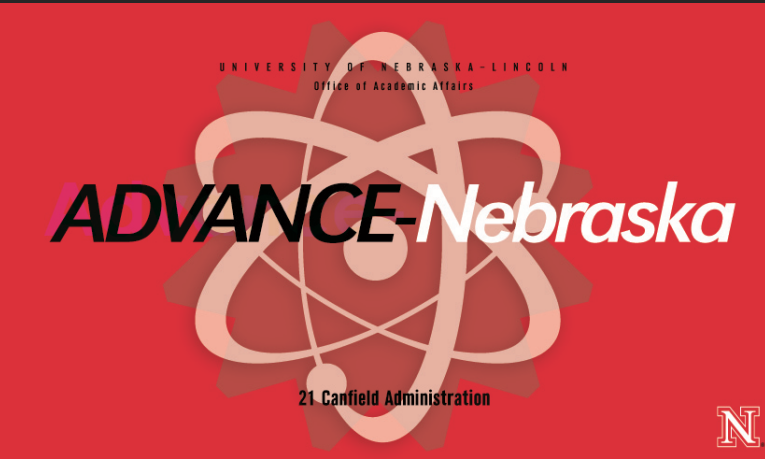# STEM Faculty Networks and Climate Perceptions: Marginalization by Gender and Race

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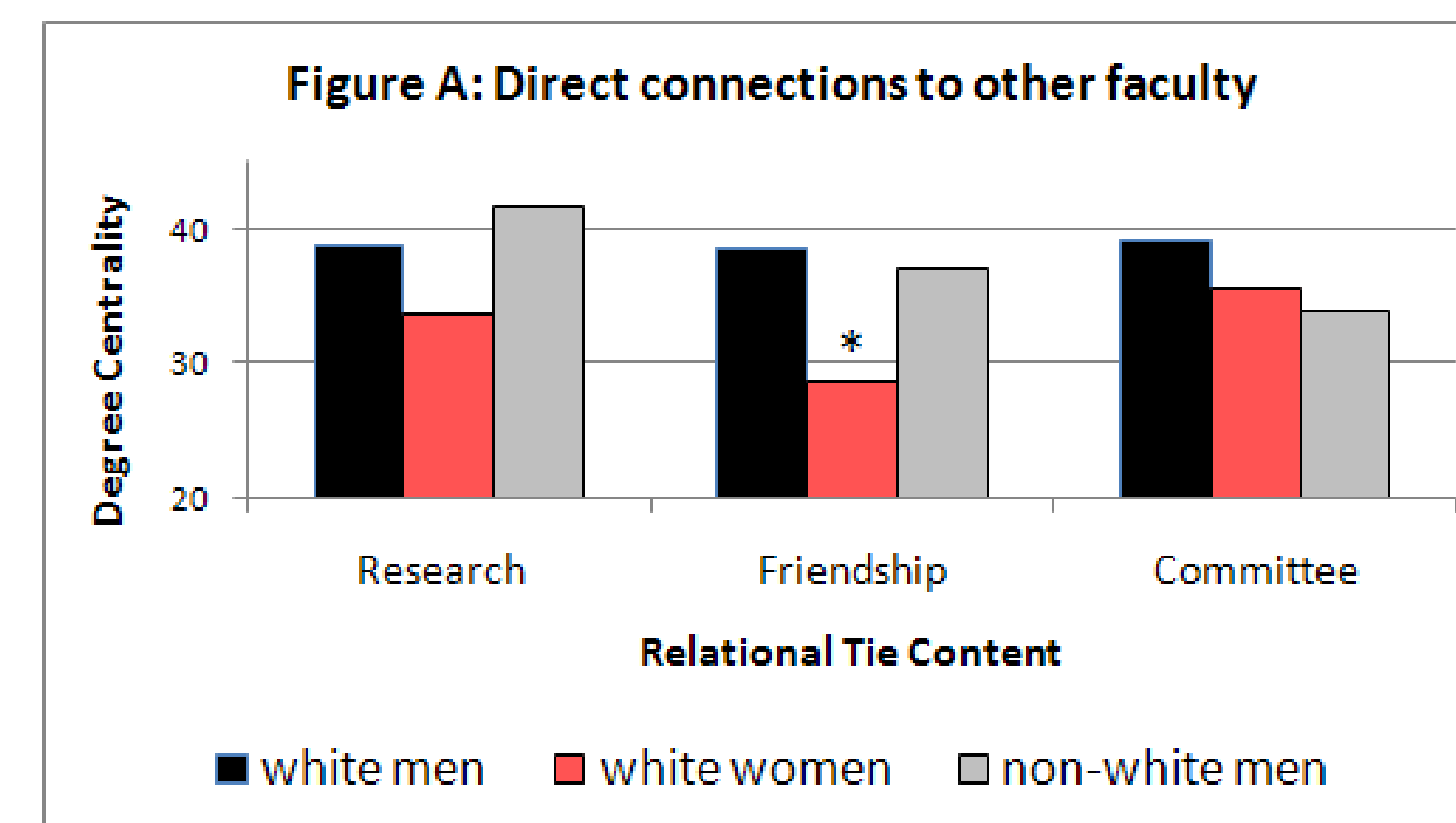
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Abstract

Using complete network data of 191 faculty members within 11 STEM departments, we explore variation in actor centrality (an indicator of network marginalization) by gender and race across three types of departmental networks: 1) research exchange, 2) friendship, and 3) committee co-membership.
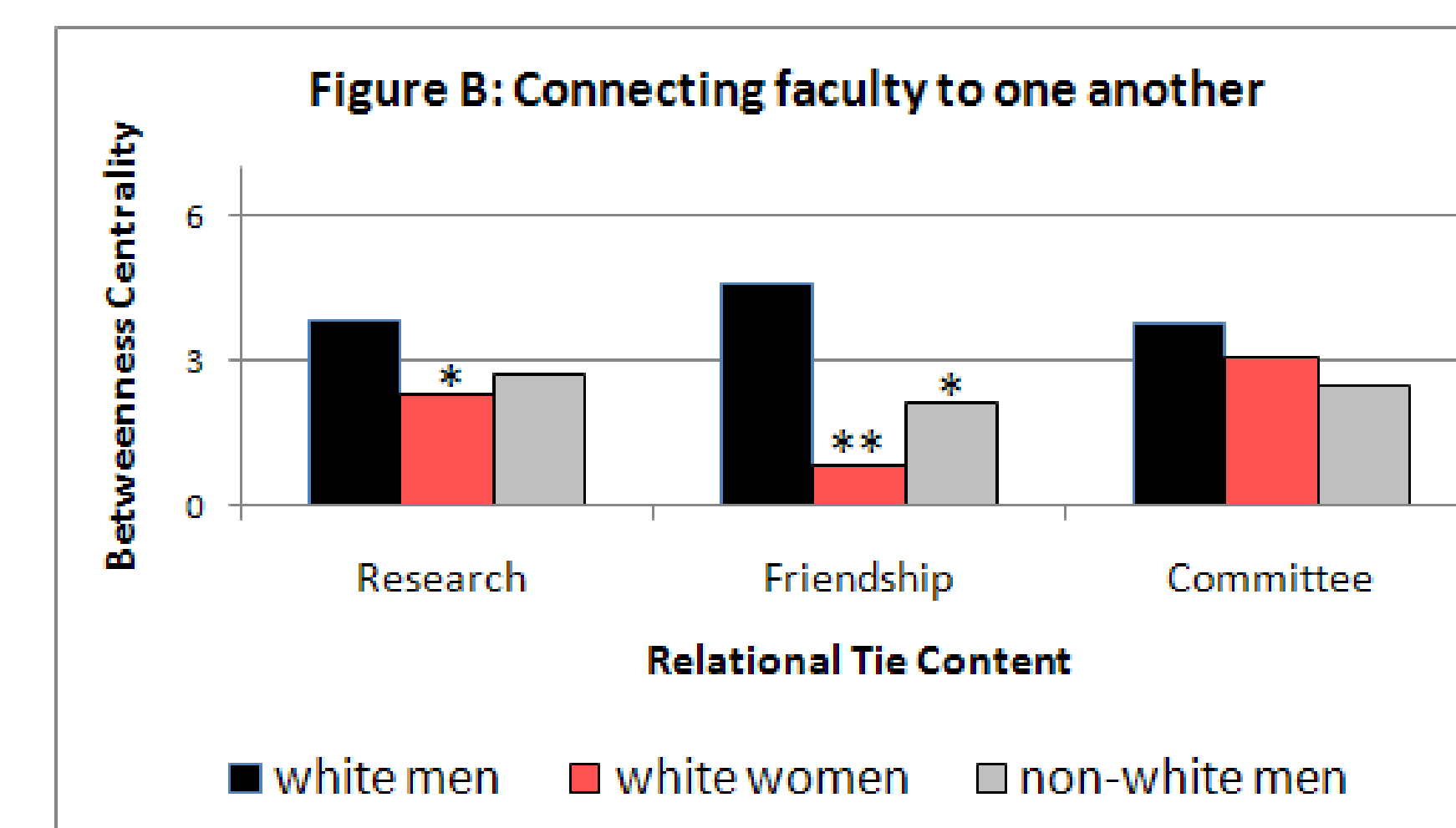
We find that actor centrality does not vary by gender or race within committee co-membership networks. Compared to white men, however, white women report fewer friendships and are less likely to be a research or friendship connection between two otherwise unconnected faculty members. Additionally, non-white men have fewer connections to well-connected faculty within friendship, research and committee networks compared to white men.

All forms of network marginalization have important implications for retention of women and minority faulty within STEM disciplines. Our findings show that faculty members who are marginalized with research and friendship departmental networks have a lower sense of belonging/comfort within their departments and lower job satisfaction. These results are specific to one Midwestern University.
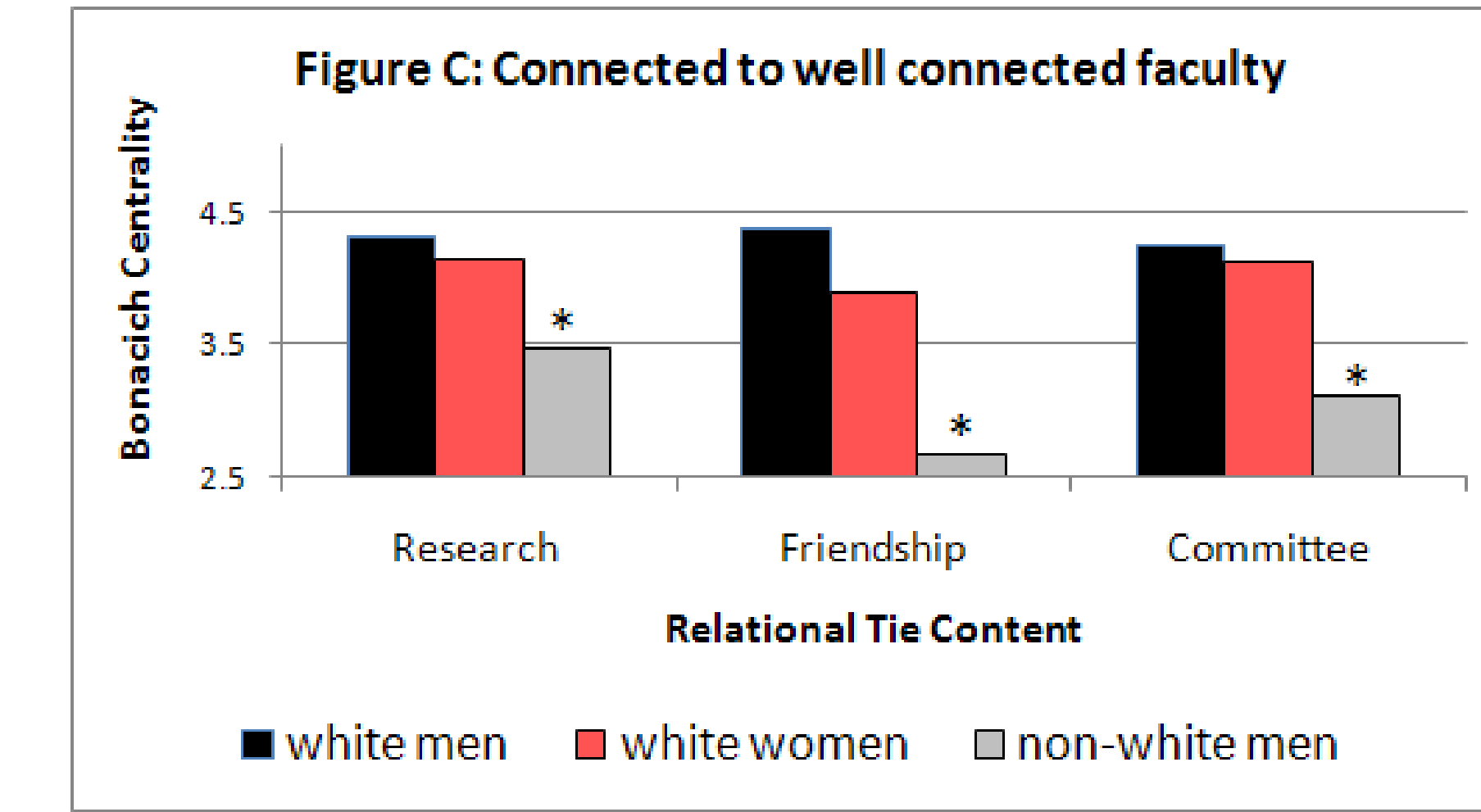
Research Questions

Previous research in non-academic settings shows that actor network location varies by gender and race (Ibarra 1995 & 1997). There is no prior research on gender and race variability in actor network locations within academia. Previous research, however, does find that women and nonwhite faculty in STEM departments feel more isolated and perceive more "chilly" climates than white male faculty (Callister 2006; Monroe et al. 2008; Rosser 2004). Therefore, we expect women and minority faculty to have higher levels of network marginalization when compared to white men. We further expect network marginalization to be associated with work climate perceptions. In this research, we address the following research questions:

• **Are women and non-white faculty more marginalized within departmental networks than white men?**

• **What type of network "inclusion" is necessary for faculty to have positive perceptions of academic climates?**

We use three indicators of network marginalization (degree, betweenness and Bonacich centrality) and conduct analyses across three types of departmental networks (research exchange, friendship and committee co-membership).
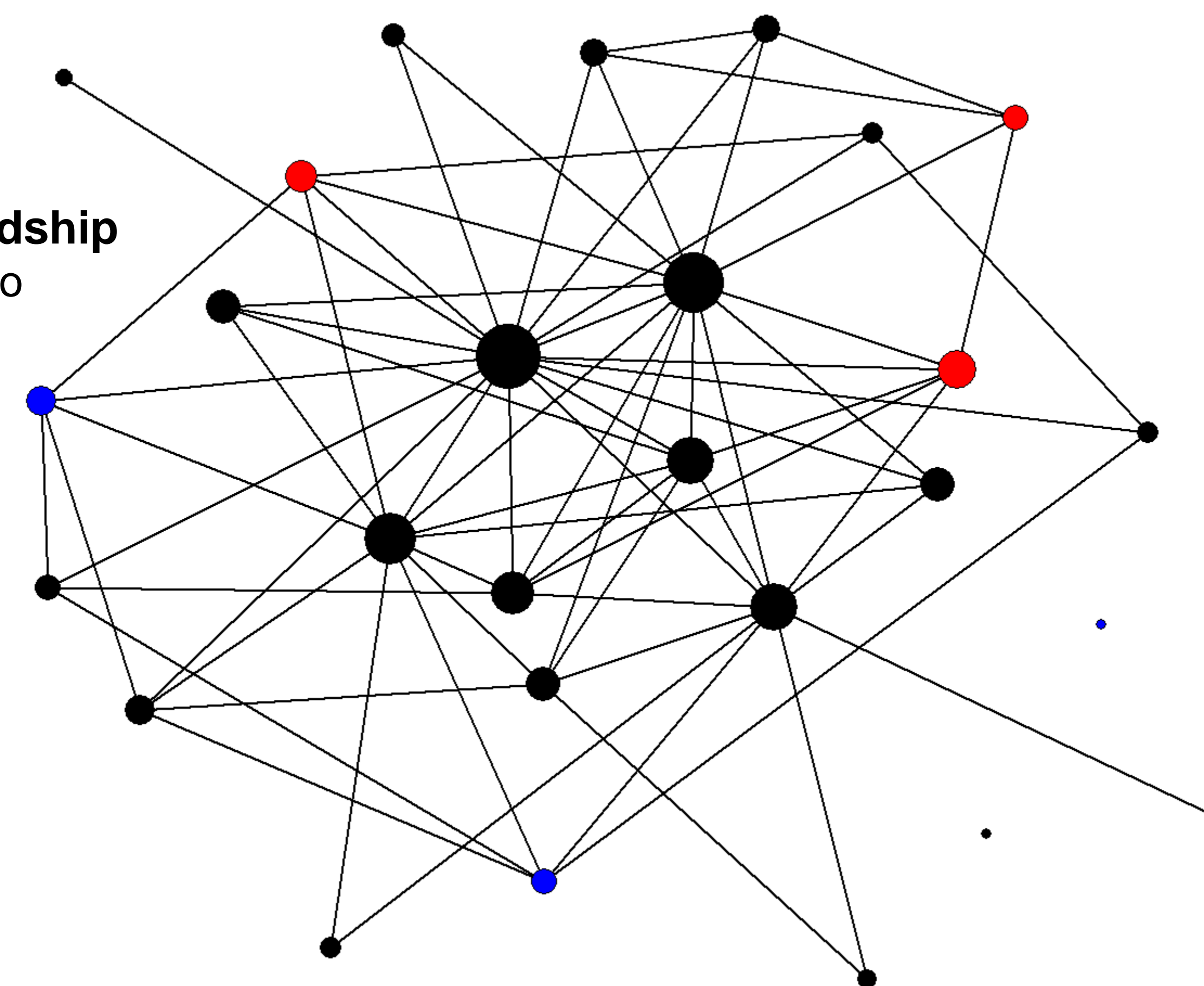
References

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Acknowledgments

Findings

Figure A: Direct connections to other faculty

Compared to white men, white women have fewer direct *friendship* connections to other faculty (i.e., lower degree centrality).

Figure B: Connecting faculty to one another

Compared to white men, white women are less likely to be an intermediary between two unconnected faculty members (i.e., lower betweenness centrality) in *friendship* and *research* networks. Compared to white men, non-white men are less likely to be an intermediary in *friendship* networks. These forms of network marginalization are clearly visible in the Network Map A.

Figure C: Connected to well connected faculty

Compared to white men, non-white men are less likely to be connected to well-connected faculty (i.e., lower Bonacich centrality) within *research*, *friendship* and *committee* networks. These forms of network marginalization are clearly visible in the Network Map B.

Network Map A: Faculty Friendship (node size is proportional to betweenness centrality)

Network Map B: Faculty Research Exchange (node size is proportional to Bonacich centrality)
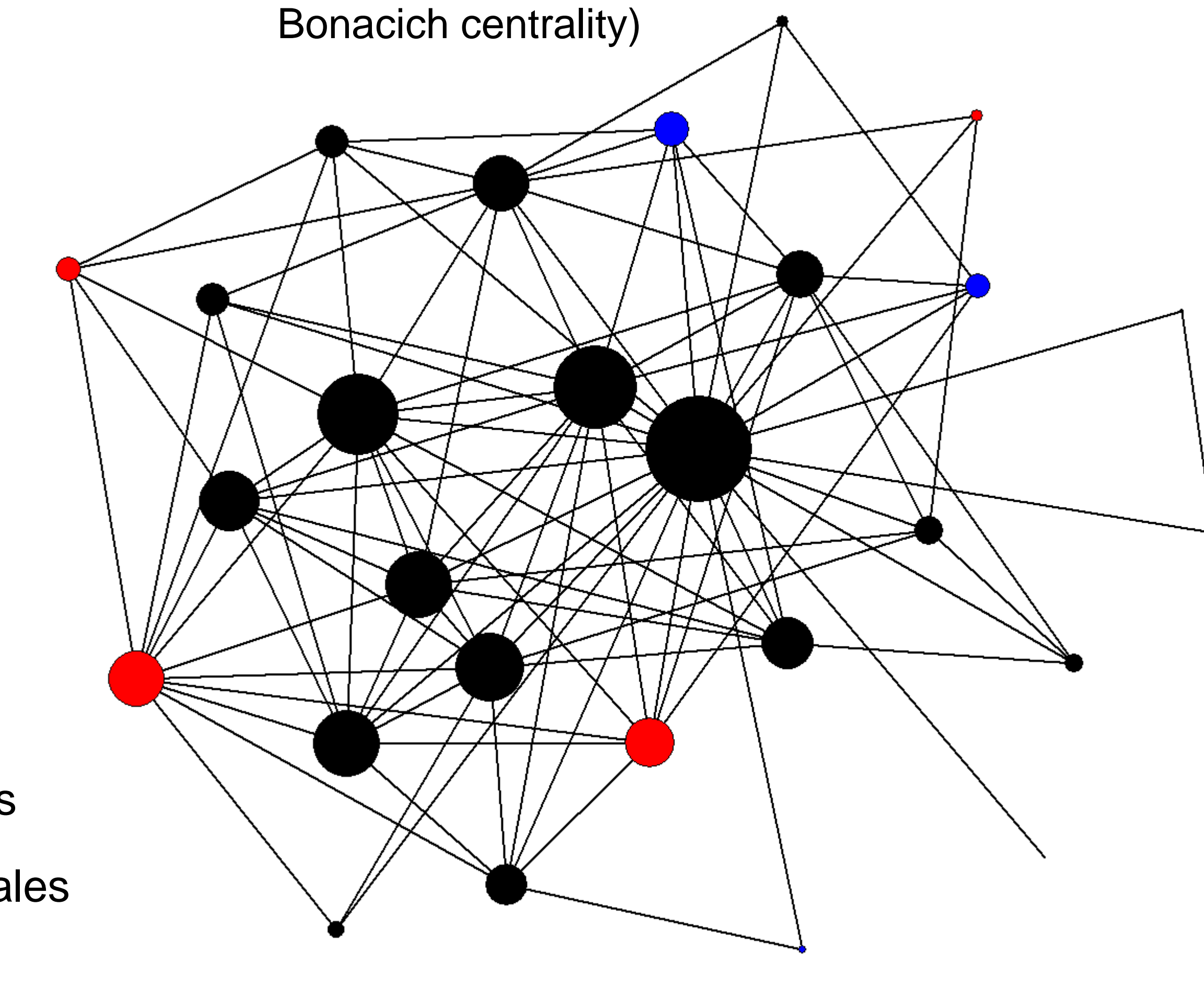
🔴 white females
🔵 non-white males
⚫ white males

Table 1. Correlation between faculty centrality and climate

	Belonging and Comfort	Job Satisfaction
	r	r
Research Exchange		
Degree Centrality	.20 *	-.01
Betweenness Centrality	.23 *	.09
Bonacich Centrality	.30 **	.27 **
Friendship		
Degree Centrality	.30 **	.11
Betweenness Centrality	.26 **	.16
Bonacich Centrality	.43 ***	.39 ***
Committee Co-membership		
Degree Centrality	.05	-.01
Betweenness Centrality	.05	-.17
Bonacich Centrality	.09	.07

*p<.10 **p<.05 ***p<.01

Faculty with more direct ties, who play the role of intermediary, or who are connected to well-connected actors within *research* and *friendship* networks report a higher sense of belong and comfort level within their department. Faculty who are connected to well-connected actors within *friendship* and *research* networks are more likely to report higher levels of job satisfaction.

Summary

• Peripheral actors in research and friendship departmental networks have less positive climate perceptions.

• Women and non-white faculty are more likely to be peripheral actors in research and friendship departmental networks.
  • Women have fewer direct connections to other faculty and are less often intermediaries.
  • Non-white faculty members are less likely to be connected to well-connected faculty.