Lee; interviews conducted and edited by
Alexandra Apolloni and Rachel Lee*

Rachel Lee
UCLA
rlee@humnet.ucla.edu

Introduction

Across the 2016-17 academic year, UCLA’s Center for the Study of Women conducted interviews with select scientists at UCLA’s campus to explore their thoughts on “science out of feminist theory.”¹ Interviewers Alexandra Apolloni and Rachel Lee asked their subjects to describe their research and then to ponder how their practices were informed by feminism. Their answers were wide-ranging but some common themes emerged. All of these interviewees recognized that feminist networks – communities of female scientists – required fostering, and that they, themselves, were indebted to strong female role models. While we tend to think of scientific research as that which occurs at the bench or in the field, these interviews clarified the enormous impact of interpersonal mentoring and affirmative networking in diversifying STEM (Science Technology Engineering and Math) fields. The two women we

Lee, R. (2017). Four Interviews with Scientists on “Science Out of Feminism”. *Catalyst: Feminism, Theory, Technoscience*, 3 (1) 1-39
<http://www.catalystjournal.org> | ISSN: 2380-3312
© Rachel Lee, 2017 | Licensed to the Catalyst Project under a Creative Commons Attribution Non-Commercial No Derivatives license

interviewed also related personal experiences in which either the desire to be or actually being a part of a robust and supportive community-within-a-community made the difference in persisting through strings of “failed” experiments or convincing them to transfer horizontally to a related field.

Below, we publish selections from four of the interviews, one with Tracy Johnson, Professor and Maria Rowena Ross Chair in Cell Biology and Biochemistry at UCLA, another with Hilary Godwin, currently Associate Dean of Academic Programs and Professor of Environmental Health Sciences at the UCLA Fielding School of Public Health, another with Root Gorelick, Professor of Biology at Carleton University in Ottawa, and finally, one with Patrick Allard, Assistant Professor of Toxicology and in the Institute of Society and Genetics at UCLA. The subjects are all researchers with a connection to UCLA’s Center for the Study of Women. Locating interview subjects was somewhat challenging, as most scientists do not publicly identify themselves as feminists in their publications or publicly posted biographies. In seeking interviewees, we found that those who are engaged in diversity work on their campuses (through mentoring programs, etc.) were more likely to identify themselves and their work as feminist. While the work of these researchers suggests promise for a feminist scientific future, many spoke about gender-bias that continues to prevail in their fields, professional organizations, and departments. Where we see cause for hope, however, is in the efforts of these researchers to mentor a new generation of scientists equipped to challenge such views.

Was the scientific content of these researchers’ work recognizably feminist? In the instances of two of the researchers whom we interviewed, the answer was yes, even as each of them had contrasting aims in terms of assuming or demolishing the biological naturalness of sex differences in their research.

In a presentation titled “No Essential Differences Between the Sexes” for the UCLA Institute of Society and Genetics which occurred immediately prior to our interview, Gorelick reviewed the criteria with which we differentiate organisms as male versus female;² and then

pointed to zoological and botanical examples that cast doubt on these criteria. Following in the wake of feminist biologists such as Anne Fausto-Sterling and Joan Roughgarden, Gorelick's research unseats male and female as the primary mechanism for differentiating kinds within a species. Put more provocatively, Gorelick claims that the view that "male and female [are the] only natural sexes is false." Scholarship in this vein, contesting the naturalness of binary sex, helps to destigmatize intersex individuals and also to underscore the specious quality of arguments that attempt to rationalize as "only natural" (i.e., as rooted in biology) the extant social and political inequalities between men and women.³

On the other side of the coin are those who contest past findings in biological science that have proceeded as if sex does not matter, or put more precisely, as if the universal body is the male body. Allard's research practice explores the data gap regarding the effects of hazardous chemicals, especially the subset of endocrine-disrupting compounds (those having hormonal effects), over the life course of *female* organisms. Historically, toxicology preferred collecting data on male specimens due to their perceived hormonal constancy (given, for instance, their lack of menstrual cycles). The resulting gender bias in results, in short, was excused by way of seemingly non-gendered rationales (i.e.: the "easier" experiment to run was on males). For those investigating how chemicals that mimic estrogens and androgens interfere with and alter a host of "normal" biological functions (metabolism, neuro-endocrinological pathways, immunity, fertility), time of exposure and fluctuations in rates of growth and development across the life course have become crucial factors to consider in experimental design. Moreover, for scientific research to be responsive and meaningful to more than half the population, recognizing sex differences—the gathering of data on female organisms with their so called "complex" hormonal cycles as well as male organisms—remains crucial to the translational value of this research to human policy, regulation, and healthcare.

In terms of the research practices of the other two researchers

whom we interviewed, the relation of their science to feminism was, arguably, more subtle. Johnson's remarks, however, indicate that gender and race do matter to the scientific method. Gendered and/or racialized experiences of the world shape the kinds of issues that individuals care about, and, as such, the questions that researchers ask, the lens they employ when observing experiments, and the kinds of conclusions that they draw. Thus, regardless of whether or not a scientific project is *about* gender or a purportedly feminist question, gender matters to that project. For that reason, Johnson called our attention to her pedagogy and mentoring as key sites of feminist and racial equity work that benefits science. "Molecular biology," she tells us, "requires visualizing phenomena that are inherently hard to visualize. The first step is to come up with a model of what one thinks is happening, and then design an experiment that will get at that." For Johnson, homogeneity amongst science practitioners can lead to homogeneity in the models for visualizing molecular phenomena. Her laboratory work involves cultivating an ethos among her students—these journeymen scientists--of openness to the unexpected and to the pleasure and fun of having freshmen of diverse and underrepresented backgrounds hypothesize models in ways less constrained by years of traditional training. Giving younger students a taste of the pleasures of 'being a scientist' builds community in ways that are both rigorous and supportive. It is that community that sustains underrepresented minority women in STEM fields when "they encounter things that are negative" so that they don't feel that they are "outsiders who are looking in at what [real] scientists do."

For Hilary Godwin, whose early work in chemistry focused on how (lead) atoms bond, the desire to render her research more applicable to everyday contexts led her, first, to investigate, chemically, why lead was poisonous and then, to incorporate social factors into the equation of how poor and racial minority populations become more vulnerable to lead poisoning. Moving into the School of Public Health at UCLA, Godwin found more like-minded interlocutors for her work. In pondering how

chemistry would be different “if [it] were really diverse” and if women were at the center, Godwin pointed to her dialogues with female chemists from Cameroon in which their being oriented toward making a difference in people’s lives was always front and center. In contrast, shearing social concerns from the research platform is not an uncommon practice in traditional inorganic chemistry as practiced in U.S. universities.

What kind of science, then, has emerged out of feminism according to these select scientists? If one were expecting these scientists to identify a particular subfield as THE place to do feminist research, then our interviews did not yield a straightforward answer. Nor did the interviewees see their own enrollment in science, with its commitment to objective findings, as compromising their acknowledgment that the gender, class, and race of the observer—his/her sociohistorical situation—affects the research practice. Reflecting perhaps the salience of women-of-color, transnational, and indigenous feminisms, all of our interviewees also emphasized the braidedness of their feminism with their pedagogy of underrepresented minorities (Johnson and Allard), their conversations with “native” epistemologies (Gorelick), or their direct collaboration with women in the global South (Godwin). Additionally, all our interviewees had stories to tell about the subtleties of sex discrimination in their fields and how tuning into those effects (e.g., women being channeled into botany while men were channeled into zoology) could be difficult to articulate at the time of the event’s occurrence or could only be identified upon later reflection with other sympathetic colleagues. Conditions for working—the infrastructures of scientific research including mentoring and letter writing—in other words, were as much a central part of what could be considered the scientific practice that emerges from feminism.

In short, each of our interviewees embraced multiple key insights from feminist science and technology studies. All acknowledged the scientist’s ethical obligations to his/her students and affirmed the importance of social justice to their practices of science. Their recounted experiences also attest to science as a contested field of power, with

some confronting outright hostility toward their efforts to broaden the terrain of science. Our interviewees' contestations within science included their movements sideways within their institutions or across institutions to find more hospitable homes to address the way that disparate outcomes can follow upon seemingly neutral research designs. Finally, with their emphases on their own indebtedness to feminist mentors and collaborators, they all help move the story of what makes a scientist away from the myth of the "individual genius." What these interviews reveal, then, is that feminist theory can and does shape science. It provides researchers with the tools to recognize and respond to gender bias and discrimination in their disciplines and in their labs. It moves them to advocate for and engender a diversity of perspectives in their labs--and in so doing, it brings to light new questions and methods. Finally, it can bring scientists to question commonly-held "truths" about the nature of sex and gender.

Hilary Godwin

AA: Could speak about some of your first experiences with science. What brought you to the work that you're doing now?

HG: My parents are field biologists, so actually my first experiences with science were as a very small child doing field work with them. So from a very small age, the question was not whether or not I wanted to be a scientist, but rather, what kind.

Getting to where I am now was complicated. When I went to college I thought that I wanted to major in either anthropology or psychology, and I took both the anthropology and psychology classes my freshman year and did not like them. In the meantime I was taking freshman chemistry because I thought I might want to get a medical degree and I loved chemistry so I ended up majoring in chemistry and doing research in chemistry and then going to graduate school in chemistry, and I got a PhD in chemistry. And by the time I finished my

PhD., which was in very traditional inorganic chemistry [looking at how different atoms bond with each other], I decided that even though I really enjoyed doing it, I wanted to do something that was more relevant to people. I chose to do post-doctorate research at Johns Hopkins University in the School of Medicine and transitioned into biochemistry, and then after that, started a faculty position at Northwestern University in the chemistry department and worked on the program that I set up there looking at why lead is poisonous. [This direction] married my interest in people and chemistry. After being there for ten years, I had the opportunity to move public health [at UCLA], which was much more aligned with the research that I was doing and also my interests. I felt like I spent a lot of time trying to explain to my colleagues why I cared about people. So, so it was nice to move- to be with people who also cared about people.

It's been very liberating being in public health. My research has broadened significantly since then. I still do some toxicology work but I also do work looking at health impacts of forest conservation, water conservation, and toxics policy. It's very, very diverse compared to what I was doing when I was a chemist. So I consider myself a reformed chemist.

AA: When you were first doing chemistry were there mentors who were pushing you in the direction of doing work that involved people or were you on your own?

HG: This sounds crazy to most people who have had the experience of taking organic chemistry, but I actually really just loved organic chemistry and particularly loved the organic chemistry lab. My organic chemistry TA said, 'you should try doing lab work.' He was the one who encouraged me to start doing independent research and I just loved doing it and I loved making things. I really like to cook so to me organic chemistry is kind of the same thing. It was really passion driven. It wasn't until halfway through grad school that I thought, "what about the people?"

AA: Do you remember what made you start asking that question?

HG: I felt the work I was doing was very esoteric and, not to be morbid, but I sort of felt like if I died it wouldn't have made any difference that I had spent all that time working on my precious little molecules. I wanted to do something that had broader impact.

The work that I was doing in graduate school [regarding the bonding of atoms] was very fundamental chemistry. I made a conscious decision when I did my post-doctoral work to switch to working on biological molecules, while still working on ones that had metals in them. And then I started looking at how poisonous metals impact the proteins that naturally have good metals.

AA: And do you think of that as feminist work?

HG: Yeah, do I think of that as feminist work. I mean certainly there is an important maternal and child health component to it. Another part of it that felt feminist: I was actually the first female faculty member that was hired in the chemistry department at Northwestern University, and then the first one to get tenure, and the first one to be department chair. I felt very profoundly how it was isolating; it created pressure that I wouldn't have felt if I had been male. That was really the point in my life when I became more conscious of feminism and women's rights, and inequities.

In terms of my research, around the time I left Northwestern and came here, which was ten years ago, I started working with a grassroots organization [at its inception comprised of] all female chemists [running] women's leadership and empowerment workshops in the United States (and now globally). This was definitely an important component of the service work that I do.

In terms of research, I have a project looking at health impacts of forest conservation on indigenous populations; there is a significant component of it that to me feels feminist without question. There are very different impacts not just on indigenous versus majority populations in

terms of male and female populations [within those categories]. It has been super interesting talking to the women in the villages that we work with about it. To me, one of the most poignant moments was when the women in one of the villages were explaining to me why they thought it was important to have job training programs for women. They said, “We want to work!” and I was like “I know, I’m here working,” and they’re like “oh right!” I was like, “this is why we’re here! You don’t have to explain to me why you want to work, I get it.” And it was really where I saw how differently the women in the village interacted with me versus the all-male researchers that have been working in that village for literally decades. The first time I visited the main village we work with there, in Cameroon, my colleague was like, “Wow! The women talk to you!” I said of course they talk to me, like duh, of course! He said that, over the past 10 years that he’d been working there, he hadn’t felt like the women had ever really engaged with *him* but also that he had women researchers who were biologists doing field work whom he felt like the women didn’t engage with. And I asked, “well, it was because they were doing work that the women identified as male work, right?” And he said that that was true because there was one male researcher who really liked to cook and had actually spent a lot of time with the women, cooking with them, and he said that was the only person from his whole team over the years who had done so. I was asking them questions about their kids and the challenges they face and talking to them about things that women talk about, right? So that part of it definitely feels feminist.

AA: Going back to what you were saying about your time at Northwestern as the first woman in that department: What kind of climate do you see for your students now?

HG: It’s definitely much better in public health than it is in chemistry, even today. I started as a faculty member about 20 years ago. Even chemistry, things have improved since then. Yet, women chemists still mention having a lot of the same issues that I experienced 20 years ago. Some of

those things are just better in public health because we have better gender ratios. Where students identify issues in public health is as it relates to underrepresented minority groups. [At UCLA] we actually have pretty good representation of Hispanic students and Latino students but we don't have great representation of African-American students. It's better here than at most schools of public health, but it's still not great, so I would say [it's important to listen] to African-American students [and find] kinship.

The other group of students who I feel are struggling with issues that are similar to the things that I remember feeling - being the only person from a certain group and being identified as other - are our transgender students. We have a really strong Careers In Public Health student group and I think the gay and lesbian students feel like they have a good support group there, but I still hear from the transgender students that they feel like there are comments that people make without realizing it that touch them to their core. That part of it, to me, reminds me of when I would hear people saying [sexist or racist] things and wonder, "did that person realize he said that? I just can't even believe it" you know? So that part of it, I don't think it's completely gone.

AA: And do you think that having that experience of being the one woman or being, you know, one of very few students of color or few transgender students, do you think that shapes the kinds of questions that people ask as a scientist?

HG: For sure. It actually makes me feel like more of a complete person as I don't separate social issues from science. A lot of times scientists separate social stuff as subjective, saying science is clear cut and has nothing to do with any of that stuff. I have a view of science [as also influenced by subjective factors, for instance, in] the questions that people choose to ask, and the way that they choose to answer them.

RL: So what if you were teaching chemistry but you were teaching in a

women's studies department? Would the course be structured differently? For instance, would you start with cooking a meal and what happens to atomic bonds in cooking versus, I don't know, the making of the hydrogen bomb? How would you do it?

HG: Yeah that's a good question. I've actually never thought about that. The easy answer is 'yes' I would do something differently. So, I teach a fundamentals of chemistry in the environmental health department, which is basically a refresher of general chemistry, and it was because my colleagues kept complaining that people didn't remember what they had learned in freshman chemistry. But, of course, they don't. In their minds it was something completely irrelevant to what they're doing now, so why would they remember that stuff.

The way that I teach chemistry in the environmental health department is completely different from the way I used to teach freshman chemistry. I found a really great book that focuses on concepts as opposed to problem solving which is really the focus of most general chemistry classes. The core concepts are the same it's just different in terms of the focus, which is on their relevance to environmental problems. So I would imagine that if I were in a women's studies department that I would similarly develop a class where you take a step back and say what are the core things that I want to teach to the people who are in the class, what's the best way to convey that information, and what do the people who would be taking this course actually care about?

AA: Along these lines, I wonder if you could talk a little bit about your approach to mentorship and how you engage with students in your lab.

HG: I sort of have this philosophy that, not that suffering is good, but having gone through difficult life circumstances makes people more humble and more appreciative, that different people struggle with different things, and those are valuable perspectives to have as a mentor. When I was in the chemistry department I felt like there were a lot of

times when people would say to me, you know you mentor people that way because you're a woman and I would always push back and say actually my post-doctoral adviser who was a man had the same mentoring style. It has nothing to do with being female or male; it has to do with valuing people as human beings and a fundamental philosophy that it's important to treat people well. But you know some people think that that is gender related and I just happen to think that it's not. But would I say like, being a woman, does it influence my mentoring? Of course it does.

AA: You are interested in communicating science to non-scientists. Could you talk a bit about your work in that regard, and whether that desire also has a social justice or a feminist grounding?

HG: The origins of that desire started when I was at Northwestern communicating about lead poisoning. It really was about communicating why do we do the things we do as scientists and what the implications of the results of science are. But it comes back to the core idea that it's not enough to do science, that you have to make sure that you're communicating it to critical stakeholders and the general public. I think it goes back to my original desire to be an anthropologist. There's something I just love about the process of trying to figure out how people conceptualize the world around them and how to communicate effectively to people.

RL: How does gender or gender theory- and that can be also you know trans theory affect the practice of chemistry?

HG: To me the biggest impact still, even, you know 20 years after starting as a faculty member or as the only woman, is that chemistry still is really white, and straight white male dominated. It's not that there aren't other people but it's really dominated by [straight white men] and to me that really impacts the way they conceptualize what are important problems

and how to attack them as discipline. That [formation] made me reach out to Public Health and service. What I care about is much more in alignment with what most people in Public Health care about than it is what most people in chemistry care about. I tried to explain that to people – intellectually, public health, is like finding the right home.

But if chemistry really were diverse, how would it be different? So for instance, to me it's fascinating when I go to work in Cameroon. I often get together with women chemists through the women's leadership development program in science. And it's so fascinating to me to see how different the interests are in terms of what's considered to be important chemical topics in Cameroon versus in the United States. The things that they, as a community, tend to be interested in, to me, seem much more practical and useful. They still don't seem as practical and useful as what someone in Public Health is interested in, but compared to chemists in the United States they're way more practical. So for instance, there's a big interest in natural products and extracting things from plants. That's a big topic in the United States but in the United States it's very focused on "I'm going to isolate this really complicated molecule that comes from this obscure plant or animal and then I'm going to synthesize it in fifty billion steps," with the connection to the practical world becoming very tangential. Whereas in Cameroon, the thinking is "we know that this particular plant product is used by this community for this purpose and so we know there is some useful thing here. We want to extract that thing so that we can then market it and develop it." It's not really about a desire to make something in its pristine, pure form; it's really about how we can create a product that could be marketable and that can cause development in the economy. That could help people.

Patrick Allard

AA: Do you think of your research as a creative practice?

PA: I'd say it's a very creative practice, absolutely.

AA: And so do you think that being aware of social inequality, or gender inequality, or issues related to justice broadly defined - do you think that they shape the creative choices that you make in the lab?

PA: I think they do, but not necessarily in the direct way that you're thinking. In my lab we look at exposures and the way they affect reproduction, and I've historically focused on female reproduction for the reason that hasn't been researched as much as male reproduction. But the reason why it's not being researched as much is because reproduction is inherently very complex and the female oocytes or female germ cells develop over the entire lifetime of an individual from in utero all the way to adulthood, which is slightly different from the way males do. For males you can quickly just look at an adult and know what's going wrong; with females it's really hard; much, much harder to do. I realized that there was this gap of data around harmful impacts on female reproduction. I decided to look at what had not been historically looked at too much.

I don't think the data gaps necessarily come from social inequality. I just think there's an inherent biological difficulty in looking at things through the models that we used to have to use, and so I decided to develop new models to address that.

Of course sometimes, and I've not encountered this directly, there's the thought that "well if you figure out how males are affected then it's probably the same thing with females." I've heard those things being said before but people have not rejected my work because of that. And I think it's a very male-centric view because it's inherently actually different, but I think some people are willing to brush off the female side easily.

Parts of my work directly connects to the question of inequalities. In an ideal world where we would all be equal, magically; if there were no social differences or chemical factor differences between all of us, would our health really improve? Would we all be equal with regards to our

health? And what I'm finding through the models I've developed in the lab is that through our histories, our chemical history, we carry [our history] with us. Your ancestors still determine, in terms of chemical exposure, your health now. Even if everything was equal now we would not be equal because exposures may have effects several generations down the line but not right now. I try to actually address that question of inequality through this angle of transgenerational exposures. There's mounting evidence that those are real, that for generations you carry the burden from your ancestors sins; 'toxics sins' I call them.

And finally there is still the question of women in science. I'm lucky to be surrounded by very powerful women. I have a split appointment and both of my deans are female, and one of the leaders in my field is female. So these figures exist, but I also look at my students and I see a lack of confidence in whether they belong here, or at least that's the way I perceive it. I feel like there's a lot of confidence infusion that I need to do: "yes you belong here," "yes your work is fantastic" "you're a fantastic researcher," "you're a fantastic educator," those kind of things. I find that I tend to do that a lot more with my female students than I do with my male students who don't even take compliments anyway.

AA: I think it's true that a lot of women are conditioned to think that they don't belong somewhere, so I think it's interesting that you put it that way.

PA: Listening to my female colleagues during my post-doc at Harvard Medical School, which was a high-pressure environment, I saw the frustration from their end. They would talk about the experience of giving advice to someone but being ignored, only for a male colleague to repeat that same advice and have it taken up. Or hearing people say things like "oh that PI? She's a bitch." And then you wonder: Is it just only people like that who can make it to the top? All of these things that were said that really during my post-doc time made me think a lot more about gender in research. Not the research of gender, but the place of gender in

research and how people are being perceived.

AA: I want to go back to what you were saying about your research, and about how you're doing work on the female reproductive system and it sounds like you're asking--correct me if I'm wrong—asking questions that had not been asked before?

PA: I'm not necessarily asking questions that have not been asked, I'm just providing much, much faster tools to get to an answer. People asked questions about the reproductive impact of certain chemicals, but they were either not able to do it comprehensively for a lot of chemicals, or finding answers was extremely expensive. What I try to do is develop tools to specifically address that, so that if we have to screen hundreds of thousands of chemicals on the female reproductive system we'll be able to do it, as opposed to testing the male assuming that impacts on the female will be the same as the male. I try to directly address that by designing new tools.

AA: And do you think of that as an activist project at all?

PA: I do and I don't. What I mean by this is, to me, it's just curiosity. We know so much about the other side and we don't know about the female, and I understand that biology in itself has been a barrier. I never saw it as a societal error to correct, but then sometimes I do feel like I want to tell people off when they tell me, "Oh, but you know we already know some stuff about the male so why the female?" I think that's such a short sighted question and I often wonder why people are asking me that question because it's obvious that the biology's very different. If you know anything about biology you would know that the male and female reproductive system are inherently different from each other and the way germ cells developed are inherently different.

AA: Hearing this as someone with a background in gender studies it

sounds like activist work because it's filling a gap caused by the lack of research done on female bodies.

PA: I think to a vast extent it's being corrected, or trying to be corrected by a generation who know that now we need inclusive studies. If you're going to work with people, you have to be able to include genders, and races, and ethnicities. Historically, in toxicology, people tended to stay away from the female side because it was too variable and if you wanted to get a straight answer you probably should work on the male side because there would not be hormonal changes over the course of the month so it would be easier to get a clear answer. Fortunately, I think we're already starting to move away from that approach, but there is still that data gap that existed.

AA: So you spoke a little already about your work with students. Do you see your students asking new kinds of questions motivated by concerns about justice, representation, etc.?

PA: I've seen a lot concern about minorities and their place in science, and the issues facing first generation researchers. Two of my female students are both minority but one is recognized as a minority in science, and one not recognized as a minority. One is Latina and one is Asian, but they're both first generation students. They deal with the question of being a minority and how you can be considered not a minority although you are a minority. A lot of the most intimate things that I've learned from my students I've learned thanks to the fellowships that exist for minority students. This is where I learn about their family histories, what happened to their families, what it means to them to be doing research. I write letters of recommendation for them based on their essays, and it's a great platform for me to talk about these issues with them. I find that I'm definitely more focused on racial minority issues, rather than gender issues.

AA: All those issues do tend to connect, though.

PA: Right, but I do think that one takes precedent over the other. I think sometimes both are accounted for when an application is reviewed. The first goal might be 'let's get minorities in science', and 'oh yeah there's the gender thing', 'oh she's minority AND she's female, that's great!' Right?

AA: And I wonder if those students end up feeling kind of additional pressure then to succeed?

PA: Obviously I'm a white male, but if you're asking my perspective: I do think that it has to compound and make students feel even more so that they don't belong? I mean how many women of color are in leadership positions? All the ones I know are white females. If you start thinking intersectionally then you don't see full representation.

Root Gorelick

RL: You describe yourself as a theoretical biologist. Can you tell us what that means?

RG: I devise hypotheses, but I don't test them. Or if I do test them, I test them with my memory. I learn about as many weird organisms as I can, so I can devise a hypothesis and instantly say whether or not it is wrong. I was originally trained as a mathematician, and that's what they do: they build up a back pocket full of counterexamples. And I do that as a biologist.

AA: Do you think that coming at your work as someone who's interested in feminism, social justice, and equality changes the kinds of questions that you ask? I know that much of your work focuses on sex, so does feminism shape your approach there?

RG: Of course! Absolutely! It has to. It's meant that I end up spending a lot of time talking to my friends who do trans issues or making connections that no biologist in their right mind ever does. Part of it is that I think you get to see that there's more variation out there; that individuals really are different. Biologists tend not to want to see that; we want to think that all humans are alike. It's very weird, we think all humans are alike and then biologists as a whole can be often awfully sexist and racist.

RL: And your current work is informed by indigenous science as well - could you speak about how you came to that approach?

RG: I did my graduate school in Southern Arizona and Southern New Mexico where there really was a large indigenous presence, and a large Hispanic presence, and many students were first generation from Mexico. I was teaching a statistics class, and I had to teach the following phrase: "fail to reject the null hypothesis." It's either a double or a triple negative. And double negatives mean the opposite in Spanish that they mean in English, and so I realized that cultural and linguistic things truly make a difference.

I moved from there out to Canada, and I wanted to do the same research locally. Carleton is a university that's on First Nation territory and there are First Nation peoples nearby. We were hardly doing anything for First Nation students, and the little we were doing was over in the humanities. What could we do in science? We have indigenous students, but we don't even identify them or ask them if there's anything that we can help them with. So I thought that we should give something back to these people whose land we're on. I didn't know anything but I thought that I could learn a little bit and facilitate a conversation. So I suggested that in biology, we offer a course in indigenous perspectives on ecology in evolution. I know ecology and evolution, I can figure out traditional ecological knowledge and things like that, at least well enough to get a

conversation started. The biology department said no, in a racist way, actually. They said that indigenous knowledge is nothing more than myth and folklore. And I thought, wow, these people have hypotheses just like you do, they falsify them just like you do, and as far as I know it sounds [a lot like my] evolutionary research. Most of the evolution I've learned is also Western myth and folklore. And it's no better; it's no worse. And so I finally went to the Dean of Arts and Social Sciences, and I mention this to him and he says, "I'll pay for you to teach that, but you have to teach in the Indigenous Studies program."

I was a bit intimidated then. I started to develop relationships, both learning from the students but from the people who are actually studying indigenous cultures in other departments. Sociology, indigenous studies, political science, and other fields had started talking about plural-versality. Both feminist perspectives and indigenous perspectives are different epistemologies, and they also have different ontologies. It's seeing the world differently, right? And we probably do have different ontologies, we all have different backgrounds, and there's nothing wrong with that. Hopefully there could be synergism that could be reciprocal.

So I look at the way that I do science as a theorist. The way I work, is I take an idea or hypothesis and then I look for exceptions--the counter examples and weird stuff. And if you look at Western ways of knowing, we have a concept for that: black swans. It's an idea from the Greeks: they said all swans are white, and seeing another white swan won't tell you anything, the only thing that's really interesting is if you see a black swan, and the Greeks, the ancient Greeks, had never been to Australia where they do actually have black swans which do tell you something. And so it's the exceptional things that matter. When you look at what is modern day Canada and North America--Turtle Island--the metaphor here is the white buffalo.

You have the black swan and the white buffalo; they're showing the exact same thing. These exceptions give you the really basic and important shifts in your knowledge. So in this place there seems to be little bit of reciprocity.

AA: Another element of your work is about questioning our binaristic notions of sex. Could speak about what brought you to that question?

RG: As a graduate student, I met [molecular biologist] Shirley Tilghman. Her work opened up doors and I started realizing that a molecular mechanism could be the way that sex--in terms of femaleness and maleness--is actually determined. So I started to develop a theory around that--how a process called cytosine methylation determines sex. But I wanted to know not just what causes femaleness and maleness but all aspects of sex: how do meiosis and cell divisions arise, and things like that.

RL: The idea that you could determine femaleness and maleness by way of differences in cytosine methylation is really striking to me.

RG: So what we have are plants like the cycad or the papaya that will express their genes for femaleness in various ways -- through production of eggs, etc. There are also genes for maleness, and it is possible in the same individual to sometimes have them both turned on, and in most plants they are both turned on. But in some plants only one is turned on. But we know in some organisms, if we subject them to environmental shock, it suppresses maintenance methylation.

So what ends up happening is that these methyl groups turn off genes for, let's say, maleness. But when you impose an environmental shock, after meiotatic division they will not acquire the methyl group and the genes for maleness will be expressed. These processes were my weird entry into all of this. And I don't believe there is universal mechanism at all anymore.

RL: If you were to try to then come up with an alternative hypothesis that would be more functional and more useful and that would replace binary sex what would it look like?

RG: To me, with regards to sex, the interesting binary or quasi-binary is self-sex versus sex with someone else. I mean that in terms of self-fertilization. And it's not really a binary, there are certainly individuals that will do both. But to me that's where the interesting dichotomy comes in, and that's where the interesting testing comes in. One researcher said basically, sex is what creates diversity and variation, and I don't think it is. We can test this by looking at self-sex versus sex with someone else, and see whether one does generate more diversity--I don't think it does. Which makes for a whole other interesting story.

RL: Right, there are also so many different ways to put it together that you can see, and that are very socially constructed.

RG: It's totally socially constructed, I think. And the whole notion of biological sex--you were reluctant to use that term, and it was good that you were reluctant to use it. It's terminology that we use for convenience so I try not to use it because I still think that what we call biological sex is also social construction.

It's also why I intentionally muddle sex with gender, because I think that both are social constructs, so I use them both interchangeably. But it's because of my weird biological notions of what sex means. And people will criticize me for that, and maybe I should do better.

RL: We're also at a moment in the history of science, where this idea that you can extrapolate from studies conducted on men and apply the same results to women is coming under fire.

RG: I've had a really hard time reconciling what to say over the years and I guess my best answer to this, as an evolutionary biologist, is that I do not think that sex in terms of female and maleness is real, but sexism absolutely is. As an evolutionary biologist I don't think that race is real but racism sure is.

AA: Was there a moment when you came to this kind of realization – say, that sex isn't real but sexism is -- and did that kind of shift the kinds of questions that you were asking in your research?

RG: Yes. It really did shift. It got me to pick up a line of research that I had abandoned: how do we quantify diversity, including incorporating intersectionality into it. I'm developing some really cool, new notions on how we can quantify diversity, but also on how we can turn it into policy-- how we can get more underrepresented people in academia or anywhere.

RL: Do you mean how you quantify diversity in terms of how many students are coming into let's say STEM fields, or is it more like how to quantify diversity in a biological light?

RG: So I'll give an example. Let's say for a minute that sex is real, that male and femaleness is real, and let's say that race is real. And we take a place like UCLA. What we'd do is build an array for each department asking how many people in it are female of this race, male of this race, we'll count them up. So you've got this data array, but then how do you measure diversity with that, including the intersectionality issues? How do you then say to somebody who's doing policy that our levels of diversity have increased over time? How do we compare UCLA to another school next door, who has a different number departments, a different number people, and can we say whether UCLA has greater or lesser diversity than they do, in a statistically meaningful fashion. And once we can do that, then we can really start tying policy to [effects that increase or decrease diversity], and if you see a statistical increase in diversity or decrease in diversity, you can ask what you can and should do about it.

AA: How do you see these diversity issues playing out in your field?

RG: The issue that annoys me is that our faculty, when I look at them, do not reflect the diversity of our students. I'm in a biology department, the majority of the PhD's are earned by women, but less than twenty percent of the faculty self-identify as women. And then the percentage has dropped since I've been there. We had one job search where we interviewed five people, five white men. [When] I complained, nobody cared, the Dean didn't care, the equity people didn't care. We need to go do something about it.

When you look at biological fields, the women are all in botany. Historically, the biology [of animals] was considered the domain of men, plants were considered the domain of women, and that still persists to this day. So for instance, when you talk about epigenetics, many of those who were feminists were willing to have a more fluid look at [biological] development and things like that, so they were much more willing to bind to the epigenetic stories than the zoologists who were men were. So there's some really interesting history to be done there.

RL: What are some of your students working right now?

RG: My students are doing pretty much everything.

One person is working on sexuality versus asexuality or self sexuality in blackberry trees, especially as it goes further towards the range edge. So we know that as plants get further towards the range edge they get more and more sets of chromosomes instead of having two of each, they have four of them, or eight of them. So what does that do for the self-sexuality or asexuality of those plants. Another is studying how maple trees make maple syrup. Two of my students just graduated. One is working on how climate change is affecting flowering and fruiting time in a place where climate is changing more than almost anywhere else, which is the northern end of Ellesmere Island. The other was looking at climate change and how it affected diets and size of grasslands where things browse or graze while the climate was changing.

I do have people who study evolution of sex. My very best

graduate student was doing work on the evolution of sex as pertaining to sperm not having nuclear pores and stuff like that. I had another grad student who was studying two products of female meiosis--how two basic egg cells can fuse with one another to form another generation. She had the wherewithal to get funding from the Lambda Foundation.

RL: I'm curious about the undergrad teaching you do too. Do you find that undergrads come in receptive to these ideas about nonbinary notion of sex and gender, or is it a hard sell with them?

RG: One of the classes I teach is the evolution of sex. And I basically teach two things. I teach what is meiosis, and we probably spend half the term on that. So we tear down all the silliness, and spend the other half of the term building up something that's real. The female male differences, we do the same thing. We tear it down, but I'm not sure that we actually build anything back up. [The students] start totally frustrated with me, and at the end of the day they go home really happy. But I've basically told them everything that they've learned in the rest of their lives is a lie. And it fits in with their politics sometimes, but they don't like hearing that they wasted their time learning things that are not quite accurate, or just downright wrong at times. So that's kind of fun. Our job is to mess with them, right? To be disruptive in a constructive way and to show them to see the world differently.

RL: You flip for them what they think of as theory and fact in the sense that they think meiosis is a fact that they learned in high school biology. You've actually flipped it to say "actually that was a story we told, and a theory which I've now disproven for you."

RG: I've now disproven it, and here's an alternative which is probably closer to truth. But you know I hope [they learn] the beauty of coming up with hypotheses, and how the only good thing is if someone falsifies them. I want people to falsify them. I have been hoping that someone

would come up with some good criteria for how you could distinguish eggs from sperm, [criteria] that worked on everything. And someone could pull that out of thin air. If somebody could get some weird inspiration, or have a weird background, or a different background from mine, and these cool ideas sometimes fall out of the sky.

RL: I'm trying to get a sense of the extent to which feminism has changed the practice of your science, or influenced the practice of your science, and what I got from what you just said is that sometimes you let the surprise chance encounter drive what you're curious about.

RG: Right: It's luck and it's just paying attention to see what's around you right and looking to see what individuals look like or act like. But it's also looking at all of the weird variation and [understanding that] people are different. When people ask me what is your sex or gender right, well I say well can I change it every ten minutes, or check none of the above, because these are meaningless terms the more you look at individuals, and rather than at data points.

Tracy Johnson

AA: What led you to your current career as a researcher? Were there early mentorship opportunities that set you on this track?

TJ: I think the most significant influences probably happened while I was an undergraduate, when I was in college. I was initially interested in literature and was really enjoying it. Then I took my first chemistry class and really loved it and part of it was that I was working in a group with other students, and we did workshops together and I realized that thinking about chemistry, talking about chemistry was really fun. And so then I had a professor who, whatever it is that he saw, was really encouraging, and suggested that I focus on the sciences. That was a real motivator. It was exciting to see that someone saw a particular talent.

And over the course of the time that I was a student, he continued to be really supportive. And then the first time I worked in a research lab, the person who ran the lab, also really encouraging, created an environment that was fun and welcoming, and then by that point it was just clear to me that that's what I had to do. So it was really having great mentors who were encouraging, and who modeled also what it's like to create a vibrant and inclusive research environment.

AA: And how does that experience learning from those mentors affect the work you do now?

TJ: I think that's a great question. Probably the most significant impact is I realized that if just a few things had been different, if I had contact with just a few, fewer people, if they hadn't reached out the way they did, if they hadn't taken an interest when they did, it's unclear to me that I'd be a scientist. And I feel like I have a great job, I love what I do, but it could have easily not been that way. So the importance of mentors and people who are willing to engage really hit home for me. And so that's motivated my thinking about the possibility of [increasing participation of underrepresented minorities and women in science], knowing that there's probably, there's undoubtedly a lot of amazing talent out there that may go unrecognized if we don't keep our eyes open.

AA: So, have there been other instances where these social justice issues emerged for you? How did they shape your approach to mentoring?

TJ: I sort of grew up with it because my parents were very, very vocal and aware of the social justice issues. But they also really taught us about the significance of being both comfortable in our own skin but aware of what the impact of being, frankly, being a young woman of color was. And so I think I sort of grew up with an awareness of these conversations, of the issues. But I think probably one of the things that really struck me the most is toward the end of high school, the beginning of college, it was so

clear that— the disparity between what was happening in some schools, some high schools, some junior high schools, and what was happening in others within, you know, five miles of each other, and the complete difference in the students' experiences based on access to resources through no reason other than luck. Things can be very, very different. And so that, I think that was really striking for me. And I felt like I got lucky, you know. I got lucky to be where I was with the parents that I had and the situation I was in. So I think that really impacted the way I thought about and have thought about the way I want to conduct my own research, mentorship, and teaching.

AA: And so, what do you think is different about your research, mentorship, and teaching because you are mindful of these things?

TJ: I feel like it's easier for me to see talent in a lot of different places. I think that in science there's this sense that science is somehow objective and so pure that anybody can come up with the same questions and the same answers. And I think that when you say it out loud it sounds kind of ridiculous, but there's this sense that somehow science is free from any subjective notions. But the reality is that the way we ask questions, who asks the questions, the answers we come up with, in fields that may seem as objective as, you know, biology or physics, are completely influenced by who's doing the work and what the scientist brings to the discipline. And so, given that, I feel like I've been fortunate to see talent in a lot of different places. I feel like my eyes have been much more open to [the importance of who is asking the questions] just because of those experiences early on.

AA: And do you think that you ask different types of questions than some of your colleagues because you're thinking about social justice, or you're coming from this position of being informed by that?

TJ: You know, I feel like the answer is probably yes, it's hard for me to

articulate why, but I feel like I see the practice of science differently. And yeah, I think so, but it's hard to articulate.

AA: We read a bit of your work getting ready for the interview, and I found in some profiles and interviews that you talked about the elegance of organic chemistry. You also mentioned earlier the fun of seeing things come together. So I wonder if you could talk a bit about science as a creative process, or what makes organic chemistry seem elegant to you?

TJ: What struck me when I first [encountered organic chemistry] was that there was something very visual about the way molecules come together. And there was an order, there was a systematic way in which you [could] build reactions. But that there were a lot of different ways of coming at that. And depending on how you saw the molecules, you could take different steps. The idea that you could build something, whether it's building reactions or building an organic compound or whatever, that you could build it from component parts. Depending on which ones looked right and appropriate, those are the ones you could select as part of the building process. It felt very fun. I think that that was how, for me, organic chemistry felt elegant.

AA: When you're working with the students in the lab, what do you do to get them to have that [same] experience of fun and creativity?

TJ: Molecular biologists are interested in things that are very small or usually are happening too fast to see, or they're too small to see. And so, the creative part of it is figuring out how to see what seems like the unseeable. How to visualize things that are hard to visualize. And so, the first step is to come up with a model of what one thinks is happening, and then design an experiment that will get at that. But the creativity comes in because the experiment has to be designed to unveil something that is usually really, really hard to see. And so what I find to be so much fun with students is building models of what we think is happening,

developing hypotheses, and then thinking about what it takes to test those. Science can be incredibly creative. And different people are going to come up with different ways of looking. Two people will look at the same piece of data and will be drawn to different aspects of it, and then ask different questions to get at those aspects. And I think that's a fun process.

AA: That speaks to what you were saying before --why it's so important to have more people and different perspectives in science.

TJ: For example, the reaction that my lab explores is something called RNAse blasting, and just the way in which that was discovered reveals an example of this. And so these are essentially regions of the genome that don't appear to code for proteins, right, they don't seem to be critical. And in fact they sort of get removed by the cell; there's this sort of cutting and pasting process that happens. But for the original discovery, you know, nobody anticipated that there'd be these long stretches of sequence in the genome that did not seem to have a function and that had to be removed. And so just to discover that you had to have your eyes open to something else. You had to be willing to see that these sequences could just be looped out and removed. We're interested in now asking two questions: first of all, how does [RNAse blasting] happen? Secondly, maybe there's something more to the existence [of this removal of these noncoding regions of the genome]. Maybe there's some other way in which the process of splicing feeds back and communicates important information to the cell. So I think just being able to see that there are these events that you wouldn't expect, I think it happens when there are people with different sets of eyes who have these questions.

I'm teaching a class of freshmen right now and it's wild, it's really fun. But, you know, we're asking a very basic question about splicing to the lab class that's, basically, very similar to the kind of work that we do in the lab. Freshmen who have very little molecular biology knowledge are

coming up with so many really interesting hypotheses about how the molecules that my lab has spent years looking at, how they work. And it's partially because they don't have the constraints of all of the things that we've been making assumptions about for years. You know, not all of it is accurate, not all of it's right, but sometimes there are these nuggets of information, because the students are drawn to certain aspects of the question.

AA: I know you do a lot of work around retention and getting people to stay in the sciences. So how do you approach that? What do you think needs to happen to create a more diverse discipline?

TJ: The first question is why do students who start the process saying they want to be a scientist, why do they leave? And I think nationally the statistics are really sobering. Nationally, about 40% of the students who say they want to be STEM majors graduate with STEM majors, that's across the board. And for students who are underrepresented it's about half of that [around 20%]. And there's no difference in the degree to which those students are committed when they come in. So what happens? Even at a place like UCLA where our students come in with very strong backgrounds, again, across the board, we lose our students from underrepresented groups, and the persistence rate is half of what it is for other students. And these are students who are coming in with extraordinary GPAs, everything on paper looks great, so what is happening once they get here? We don't give enough students a taste of what it means to be a scientist. To be committed to the endeavor of science where they feel like part of who they are is being part of this community, as opposed to being outsiders who are looking in at what scientists do, but starting to identify as scientists very early. And this isn't just coming from me, there's data out there that talks about this idea of students who perceive themselves as scientists tending to stay in the sciences longer. Particularly in the life sciences, we just don't do that. We give them all of these hoops to jump through before they get to do what I

think is the fun stuff that they come here to do, which is to do research, or to think about biological questions, or to be involved in the process of discovery. We tell them here, you jump through all these hoops first, and then maybe we'll let you be part of a club. And I think that's what I've been interested in seeing disrupted so that students can start to see themselves as scientists very early and see what they have to contribute very early and become committed to being part of this community, and so then when things get really tough, or when they encounter things that are negative, it's not as much of a crisis because they're already part of a community and these things can be put into the perspective that they deserve to be in, which is not immobilizing, but things that you just push through.

AA: What kinds of things do you do, either in your classroom or in your lab, to create that for students?

TJ: It's part of the motivation for this lab class that I'm teaching, so that students do authentic research as freshmen. And the students can go to seminars and hear scientific talks and maybe engage in the practice of trying to really deconstruct what the talk is about, and not assuming that you have to have this enormous wealth of knowledge before you can begin to understand what's happening in a scientific lecture. And maybe students can start to work together as a community, creating communities around scholarship as opposed to communities around surviving difficulties of the discipline, communities around thriving as scientists. That's what I've been really interested in, in trying to find ways of doing this early, the earlier the better, I think, before they're done with their freshman year.

AA: Do you think that there are particular challenges for your women students that are maybe getting in the way of retention?

TJ: I think that the challenges facing students of color, women of color,

women generally, men of color, I think that they're all a little bit different. There are nuances to each. That said, I think that one of the commonalities is this idea of inclusivity, being included, feeling not being included, feeling like you belong in the scientific realm. And it's hard to send that message when you look around and there's nobody at the levels that you're striving to be who looks like you. When you're in a department where, you know, there are no women faculty, or a few women faculty. That doesn't really send the message that you belong here as a scientist. So I think that one of the challenges is embracing the identity of a scientist early, but all the way through to graduate students and post-docs it's difficult when there's not a lot of representation.

AA: And when somebody's through grad school, through a post-doc, do you think those challenges are still there?

TJ: Oh absolutely, absolutely. And we've heard some very high profile cases of blatant sexism, and wildly inappropriate behaviors that go completely unchecked, which happens when you have fields that are dominated by very a particular, a very specific and narrow group of people. And then there are these subtle things too, for example, when young women are applying for fellowships or postdoctoral positions, there's really interesting data about what goes into their letters and how that compares to their male colleagues. So there are a lot of ways in which young women still are getting the message that is not very inclusive, or that's not very supportive of true diversity. And it's an uphill battle because we'd all like to believe that all of those issues are resolved, but they're not.

AA: You have a fellowship with the Howard Hughes Medical Institute? Could you talk about the work that you do on behalf of them?

TJ: Yeah! I'm so excited about that: I feel like I'm just really lucky to be part of that community. So it's a Howard Hughes Medical Institute

Professorship. It's a society of faculty at research universities around the country. The year that I was awarded there were fifteen of us nationwide who received a million dollars over five years to do something innovative in undergraduate education. And so part of that was the motivation for starting this HHMI Pathways to Success program, which is very conscious of thinking about what it takes to support diverse groups of students' success in sciences. It's based on some of the principles that we talked about—early engagement in research, early exposure to authentic research experiences, being part of a learning community that's both rigorous and supportive, deep mentoring that's both horizontal as well as vertical mentoring—these are all, again, based on the work of other people who've thought about what does it take to generate a successful learning environment for students across the board but certainly one that works for students from underrepresented groups. And so that's what I've been doing. It's been the most rewarding thing. It's challenging to undertake all of that with all of the demands of research because that doesn't go away, but it's also liberating to have an organization of the stature of HHMI that takes a step back and says, we get how important it is to do research, but now let's have a conversation about how research scientists can engage in generating real educational innovations. And that's just been a wonderful thing. And I look at the other people who have this same professorship and there are so many people who I've respected for my entire scientific career, and now the ways in which they've approached beautiful research, they're applying to questions of how do you change what we do in education. And it's been so much fun to see that creativity transferred across those two foci.

AA: So now that there are people taking interest in these diversity questions, these education questions, do you think that the challenges faced by your students (particularly students of color and women), have changed?

TJ: So the short answer is yes, and now I have to think about what I

mean. You know, to be honest, I think a lot of what I dealt with was much more overt, even when I was a student. Young people are growing up in a supposedly post-racial society in which feminism has complicated connotations for young women, and that, I think, has been one of the challenges because it's hard to meet things head-on when everyone wants to pretend like they're not there. Even though there were some aspects that were more difficult when I was starting off, it made addressing issues head-on much easier. And now students are sort of living in this world where they're all trying to pretend like things aren't happening when they are. But it's also exciting to see some of the social movements on campuses where I feel like the awareness is much more transparent, and students are much more vocal in demanding recognition [for] things [like sexual harassment?] that we should have been addressing for them all the time. So that part actually is exciting. But I think that it's been a little bit of a time coming.

AA: So, I have a very open-ended question. What do you think that a feminist anti-racist scientific practice could look like? Or in an ideal world, what would an approach to scientific research that's founded in social justice, what would that entail? What kinds of questions do you think would get asked?

TJ: I'd say, number one, the scientific environment would look very different. I would not go to a meeting of hundreds and hundreds of people and be one of three or four African American scientists. The place where you'd truly come to that anti-racist feminist scientific practice would look fundamentally different than it does now. Because, the reason why it's not that way is not because the talent isn't there. We have to look deeper about what's really going on. So that's the first thing.

The second thing is that I think that the sense of community would look different. The way in which we think about building communities of scholars. I'm in one field where some of the key people in the field, the stars of the field, are women. And when I go to those meetings, they're

totally different from the meetings I go to which is, my other field, which is pretty male dominated. And in that first field, there's a sense of different standards of behavior, differences in the way you treat junior scientists, the fact that in one night at dinner there was a conversation about how our practice fits in with the larger questions in society. That happens, I think, because there are smart, committed women who have decided that they are not going to just be women scientists, scientists who happen to be women, but they're going to think about what it means to be a woman scientists. And I feel really lucky to be part of that community. So that's what I mean when I say that the community looks different.

The other thing is that I think that a lot of our questions would be different. If you look at great research, very little of that research has focused on and thought deeply about whether or not we should be looking at female and male subjects. Even if you're talking about model organisms, for instance, mice, I think that there would be an increased awareness that you cannot just look at male mice and make all of these assumptions about the way the brain works, and how hormones affect the brain, or epigenetics and hormones... you can't do that if you're only looking at one gender category of organisms. We're not going to get the big picture. And I think for a lot of women that seems so obvious, and so I think that that would be different.

AA: Do you think you ask different kinds of questions because you're thinking about race, thinking about gender?

TJ: I think I do. It's easy for me to ask a question about a molecule or a part of a molecule that could easily be disregarded. I wonder, sometimes, if I'm somehow drawn to the idea that there might be more there and to trying to understand what it is. And so this is all now happening at a molecular level, but I just feel like some of that scientific curiosity, I can't help but think it may be tied to kind of who I am and how I've thought about the world in other ways.

AA: I was thinking about that earlier when you were talking about bringing different perspectives to the table and even being able to look at society and recognize injustice, and recognize when people are overlooked-- does that perspective tie in to asking different kinds of questions.

TJ: Yeah, I think it does. I don't have any proof of that but, somehow, I feel like it might influence the way I think about the science. I can see this in my class. With a room full of students we can generate a class dataset and different students are going to pull different things out of that. And if they're all coming from the same narrow perspective of privilege and class and parents who are scientists, or whatever, if they're all coming from the same place, I'm not convinced that we're going to get the same nuanced complexity of answers. And if we don't, we're really missing a lot. Is that influenced by gender, race, socioeconomics? Probably, but in ways that we don't necessarily know. The other thing I will say is that science is hard work, and there's a lot of failure. There's a lot more failure than success! And there's a certain kind of person who can embrace the failures, learn from them and actually begin to see them maybe not so much as a failed experiment. Because a lot of times those failed experiments are actually telling us things that are really interesting, maybe not what we initially thought we were looking for, but something interesting. The kind of person you are influences how you're able to move.

AA: Did you have anything else you wanted to say or add?

TJ: One thing, I don't really know how to bring this into our discussion, but one thing that's sometimes a little frustrating: when we have conversations about the women in science, one of the easy places to go is the time commitment of being a scientist in the context of family, and the challenge of dealing with that. There are women who do it, who do both, and enjoy both, and we don't talk enough about those examples. It feels a little bit like a cop out for there to be an assumption that the

underlying reason why we have fewer women in science is because of family commitments. And certainly, there are ways of creating structures that make it feel less like a mutually-exclusive choice. That was just one thought I had.

AA: It ties back to what you were saying about the community looking different and [synergies between that goal with] making science more open to women with families.

TJ: Right, right, absolutely. If a woman decides that she's going to have a child, the policies in every institution to support it often treat pregnancy like a disease. The message there is that there is something wrong that the institution's accommodating. Once we start shifting those conversations, then I think that that's going to be real progress [toward normalizing the assumption] that men and women should be taking, or can be taking, the same amount of responsibility automatically [for postpartum childcare]. You know, let's make family leave not just about a woman having to ask for something special, a recognition that parents may want to and need to take time for other responsibilities. Normalizing it so that it's not about women needing something exceptional. I wonder if anyone's ever done a study of the children of academic women, who they are, how they see themselves. For the women who I know who have children, there are a lot of ways in which those children benefit from having a mom who's a scientist. And we don't talk about that as much as the issue of compromise. And then we send that same message to undergraduates and graduate students, and everybody's having the discussion about how this career is hard. It's not easy, but there's little [that's easy] that's worth having.

Notes

¹ For instance, the CFP to this special issue highlights that “No knowledge-project, including those typically granted the epistemic status

of science, can offer us unmediated access to the stuff of the world. Might feminist theories' different mediations into our worlds offer new knowledges about them, and new ways of understanding those knowledge projects themselves? We contend that feminist thought can do more than offer us resources for the sciences, rather, we wish to demonstrate that sometimes feminist thought *is* science."

² Gorelick tackled this question by speaking of differentiating criteria of organisms in both their diploid phase (e.g., as fully formed organisms) and in their haploid phase (e.g., as gametes).

³ Extant inequalities between men and women politically and economically can be gauged, for instance, by comparative data on income earned, history of the franchise, positions of political leadership, and so forth.