Understanding identity and social networks among graduate women in physics.

Allison Gonsalves, Hannah Chestnutt, and Abby Spilkevitz

McGill

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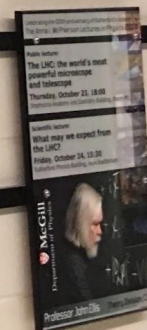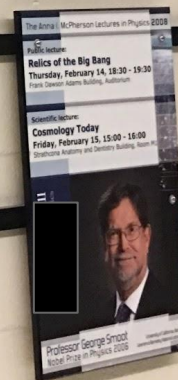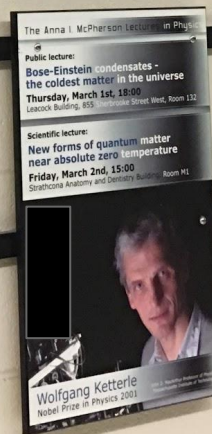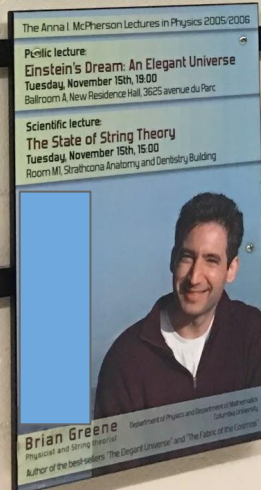
Context

"So we had an undergraduate lounge where people could go hang out between classes, do work and assignments together, I think at one point there was a computer gaming console, a foosball table, people eat lunch in there. I don't even re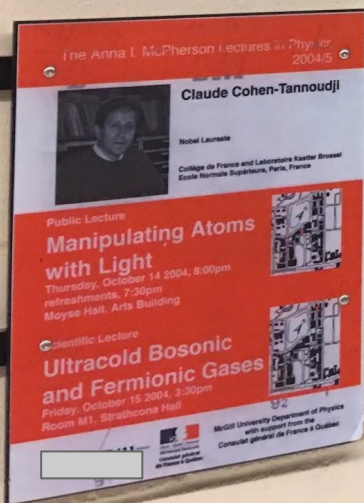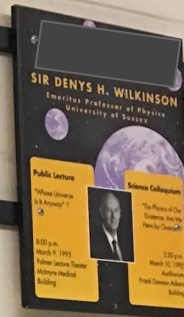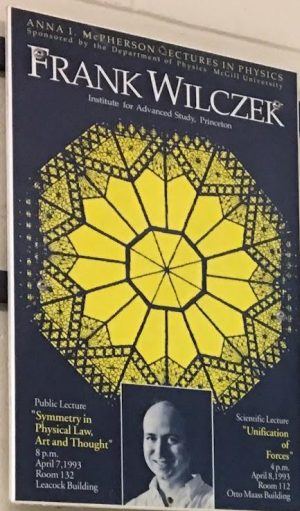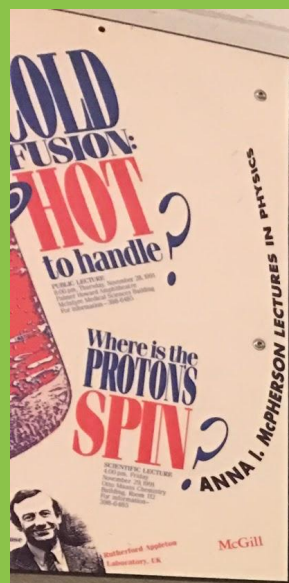member specifics except for people would say "*I raped that exam*", **use rape as a verb casually**, **which never made me comfortable to hear**, but I don't think I called anybody out on it, I think I was just a bystander which is bad, and that's not even a male/female issue [...] So **I remember that word being thrown around a lot**, which was problematic for anybody. **But I didn't think of it as an equity issue or like a thing that would affect me more because I was a woman.**" (Renée, PhD student)

▸ Gendered harassment/microaggressions → sense of belonging (Barthelemey et al., 2016)
▸ Experiences that necessitate access to *counterspaces* (Solorzano et al., 2000; Ong et al., 2018)

What is a counterspace?

▸ Safe space where marginalized students can get support and refuge from isolation/microaggressions

▸ Peer-peer relationships, EDI conferences, Campus groups, etc

▸ **Can provide access to relationships and resources that support identity work/sense of belonging**

Maria Ong and colleagues (2018)

Counterspaces for women of color in STEM Higher Education: Marginal and Central spaces for persistence and success. *Journal of Research in Science Teaching*, 55, 2, p. 206-245

Identity theory

Learning to become a physicist entails engaging in practices (material and social) that shape who we are and who we would like to become (e.g., Wenger, 1998; Holland et al., 1998).

"Identity work" is influenced by the available identities in the setting (e.g., *celebrated subject positions*; Carlone et al., 2015).

It is also influenced by resources available in the setting. We focus on *material resources* (virtual and physical); *relational resources* (interpersonal connections); and *ideational resources* (ideas about oneself and relation to others/ideas about what is valued and what is good (Nasir & Cook, 2009)

Social network analysis

What is a network?

What is social network analysis (SNA)? (Marin & Wellman, 2012)

Why use SNA to study identity work? (Dobbie et al., 2018)

Seafood gathering among a community of Agta children of the Philippines. Photo Credit: Rodolph Schlaepfer

Methodology

Context: physics department at Eastern University*

Participants: 13 members of the Women Physicists Group*

Data collection:

Mixed-methods social network study (Edwards, 2010)

- ▸ survey to collect data about members' motivations, experiences, connections
- ▸ interviews including 'participatory mapping' - the generation of hand-drawn ego-centric sociograms

Data analysis:

- ▸ analysis of transcript data
- ▸ analysis of ego-centric sociograms
- ▸ generation and analysis of whole network sociograms

*pseudonyms

Findings

- **Relational resources**

- **Ideational resources**

- **Material resources**

Resources that flow through the network may contribute to students' insider-ness and identity work in physics

Relational resources

"The positive relationships with others in the context that can increase connection to the practice." (Nasir & Cook, 2009, p. 47)

WPG network structure disrupts traditional hierarchies that impact how individuals interact

▸ Resources such as support, access to advice, role modeling flow more freely
▸ Brokers facilitate the flow of resources

Formal Network - Physics Department
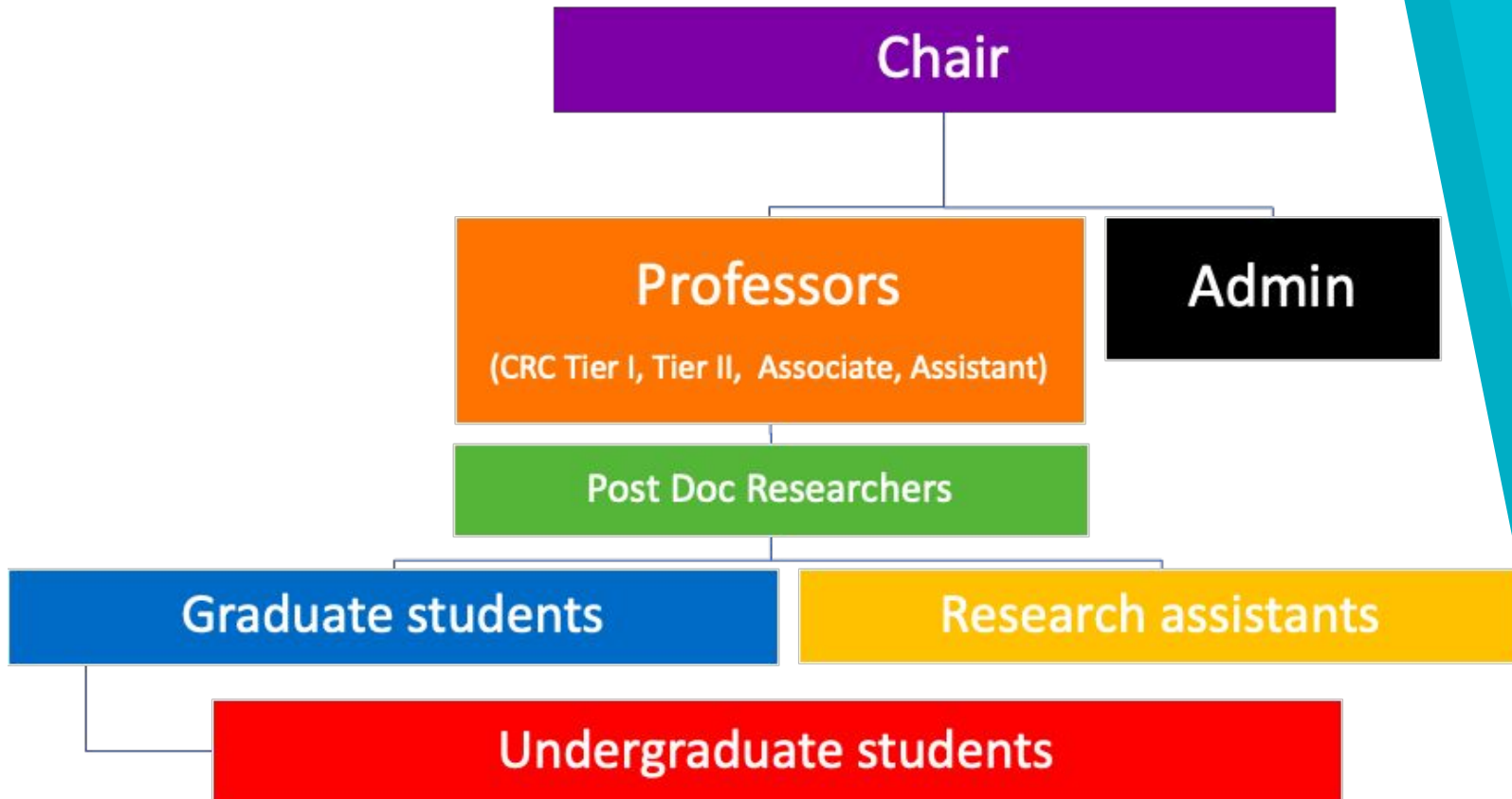
This is an example of the hierarchical structure of the formal network of the physics department members.

Disrupting hierarchies

This sociogram depicts positions based on participation in the WPG, demonstrating a disruption of the the departmental hierarchies from the previous slide.

Chair of department

Professor

Administrator

Postdoctoral researcher

Graduate student

Undergraduate student

Non-academic or non-McGill position
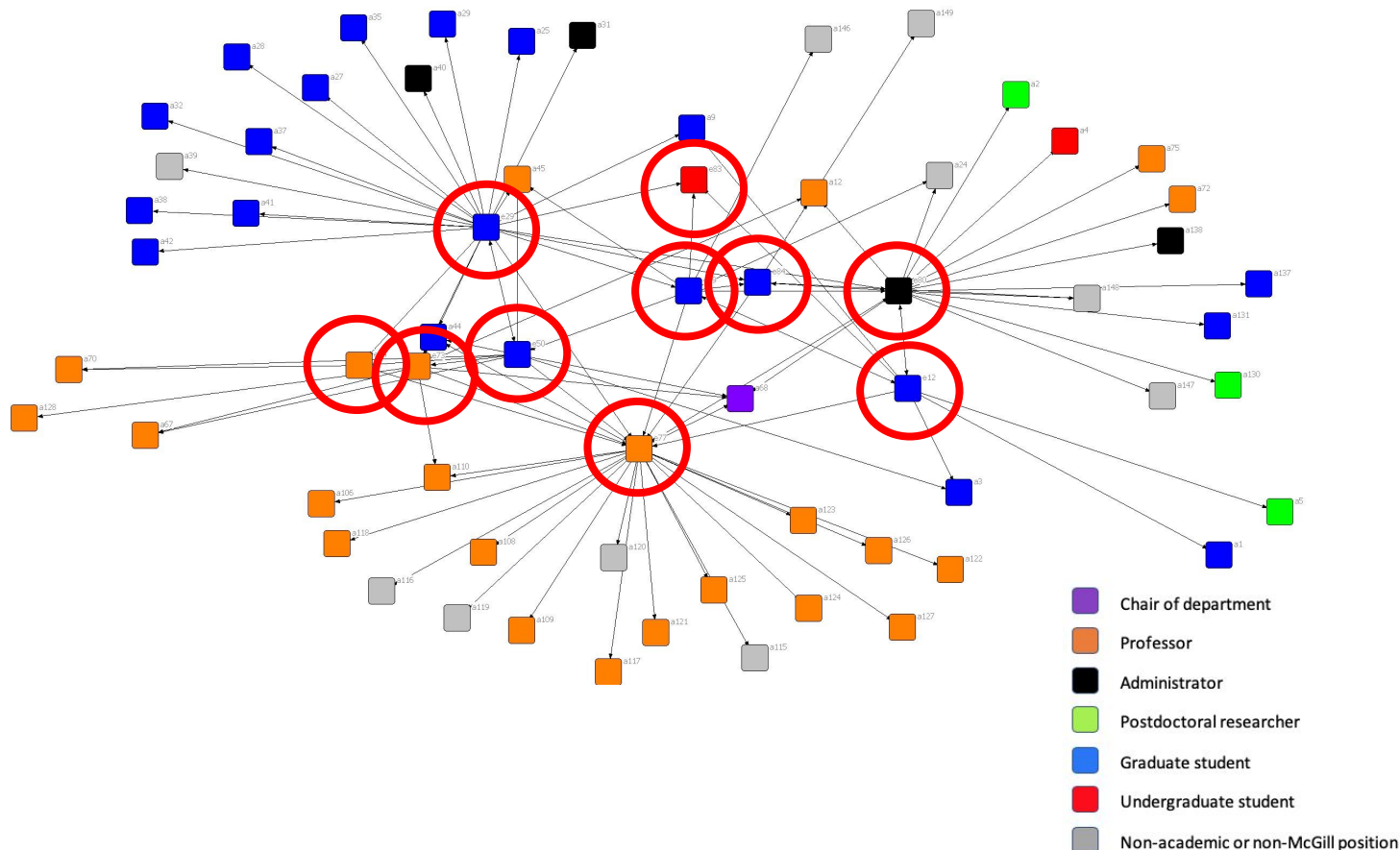
Disrupting hierarchies - shifting forms of interaction

I want to also add that she's also very friendly, like she'll come to the physics pub crawl and stuff and she'll chat with you, **she doesn't have that professor-student boundary sometimes.** (Harriet - doctoral student)

I don't know for some reason the way it happened **in the WPG [...], it felt like [faculty] were kind of more like partners.** *[...] So yeah,* **I think that this changed the dynamics a little bit.** (Maria - doctoral student)

Disrupted hierarchies facilitated greater access to support

*It's really nice to have faculty involved and have access with faculty who are also interested and keen. **Rather than just feeling like students who complain all the time.*** (Harriet - Student)

*I get a very special kind of support from WPG, which is just to talk about all these things, like ... imposter syndrome, and bringing in all those really motivational speakers to come talk to us, that was a special kind of support, **I took something from that I wouldn't take from the other areas.*** (Renée - Student)
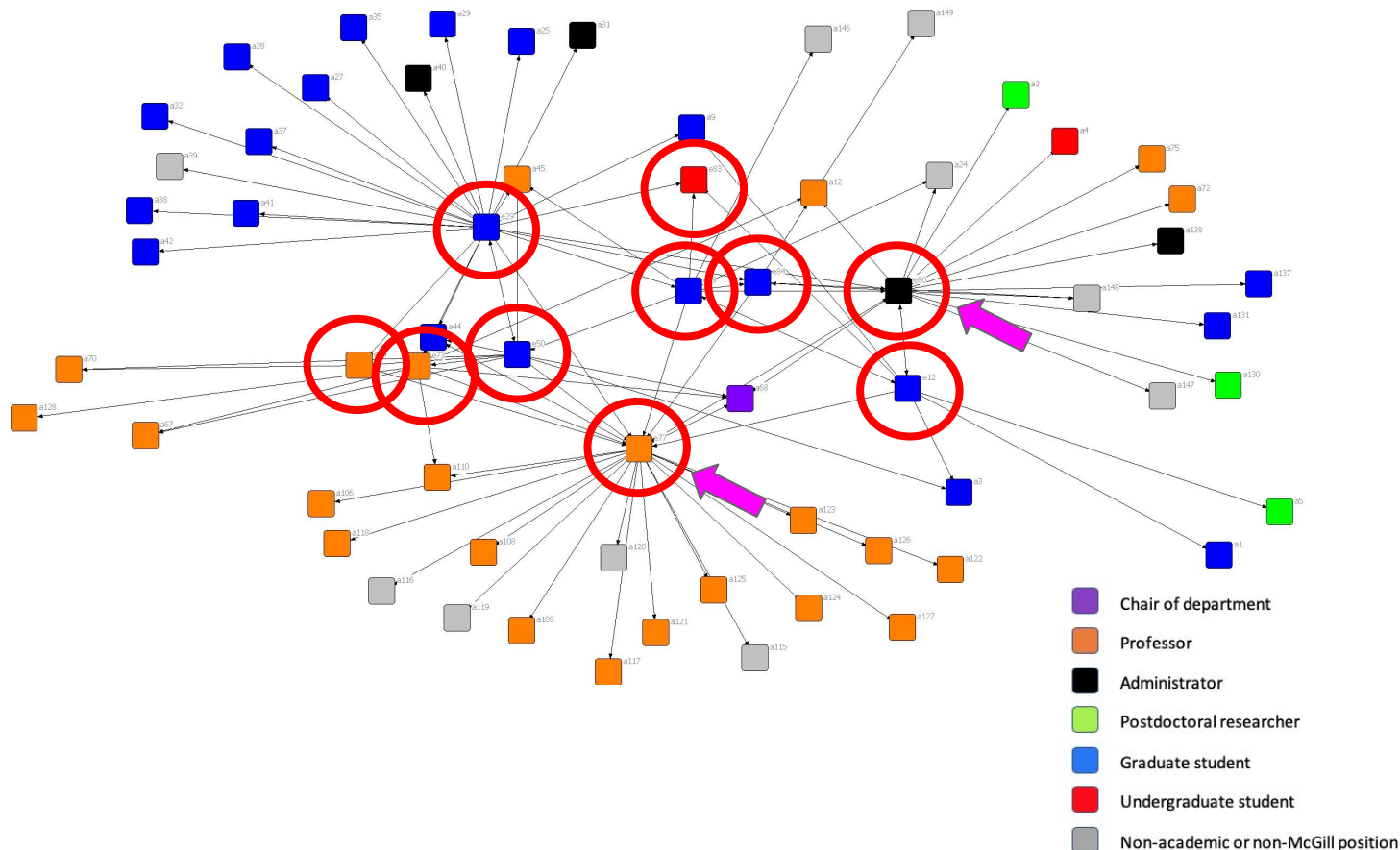
Cautions about disrupted hierarchies

My supervisor was always very supportive, but she's also kind of like the sort of professor that didn't feel [gender issues/sexism] it was a problem all the time. [...] *And then I don't know, it just felt like at some point she was always talking to me about [gender issues], [...] it was like a little bit tiring for me.* (Maria - student)
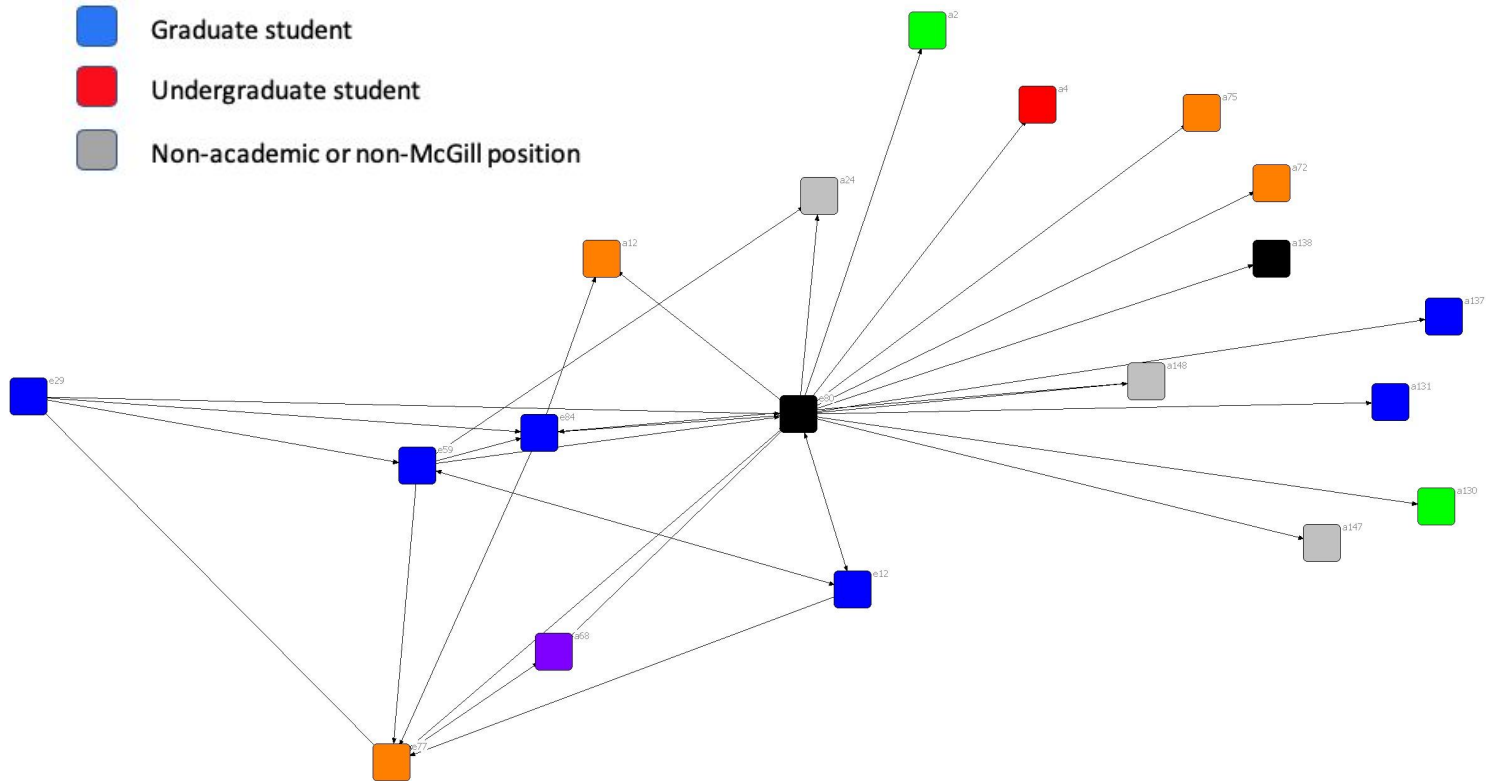
Brokers

Two members of the WPG have high E-I indices and betweenness scores indicating that they bring resources in to the group, are consulted frequently by group members, and may connect members.

Chair of department

Professor

Administrator

Postdoctoral researcher

Graduate student

Undergraduate student

Non-academic or non-McGill position

Identifying Brokers: Ego-network

Legend:
- Chair of department (purple)
- Professor (orange)
- Administrator (black)
- Postdoctoral researcher (green)
- Graduate student (blue)
- Undergraduate student (red)
- Non-academic or non-McGill position (gray)

Role of brokers

So if someone asked me "I'm having this problem and I don't know what to do", I could say go talk to this person. [...] I'm on their level but I also have access to a bit more insider knowledge. And **there's a bit less of a divide between me and them. [...]** *And I think I interact with everyone on different levels. I have to go to the faculty meetings for example, but I also do the outreach with grad students.* **I have a foot in every group sort of. I think that also helps me do my job better, just understand what everyone's feeling.** (Cassie - Admin)

I would have conversations about equity [with Cassie] more than anyone else [in WPG], because she's really interested in those topics and good at talking about them and has thought a lot about them. (June - doctoral student)

Ideational Resources

"The ideas about oneself and one's relationship to and place in the practice and the world, as well as ideas about what is valued or good." (Nasir & Cook, 2009, p. 47)

New forms of interactions facilitate the availability of expanded forms of "physicist identities"

▸ New "celebrated subject positions"
▸ New forms of possible selves

Expanding available identities

We asked students: "Describe an exemplary physicist"

- Students highlighted social characteristics like empathy, community as well as more traditional technical characteristics like strong research skills and hard working.

*[Prof. X] is like, the **nicest person.** She sort of works at like, 1000 miles an hour, in that, it seems like she's always answering emails, and making time for people.[...] So she has a really good system of doing great research and having sort of this little community of her own research group operating on its own, but also **really cares about the individual scientists.** (June - doctoral student)*

Material Resources

"The way in which the physical environment, its organization, and the artifacts in it support one's sense of connection to the practice." (Nasir & Cook, 2009, p. 47)

- ▸ WPG as a "space" supporting forms of identity work
- ▸ Financial resources flow through the WPG network (in the form of novel TAships that facilitate new forms of identity work)
- ▸ Posters in the physical space

The WPG: A space as a resource

I don't feel like I have the emotional resilience to deal with like the physics environment in general [...] It feels like the **committee has facilitated a lot of space for me to discuss the ideas that I have or the concerns or challenges that I have regarding gender problems or like how gender affects your life in physics.** *[...]*

With the space in WPG I feel kind of like there's **this agreement that gives space for different conversations and interactions.** *(Maria - Student)*
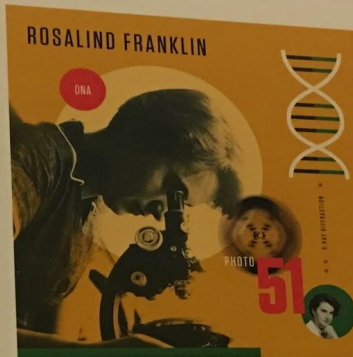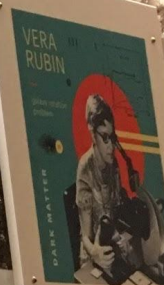
Conclusions

"Counterspaces must be created closer to STEM's center, because that is where more stakeholders and members with power can publicly address bias, exclusion and microaggressions" (Ong et al., 2018)

▸ WPG now has infrastructure, and legitimacy in the department

▸ However, despite its success, it is not a dense network, and is therefore fragile (e.g., removing key actors may disrupt numerous ties)

▸ Goals of the WPG (advocacy) conflict with students' needs (support group)

Limitations

Intersectionality

▸ The WPG is comprised of predominantly White women, as is our study.
▸ This is a limitation of both the committee and our study.
▸ Data suggests that WOC have specific needs unaddressed by the WPG.

Longitudinal data

▸ Network density and role of brokers over time

THANKS!

Any questions?

Allison Gonsalves

Assistant Professor, Faculty of Education

McGill University

allison.gonsalves@mcgill.ca