# Gendered Intersections: Negotiating Power, Status, and Identity in Interdisciplinary Science

by

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To my mom,
for a lifetime of unwavering support,
and to Mark,
for making everything possible.

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## Table of Contents


Dedication ……ii

Acknowledgements ……iii

List of Appendices ……x

Abstract ……...xi

Chapter 1: Introduction……1

Chapter 2: Literature Review……..23

Chapter 3: Explaining Difference in the BIRG:
"Different but Equal" or "Outsiders Within"……....62

Chapter 4: Origins of Inequality: How Structural Inequalities and
Existing Hierarchies Shape Interdisciplinary Science……104

Chapter 5: Status Matters: How Perceptions of Status
Shape Interdisciplinary Science..... 148

Chapter 6: Saving Face, Resisting Status, and the Making of a Symbolic Divide…… 197

Chapter 7: Conclusion……... 235

Appendices ……... 256

Bibliography …… 264

## List of Appendices

Appendix A:  Reflections on my Position as a Researcher……256

Appendix B: Participant Descriptions……..260

Appendix C: Interview Schedule……..262

## Abstract

Interdisciplinary solutions are increasingly touted as essential to solve intractable problems in health research, but recent studies have shown that perceptions of scientific status shape how science is negotiated in interdisciplinary groups, threatening the potential of these boundary-breaking mergers. To date, however, existing studies focus exclusively on epistemological differences, failing to consider how other dimensions of difference and inequality shape the process and products of interdisciplinary science. Gender as an analytic category and marker of difference, for example, is all but ignored in this canon, even though a parallel research program demonstrates the multiple barriers women face in the sciences. This project seeks to fill this gap and bridge these two research areas. This qualitative study draws from over 90 hours of ethnographic observation and 23 semi-structured qualitative interviews to inductively explore how nurses, engineers, and doctors, working together in an interdisciplinary group in the academic health sciences, negotiate gender and other differences as they collaborate on a shared problem in women's health. I show that the nurses felt marginalized in the group from the beginning as they faced multiple structural and cultural obstacles to equality. Intersecting status markers, many of which were gendered, shaped their experiences in the group, and ultimately the process and products of the group's collaboration. Finally, I highlight the identity processes involved in interdisciplinary collaboration, showing how the nurses adopted various strategies to manage their experiences of inequality in the group, strategies that often and ironically exacerbated their unequal position. This research highlights the importance of

considering power and status differences, and especially the effects of gender, in interdisciplinary collaborations in the sciences. Some individuals, especially those who suffer from multiple, intersecting low-status markers, may face particular risks in interdisciplinary research groups. Moreover, this project reveals that even successful groups can unconsciously privilege certain perspectives and scientific approaches, thereby limiting the potential of interdisciplinary collaborations.

## Chapter 1: Introduction

Interdisciplinary scientific collaboration requires that researchers from different disciplines come together to share knowledge, methods, perspectives, and resources to make headway on complicated problems. Distinctions and differences are necessary—in fact, touted as the very advantage of these cross-disciplinary collaborations (National Academy of Sciences 2004). But while differences are needed for interdisciplinary innovation, they also ironically, have the power to impede the very process of this boundary-breaking work. Scholars of interdisciplinarity and champions of these mergers have written extensively about the social barriers to these collaborations, looking primarily at the structural constraints and cultural differences that hinder cross-disciplinary unions (Klein 1990; Sá 2008; Pfirman and Martin 2010; Weingart and Stehr 2000). In the academic sciences, these barriers often emerge as intersecting structures that constrain collaborations at the inter-institutional, university, and departmental levels (Abbott 2001; Sá 2008; Jacobs and Frickel 2009). Culturally too, scientific disciplines and the allied health professions have varied norms, languages, methodologies, and scientific protocols—all of which shape individuals' expectations of how science should be done and shared with others (Gardner 2013; Klein 1996; Knorr-Cetina 1999)

But what about other types of differences, and how might they also shape the potential and process of interdisciplinary collaboration? Beneath the premise that diverse disciplinary perspectives are necessary to move understanding and shared knowledge forward lies the

implicit assumption that the voices at the interdisciplinary table are equally powerful and equally valued. Seminal works in sociology, however, have shown that differences are rarely just differences. Instead, they often mark inequality with more powerful individuals and groups determining the social norms and enforcing rules that govern behavior (Weber 1978; Durkheim 1973; Bourdieu 1984). Dividing lines can be based on identity characteristics such as race or gender, as well as on group affiliations and other markers of social status (Ridgeway 1997; West and Zimmerman 1987; Collins 1990; Bourdieu 1984). Social psychologists have long maintained that exclusion, or the drawing of lines demarcating in-groups and out-groups, is a fundamental human strategy used to bolster one's own position compared to that of others (Berger et al. 1977; Ridgeway 1991). Studies focusing on interactions within groups have highlighted how inequality masked as difference is both enacted and simultaneously reinforced through routine organizational and interpersonal processes (Kanter 1977; Epstein 1992; Manley 1995; West and Zimmerman 1987). Often symbolic boundaries, or conceptual distinctions of difference, are used in lieu of explicit social barriers as a mechanism that solidifies difference between individuals and groups in various settings (Epstein 1992; Lamont and Molnar 2002; Lamont and Fournier 1992; Bourdieu 1984).

Though a few studies of interdisciplinary groups reveal that epistemological differences (and inequalities) shape individual appraisals of their contribution and the collaborative potential of interdisciplinary research groups (Miller et al. 2008; Gardner 2013; Albert et al. 2009; Lingard et al. 2007), other differences of power and status are effectively ignored in this canon. Given this extensive research foundation, its omission in the scholarship encouraging and evaluating interdisciplinary science seems a glaring oversight. This project seeks to fill this gap by

exploring how status markers and symbolic distinctions more broadly might undermine the success of an interdisciplinary collaboration.

*Project Origins and Research Questions*

Over the course of almost two years, I studied an interdisciplinary research group in the health sciences whose shared research agenda investigated birth-related complications and injuries to the pelvic floor. I chose this team, which I will call the Birth Injuries Research Group, or BIRG[1] for short, for good reason. I had just finished studying another emergent interdisciplinary research group in women's health that never quite got off the ground; the collaboration ended poorly by everyone's calculation, with considerable interpersonal acrimony and "wasted" time on a grant that was un-scored by the NIH. While this failed group never advanced past the application stage, they had ample time to disagree about scientific differences and disciplinary priorities as they hashed out their proposal in the final months leading up to the submission deadline. But I also discovered something else, something virtually nonexistent in the literature on interdisciplinary collaborations: gender emerged as an important marker of status within the group. Not only was interdisciplinary emotional labor and process work devalued as ancillary to the science within this group, but it was feminized as well. Some team members spoke of the relational skills required to communicate across disciplines as being at odds with more masculine, scientific mindsets. I was told that there was an inverse relationship between interpersonal skills and scientific ones. Reflecting common gender stereotypes, some group members noted that women were naturally better at managing "people," and men were

[1] All names and acronyms used throughout this dissertation are pseudonyms to protect the confidentiality of my research subjects and their research agenda. The BIRG's disciplines and research topic are essential to my analysis, so these details were not modified. Its also worth nothing that I use the acronym "BIRG" with self-conscious reservation as it too unwittingly reflects a difference that emerged as salient in the group. Some group members did not characterize birth-related complications as "injuries" even though the group at large used this terminology.

better at the science. Moreover, as group members began to recognize that the shared interdisciplinary proposal would most certainly end in failure, they began to cut their losses and pursue other work. A few key women in the group were left "holding the bag" as they went through the motions of submitting the large grant that was, by everyone's estimation, a futile effort by that point.

It was in the course of conducting this earlier research that I first heard about the BIRG. They were repeatedly mentioned as a "successful"[2] interdisciplinary team that "got it right." The BIRG was also well-known around the same university-wide health sciences community for being an incredibly collegial group that capitalized on its disciplinary differences while avoiding potentially factious disciplinary divides. Moreover, I was told, the BIRG had an illustrious track record: its members had secured multiple prestigious grants, were incredibly prolific in terms of publications, and were also well-known—famous even—for their innovative scientific work. Eager to explore how a "successful" interdisciplinary collaboration had seemingly conquered the obstacles that had proved to be the undoing of my previous case study, I set about gaining access to study the group. After an important gatekeeper in medicine who was keen on studying interdisciplinarity brokered my introduction to Tom, he in turn, introduced me to Phillip and Anna. All three enthusiastically agreed to let me study their group.

*Research Questions*

Though I expected the BIRG to be quite different from my first case study, my previous experience in the field shaped my research questions. My first question asked simply: how do individuals collaborating in an interdisciplinary group understand and negotiate difference? I

[2] Success in this instance was defined simultaneously by the BIRG's ability to secure two cycles of multi-year center grant funding by the National Institutes of Health (NIH), but also because as a team, they were widely regarded as enjoying a harmonious collaboration in the university's health sciences community.

wanted to explore inductively whether, and then how individuals experienced the structural and cultural obstacles cited in the scholarly canon of interdisciplinary science. Moreover, I wanted to consider what other differences might prove salient for team members. Since my previous case study had not advanced past the proposal stage, I wanted to see how "successful" interdisciplinary group members navigated disciplinary divides and other differences when they were financially motivated to make interdisciplinary research work.

My second research question investigated the role of status in an interdisciplinary scientific group. Sociologists of science have shown that scientists seek to establish "epistemic authority" when faced with competition from others (Gieryn 1999), but scholars of interdisciplinarity have largely focused on how interdisciplinary teams interpret scientific and epistemological differences, often ignoring the role of status and power in these collaborations. So I wondered, how do power relations and status assessments play out in an interdisciplinary group where different disciplinary perspectives were the very point of the union? Beyond epistemological and scientific differences, were other status markers salient for team members in a "successful" interdisciplinary group? And if so, which ones were important and how might these differences emerge during the course of collaboration?

My third question specifically considered the role of gender within the BIRG. I reasoned that since the BIRG had already been awarded not one, but two rounds of multi-year funding with the NIH, they had learned to prioritize, rather than devalue interdisciplinary process work, a robust gendered finding in my previous study. But research from various disciplines highlights that gender often emerges as a meaningful difference that organizes expectations and contributions in professional settings (Hochschild 1978, 1983; Reskin 2000; Reskin and Roos 1990; Acker 1990; Williams 1989). The women's health arena is an especially gendered terrain

(Martin 1987; Thompson 2005; Rapp 1999; Luker 1984). Considering that the BIRG was a professional group comprised of three very different, and differently gendered disciplines—medicine, nursing, and engineering—I wondered if and how gender would emerge as a salient social category for this interdisciplinary women's health research group (Berger et al. 1977; Ridgeway and Correll 2004). I asked: how might gender emerge to shape individual perceptions, group processes, and scientific decision-making in the group? And how might team members understand and negotiate these differences while working together on an interdisciplinary project?

*First Impressions*

When I first met with the group in April 2008, team members eagerly told me that the BIRG was indeed as uncharacteristically functional and collegial as the rumors suggested. I was told that Tom, Phillip, and Anna, the group's principal investigators (PIs), had no tolerance for old-school hierarchies and inflated egos, and that they shared a deep respect for each other as individuals and scientists. The BIRG leaders also, importantly, shared an abiding interest in a specialized yet understudied topic—birth-related injuries to the pelvic floor. Team members explained to me, often unsolicited in hallways after meetings, that long-standing professional and personal relationships among the three leaders cemented an atmosphere of egalitarian collaboration that shaped the group's culture. This culture of equality, I was assured time and time again, allowed for a strikingly harmonious work environment that facilitated the group's innovative scientific breakthroughs. This was the dominant narrative shared with me, and an idyllic one to be sure.

My own initial impressions corroborated these stories. As an observer of the group, I too saw and experienced a decidedly friendly and inclusive environment. From the outset of my research, Tom, Phillip, and Anna, were genuinely eager to have my social scientific eyes observing their work and encouraged me to join them for a variety of meetings and group activities. They were proud of their shared work and believed in transparency in the name of scientific knowledge production. This stands in contrast to the well-documented experiences of field researchers and ethnographers who have encountered resistance studying cultural elites (Ortner 2010; Hertz and Imber 1995; Ostrander 1993). The group also appeared harmonious. Tom, Phillip, and Anna treated each other, and members of their research teams, respectfully—at least in my presence. This was a far cry from my previous study, where I witnessed eye-rolling and tension in meetings, and heard even worse stories in interviews as team members described backstabbing, in-fighting, insatiable greed, and dramatic stories of yelling, cursing and other angry outbursts—all in the name of interdisciplinary science. To be sure, I saw no such dysfunction in the BIRG. A culture of mutual respect permeated the group's shared narrative, and as best I could initially see, the group's interactions too.

Selfless acts and egalitarianism abounded. I personally witnessed the PIs' extraordinary dedication to their research teams. I was surprised by how much time the leaders spent mentoring junior scholars not only on research-related activities, but also on their professional development. My fieldnotes were filled with countless scribbles noting instances of mentoring. When I later spoke to team members, most confirmed that the PIs were unusually "selfless" in their dedication to mentoring junior investigators, regardless of discipline or level of experience. Jenni, an engineering student was quick to share that she valued Anna as a female role model in the sciences even though their specific scientific work did not overlap. Having a woman's

perspective, she said, was invaluable to her as she plotted her career moves as a post-doctoral researcher. Tom and Phillip also appeared generous in their commitment to all of their female protégés, suggesting that interdisciplinary collaboration might provide an unconventional pathway to preventing gendered opportunity-hoarding and would facilitate interdisciplinary mentoring of women in science (Tilly 1998; National Academies of Science 2007). This interdisciplinary mentorship stood out to me as an important finding in its own right.

At first glance, decision making too seemed to take a surprisingly egalitarian tack. Among the PIs, decisions about budgetary matters and scientific choices were, in my estimation, reached by consensus in the investigator meetings. Moreover, the leaders also routinely solicited the opinions and input of junior investigators and key staff as they plotted next steps, analyzed data, and published findings. This alone, according to many group participants, was no small feat in academic science and easily distinguished the group as progressive and democratic. Erin, an administrator with the group, was astounded at how genuinely selfless the PIs were with each other and their respective research teams. She had worked as project manager for many groups in the health sciences and had never seen anything like it. Others marveled at the three principal investigators' civility and fairness, traits that, they assured me, were in short supply among the often competitive and turf-conscious teams in the academic health sciences. It seemed that the stories of unparalleled collegiality in the BIRG were true.

*Later Revelations*

However, over time, as I became more accustomed to the group, and they became accustomed to me, I began to realize that BIRG's success story was far more complicated than first impressions would suggest. While the BIRG was undoubtedly "successful" in terms of its

collective output—and I hasten to add—in its overall congeniality, there were moments when deep fissures were exposed. While I did find ample evidence that the leaders eschewed a rigid top-down hierarchy, I began to notice that implicit boundaries often operated in lieu of more draconian measures to not only mark difference, but also to denote progress and evaluate contribution within the group.

Many of these symbolic boundaries correlated with power in a material sense, and perhaps originated in structural conditions, but they now manifested as a durable status effect that unwittingly shamed some group members (Lamont and Molnar 2002). For example, the well-entrenched occupational hierarchy between medicine and nursing as clinical professions emerged in this research group too, although here it operated as a status marker, conferring multiple privileges and discursive power to medicine even though the group's success relied upon the disciplinary expertise and unique contributions of both medical and nursing researchers. These markers were subtle, sometimes cloaked in objectivity, and to an outsider's eye, nearly invisible. But the advantage of ethnography is that time reveals important distinctions, and patterns that are too faint to notice upon first glance (Atkinson et al. 2001; Loftland et al. 2006).

And while the group's leadership outwardly promoted a culture of equality—and it is crucial to note, in my opinion was truly committed to it—deep-seated beliefs about science, professionalism, and gender also shaped individual and group understandings of the BIRG's research. For example, while "science" was the raison d'etre for the group, and universally spoken of as an unmitigated good, valuable in and of itself, its specific meaning varied among individuals. The PIs often spoke of making decisions based on what was best for "the science," but beliefs about what constituted "good" science—be it cutting-edge, efficient, significant, randomized-double-blind, longitudinal, fundable, feminist, and/or preventive—varied as

members negotiated scientific differences and sought to have their priorities, disciplinary strengths, methodological approaches, and working styles validated within the group. I soon discovered that thinking merely in terms of scientific, or even cultural differences among disciplines, was grossly inadequate.

When BIRG members spoke of scientific differences, I learned that they were almost always really talking about deeper, philosophical divides and moral distinctions that cut to the heart of their professional and personal contributions to the research area and the group. And as they ruminated on organizational and administrative hurdles, I discovered that they were also talking about navigating power relations and intersecting status differences. Other symbolic distinctions also proved salient for the group's members, but were harder to explain and less defensible within the framework of egalitarian collaboration. These were differences that group members spoke about in hushed tones or with a twinge of hesitation when they chose to articulate them at all. Often times they stammered and deferred to another group member who would have "more to say" about thorny issues. These distinctions were uncomfortable and hard to explain precisely because they were at once interpersonally and potentially divisive, yet also, surely not powerful enough to affect the progress of a serious and respectful scientific group.

In particular, gender, I learned, was a ubiquitous status marker, in part because it was such a reliable signifier within and between disciplines. Far from being a background identity divorced from science, gender emerged as an orienting frame central to both individual perceptions but also the scientific work at hand. It simultaneously served as a status marker associated with disciplinary legacies and research traditions, scientific approaches, ideas about professionalism and work, and feminist research identities. Gender also shaped individual experiences and perceptions of organizational processes within the group.

Importantly, I found that all of these differences took on symbolic significance in the group. As it became clear to me that the BIRG's processes and goals were shaped by preexisting hierarchies that favored certain epistemological ideals, standards of professional conduct, research questions, and methodological approaches, I began to understand, or at least contextualize, the dramatically different behaviors and strategies of group members. For example, some group members sought to improve accountability and efficiency in the BIRG, all in the name of enhancing productivity, while others actively resisted these interdisciplinary overtures. Explicit barriers rarely structured the group's organization and work, but the symbolic residue of long-standing power dynamics and status distinctions still shaped the terrain of the collaboration, group interactions, and the perceptions and experiences of individual members.

Over time I came to believe that these symbolic boundaries were *all the more* interesting and important because the BIRG was—by objective standards—a respectful, well-functioning, collegial, and successful interdisciplinary group. This was a group that defied the stereotypes of academic science as fraught with internal competition and jockeying for power and control. If symbolic boundaries were operating here, I reasoned, then subtle dividing lines could also be sabotaging well-meaning collaborations and diverse groups elsewhere.

*About the BIRG*

To help situate my research, I will briefly outline the BIRG's history and the group's shared research agenda. As I mentioned earlier, The BIRG's three PIs, Anna, Tom, and Phillip, hailed from the disciplines of nursing, medicine, and engineering respectively. They all held appointments as research professors at the same top-tier research university in the Midwestern United States, though Anna was untenured during my time with the group. When I met them in

2008, they were working under their second 5-year funding cycle of the IRSAG[3] grant, a prestigious interdisciplinary center grant administered through the NIH. Importantly, however, they had been collaborating together for over 15 years, long before they were funded as a bona fide interdisciplinary research team. Tom and Phillip met first, by chance, as they both sought the same female cadaver for independent research projects. After discovering a mutual interest in the biomechanical properties of soft tissue, they began working together to develop their research ideas and submit grant proposals on a relatively unexplored area—birth-related injuries to the pelvic floor.

Even though they had very different disciplinary backgrounds, Tom and Phillip shared much in common. First, they both were primarily interested in discovering the mechanisms of pelvic-floor dysfunction. Phillip's engineering training made him an expert in problem specification, measurement, and experimental and computer modeling of the musculature in the pelvic floor. As a research professor in medicine, Tom had clinical and surgical expertise to contribute, and also had access to a large patient population at the university's medical school and teaching hospital. Because Tom and Phillip both shared a relatively narrow approach to the research area, they also both preferred cross-sectional research designs. They were both interested in isolating the reason why some women developed pelvic floor prolapse after giving birth and others did not.

Around the same time Tom began working with Phillip, he also was developing his research ideas with Julia, a senior research professor in nursing. Tom was relatively junior in terms of research at that time, and Julia shared many of Tom's interests in the biomechanical dimensions to pelvic floor injuries. But while Tom was interested in specifying the

[3] IRSAG stands for Interdisciplinary Research on Sex and Gender. I also recently learned that the BIRG was just awarded their third cycle of IRSAG funding.

biomechanical dimensions of muscular dysfunction in the pelvic floor, Julia's focus was slightly different, reflecting her nursing background and a more feminist, woman-centered research orientation. She was interested in issues of prevention and recovery—how women experienced pelvic floor injuries and how to prevent them. Toward this end, her early research investigated how physician-related behaviors during labor and delivery exacerbated birth-related complications and injuries. So while Julia, Tom, and Phillip shared interests in this rather narrow research area, their specific interests reflected their respective disciplinary priorities and scientific conventions.

Anna first met Tom and Phillip in her capacity as Julia's doctoral student. As Anna trained with the group, she ran many of Julia's research projects and became adept at managing longitudinal clinical research projects. Over time, as Julia began to pursue other professional opportunities and research avenues, Anna took over the nursing mantle and continued to collaborate with Tom and Phillip as she developed her research interests and career. Importantly, Tom and Phillip began working with Anna as her mentors. They both served on Anna's dissertation committee, and after earning her Ph.D., Anna continued her work with Tom and Phillip as a post-doc with Phillip in engineering. While it appeared unconventional for a nurse to work with an engineer, Anna, Phillip, and Tom had, by this time, spent many years working together developing their interdisciplinary research program.

Like her predecessor Julia, Anna's research focus was quite different from that of Tom and Phillip. While they all shared a research interest in birth-related complications, she too was more interested in the actual experiences of real women who dealt with birth-related complications or injuries. This focus shaped her research—in that she preferred longitudinal

designs that followed a real sample of women. She developed a particular interest in women's experiences with incontinence and other postpartum complications.

When Anna's post-doc ended, she was able to secure a soft-money position at the university as a research scientist in medicine and continue her work with Tom and Phillip. During this period Tom, Phillip, and Anna's hard work began to pay off. They began securing funding to pursue their shared research agenda. First, Anna applied for and was awarded a R21 grant. Other small grants came along as well. But the most impressive consequence came when the group was awarded their first cycle of IRSAG funding which guaranteed five years of research support for their projects. This prestigious grant helped Anna gain recognition and she was offered a tenure-track position in the School of Nursing.

While securing the grant was undoubtedly a victory for the group, the large, interdisciplinary dimensions of the IRSAG grant initially created administrative complications at the university level. Funding was delayed as institutional units negotiated how to disperse the funds to the three differently positioned principal investigators. In organizational terms, each PI "owned" their disciplinary projects and directly managed their disciplinary research budgets and teams. But the grant's organizational structure also included two "cores"—independent administrative and scientific scaffolds that also distributed resources across the projects. Importantly, as the group began to work together, they realized that while their shared research mission was to better understand birth-related injuries and complications to the pelvic floor, the different disciplinary approaches meant that engineering and medicine were often seeing eye-to-eye and nursing was in many ways an outlier.

Two other co-investigators, or Co-Is, also worked in the BIRG; Karen joined Anna from nursing, and Elaine, Tom's colleague from medicine, contributed her expertise in urology and

fecal incontinence to the group. The disciplinary teams' composition varied, reflecting different disciplinary training structures and divergent institutional conventions among the disciplines. In addition to Karen, Anna worked with one graduate student, Nadia, but was supported primarily by "staff" research associates who were paid for their hourly work on the IRSAG grant. These staff members also worked on Anna's other ongoing research projects. Phillip worked almost exclusively with graduate students and post-docs, but also employed undergraduate research assistants. In medicine, Tom and Elaine supervised three rotating medical fellows in urogynecology who worked to advance the BIRG's research. Medical students and visiting scholars who came to study with the prestigious group also worked on the medical projects during my time with the group. The BIRG also relied on the expertise of other, more peripheral members. Carla, an experienced radiologist, assisted the group in interpreting MRI images that were a critical part of their research program, and David, a statistician helped clean and analyze the vast quantitative data the group accumulated during the course of their research. Finally, other staff members, namely a project manager, a financial manager, and clinical research assistants also worked to execute the BIRG's research agenda.

When I first met Tom, Anna, and Phillip, the BIRG had recently been awarded a second 5-year IRSAG grant. The group's collective research record was impressive and the team was gaining an international reputation for being pioneers in the area of pelvic floor research. There was, however, one black mark on their collective record. As the group gained recognition for its work, Anna was ironically, denied tenure by the School of Nursing. Despite her continued grant support and extensive publication record (at least compared to her nursing colleagues), Anna's nursing colleagues felt that she failed to demonstrate independence as an investigator. Collaborating with Tom, her former faculty mentor and a physician, worked against her in the

eyes of her nursing colleagues. In an unprecedented move, her sympathetic dean restarted her tenure clock, realizing that she had been "bullied," or at the very least, misevaluated by the old guard in nursing. When I began observing the BIRG, this was Anna's career status; she was technically an assistant research professor, but on her second stint on the tenure clock.

*Research Design*

Because I wanted to understand how group members experienced and negotiated difference in the course of their interdisciplinary work, I chose a mixed qualitative research design combining ethnographic methods and in-depth interviews. Since I was personally and professionally unfamiliar with the BIRG's research area, incorporating ethnographic methods allowed me to get a hands-on feel for the group's topic and other contextually relevant data. Because I was interested in how team members negotiated difference within the BIRG's interdisciplinary context, ethnography allowed me to capture individual behaviors in the group's various micro-interactional settings. Not only would this give me a birds-eye view to assess the nonverbal dimensions of collaboration, but I knew it would later prove useful as I linked group members' behaviors to their individual understandings about the group. I also knew that spending time immersed in field research would allow me to build relationships with BIRG members, potentially resulting in more truthful exchanges and a deeper understanding of individuals' experiences with the group over time.

I began by engaging in 18 months of participant observation, attending 31 group meetings of various types. I also routinely spoke with BIRG members more informally, often after meetings. It was typical for one or more participants to walk with me to the elevator, out of the building, or to the bus stop as we continued talking about their experiences working in the

group. In addition, I attended the BIRG's annual Birth Muscles Research Group (BMRG) symposium in both 2009 and 2010. This was a day-long conference that the BIRG hosted every spring to highlight its research, but also to promote research relevant to birth injuries or the pelvic floor muscles more generally. I also accompanied Tom and Anna as they represented the BIRG at the NIH's annual Directors meeting, where representatives from all the IRSAG centers met in Washington, D.C. to discuss their scientific progress and share ideas. In all, I conducted over 90 hours of observation. I took extensive fieldnotes during each meeting, but I also wrote detailed notes after each meeting to clarify and contextualize specific exchanges. I then typed, coded, and analyzed these notes using qualitative analytic software HyperResearch 2.8.2.

Though I routinely spoke with BIRG members informally before and after meetings, I began formally requesting interviews from group members after observing them for a year, ultimately conducting 23 in-depth, semi-structured interviews. By incorporating in-depth interviews of participants to complement my ethnographic observations, I was able to ask follow-up questions to better understand interpersonal interactions and individual experiences of interdisciplinary work in the BIRG. I solicited interviews from all active BIRG members whom I had seen during the routine course of my participant observation, as well as many from more peripheral group members whom I had never seen or met, but were often mentioned during the course of my research.[4] The interviews were audiotaped, and on average lasted an hour, but ranged from 34 to 97 minutes. I transcribed the interviews myself because I wanted to make additional notes about inflection and the "feel" or context of each interview. I then wrote analytic memos to explore emergent themes, using both open and focused coding techniques to analyze the data (Emerson et al. 1995). Combining these techniques let me purposively look for

[4] In all, I sent out 28 email requests. Three relatively peripheral members never replied to my email requests, one team member was never able to find time to meet, and one team member explicitly declined to speak with me on the record.

gender differences, but also allowed me to inductively explore how group members talked about and negotiated other differences within the group. After analyzing all interviews with HyperResearch 2.8.2 qualitative analysis software, I compared themes and findings to my fieldnote analyses, making connections across my data, noting the consistencies and discrepancies between interviews and observational data.

*Looking Ahead*

This project offers a thoughtful and thought-provoking account of how individuals participating in the BIRG understood and negotiated difference as they worked together on an interdisciplinary project. As I have described above, the BIRG was in many ways an incredibly successful and collegial interdisciplinary group. Due to space limitations and the necessarily truncated scope of any research project, it is with a pang of regret that I was not able to fully describe the myriad successful aspects of the group's collaboration. For that, especially to the BIRG members who welcomed me with open arms, I am truly sorry. But as a social scientist, I argue that it is equally important to focus on the shortcomings and hidden pitfalls that unwittingly reproduce inequalities in social settings, despite members' best efforts.

The more time I spent with the group, the more I realized that team members saw and experienced distinctions differently, and power and status shaped these perspectives. In this dissertation, I focus on isolating and explaining how status and other divisive symbolic boundaries operated under the radar to shape the experiences of group members, and by extension, the process and products of this interdisciplinary group. While many studies have explored how structural and cultural impediments affect the potential of interdisciplinary

collaborations in the sciences, my research goes deeper to reveal that these groups face other, often unacknowledged, and thereby far more insidious obstacles to innovative work.

In Chapter 2, I begin by outlining the theoretical background that informs this work. I set the backdrop of my study by introducing theories of status, symbolic boundaries, and identity, and well as specific literatures on gender inequality at work and in science. The specific context of my group, as well as the qualitative orientation of my work allowed me to explore many outstanding questions and make theoretical contributions in many scholarly fields. For example, my findings add real-world, contextual richness to the largely experimental study of status markers in social psychology, and also link organizational processes to socio-emotional accounts providing new insights on the gendered organization of science in an interdisciplinary collaboration. Moreover, my work fills a gap in the existing literature on symbolic boundaries by tracing how individuals negotiate status expectations to conform to or resist dominant definitions of a "worthy person" in a specific environment (Lamont 2002).

The next four chapters make up the empirical contributions of the project. Chapter 3 is largely descriptive as I unpack the divergent stories of "difference" within the BIRG. At first, I was struck by shared stories of inclusiveness and respect that were repeatedly touted by BIRG members. As someone unfamiliar with the group, these stories stood out. Over time, however, I realized that while this was in fact the dominant narrative—that is, a majority of BIRG members spoke of the group in this way—not *all* group members experienced the BIRG as a harmonious collaboration. I realized that while the engineers and doctors shared a deep and integrated collaborative relationship, the nurses operated in relative isolation. I also learned that it was the engineers and doctors who truly experienced the BIRG as a collegial, inclusive, and egalitarian

group. The nursing researchers, in contrast, shared that their disciplinary perspective was not valued in the group's interdisciplinary scientific agenda.

In Chapter 4, I explore how existing hierarchies and material inequalities among disciplines shape the parameters and processes of interdisciplinary collaboration in the academic health sciences from the outset. By offering different group members' accounts of initial start-up difficulties, I demonstrate that relative disciplinary power buffered some group members from interdisciplinary challenges while others from less privileged disciplines were rendered even more vulnerable by their interdisciplinary affiliation. I also highlight how relative disciplinary power affects individual self-perceptions and behaviors in interdisciplinary decision-making. I show how institutional vulnerability is perpetuated in interdisciplinary groups as some individuals learn to cultivate a "victim mentality."

In Chapter 5, I trace how status emerged to rank order and confer value to certain tasks, roles, disciplinary approaches, and individuals within the group. Despite members attempts to minimize existing material inequalities to create an even playing field within the group, vestiges of power and inequality remained, and status was often the medium through which value was understood and communicated within the group. The group's egalitarian orientation masked more subtle distinctions that, in the end, did the work of rank-ordering scientific approaches and professional orientations long after obvious structural barriers were addressed. In this way, perceptions of status were unwittingly reproduced, and ultimately, shaped interdisciplinary science through individuals' self-perceptions and subsequent behaviors. At times, status distinctions were ambiguous as group members realized that some imported status markers did not carry much weight within the BIRG's interdisciplinary context. Gendered boundaries and status distinctions proved especially important within the context of this particular

interdisciplinary women's health research group (Ridgeway and Correll 2004). I also show how multiple low-status markers intersect in practice to create durable distinctions that group members use to understand their individual contributions as well as the group's priorities and collaborative capacity.

In Chapter 6, I explore how individuals link status and scientific differences in their understandings of interdisciplinary science. In particular, I show that status appraisals linger in the minds of low-status group members and imbue epistemological and philosophical differences with a moral valence, creating durable symbolic boundaries within the group. While high-status group members promoted efficiency and productivity as agreed-upon goals worth pursuing, low-status members often resisted these efforts, recognizing that the deck was stacked against them if their time-consuming, woman-centered approach was subjected to these standards. I then link these reflections to behavior by exploring how individuals' perceptions of status and other professional boundaries influenced their interactions with others within the group. These lower status group members worried that their values and scientific priorities would never be perceived as important as those of their high-status colleagues, and wondered if an interdisciplinary affiliation ultimately muffled their unique scientific voice.

Finally, in Chapter 7, I conclude by summarizing the theoretical and empirical contributions of this work and considering the consequences and limitations of my findings. First, I trace how intersecting existing power relations and intersecting status distinctions emerged to affect the process, products, and players in interdisciplinary science. While these ideas are well-trodden turf for sociologists of knowledge production and science, this analytic approach has often been neglected by those doing, as well as by those studying, interdisciplinary research collaboration in the sciences (for exceptions see Lingard et al. 2007; Albert et al. 2008;

Albert et al. 2009). My project also makes significant contributions to many specialized research areas. By illuminating the process by which gender status markers were mobilized and sustained in a specific context, I contribute empirical evidence to the "gender system" (Ridgeway and Correll 2004). My project also makes a unique contribution to existing scholarship on status and symbolic boundaries. I go beyond the robust experimental canon in status to show how multiple status markers intersect to shape the experiences of marginalized group members in a specific context—an interdisciplinary research team in the health sciences. Status markers were often ambiguous, highlighting the negotiations involved in constructing status orders in new arenas. By investigating how devalued individuals make sense of and negotiate their relative status in the group, I also link status appraisals to identity work in a real context, an underdeveloped research area (Stets and Burke 1996). Finally, I consider the consequences of inequality within interdisciplinary groups. Gender biases and symbolic boundaries, especially unacknowledged ones, threaten the collaborative potential of diverse groups, but they also pose a particular threat to marginalized individuals.

## Chapter 2: Literature Review

*Introduction*

In recent years, interdisciplinary[5] approaches and research paradigms have enjoyed a surge in popularity as proponents have argued that more integrative solutions are essential for the problems of a changing world (National Academy of Sciences 2004; Rhoten and Pfirman 2007; Weingart and Stehr 2000; Klein 1990; Kates 1989). In the academy, interdisciplinary research (IDR) has become a buzzword for work that is both revolutionary and innovative. This is especially the case in the sciences where there is widespread recognition that interdisciplinary approaches are absolutely essential to understand and address increasingly complex and intractable problems (National Academy of Sciences 2004; AAU 2005). No doubt incremental interdisciplinary successes and especially the emergence of successful "interdisciplines," such as neuroscience, nanotechnology, and genetics, have further galvanized proponents of interdisciplinarity who tout these boundary-breaking mergers as nothing less than the future of science (National Academy of Sciences 2004; Frickel 2004).

While some critics challenge that the benefits of interdisciplinary research rest largely on assumptions of promise that have not yet been empirically determined (Jacobs and Frickel 2009) or more seriously, that the buzz about interdisciplinary research diverts resources from

[5] There are numerous definitions of interdisciplinarity. I borrow from Rhoten and Pfirman who define interdisciplinarity as "the integration or synthesis of two or more disparate disciplines, bodies of knowledge, or modes of thinking to produce a meaning, explanation, or product that is more extensive and powerful than the sum of its parts" (2007, p. 58).

established and fully vetted disciplinary projects (Marks 2006; Weissmann 2005), no one denies that recent enthusiasm for interdisciplinary research has inspired nothing short of a sea change in governmental, academic, and private industry research initiatives in recent years (Jacobs and Frickel 2009; Brint 2005).[6] "Top-down" funding mechanisms to encourage these integrative approaches have exploded throughout the public and private sectors as agencies and individuals seek to foster interdisciplinary research, collaboration, and individual capacities (Rhoten 2003; Mansilla et al. 2003; Brint 2005; Gershon 2000; Rhoten and Pfirman 2007).

These financial incentives have, in turn, induced systemic structural changes in the academy as university presidents and provosts wish to capitalize on the emergent resources earmarked for interdisciplinary collaboration and research (Sá 2008). For their part, scholars too have increasingly pursed interdisciplinary agendas from the "bottom-up" (Jacobs and Frickel 2009). Proponents of interdisciplinarity are encouraged by the proliferation of interest and incentives to support these endeavors, arguing that revolutionary advances are only possible by breaking down the artificial yet socially entrenched boundaries between disciplines to merge bodies of expert knowledge (Klein 1990; National Academy of Sciences 2004; Karlqvist 1999; Kates 1989; Fuller 2003).

It is within this context that scholars have expanded the theoretical foundation of "interdisciplinarity," laying the groundwork for empirical inquiry in this area. But scholars of interdisciplinarity are a diverse group, and in striking irony, many are not in conversation with related research traditions (e.g. research on cross-functional teams and interprofessional collaborations), or disciplinary literatures that have deep empirical roots and therefore might help

[6] While some scholars debate the merits of interdisciplinarity, it is worth specifying that this project begins with the assumption that there is something inherently valuable in interdisciplinary endeavors and in the inclusion of diverse voices in knowledge production more broadly (Rhoten and Pfirman 2007; National Academies of Science 2007).

fully theorize and understand the challenges to interdisciplinarity. For example, in "the science of team science" literature, there is recognition that contextual influences shape interdisciplinary groups (Stokols et al. 2008), but the emphasis on assessing and evaluating the effectiveness of these teams has meant that organizational inequality is given cursory treatment (Masse et al. 2008; Stokols et al. 2005; Hall et al. 2008). This trend reflects a larger criticism levied at the "workplace diversity" scholarship—that studies of diverse groups often neglect a rigorous consideration of how power, status, and organizational processes may structure and perpetuate inequality in interdisciplinary groups (DiTomaso et al. 2007). Though a full review of the scholarship on interdisciplinarity is beyond the scope of this dissertation, I will offer a brief overview to introduce the gaps in the scholarship that situate my research project.[7]

*An Overview of Interdisciplinarity*

The literature in this area is vast and becoming increasingly specialized as capital investments in IDR encourage further theoretical and empirical investigation. As such, there is considerable ambiguity in the literatures tracing interdisciplinary developments and research initiatives, often resting on multiple definitions and various intersecting typologies (Jacobs and Frickel 2009). While some scholars have focused on philosophically exploring the changing nature of intellectual work, distinguishing between traditional disciplinary pursuits and emerging interdisciplinary endeavors (Weingart and Stehr 2000; Fuller 2004), others have developed typologies of interdisciplinarity[8], speculating that the level of integration among disciplines

[7] Jacobs and Frickel (2009) offer an impressive sociological consideration of interdisciplinarity. See Klein (2008) for a review on the evaluation of interdisciplinary research. *The Oxford Handbook on Interdisciplinarity* (2010) illuminates the breadth of interdisciplinary approaches.

[8] Individuals from disparate disciplines can work along side each other (multidisciplinarity), across disciplinary boundaries (interdisciplinarity), or to integrate disparate approaches with the goal of creating fundamentally new knowledge forms (transdiscipinarity). Though these distinctions are important to those who theorize

influences the process of collaboration as well as the ultimate research product or outcome (Klein 1990; 1996; Lattuca 2001; Aboelela et al. 2007). Still others have theorized that interdisciplinarity itself encompasses myriad formulations and occurs at multiple levels. Interdisciplinary synthesis can happen on the cognitive level, as an individual researcher incorporates different disciplinary methods or frames in his or her research, but it can also be produced at interpersonal, interdepartmental, and interinstitutional levels (Pfirman and Martin 2010; Rhoten and Pfirman 2007). Interdisciplinary researchers can focus their efforts on organizing knowledge production at the level of field-creation, as new "interdisciplines" emerge in a collaborative context, but also to tackle specific problems (Rhoten and Pfirman 2007).

Because the forms of interdisciplinarity are diverse, there is also considerable variability in the contexts in which interdisciplinary research is pursued. My project focuses on interdisciplinarity as it is undertaken at the team level in the academic health sciences within a group working in a single institution of higher education. As a result, my literature review emphasizes the empirical research of interdisciplinary teams in the sciences and studies that explore the experiences of scientists in the academy. But interdisciplinary research in the sciences is also pursued in various non-profit and for-profit settings, and in teams and research collectives of varying sizes that span large research communities, multiple sectors, and great geographic distances (Klein 2008; Stokols et al. 2005; Pfirman and Martin 2010). Because of the variability of forms, purposes, and goals that comprise interdisciplinary research in the sciences, it is important to remember that the context matters greatly as all knowledge is ultimately produced locally, even as it is shaped by broader social factors (Galison and Stump 1996).

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interdisciplinarity, throughout this dissertation I will use the terms "interdisciplinarity" and "interdisciplinary" to capture working across disciplines.

While interdisciplinarity is by no means a novel idea, but rather one that has come in and out of favor as an intellectual alternative to disciplinary knowledge production over time (Weingart and Stehr 2000; Klein 2001; Abbott 2001; Turner 2000; Whitley 1984; Rhoten 2005), interest in interdisciplinarity has in fact been increasing in recent years (Jacobs and Frickel 2009; Braun and Schubert 2003). As such, many scholars have focused on the obstacles to interdisciplinarity, highlighting how existing institutional arrangements and disciplinary structures prevent interdisciplinary changes within the academy (Abbott 2001; Turner 2000; Sá 2008). In his book *Chaos of Disciplines*, Andrew Abbott (2001) argues that despite recent interest in interdisciplinarity, disciplines will remain the primary structural unit in the academy largely because of the "dual institutionalization" of the academic job market and the disciplinary system within universities. Because the academic job market relies on individuals trained in the disciplines, this perpetuates disciplinary structures at the university level (see also Turner 2000).

Rigidly entrenched reward structures, such as established protocols for promotion and tenure review, are also tied to disciplinary conventions and expectations (Sá 2008; Lamont 2009; Pfirman and Martin 2010). Moreover, interdisciplinary research is likely to be critically assessed in the peer review process (Langfeldt 2006; Lamont 2009), and individual productivity is diminished when scholars choose more general interdisciplinary research paths instead of specializing (Pfirman and Martin 2010; Leahey 2007). Even when an institution explicitly touts an interdisciplinary mission, productivity in one's own discipline is often still the most important factor when individuals are evaluated for tenure and promotion in their own departments (Pfirman and Martin 2010). For all these reasons, research suggests that junior scholars who pursue interdisciplinary research face the greatest risks when pursing interdisciplinary research (Pfirman and Martin 2010; Rhoten and Pfirman 2007).

While structural barriers impede the inclusion of interdisciplinary perspectives and collaborations, proponents of interdisciplinarity are hopeful that financial incentives might be the impetus to change entrenched disciplinary and departmental structures within the academy (Fuller 2004). They challenge universities to implement organizational strategies alongside institutional incentives to ensure that interdisciplinary mergers achieve their potential (Sá 2008).

Cultural barriers also threaten the potential success of interdisciplinary groups and individuals pursuing interdisciplinary research (Metzger and Zare 1999; Brewer 1999; Rhoten and Parker 2004; Lattuca 2001). Communication has emerged as a challenge as interdisciplinary participants must negotiate terminology and decide on a lingua franca as they navigate disciplinary divides (Klein 1990; Galison 1997). Others note that language differences often reflect larger chasms between disciplines, unearthing what sociologists of science and scientific knowledge have known for some time—that is, that disciplines and professions have different intellectual histories, epistemological orientations, cultural norms, research habits, and methodologies—all of which shape understandings of science and the process of knowledge production (Gieryn 1983, 1999; Knorr-Cetina 1999; Shapin and Schaffer 1985; Lamont 2009; Owen-Smith 2001).

In practice, these different "epistemic cultures" (Knorr-Cetina 1999) often serve as barriers to interdisciplinary collaboration (Klein 2005; Gardner 2013). Operating in disciplinary silos, cultural differences are unacknowledged and uncontested. But in interdisciplinary contexts where scientists are working together on shared, interdisciplinary research questions or problems, these differences become salient. As a result, interdisciplinary researchers often engage in "boundary-work" to mark their scientific perspective, defend their "academic tribe" or establish "credibility" in an uncertain environment (Gieryn 1983; Latour and Woolgar 1986;

Mizrachi et al. 2005; Albert et al. 2009; Becher and Trowler 2001). Some researchers highlight that interdisciplinary science is "facilitated" when scientists come from traditions or communities that share epistemological assumptions (Pfirman and Martin 2010; Stokols et al. 2005). Interdisciplinarity varies in degree, so those who are closer, scientifically speaking, have an easier time working together (Pfirman and Martin 2010).

But while interdisciplinary scholars are keen to focus on structural constraints and cultural differences, the canon on interdisciplinary science largely ignores frank discussions of status and power. When the National Research Council published their report outlining their findings and recommendations on what was needed to promote interdisciplinary research, there was no explicit mention of how entrenched power relations and status arrangements within the academy, or among and within scientific disciplines, might shape the nature of interdisciplinary research or the final products of interdisciplinary working groups (National Academy of Science 2004). To clarify, this volume addressed the important role that external parties such as funding agencies, academic leaders, and professional societies play in incentivizing and encouraging interdisciplinary work, and described the "professional risks" of pursuing interdisciplinary research paths at length, highlighting that individuals engaged in interdisciplinary research faced problems with evaluation, promotion, and productivity. But these topics were strangely divorced from theoretical and empirical research that links scientific processes, goals, and assessment to existing power and status structures.

This exclusion, while perhaps diplomatic, unwittingly masked the multiple privileges and hierarchies embedded in an unexamined interdisciplinary science. By forgoing explicit discussions of how power and status shape existing scientific hierarchies, professional rewards and reputations, and scientific opportunities for individuals and interdisciplinary groups, this

report also failed to consider how other markers of status and belonging, like gender (Ridgeway 1997), might shape appraisals of scientific value and contribution and as an extension, the process and products of interdisciplinary science.

Recently, however, a few scholars have turned their attention to the effects of status in interdisciplinary teams. Instead of merely reflecting disciplines' different "epistemic cultures," these authors found evidence that epistemological and methodological differences are laden with status judgments about who has more to contribute, or whose perspective is more valuable at the interdisciplinary table. In particular, the "hard" vs. "soft" science disciplinary divide emerged as important in conferring status to and shaping contributions among interdisciplinary researchers (MacMynowski 2007). Scientists hailing from the "soft" sciences felt less confident about their contribution to the interdisciplinary group than their "harder" science colleagues (Stokols et al. 2005; Gardner 2013). In the health sciences, Albert et al. (2009) found that biomedical scientists and clinicians discounted the approaches and qualitative methods of social scientists, revealing a cultural barrier to the inclusion of social science researchers into the health research field. And finally, in their case studies of two interdisciplinary ecological research teams, Miller et al. (2008) warn of the danger of "epistemological sovereignty" whereby interdisciplinary research groups unwittingly entitle a single discipline to determine the direction of the project while other disciplinary perspectives are subordinated or merely cast in supporting or service roles. They call for a reformulation of interdisciplinary research as "epistemological pluralism" to ensure that the potential of interdisciplinary research teams are realized (ibid).

Taken together, these researchers exposed how disciplinary status—as a function of epistemological and methodological differences—shaped the perceptions of interdisciplinary scientists and threatened the potential of their interdisciplinary research collaborations. But

while these accounts importantly explore one dimension of scientific status and power, they fail to consider how other markers of difference might also shape collaborative processes and individual experiences within interdisciplinary groups. What about other differences that shape access to resources or designate status hierarchies among interdisciplinary researchers? How might they too emerge in interdisciplinary scientific collaborations to confer advantages to certain interdisciplinary team members? While issues of status and power in science and work groups are widely theorized in other literatures (Bourdieu 1984, 1988; Ridgeway 1997; Foschi et al. 1994; Valian 1998; Tajfel and Turner 1986; Stewart et al. 2007) these ideas are just beginning to shape the theoretical frames and methodological approaches of scholars examining interdisciplinary research groups (Lingard et al. 2007; Albert et al. 2009; Gardner 2013).

Preliminary research has shown that women are more likely to engage in interdisciplinary collaborations than men (van Rijnsoever and Hessels 2011) and anecdotal evidence suggests that women (and perhaps minorities too) are drawn to interdisciplinary scientific ventures both within and outside the academy because they seem less hierarchical (Rhoten and Pfirman 2007; Smith-Doerr 2004). This alone suggests that gender biases, or perhaps a desire to avoid them, might be shaping women's preferences to engage in interdisciplinary collaborations and programs of research. Yet women's experiences in IDR are largely undertheorized (Rhoten and Pfirman 2007). Moreover, gender, as a marker of inequality that shapes access to resources, social processes, and individual experiences is all but ignored in this canon (Rhoten and Pfirman 2007).

Rhoten and Pfirman (2007) insightfully juxtapose these omissions in interdisciplinary initiatives and in the interdisciplinary research canon more broadly to those in a parallel research program that seeks to promote another type of scientific diversity by proactively considering gendered barriers to women's participation in the sciences (National Academy of the Sciences

2007). Given the extensive research that theorizes and empirically demonstrates the importance of gender at work (Williams 1989; Acker 1990; Reskin 2003; Ely and Padavic 2007; DiTomaso 2007), in the academy (Smith 1987; Roos and Gatta 2009), and in the sciences (Valian 1998; Fox and Long 2005; Stewart et al. 2007), neglecting to theorize gender as a social process and possible marker of inequality or consider women's experiences as interdisciplinary researchers is a conspicuous blind spot in an otherwise thorough research canon. Studies that consider how gender may shape the experiences of interdisciplinary researchers, as well as the process and products of interdisciplinary science are of particular importance to illuminating the micro-level processes that perpetuate gendered inequality in various contexts (Reskin 2003; Ridgeway and Correll 2004).

One final gap in this research canon reflects the largely macro-level, programmatic emphasis driving this research area (National Academy of the Sciences 2004): the experiences of interdisciplinary researchers are relatively neglected (Kumar 2012). Though there are a few studies that prioritize individual experiences of interdisciplinary work (Latucca 2001; Kumar 2012; Lingard et al. 2007; Rhoten 2003), for the most part individuals have only been considered in so far as they represent the "risks and rewards" to an interdisciplinary program of work (Kumar 2012). How individuals experience and negotiate interdisciplinary collaborations, especially as they make meaning of their shared work, is largely ignored, as are issues of the self and emotions more broadly (Latucca 2001; Lamont 2009).

My project goes beyond the existing scholarship on interdisciplinary groups to consider how perceptions of power and status might shape individual perceptions and experiences of interdisciplinary science. By inductively exploring how individuals negotiate difference as they work together in a "successful" interdisciplinary team in the health sciences, my research

considers the epistemological barriers reflected in the literature, but also how gender and other markers of inequality might emerge to shape the experiences of group members and the very the process and products of interdisciplinary collaboration. By centering individual experiences, this project also sheds light on the internal processes of the self and identity that often go unexamined in the context of interdisciplinary work in the sciences (Kumar 2012).

*Theorizing the Self, Identity, and Status in Interdisciplinary Research*

Symbolic interactionists are credited with being among the first to theorize the relationship between the self and society. These theorists posit that an individual's identity is neither innate nor fixed, rather individual meaning-making and the construction of self is an inherently social process that is constantly negotiated through interactions with others (Mead 1934; Cooley 1902). The self then is a composite of myriad symbolic constructions of self and negotiating meanings with others, both real and imagined. Though one's self can change over time and is continually shaped in different social settings, individuals often act in habituated ways that anticipate others' responses. Erving Goffman developed these ideas to theorize how individuals actively manage the impressions of others in social interactions. He argued that people engage in deliberate interactional strategies to influence the positive appraisals of others. One such tactic was "face-work," which encompassed the micro-level strategies people used to maintain "face," or their positive self-image in social interactions (Goffman 1967). Later, in discussing social stigma, Goffman theorized how individuals work to salvage a "spoiled identity" by concealing parts of themselves that they suspect will be negatively evaluated by others (Goffman 1963).

Social psychologists have helped to illuminate the mechanisms of exclusion by showing

how implicit bias resulting from in-group favoritism, or homophily, shape perceptions of difference in a variety of settings (Brewer and Brown 1998; Fiske 1998). Status distinctions emerge during the course of routine interactions as individuals look for cues, or status characteristics, in the environment to assess the capabilities of others (Berger et al. 1977; Wagner and Berger 2002). While some status cues are related to the situation at hand, others are more diffuse, either directly communicating a general status (i.e. cues revealing gender or other socio-demographic characteristics) or more tacitly inferring a status category (i.e. cues such as style of dress). Some status characteristics are more or less "salient" depending on other factors (ibid). Gender, for example, is more likely to be salient in mixed-sex groups because it distinguishes between the sexes, but not in single-sex groups where it recedes in the background (Berger et al. 1977; Ridgeway 1991). In new contexts or uncertain situations, individuals are especially likely to rely on diffuse status characteristics and stereotypes to make sense of each other and assess how they fit in to the implicit status hierarchies in play (ibid).

Expectation states theory emerged as an extension of this work to explain and predict how status beliefs shape behavior in task groups (Berger et al. 1977; Berger et al. 1985; Ridgeway and Walker 1995). When individuals share the same goal, hierarchies of status and influence inevitably emerge as individuals try to determine the usefulness of each other's contribution. Once status associations are formed, they become self-fulfilling, shaping how individuals not only contribute in that setting, but also how their suggestions and contributions are perceived by their collaborators (Ridgeway 1991). Over time, individuals internalize status beliefs and then reenact them in social situations through automatic cognitive appraisals. Although cognitive attributions vary from context to context, they produce status hierarchies that structure opportunities and shape expectations for individuals and groups (Berger et al. 1977;

Berger et al. 2002; Fiske and Taylor 1991; Ridgeway 1991).

While much of this research program confirms the durability of the larger status order, some studies highlight the power of the individual to shape and resist status assessments. When individuals contest status appraisals in mixed groups, the appraisal's effect is somewhat diminished, hinting that resistance may be a mechanism to disrupt how diffuse status beliefs are perceived and mobilized in various settings (Ridgeway and Correll 2006). Other studies have shown that smaller groups or subcultures might also have their own "local frameworks" where they draw on status characteristics unique to their social beliefs and practices (Berger et al. 2002). So while status orders are durable, both of these findings highlight the possibility that individuals can challenge them in local contexts.

But while these largely experimental studies on status help to specify the conditions under which status is enacted and thereby predict behaviors in task groups, this research is limited in two important ways. First, it does not illuminate how multiple status markers may intersect in dynamic social settings. The extent to which a single status marker shapes actors' behavior in a social setting depends on the other status markers in play. This research is also limited in that it fails to account for how other contextual factors influence attributions, individual behaviors, and interactions. By exploring how individuals negotiate status in an interdisciplinary context, my project adds to an understanding of how status processes are enacted and understood in a naturalistic setting.

Cultural sociologists also explore how status distinctions perpetuate inequality in society, but often characterize these differences as symbolic boundaries, or the "conceptual distinctions made by social actors to categorize objects, people, practices, and even time and space." (Lamont and Molnar 2002, p. 168). Like social psychologists, they see status appraisals as cognitive

shortcuts. Because individuals are inundated with various social cues and stimuli during the course of routine interactions, they come to rely on go-to conceptual distinctions to distinguish among people and confer status to socially desirable traits, individuals, and groups (Lamont and Molnar 2002; Bourdieu 1984; Epstein 1992). By erecting "symbolic boundaries" about what characteristics, activities, and social positions are most valuable, individuals can quickly categorize new information and make sense of a complicated world.

One way in which symbolic boundaries confer status is by signifying the various social resources that actors have at their disposal. Signs of an individual's economic position (economic capital), social relationships and connections (social capital), credentials and cultural competencies (cultural capital), and their moral character (moral capital) all collectively communicate one's symbolic capital and help to establish that person's position relative to others in any social setting (Bourdieu 1984; Lamont 1992; Lamont and Molnar 2002). Because classification schemes are linked to these multiple forms of capital, many of which carry material advantages, symbolic boundaries go beyond communicating relative status to shape access to resources and thereby structure inequality in social spaces (Bourdieu 1984).

Although symbolic boundaries are often less explicitly regulated than more objectified or "real" social divisions and hierarchies, they tacitly work to connote power by regulating the "micromechanisms" of exclusion (Lamont 1992; Collins 1992; Mizrachi et al. 2005). Though the type and content of these classification schemes vary widely depending on the context and social actors at play, many conceptual distinctions, like gender, are durable and communicate shared cultural associations in various social settings (Epstein 1992). Moreover, individuals' social position(s) within various contexts influences how they interpret these cultural schemes. Some social actors are relatively privileged in status terms within a given context, and so while they

benefit from the symbolic distinctions at play, they are likely to legitimize or interpret these divisions in very different ways from those who have relatively lower status (Mizrachi et al. 2005; Albert et al. 2008; Gieryn 1999).

The diverse scholars and projects incorporating a focus on symbolic boundaries speak to its flexibility as an analytical concept and theoretical tool. For example, the explicit consideration of moral boundary work (Lamont 1992) as a strategy one might use to assert symbolic capital is particularly useful for scholars of gender who have long considered how women's lower economic power often make a resource out of emotions and other stereotypically feminized behaviors (Hochschild 1983; Collins 1992; Epstein 1992; Pierce 1995). But while some studies show how the emergence of symbolic boundaries actively informs and shapes behavior (Mizrachi et al. 2005), much of the literature in this area merely assumes that behavior follows the construction of symbolic boundaries (Lamont and Molnar 2002). Qualitative research incorporating both in-depth interviews and ethnography illuminates how individuals draw boundaries by linking individuals' meaning-making to their actual behaviors in a specific context.

Status processes and symbolic boundaries are deeply connected to one's sense of self and identity. When an individual contemplates how they are perceived (Goffman 1967), or if they belong in a setting (Epstein 1992), they are actively constructing a sense of self and identity. While many scholars have speculated that interdisciplinary research paths offer both risks and rewards for individuals (Metzger and Zare 1999; Brewer 1999; Rhoten and Parker 2004), the empirical canon privileges the assessment of interdisciplinary teams and research products, largely ignoring how individuals working in interdisciplinary arenas experience these collaborations or fare within the context of their shared work or (Sá 2008; Kumar 2012). Those

few studies that have looked at identity processes and individual experiences of interdisciplinary work reveal that individual perceptions of self and belonging not only shape one's commitment to their interdisciplinary colleagues and research agenda, but also affect the interdisciplinary process and product (Lattuca 2001; Kumar 2012; Lingard et al. 2007).

Some scholars have highlighted how individuals struggle in interdisciplinary contexts. Not only are some participants less likely to be valued within the context of group work (Gardner 2013; Miller et al. 2008), but they also struggle to integrate their interdisciplinary work into a cohesive narrative of self. In her ground-breaking and oft-cited qualitative investigation of college and university faculty involved in interdisciplinary collaborations, Lattuca (2001) highlighted that interdisciplinary faculty often faced professional "identity crises" as they navigated the borders between disciplines. This early study importantly uncovered that interdisciplinary work not only has the potential to redraw disciplinary boundaries, but also to impact individual scholars' sense of self and belonging. Taking her lead, a few others have theorized that interdisciplinary work can marginalize certain interdisciplinary researchers as they struggle to position themselves both within their interdisciplinary group, but also within their own scholarly communities and academic departments (Pfirman and Martin 2010; Kumar 2012). As a corrective to the preponderance of studies focusing on the interdisciplinary team, Kumar (2012) interviewed interdisciplinary researchers in the health sciences to shine light on the identity processes involved as individuals pursue interdisciplinary research. Her project, like Latucca's, highlighted that individuals often struggle to "fit in" within the context of interdisciplinary work, but like Latucca's, was limited in that it sampled individuals who did not work together.

Perhaps the most insightful examination of the identity work inherent in interdisciplinary collaboration was offered by Lingard et al. (2007). By self-consciously and reflexively examining their own qualitative interdisciplinary collaboration, Lingard et al. (2007) unearthed the hidden identity politics that emerged as members negotiated their involvement in the group. They were at once part of an interdisciplinary group, but also hailed from different disciplinary homes. At the same time, they were each at different places in their respective careers and realized that other structural dynamics not only shaped the demands on their time, but their scientific approaches within the group as well. Moreover, they realized that their "individual identities within the team [had] been powerfully shaped by the requirements and scientific values of the funder." (ibid, p. 509). As a result, this group warned other interdisciplinary groups to "pay attention to how the politics of identity on the team shapes the stories they tell, just as single authors customarily attend to the politics of writing up qualitative results." (ibid, 516).

And finally, others highlight the importance of theorizing the role of the self in interdisciplinarity by suggesting that a hidden obstacle to collaborative work is in fact a deep-seated internalized resistance to it (Weingart 2000). Enthusiasm for interdisciplinarity may merely represent a discourse for innovation in knowledge production and therefore reflect scholars' self-interested desire to appear open-minded. In practice, scholars are far more likely to be wed to rigid disciplinary conventions and expectations and make choices that oppose interdisciplinary mergers and innovations (ibid; Lamont 2009).

These studies highlight that interdisciplinary groups are perfect settings in which to explore how individuals and groups negotiate identity processes, and especially, how they make sense of multiple identities as they intersect in real life. While social identity theorists see identity as rooted in social categories or group affiliations (Hogg and Abrams 1988; Turner

1987; Tajfel 1982), identity theorists see that the self as shaped by various roles that an individual inhabits (Thoits 1986; Burke and Tully 1977), arguing that one identity often prevails in specific contexts (Stryker 1980). But individuals involved with interdisciplinary teams are likely to have multiple identities salient simultaneously. Interdisciplinary team members perform various professional and task-oriented roles in the context of their group, but the very pretense of their union is based on their disciplinary expertise. At the same time, they are part of an interdisciplinary collective and so develop a group identity too. While some scholars argue that holding multiple identities is beneficial (Linville 1987; Thoits 1983, 2003), others highlight the problems that arise when multiple identities interfere in a given setting (Settles 2004; Van Sell et al. 1981). By exploring how individuals make sense of their own experiences in an interdisciplinary group, as well as investigating the conditions under which individuals emphasize various group affiliations or roles, my research will add to our understanding of how individuals negotiate "multiple identities" (Burke 2003) in new spaces, and also answer a call that researchers bridge identity traditions to yield "a stronger social psychology" (Stets and Burke 2000, p. 234).

*Power and Status in Science*

While the earliest sociological considerations of science and scientific knowledge production focused on the institutional nature of the scientific enterprise (Merton 1973), the field quickly expanded to consider how power, status, and self-interest shaped scientific understandings and processes[9]. Sociologists and other social researchers of science have applied these theoretical insights to examine how power and status shape scientific categories and

[9] Power is usually defined as the authority to compel others to act in a certain way and is often rooted in one's access to and control over resources. Status, on the other hand, often correlates with material power and structural position, but refers more specifically to a social ranking based on prestige or honor (Weber 1968).

understandings, as well as the process of scientific work more broadly (Merton 1968; Bourdieu 1988; Whitley 1984; Gieryn 1983, 1999; Zuckerman and Cole; Owen-Smith 2003; Frickel and Gross 2005).

In Robert Merton's original theoretical formulation of the sociology of science, he focused on the normative values of science, theorizing how universalism, communalism, disinterestedness, and organized skepticism characterized the field (Merton 1973). Social influences worked as a corrupting force on what would otherwise be a more objective, or "cognitive" scientific enterprise (ibid). But Merton's analysis unwittingly adopted many of the epistemological ideals and assumptions of an enlightenment science: by maintaining an impartial stance and rigorously applying methods, scientists could achieve an objective understanding of the real world. Merton's critics challenged his functionalist analysis, charging that science did not lie outside power structures, but rather was inherently shaped by them (Fox and Long 1995). Corporate and state interests influenced the scientific enterprise (Aronowitz 1988; Noble 1977), but so too did existing structures of inequality that shaped what topics were considered legitimate to pursue (Epstein 1996), who was allowed to participate in scientific knowledge production (Harding 1991), and what methodologies and epistemologies characterized the "best" science (Harding 1991; Haraway 1988).

Others highlighted that scientists themselves were often motivated by subjective concerns, so professional self-interest had always been part and parcel to the scientific enterprise (Mulkay 1976; Harding 1991; Bourdieu 1988). While novelty and innovation were touted as important goals, in practice, scientific advances are constrained by existing reward structures (Cole and Cole 1973) and a scientific elite who act as gatekeepers and control the peer review system (Whitley 1984). As a result, scientific evaluations, outcomes, and experiences were

widely stratified among fields and individuals (Cole and Cole 1973; Zuckerman and Cole 1975). And though the sciences were once loosely organized, the emergence of a rigid disciplinary system within the academy introduced status as an important component in scientific knowledge production (Whitley 1984). As scientists were forced to compete for resources, having the reputational advantage in their respective fields mattered all the more (ibid). Since it was against the culture of science (e.g. communalism) to crassly hoard one's ideas or innovations for personal gain, myriad status markers became intelligible signs of prestige among scientists.

Far from being impartial, scientists were often engaged in a struggle for legitimacy and power as they sought to leverage various forms of symbolic capital (economic, social, and cultural) to further their individual and disciplinary interests (Bourdieu 1984, 1988). Others developed these ideas to explain the symbolic distinctions that emerged as scientists competed for credibility and scientific authority in various contexts. Thomas Gieryn challenged the idea that scientific claims were fundamentally demarcated from non-science knowledge claims (those offered by religion, policy, art, etc.) by showing that scientists used different ideological justifications to claim scientific authority depending upon their specific goals. He demonstrated how scientists engage in "boundary-work"– that is, they choose from a range of strategies to distinguish science from non-science to further their professional interests. In later work, Gieryn (1999) elaborated this idea to consider how scientists engage in "credibility contests" as they compete for "epistemic authority" across scientific fields (on credibility see also Latour and Woolgar 1979).

Science studies scholars too problematized the notion of a rational, disinterested, and "positivist" science by illuminating how science has always been an inherently social process (Knorr-Cetina 1981, 1999; Shapin 1994; Latour and Woolgar 1979; Latour 1987; Epstein 1996;

Fujimara 1996). Though Science studies historically eschewed structural investigations of science in lieu of more ethnomethodological or interactional approaches, scholars from this tradition eventually turned their attention to issues of status and power in science by emphasizing the role of scientific legitimacy and politicization of science (Albert and Kleinman 2011; Shapin 1994; Haraway 1988; Galison and Stump 1996; Galison 1997; Frickel and Gross 2005). Others have argued that the role of expertise is important in evaluating the contributions of various stakeholders in science, especially within the context of multidisciplinary collaborations (Collins and Evans 2002; Gorman 2002). They argue that while scientists no longer can claim a monopoly on "truth claims," the problem of "extension" remains—that is, how much should the public and other interested parties contribute to decisions about technical decision-making (Collins and Evans 2002). By considering alternate claims to experience and expertise, these scholars further disrupt the legitimacy of existing scientific hierarchies and the power of established scientific experts (Collins and Evans 2002).

Scientists' claims for authority and status are legitimized by various structures and status markers. Scientific disciplines are hierarchically arranged, organized by intersecting continuums that confer power and status within and between fields (Cole 1983). The hard/soft scientific divide is one such continuum that has been used to characterize the disciplines. The natural, "hard" sciences have relatively high-status, and the social or comparatively "soft" sciences are lower-status disciplines. Hardness has historically referred to the level of internal consensus of the discipline (though this has been criticized by Cole 1983), but also the extent to which disciplines rely on the scientific method, employ testable predictions, and use quantitative methodologies as they gain purchase on scientific problems (Cole 1983). Disciplines are also situated on a theoretical/basic/applied continuum with the most theoretical or abstract sciences

(e.g. physics) given the highest status and more applied fields, especially those who are concerned with relatively low-status problems (e.g. social work and nursing) granted less. In this way, power relations between and among scientific disciplines shape one's scientific capital and reputational advantage (Bourdieu 1988; Whitley 1984).

The epistemological and methodological characteristics associated with the relative hardness or softness of a discipline also confer status, and often shape access to resources even within disciplines or fields. Michele Lamont (2009) traces the valorization of quantitative methods in sociology to the U.S. government's increasing dependence on social science researchers in the 20th century. As disciplines competed for resources, they increasingly sought to "quantify" their contributions to appear deserving of resources. The belief that quantitative methodologies are more rigorous and "scientific" than qualitative ones is still widespread in the sciences (Lamont 2009; Keller 1985).

Feminist scholars have weighed in, arguing that the status orders of science can best be explained by gendered biases and exclusionary practices (Harding 1991; Haraway 1989; Keller 1985). In her path-breaking book, *Reflections on Gender and Science* (1985), Evelyn Fox Keller argued that science is revered in part because of its historic association with men. As a result, Keller explains, science is culturally coded—or gendered—as masculine and maintains its cultural status because of its symbolic association with men. Scientific objectivity and rationality are also coded masculine, and thereby maintain status because they are juxtaposed against more subjective and emotional domains that are marked as feminine (ibid; Harding 1986, 1991). This creates multiple gendered hierarchies: not only between scientific and non-scientific pursuits, but also among and within scientific disciplines. The disciplines and methodological approaches deemed most objective are considered the most masculine, and designated as "hard."

Those that are perceived as more subjective are considered "soft" and associated with women. Feminists warn that these distinctions are deeply entrenched, self-perpetuating, and dangerous. Not only do gendered hierarchies create barriers for women pursuing scientific careers—who are cast as outsiders to the culture of science—but gendered status distinctions also work to discredit woman-centered and more subjective approaches (Hamilton 1993; Harding 1986).

Other status markers in science work to symbolically communicate and thereby perpetuate status on structural, cultural, and individual levels. Within the academy, institutional affiliation communicates scientific social capital (Bourdieu 1988; Burris 2004; Baldi 1995), linking elite scientists to other elite scientists, and thereby marginalizing those who hail from less prestigious universities and institutions (Lamont 2009). Institutional prestige has been shown to shape not only peer review assessments of scientific work (Chubin and Hackett 1990), but also salaries, and the disbursement of grants and other awards (Long et al. 1979). Other professional designations explicitly denote status. One's institutional rank and tenure (e.g. junior vs. senior, and more specifically, assistant, associate or full professor) and occupational position (e.g. research scientist vs. research professor) communicate one's power but also status in the academic sciences. Titles such as endowed chairs and "distinguished" professorships are allocated sparingly and also signify one's reputation and prestige in the field.

Productivity, referring to one's collective publication record, has long been considered the most important marker of one's contribution within the academic sciences, especially at research intensive universities (Xie and Shauman 1998; Long 1978). Productivity is at once considered an objective measure of output, but because of its link to the peer review process, it also carries reputational advantages. In the peer review system, scientific work is subjected to critical and "objective" scrutiny by one's peers to ensure that each contribution is rigorously

vetted by established gatekeepers in the field. But while publications, and especially the extent to which they are cited, have long been considered a measure of scientific quality (Cole 1973; Cole and Cole 1967), research continues to show that the peer review process itself is biased (Roy 1985; Chubin and Hackett 1990). Those studying peer review inevitably cite Merton's (1968) famous "Matthew effect" which demonstrated that high-status scientists were much more likely than their low-status colleagues to receive praise and recognition for subsequent similar accomplishments. Subsequent research has substantiated these claims. Because reviewers are not blind to the authors they are evaluating, one's rank, reputation, institutional affiliation, and assumed biological sex all shape reviewer expectations and reports (Chubin and Hackett 1990; Wenneras and Wold 1997).

Myriad other status markers and hierarchies operate to assess scientific contribution, many of which are linked to financial power and reputational prestige. Scientific journals themselves are arranged in a status pecking order. Each discipline or field has "top" journals that are considered the most rigorous and discerning (Bollen et al. 2006). Having one's work accepted for publication in a "top" journal carries more weight than if the same findings were published in a lower-tier journal.[10] Some argue that the proliferation of journals and online publication outlets has meant that grants and fellowships have become even more important as a sign of one's relative status in his or her scientific field. Long a sign of prestige and scientific autonomy, grants and fellowships, or "external funding" is further evidence that one's scientific contribution matters to the scientific community at large (Melguizo and Strober 2007). These funding mechanisms are also hierarchically ordered. In many scientific fields, being awarded an

[10] The preeminent status of disciplinary journals is a well-recognized problem among scholars of interdisciplinarity. Interdisciplinary journals tend to be less prestigious than disciplinary-specific journals. As such, publishing outside of one's discipline is a "risk" for interdisciplinary researchers and may negatively affect one's disciplinary assessment (National Academy of Science 2004).

R01, the NIH's oldest granting mechanism considered the "gold-standard" among individual investigator grants, is of paramount importance in securing tenure (Rockey 2014; Greenberg 2008). R01s not only demonstrate a project's scientific value, but they also communicate scientific autonomy and prestige for the investigator.

But grants not only communicate status for the individuals and teams who secure them, they also bring prestige and resources to their institutional homes (Melguizo and Strober 2007; Gonzales 2012). Universities gain status when their scientists are awarded prestigious grants, but also profit financially as they routinely take a percentage of the award to cover administrative and overhead costs (ibid). Other accolades administered by professional societies (e.g. the National Academy of the Sciences), prestigious awards like the Nobel prize, and simply being renown or "famous" in one's field confer status to both individuals and their departments and universities. Importantly, other status markers also imply power in local scientific contexts (Galison and Stump 1996). For example, being a principal investigator (PI) connotes status, but it also reflects one's scientific authority and power in the group. Collectively, all of these status markers work to communicate one's general status position within a scientific field, discipline, or academic department, but also at the micro-level, within a research team or collaboration.

One of documented risks of participating in interdisciplinary research is that the status dimensions are emergent, varied, and unpredictable (Rhoten and Parker 2004; Pfirman and Martin 2010). Though grants are increasingly earmarked for interdisciplinary research, these collaborations are still "risky" because their scientific products are likely to be evaluated within narrow and relatively conservative disciplinary status frames. In her study examining the review process of interdisciplinary proposals, Lamont (2009) highlights the role of status and symbolic boundaries during the evaluation process. By showing that experts still use disciplinary-specific

lenses as they evaluate others because their cultural training has already conditioned them to assess certain epistemological frames and methodologies as superior. Interdisciplinary researchers also suffer in terms of more "objective" criteria such as productivity. Researchers who specialize are twice as productive as those who pursued research in multiple areas over the course of their careers (Leahey et al. 2007).

While granting mechanisms, especially interdisciplinary ones, are looking to underwrite the next big discovery, the peer review process is inherently conservative and disproportionately publishes those who are known and established in verifiable networks. In this way, scientific "interdisciplines" share common ground with social movements, because they too face political contestations and resistance from the established order (Frickel and Gross 2005). But at the same time, interdisciplinary mergers and products also have the potential to be high-status outliers (Pfirman and Martin 2010). "Hot" interdisciplinary discoveries or innovative approaches that garner acclaim or change the way a field is organized carry a status reward of their own. A case in point is neuroscience, a successful interdiscipline that not only fundamentally changed existing scientific paradigms in many related fields, but also disrupted the status quo in terms of scientific status. Herein lies the status paradox of interdisciplinary science—which some see as reflecting Kuhn's 'essential tension' between change and tradition within science (Kuhn 1962; Weingart 2000)—it is inherently risky, but the potential rewards are great.

But while interdisciplinary science has the potential for game-changing acclaim, these mergers are likely to be shaped by deep-seated beliefs about science. Status is especially likely to confer symbolic advantages to individuals and groups as they seek to establish legitimacy in new spaces (Bourdieu 1988; Gieryn 1999, Lamont 2009; Zerubavel 1991). Questions such as who is considered worthy to join these collaborations, and how the expertise of various parties is

negotiated at the interdisciplinary table are likely to be salient (Collins and Evans 2002; Miller et al. 2008). In his study of a neuroscience lab, Jason Owen-Smith (2001) found evidence that multidisciplinary team members used skepticism as a control process to manage problems that emerged in an uncertain scientific work environment. Since one's scientific reputation is at risk by signing off on ideas or perspectives that are not fully understood (or vetted), status and skepticism are linked in multidisciplinary groups. In this study Owen-Smith not only revealed how skepticism was deployed, but he also foreshadowed the importance of claims of expertise in multidisciplinary science (Collins and Evans 2002). While Owen-Smith discovered that female scientists fared less well than their male colleagues, he argued that it was individuals' position in the group, rather than gender, that explained the processes of skepticism that he observed. By conceding that "systematically untangling the general effects of gender from more subculturally based expectations is beyond the scope" of his analysis (2001, p. 443), Owen-Smith alludes to a problem that scholars studying women's outcomes in scientific settings have made repeatedly—isolating the effects of gender is particularly difficult as it often correlates with other markers of status and occupational position (Xie and Shauman 1998; Charles and Grusky 2007; Williams 1989).

Since the experiences of women and gender as social category have both been largely ignored in interdisciplinary science (Rhoten and Pfirman 2007), inductively exploring how gender emerges as a salient difference in interdisciplinary research fills an important gap in this area. How might perceptions of gender shape individual experiences of interdisciplinary science? How might these perceptions and experiences in turn, influence behavior to ultimately shape the process and product of interdisciplinary collaboration? To situate the importance of

gender for this study theoretically, I turn to the scholarship that shows how gender acts as a powerful marker of difference at work, and in the sciences.

*Gendered Status Problems and Links to Inequality at Work and in Science*

Gender scholars have spent the last several decades working to decouple the assumed link between biological sex and gender in social research. Gender, they argue, is not a static role or identity that reflects biological sex differences, but rather a dynamic social process that is embedded in cultural beliefs, institutional roles, and enacted in context-specific ways (Britton 2000; Ridgeway and Correll 2004; Acker 1990). Because sex differences are one of the primary cultural schemas individuals use to make sense of each other during routine social interactions, beliefs about the differences between men and women are widespread. Importantly, because men have greater resources and power compared to women, gender beliefs communicate status and inequality as well as difference (Ridgeway and Correll 2000). Gender status beliefs, or "widely held cultural beliefs that evaluate one sex as generally superior and diffusely more competent than the other," (Ridgeway 1997, p. 221; Ridgeway 1991) are pervasive and mark men as more valuable and capable than women. By extension, masculinity and masculine characteristics are also valued more highly than feminine traits or those associated with women (ibid), so gender status attributions not only confer value to individuals, but also to cultural practices, behavioral expectations, emotional expressions, and a wide range of tasks, both paid and unpaid (Ridgeway 1991, 1997; Acker 1990; Williams 1995).

In this way, gender can be seen as a multilevel "institutionalized system of social practices," organized around maintaining difference and inequality based on biological sex differences (Ridgeway and Correll 2004, pg. 510; see also Ridgeway and Smith-Lovin 1999).

The gender system reflects, justifies, and perpetuates gendered inequality at multiple levels: at the macro-level of resources and cultural beliefs, at the interactional level as gendered patterns of behavior and routine practices reproduce gendered expectations, and at the level of identity as individuals continually construct a sense of a gendered self (ibid).

Conceiving gender as a system helps illuminate the mechanisms that perpetuate gender inequality. Because gender status beliefs are universal, they follow women in all situations where gender is salient marker of difference (Ridgeway 1997). Women are bombarded by messages that they are less competent than their male peers, which causes them to lose confidence and doubt their abilities, especially in arenas that are gendered masculine (ibid; Steele and Aronson 1995). Through interactions, women also confirm gender status beliefs by acting less assertively and deferring to their male peers (Ridgeway 1997). Moreover, because men are privileged by gender status beliefs, they ignore evidence that contradicts them (ibid). They are also less likely to see women as experts and evaluate women's work more harshly (Wenneras and Wold 1997).

Because gender is not fixed, it is negotiated in contextually specific ways. The "social relational context," or the specific arena where gender relations play out, is crucial because it shapes the way gender is variably deployed, enacted, contested, and understood (Ridgeway and Correll 2004). While these local sites are where change to the gender system is possible, gender status beliefs are resistant to change and often persist long after structural impediments to equality are dismantled (ibid).

Scholars have utilized the gender system to explain women's barriers to equality at work. Gender status beliefs work to shape perceptions about the nature of paid employment, who is best suited for different types of work, and notions of professionalism and workplace behavior. At the macro-level, there is widespread sex-segregation across occupations, but also within

occupations as men receive higher pay and assume the more prestigious positions within most fields (Charles and Grusky 2007). While it was once assumed that women had less economic power because they chose lower-status jobs and professions, research has shown that when an influx of women enter an occupation, it become feminized and loses status (Williams 1989). Men too recognize the low status of work that is female-dominated and instinctively stay away from these professions and jobs. Sociologists note that this reflects a universal gender status belief—women's work is devalued, regardless of the nature of the work (Williams 1995).

Within organizational contexts, cultural beliefs about gender also continue to shape the micro-level institutional structures and policies that normalize the experience of the male worker (Kanter 1977; Reskin 2000, 2003; Fletcher 1999; Williams 1989; Reskin and Roos 1990; Britton 2000). While Kanter (1977) was the first to theorize that the "masculine ethic" at work allowed for males to easily assume managerial roles, other researchers have developed this idea by showing that gender stereotypes confer advantages to men as "ideal workers" and "natural" leaders (Ridgeway 1991, 1997, 2001; Ridgeway and Correll 2004; Acker 1990; Eagly and Karau 2002; Williams 1995, 2000). At the same time, women struggle to have their authority and expertise recognized in professional arenas (Fox 2001). This is compounded in male-dominated professions where men often enact gendered exclusionary practices as a way to emphasize a masculine culture and maintain their higher status (Traweek 1988).

Other researchers have focused on how gendered beliefs shape behavioral expectations at work. Because individuals are held accountable for "doing" normative gender, they reproduce gender differences during routine interactions (Connell 1987; West and Zimmerman 1987). As gender ideologies get routinized through interactions, they become institutionalized structures of gender over time (Connell 1987; Ridgeway and Correll 2004). But importantly, women alone

suffer a double bind for "doing" gender at work. When they acting in normatively gendered ways, they seemingly confirm gendered status beliefs and are discounted as being less competent than their male peers. If they act assertively or in other characteristically masculine ways, they are penalized for not "doing" gender properly (West and Zimmerman 1987). In contrast, men who pursue work in female-dominated professions experience a "glass escalator" as universal gender status beliefs work in their favor. They are seen as adding status to women's fields and are promoted more quickly than women (Williams 1995).

Women are also expected to take on the burden of feminized emotional labor at work (Hochschild 1979, 1983). Because women are materially disadvantaged compared to men, they must make a resource out of managing others' emotions on the job. While "doing" this type of gendered labor is not natural, but rather strategic, emotionality becomes linked to women and is further devalued as a feminine trait (ibid; see also Pierce 1995). In academia, female faculty members are also expected to be more emotionally responsive to their students' concerns and are penalized if they don't show "warmth" as well as competence (Kierstead et al. 1998). Similarly, other researchers have found that "feminized" relational practices—the cooperative and team-oriented behaviors that are touted as necessary for innovation and change within organizations—are devalued when promotions and other rewards are handed out (Fletcher 1999). Taken together, these findings hint to a potential problem for interdisciplinary groups in the sciences: while studies show that interdisciplinary scientific collaborations benefit from those who have the relational skills to communicate across disciplines, these very abilities are gendered and might be devalued as ancillary to the science in interdisciplinary contexts.

*Gender and Science*

Within the sciences, women face other barriers to equality. The masculine culture of science (Keller 1985) creates an exclusionary environment that shapes women's sense of belonging from the outset (Traweek 1988). In the last several decades, there has been a concerted movement to understand and eradicate persistent gender inequality in women's representation and participation in the science, technology, engineering and math (STEM) fields, and in the academic sciences more broadly (National Academies of the Sciences 2007; Stewart et al. 2007). Researchers have uncovered that the goal of women's equal participation in the sciences is elusive in part because beliefs about gender inequality are deployed and reproduced on multiple levels simultaneously, working to create barriers for women at structural, cultural, interactional, and individual levels (ibid; Ridgeway and Correll 2004).

Historically, the problem of few women in the sciences was one of access. Deep-seated beliefs about the innate biological differences between women and men (Pinker 2003; Baron-Cohen 2002) were often touted as the rationale why women were deemed unfit for scientific work; women were considered both cognitively and emotionally incapable of pursuing serious careers in the sciences (Keller 1985). These beliefs were reflected in socialization practices as boys were encouraged from an early age to develop the skills necessary to participate in scientific work, while girls were often told that they were not as innately talented or capable as boys and men at these serious intellectual pursuits (Jacobs and Eccles 1992; Valian 1998; Tenenbaum and Leaper 2003). Women who pursued interests in science or math despite the pervasive cultural beliefs working against them often encountered structural impediments that reflected the same widespread gender beliefs. Explicit policies of exclusion (e.g. gender-based admission policies) and overt gender discrimination within scientific arenas worked to

effectively keep women from participating and succeeding within the sciences (Valian 1998; Harding 1986).

While research has disproved theories of biological sex differences in mathematical or scientific abilities, these beliefs persist.[11] Research continues to demonstrate how widespread cultural beliefs about gender still insidiously shape women's interest in the sciences as well as their self-perceptions of their scientific abilities. For example, children of both sexes believe that men (especially white men) are the archetypal scientists, and that internalizing cultural beliefs about who can be a scientist discourages girls from pursuing scientific careers (Finson 2002; Keller 1985; Harding 1991; Eagly and Karau 2002). Stereotype threat research also confirms that deep-seated gender beliefs about women's abilities as compared to men are easily triggered and affect performance (Steele and Aronson 1995). When primed about sex differences in math, women perform worse on standardized tests than when they are not primed to consider sex differences at all (Spencer et al. 1999).

Despite these obstacles, women have made considerable inroads into many scientific fields yet still face significant challenges as they pursue careers in the academic sciences (Etzkowitz et al. 2000). Many scholars focus on the "leaky pipeline" analogy, showing that at each successive stage of academic scientific training, women "leak" out at higher rates than men, leaving the sciences to pursue other educational or professional paths (Kohlstedt 2004; National Academies of Sciences 2007). Those who remain are promoted more slowly at every rank and are also underrepresented at the highest ranks in the academy across scientific disciplines (Valian 1998).

[11] As evidenced by then-Harvard president Larry Summers' 2005 controversial remarks on women's diminished aptitude for high-level science in his speech at the National Board of Economic Research Conference.

Others note that the masculine norms of competitiveness and aggression create a "chilly" climate for women (Traweek 1988; Sallee 2011). The "old boys" network also persists to sustain gender inequities in science at the cultural level (Nettles and Millett 2006). Women feel like outsiders and have a difficult time securing access to informational networks and finding reliable mentors compared to their male colleagues (Zuckerman et al. 1991; Reskin 1978; Fox and Long 1995; Valian 1998; Xie and Shauman 1998). Unconscious biases against women affect their progress in direct ways too. Women are less likely to be seen as "experts," (Fox 2001) and the peer review process has been shown to privilege men, revealing gender to be another salient status marker that operates in scientific evaluation (Wenneras and Wold 1997). Moreover, when women underperform compared to men, the gap in their outcomes is often attributed to their natural proclivities or choices as opposed to fundamental structural inequalities (Valian 1998). For decades, researchers sought to solve the "productivity puzzle" (Cole and Zuckerman 1984). Women had long lagged behind men in terms of research productivity in the sciences, which perpetuated assumptions that they were capable of competing with men in the sciences. Xie and Shauman (1998) dispelled this explanation showing that it was actually structural inequalities that explained women's lower productivity levels.

Undoubtedly, the very real historic exclusion of women from scientific fields continues to yield a persistent effect on the composition and status of scientific disciplines. In the academy, most scientific disciplines are still stratified by gender, with women underrepresented at the highest levels in most fields (Valian 1998). There is also an inverse relationship between the number of women in the discipline and the relative status of the field (Zuckerman et al. 1991; Rossiter 1982; Xie and Shauman 1998; Traweek 1988). And while explicit gender discrimination and sexual harassment still are more likely to affect women than men in the

sciences, it is most often seemingly neutral institutional practices that work to disadvantage women under the radar. Expectations of performance and work are often based on male normative experiences and life trajectories and so effectively discriminate against women in practice (Etzkowitz et al. 2000; National Academies of Science 2007). For example, childcare responsibilities still disproportionately fall to women, so work-life balance issues adversely affect women's career progress to a greater extent than their male colleagues.

The gender system is also useful in understanding gender inequity in the sciences. Cultural beliefs about gender continue to perpetuate biases and unconscious prejudices against women, which in turn reproduce barriers to their equal participation in the sciences on multiple levels. Gender beliefs not only create a "chilly" climate for women in the sciences, but they also work on the individual level to shape women's self-concept, professional expectations and self-confidence as they pursue careers in the sciences (Etzkowitz et al. 2000; Ridgeway 1991, 1997). This helps explain why, despite myriad structural changes to level the playing field in the academic sciences, women are often still plagued by self-doubt and feel like outsiders to science.

As scholars continue to tackle the persistent bias and barriers that prevent women's equal participation in the sciences, there are several untapped avenues for exploration. First, scholars from many disciplines have noted that gender is not the only axis of disadvantage that affects women in the sciences. There is considerable evidence that women of color suffer multiple disadvantages as they seek to establish careers in the sciences (Collins 1999; Turner 2002). Other researchers have also found that exploring the salience of identity categories is key to understanding women's cultural experiences and goodness of fit in the sciences. Some research shows that women's feminist and scientific identities are in conflict in the sciences, revealing how internal identity processes might undercut women's perceptions that they belong in

scientific work (Settles 2004). This research suggests that other salient markers of status or identity might influence women's self-concepts and perceptions of inclusion in the sciences. While scholars recognize that intersectional analyses are crucial, they often prove difficult to implement in empirical research (Choo and Ferree 2010; Shields 2008). For these reasons, inductive explorations of difference that consider how multiple systems of oppression operate simultaneously to marginalize some members of the academic sciences will help articulate the mechanisms of disadvantage in scientific settings.

Finally, conceiving of different scientific disciplines, academic departments, and interdisciplinary research teams as specific social relational contexts helps give theoretical purchase to why women's experiences in the sciences vary across scientific settings, disciplines, and even from lab to lab (Ridgeway 2009; Smith-Doerr 2004). Though women were once thought to fare better in the less hierarchical, network-based organizational structures in for-profit research sectors (Smith-Doerr 2004), subsequent research complicated this finding (Whittington and Smith-Doerr 2005). The dominant gender frame in any given context matters in shaping women's outcomes in the sciences. Thus, while women in biological sciences do better in network-based contexts, women in the physical sciences (where women are underrepresented) actually fare better in settings that have more formal provisions for equality (Whittington and Smith-Doerr 2008; Ridgeway 2009). Given the multiple factors that explain and continue to perpetuate women's unequal participation and sense of belonging in the sciences, closely examining the effects of one specific context will contribute to understanding women's experiences in the sciences (Ridgeway and Smith-Lovin 1999; Ridgeway and Correll 2004; Ridgeway 2009).

*The Women's Health Arena: A Unique Context*

For scientists working in women's health, there are additional layers of gendered status distinctions that shape the terrain of scientific work in this arena. The ascendance of the medical profession broadly, and the professional domination of obstetrics more specifically, were from the start, marked by the exclusion and subordination of women (Freidson 1970; Starr 1982; Light 1988; Manley 1995; Rossiter 1982; Kobrin 1984). Women were not permitted to enroll in medical schools, and female midwives and other lay practitioners who had historically managed women's health care were marginalized to the fringes of society or relegated as feminized support staff in the field of nursing (Manley 1995; Rossiter 1982; Kobrin 1984). In this way, medicine quickly and effectively institutionalized a gendered hierarchy where male physicians alone were legitimate producers of medical knowledge. The subsequent sex-segregation of the allied health professions reflected this history of devaluing women and "followed a single principle: the higher the prestige, power, and pay of the occupation, the smaller the proportion of women." (Anspach 2010, p. 230).

Scholars who focus on interprofessional collaborations and cross-functional teams continue to trace the effects of medicine's power and control over expert knowledge within group settings, exploring how the status and power of the medical profession undermines collaborative efforts in both team research and medical education (Whitehead 2007; Atwal and Caldwell 2006). Nurses in particular have often noted that their perspective, representing a patient-centered or experiential approach to knowledge production, has been historically discounted as doctors' authority was inviolable and their medical expertise considered superior (Atwal and Caldwell 2006). This mirrors what other feminist health researchers have long claimed: that science still reflects the problems and priorities of its history as a male-dominated

enterprise that is fundamentally biased against women (Harding 1991; Keller 1985; Hamilton 1993).

In the women's health arena, however, gendered relations at work are further complicated by both the historic legacy of the disempowered female patient and the politicization of women's reproductive health. Since the earliest medical accounts, women have been depicted as emotional, unreliable, and thereby unfit to make decisions about their own bodies (Ehrenreich and English 1978). Their reproductive bodies and processes were portrayed as volatile and in need of medicalized "scientific" regulation (Martin 1987; Clarke 1998). Some argue that these unfavorable portrayals served to prop up the professional authority and scientific credibility of doctors at the expense of women's health (Ehrenreich and English 1978; Hamilton 1993). As such, scientific issues and concerns that are of importance to women, as well as more qualitative, woman-centered methodologies that give voice to female patients and research participants have long been devalued in the hierarchies of the sciences (Harding 1986, 1991; Lamont 2009; Hamilton 1993). The politicization of women's reproductive health has further silenced women's voices by transforming their private choices into public policy debates (Rapp 1999; Luker 1984; Thompson 2005). For these reasons, reclaiming a feminist standpoint or feminist epistemology has been a priority for many researchers in the allied health professions and for those studying women's health more broadly (Hamilton 1993; Pols 2014).

Given the history of medicine's professional dominance within the allied health professions in terms of both power and prestige, neglecting the role of status in interdisciplinary research groups in the health sciences is particularly troublesome. As medical decision-making becomes more multi-vocal and open to public debate, doctors' monopoly on expertise is increasingly challenged (Hamilton 1993; Pols 2014; Vestal 2013). This opens the door for

previously marginalized participants to assert their claims for expertise in healthcare settings and within the context of scientific knowledge production (Collins and Evans 2002; Pols 2014).

*Conclusion*

While scholars from various fields have explored the effects of status, many of these disparate traditions are not in conversation with one another. Moreover, the canon on interdisciplinarity has ignored much of this scholarship, most notably, research that explores how gender shapes science and working groups. By drawing from these diverse literatures my project develops a more robust theorization of status in interdisciplinary scientific collaborations.

# Chapter 3

## Explaining Difference in the BIRG: "Different but Equal" or "Outsiders Within"

### Introduction

When I first met with the BIRG's principal investigators to request permission to study the group, I was welcomed with open arms. I sensed that the principal investigators seemed to genuinely like one other, and were happy to have someone come and observe their successful collaboration. But the longer I spent with the group, the more I found myself jotting down notes about awkward pauses and writing things like "there's more going on here" in my fieldnotes. I couldn't quite put my finger on it, but something wasn't quite right. The more data I collected, I began to see that the story of the BIRG as a happy and harmonious family wasn't exactly complete.

In this chapter I set the stage for my empirical analysis by outlining how BIRG members experienced difference in the group. As I mentioned in the introduction, my project's primary research question was simply: How do members of the BIRG understand and negotiate difference within the interdisciplinary group? I start by unpacking a key finding—that is, when I talked to team members, they described vastly different experiences within the BIRG. And there was an undeniable pattern: the engineers and doctors spoke of mutual respect, true collaboration, and egalitarianism, while the nurses described feeling unappreciated and like they were outsiders to the club.

I also discovered that the disciplinary groups were not equally integrated. While the PIs were long-standing collaborators, their respective research teams did not collaborate in equal measures. When I asked BIRG members about disciplinary differences within the context of their shared work, my analysis revealed important differences which fell almost perfectly on disciplinary lines. On the one hand, the doctors and engineers shared stories reflecting true collaboration with each other. The engineers and doctors shared common research approaches, interests, and methodologies. They both adopted a biomechanical approach to problem specification and measurement, strongly valued objectivity in data collection, and preferred tightly controlled cross-sectional research designs that could be executed, analyzed and written-up relatively quickly. Getting papers "out the door" was also of utmost importance to both engineering and medicine, so they work-shopped everything from ideas, conference presentations, and drafts of articles on shared publications, all in the effort of moving the research along. To be sure, they experienced disciplinary differences—cultural differences, language differences, differences in disciplinary schedules and time commitments—but importantly, these differences never proved to be problematic or hindered collaboration. In fact, they often framed their differences in terms of "sharing strengths." And while disciplinary differences justified the collaboration—no doubt in part because the team was funded by the prestigious IRSAG grant, a competitive NIH grant earmarked for scientific interdisciplinary research on issues related to sex and gender—the engineers and doctors also told "sameness stories" to consolidate an interdisciplinary culture and group identity.

The nurses, however, offered a very different take on interdisciplinary collaboration in the BIRG. I began my introductions and observations of the BIRG at the investigator level, where I would routinely see Tom and Phillip meeting with Anna and sometimes Karen, a nursing

Co-I with the group. But the longer I spent observing the BIRG, the more I realized that the interdisciplinary collaboration with nursing did not trickle down to Anna's actual research activities or include her staff and research associates. The nursing team, with a few exceptions, seemed to work only with each other and exclusively on nursing projects within the BIRG.

Although the BIRG trainees in medicine and engineering could provide rich details of their collaborative work with each other, they would frequently mention that they did not really know much about the nurses' work, guessing that the nursing group pursued different interests within the larger research area. Some went so far as to lament this fact, wishing they could spend more time training with Anna, whom everyone, especially the female junior associates from medicine and engineering, admired. So I wondered, was it merely shared scientific interests that made natural collaborators out of the engineers and doctors while leaving the nurses to work on their own projects?

After months of observation and careful analysis of the data, I began to understand the complicated answer to my question. I discovered that the relative isolation of the nursing team occurred neither by accident, nor did it simply reflect nurses' desire to work alone. Rather the nurses largely worked by themselves because they did not feel like their scientific interests were shared or valued within the BIRG's interdisciplinary context. The nurses espoused a patient-oriented, feminist research perspective that sometimes clashed, albeit quietly, with the goals of engineering and medicine. Their projects were longitudinal and as a result, were often messy and slow going, their data collection complicated by a commitment to protecting and retaining their female participants at every level. This had the effect of slowing their day-to-day progress and detracted from their productivity in the group.

I also learned that these disciplinary priorities or differences—between engineers and doctors on the one hand and nurses on the other—were not mere differences. Rather these different perspectives and approaches were attached to a sense of value and affected individual experiences in the group and the collaboration as a whole. While the doctors and engineers talked of a "different but equal" culture in the BIRG, the nurses did not share this belief or experience the group in this way. When I spoke to nurses in interviews, they were the only BIRG members who failed to tout "respect" as a shared group ethic. And all but one nursing researcher described situations or experiences where they felt their professional values, strengths, and work were not appreciated in the group. From their vantage point, the nursing approach was ignored—or even worse, actively devalued within the group. I began to see that the engineers and doctors were the real interdisciplinary players in the group while the nurses bided their time at the table as "outsiders within."[12]

### *Muscle Meetings: an Environment Conducive to Collaboration*

When I first began observing the BIRG, I was invited to attend the group's weekly "muscle meetings."[13] This was a standing, Wednesday morning meeting where BIRG engineers and doctors worked on various aspects of their shared work. These meetings were my primary introduction to the BIRG's scientific projects, and I soon realized that the nurses never attended

[12] Patricia Hill Collins coined the term "outsider within" to describe the experiences of black women who had a unique standpoint because of their experiences of oppression along race, gender, and class lines. Because they were not privileged within the system on multiple levels (outsiders), they could better critique the institutional structures and culture from within. Collins noted that this standpoint gave rise to an activist mindset and the tradition of black feminist thought. In later chapters, I develop the idea that the nurses' outsider status similarly inspired a moral stance within the group.

[13] When creating a pseudonym for these meetings I decided on "muscle meetings" because the engineers and doctors adopted a reductionist view of birth injuries. They were largely concerned with the musculature of the pelvic floor and thus did not reflect on the women depicted on MRI images or in 3D models who experienced birth-related injuries. This stands in contrast to the nurses who adopted a woman-centered approach as they considered birth-related injuries and complications.

the muscle meetings, though I learned later that many years earlier, Anna did attend at one time. But during my time with the group, the muscle meetings were a collaborative space where the engineers and doctors worked together on their shared research. Because these meetings were held every week, I learned quite quickly how the two disciplinary groups, and their individual members, worked together.

With both Tom and Phillip presiding, the content of the meetings ran the gamut from brainstorming sessions, where both sides would consider new ideas and hash out research designs, to intricate negotiations on shared interdisciplinary projects. A typical week's conversation might first address how to use 3D modeling software to make reliable measurements of muscle tissue, and then shift to consider ongoing challenges with a project's experimental trials. Negotiating terminology and deciding how to best analyze shared data were also frequent topics of conversation. Some weeks one or more junior scholars were "on," presenting their shared work or asking for help on a challenge or problem. Other times, the meetings were turned over to help produce or polish work going out the door—workshopping manuscripts and upcoming conference presentations were frequently on the docket.

Not only was there much interdisciplinary give-and-take as BIRG affiliates negotiated conventions, scientific approaches, and shared research protocols, but Tom and Phillip also offered interdisciplinary mentorship to each other's junior colleagues and associates. Attendance varied from week to week, as specific group members negotiated other commitments or research obligations, but there was an open-door policy—everyone from both research teams was welcome when they were able to make it. Visiting scholars also attended periodically. Summer research fellows and colleagues in town for short trips were invited to come share in the research process as they trained with the group.

The open-door policy dovetailed with the tone of the meetings themselves. Tom and Phillip were typically both in attendance, unless one was out of town for a conference or presentation, and they led the meetings in an "open" and "laid back" format that encouraged open discussion and intellectual curiosity. Team members from both disciplines shared with me that it was a safe space "conducive to collaboration." The meetings certainly had a professional structure, yet they were also lively and collegial. Junior fellows and trainees came and went as needed—people often arrived late or left early. And the level of participation from everyone around the table was impressive. Those in attendance appeared both engaged and respectful. It was commonplace for attendees of all levels—students, post-docs, fellows, and Tom and Phillip themselves—to jump in and offer useful feedback to their colleagues' concerns and questions, brainstorming ideas and solutions to shared problems.

The muscle meetings not only provided the physical space to have ongoing, interdisciplinary conversations, but junior scholars and those new to the group experienced firsthand what interdisciplinary collaboration in the BIRG looked like. When I later interviewed BIRG engineers and doctors, all team members from these two disciplines, without exception, mentioned that the regular meetings were critical to the group's interdisciplinary success. I heard from many team members that everyone, no matter how junior, was encouraged to share their ideas and learn from each other. Every opinion was valued and of potential use to the shared science. Here Sarah Pinker, a medical fellow, shared her thoughts about the muscle meetings:

> Because I think when you have the experts in the room, it can be kind of awe-inspiring and intimidating to say something if you see something that might be a little bit off and they're not bringing it up. But the environment in there has always been so supportive to say things. No one will say, oh well that's a dumb idea. It's always, 'that's an interesting perspective'.

Others emphasized that while Tom and Phillip provided different perspectives, they modeled a true interdisciplinary dialog. When I asked Chelsea, an engineering student, what she thought worked well in the BIRG, she too highlighted the weekly exchanges in the muscle meetings:

> I think a lot of it is the communication at the Wednesday morning meetings. Especially, I think that Dr. Gavin and Phillip set a really good example the way they sort of go back and forth and really show everyone their different perspectives and how they can talk about them. And I think everyone is willing to tell other people where they're coming from. This is how you need to understand it engineering-wise and this is how you have to understand it medically.

Here, Chelsea captures two refrains that I heard from many other team members: First, the muscle meetings provided a forum for collaboration, a regular physical space where each side could come together and work on shared problems and concerns. But just as important, the muscle meetings were also a symbolic space that fostered a willingness to share. Tom and Phillip, as disciplinary leaders, were instrumental in modeling and facilitating interdisciplinary collaboration between their respective research teams. But they were modeling much more than just a scientific back-and-forth. Tom and Phillip's presence at the muscle meetings also set the tone for the partnership, collegiality, and mutual respect.

### *Mutual Respect and No Hierarchy*

In addition to sharing regular time at the table in the weekly muscle meetings, I learned from BIRG engineers and doctors that respect for one's colleagues was a critical component of their successful union. On this front, Tom and Phillip again modeled the behavior they hoped to see in their protégés. Everyone from these two disciplinary teams, without exception, spoke in some way of their deep, mutual respect for one another's disciplinary approach and scientific interests. BIRG members frequently touted this respect, recognizing that it facilitated

collaboration between the two teams. Robert, a physician who worked with the group put it like this:

> I'd say that first of all, there's great mutual respect between them…You know, for instance, a lot of times you find a difference and you suddenly put up a defense, like, you don't worry about that because this, and you kind of dismiss it, but really to compliment someone like Dr. Gavin or Dr. Andrews—they tend to be very open to try to understand what's of value with that different opinion.

Far from being threatened by new ideas, both Tom and Phillip were open to the other's perspective. Among BIRG members from engineering and medicine, Tom was often described as a "visionary" and Phillip was universally heralded as having the ability to objectively see value in boundary-breaking science. Often, team members highlighted that Tom and Phillip, as interdisciplinary colleagues, were actually more accepting of the other perspective than members of one's own discipline. Here, Ri, an engineering graduate student, reflects on Tom's unique ability to respect an engineering perspective, even a highly theoretical one often dismissed by other engineers.

> I mean, I think that Dr. Gavin completely accepts the engineering approach, completely accepts it—is happy to apply engineering mathematics to medical science. He believes in that. I think that some doctors think you guys have your fancy math stuff that might be only for theoretical modeling or something. Even within engineering, experimental guys, they don't believe in computer modeling. They think computer modeling is good for presentations or something.

Junior researchers from these two disciplinary teams also experienced mutual respect in the BIRG. They frequently described a culture of respect, often citing examples from the weekly muscle meetings. When I asked Chelsea, an engineering student, what she saw as the most important thing for interdisciplinary science, she described respectful communication and equality as critical dimensions to a successful interdisciplinary partnership.

> I think two-way communication. Not only telling people, but really listening and processing other people's perspectives. A lot, I think…being peers with everyone is really important, I mean nobody looking down on anyone else really. You're a lot more open that way. I think that's really, just communicating and being on the same level, you're going to get the most information across and have success.

The importance of being "peers with everyone" was salient for all of the BIRG members from engineering and medicine. A culture of mutual respect and equality sustained the idea that each side was truly sharing strengths at the interdisciplinary table. Members of each side believed that their perspective was equally valued in the scientific enterprise. Not surprisingly, linked to the "mutual respect" narrative was an oft-cited perception among engineers and doctors that the two groups worked together with a flat organizational structure where everyone, no matter how junior, had something to contribute. Chelsea spoke of the importance of "being on the same level," and others did too. Everyone knew that Tom and Phillip were technically in charge—in fact many spoke of their great leadership—but neither had a need to explicitly invoke hierarchy, which made the BIRG feel like a true team. Many group members went so far as to describe Tom and Phillip as being the rare "egoless" researchers who were "open" to new ideas and not threatened by novel collaborations. And more broadly, the group's leaders, I was told, were not mired in the professional jealousy and divisive competitiveness that often characterized academic research groups. Here, Sarah described the lack of hierarchy and the value attached to all perspectives:

> So I came in as basically, I just wanted to be a member of the research team, be one of the people involved in the collaborative efforts. And I think that they do an incredible job of making it feel like a team. There's really no hierarchy within the meeting with the exception of—I mean both Dr. Gavin and Dr. Andrews are very accomplished, well-known researchers. The rest of us, when I first started, there were other faculty members from urogynecology involved and there were other Ph.D. researchers who had been around a lot longer, but there was never a sense of your opinion is any less because you're new. It was very much a, everybody-comes-with-their own-strengths, and just because you're a new person doesn't mean that your input is any less. So there wasn't really hierarchy.

For their part, Tom and Phillip also both emphasized the importance of mutual respect and equality in facilitating interdisciplinary relationships. Here, Tom offered the secret to the group's success:

> Well, there is one anatomy, one physiology, one set of dysfunctions, and there are people of two different backgrounds looking at the same thing. And so as long as everybody's trying to understand the same thing and as long as everyone gets along and respects one another, it all falls out pretty easily.

The leaders' approach set the tone, and the group's culture mirrored an inclusiveness and collegiality that was, I was told, off-putting to ego-driven and arrogant people. As a result, researchers who were interested in harmonious and egalitarian interdisciplinary collaboration pro-actively self-selected the group, while those who were not "team players" opted out once they recognized that self-serving, bad behavior was not tolerated in the BIRG. Sarah recounted how one woman who shared professional interests with the team immediately clashed with the group's egalitarian culture and left. Elaine, a physician and Co-I in the group also spoke to this issue:

> We've tried to bring in a few people that weren't so nice, and they didn't last. […] You're not going to be part of our group. And that did happen with one person. And it was just like, sorry. And it was because it was all ego and power and you know? Well, we share everything. We're not like that. And so it was like okay, no, we're not going to work like that.

Many BIRG members from these disciplinary teams shared similar sentiments or anecdotes. Internal competition and large egos, I was told emphatically, had no part in the BIRG. When I asked Tom about conflict in the group, he agreed that conflict-oriented people, or those averse to working as a team, were definitely the exception. He explained it in terms of norms: "Yeah, there isn't a lot of conflict in the group, so if somebody raises a bunch of conflict, they're kind of outside the cultural norms."

But the inclusive collaboration between engineering and medicine went beyond merely avoiding conflict and cultivating professional respect. I heard from many junior scholars that the BIRG was unique in that it not only supported the science, but supported the researchers as people too. It was striking how many engineering students and medical fellows described feeling autonomous in the BIRG. Not only did they feel like they were making a scientific contribution, but that they had independence and professional freedom within the group as well. Jane, a medical student, was surprised at the independence she enjoyed working with the group on summer research fellowship. As a student, she expected to just work as a hired hand on someone else's project but instead organized her own project and would be first-author on a publication from her data. She was treated as an equal, someone who could make an independent contribution to the scientific effort, and this was a pleasant surprise.

Moreover, junior scholars from both disciplines described feeling valued not only for their unique insights and ideas, but also as individuals with their own professional interests and budding careers. Jenni, an engineering graduate student, shared that Phillip encouraged her to develop as a young scholar in addition to making contributions to the BIRG's research agenda. As a result, she felt tremendous license to pursue projects and professional development opportunities that interested her while working within the group. Gwen, a medical fellow, explained that working with the BIRG was considered " the most benign fellowship around." Unlike other competitive, cut-throat programs where the goal would be to further supervisors' careers or research on the backs of fellows' labor, in the BIRG, the goal was flipped—the program was designed so each individual could find their niche and flourish. She reflected on this during our interview, "So I think their primary goal—I mean we all work hard—but their primary goal is to see us grow as professionals." This, she assured me, was not typical when

working for senior researchers in academic science. Other group members from these two disciplinary teams concurred, noting the freedom and professional respect that pervaded the scientific enterprise in the BIRG. Disciplinary perspectives were considered important assets in the interdisciplinary exchange, but individuals mattered too.

Perhaps not surprisingly, I learned that the lack of hierarchy and conflict, as well as the harmonious relations between the engineers and doctors, mirrored Tom and Phillip's working relationship. Theirs was nothing if not a partnership between equals. While Tom was the lead principal investigator of the entire IRSAG grant, both he and Phillip were the PIs of their respective disciplinary projects and relied heavily on each other's professional experience and opinion. And because they had worked together for so long, they had an uncanny appreciation and understanding for each other's disciplinary perspective. Many BIRG members noted their professional compatibility and the equality of their scientific perspectives at the interdisciplinary table. Several others noted that their bond transcended science—after all these years, they were friends too.

Tom and Phillip also spoke of each other and their scientific partnership in glowing terms. They each considered the other to be indispensable, irreplaceable even, as a colleague. Phillip told me that generally, he was wary of collaborating with surgeons because they often expected professional deference. He explained that his "antennae are up when I meet a physician for the first time," especially surgeons, because "they are arrogant" and "treat everyone else like technicians." But he went on to clarify that "only one in ten thousand orthopedic surgeons in the country" were like Tom, whom he considered to be "very humble" and "thoughtful." When describing Phillip, Tom positively gushed:

> Everybody looks to Phillip, you know, because of his wisdom and his experience and his good natured, even-tempered, unflappable, always-helpful…I still

> remember one time—before every grant goes in, there is a time when it is the dark night of the soul—when you do not believe that you can get anything done. I remember one time calling him at like 10:30 at night, you know, when I was just kind of at my wits' end and Phillip just said, 'you know, oh, I'll come over.' And so we were sitting in the office here until about 2:00 in the morning, you know, just because Phillip was just so kind and generous.

Tom and Phillip's mutual respect was infectious, and it set the tone for collaboration between their two teams. In interviews with BIRG members from engineering and medicine, everyone, without exception, spoke of Tom and Phillip's bond and their long-standing and fruitful interdisciplinary partnership. In fact, their partnership was so universally lauded, that I began to see that their relationship itself helped explain the relational dynamics and larger culture of the BIRG.

### *Different but Equal*

When I spoke with the engineers and doctors in formal interviews, I heard elaborate stories of successful integration between the two cultures as team members described how they negotiated differences and the importance of trading expertise and strengths across the interdisciplinary table. Collectively, I noted, these stories captured the sentiment "different but equal."[14] The engineers and doctors acknowledged that differences existed, but each side was committed to the collaboration, believing that an interdisciplinary perspective was essential to move the science forward. When challenges arose, individuals from both disciplines reported that mutual respect, open communication, and structures for success helped foster solutions.

[14] I use "different but equal" consciously here to denote the contrast between my findings and experiences of researchers elsewhere who argue that difference almost always signifies inequality (e.g. Epstein 1992; Tilly 1998). "Different but equal" also alludes to the premise of "separate but equal" outlined in Plessy vs. Ferguson (1896), the U.S. Supreme Court case that upheld the constitutionality of state laws allowing for racial segregation as long as facilities and policies were deemed "equal." In practice "separate but equal" allowed for widespread racial inequality and discrimination until Brown vs. Board of Education (1954) declared this practice unconstitutional.

Finally, team members from engineering and medicine reported feeling important and believed they made a contribution to the shared science.

*Seeing Differently*

Disciplinary differences were easy to spot for the engineers and doctors. In fact, they mentioned them during meetings all the time. Some differences between medicine and engineering were considered epistemological, as they captured how each disciplinary perspective thought about or saw dimensions of a problem. Others, equally important, captured different disciplinary skill-sets and abilities. Importantly, however, the engineers and doctors saw differences as valuable assets in their shared work—in short, the two teams saw themselves as "different but equal."

The most salient difference between the two disciplines was in how they saw and approached the subject matter. Engineers, I heard, saw the problem in theoretical and mathematical terms, often proposing formulas as part of the solution in scientific discussions. Spatial awareness, quantitative analysis, and abstract thinking were all skills that engineering brought to the table. The medical fellows, while they appreciated this expertise, sometimes found it difficult to understand. Here, Chelsea, an engineering student, explained how this particular difference emerged in her close collaboration with a visiting medical fellow, Abigail.

> Well, a lot of it seems…it's just that engineers and medical professionals think differently.
>
> *How so? Could you give me an example of that?*
>
> Well, one thing that Abigail and I've been talking about recently is 3D spatial awareness. Because we're doing a lot of computer modeling, it's helpful to kind of rotate the model in your head if you can. And I don't have a problem with it. It's really easy for me. I'm used to thinking like that, whereas Abigail has a lot

> harder time with it. And I think a lot of it is different areas of the brain and which ones are developed in different people and that's how you are drawn to your careers and stuff. But, that's one difference that we notice. And just sort of thinking mathematically and scientific…well, we're both thinking scientifically, but thinking more mathematically than more about the patient.

Importantly, Chelsea noted that while Abigail was not able to visualize a rotating model like she could, they were both still thinking scientifically about the problem. This idea that engineers and doctors thought about things differently came up again and again in interviews with members from both sides, often to juxtapose, as Chelsea explains, a more mathematical or analytic perspective on the part of the engineers versus a more patient-oriented or biological perspective on the part of the doctors. For Chelsea, these differences might have even been innate, but again, that was okay, both perspectives were scientific and useful to the shared endeavor.

How each discipline tackled problems also emerged as salient for team members. The engineers saw themselves as "problem solvers" first and foremost, and correctly specifying the problem from the outset was of paramount importance. As Tom explained:

> So one of the things that I've appreciated learning about engineering, is the discipline that they have in defining what the specific problem is that needs to be solved. And they will spend a huge amount of time defining what the problem is. Because once they've adequately defined the problem, then they can design the solution for it. And docs don't necessarily get that.

Engineering's emphasis on specificity and precision extended to measurements as well. Later in the interview, Tom shared what he viewed as another key disciplinary difference between engineers and doctors—the precision of engineering's measurements, in this case muscle tissue:

> And in the engineering world, analyses that have to do with highly precise measurements of cross-sectional area perpendicular to muscle fiber direction are the norm. And if you don't make measurements in that way, you're not part of

> the club. And in medicine, you kind of say, you know, we measured how thick the muscle was and we ignored all these other things and that's what we've found out. And so Phillip's priority is to really work on all these very detailed precise measurements, and I keep saying, let's just get a ruler out and measure the thickness of the damn muscle.

Tom's tone in this exchange was one of deep respect. He valued what the engineers—and in particular, Phillip—brought to the table, but he also saw that requiring precision had a downside. The engineers, he said "have been challenged by the lack of precision in biological systems." Soft tissue was notoriously hard to understand, and the engineering students often lamented that it did not behave as predictably as steel, for example. And while Phillip was considered exceptional among engineers in his ability to understand clinical constraints, his graduate students and post-docs were newer to the collaboration and often overwhelmed by the logistical complications of working with real people in clinical settings. Many of the engineering students relayed to me their frustration at their failed first attempts at capturing clinical "reality" in computer models. I also saw firsthand in weekly muscle meetings that Tom often sent them back to the drawing board when their original designs or ideas were impractical or worse yet, potentially dangerous to implement in clinical settings. This is where the physicians' abilities and clinical training paid off.

In contrast, medicine's clinical prowess was often characterized as the ability to make decisions quickly, often with incomplete knowledge, and under challenging and uncertain circumstances. The doctors were also trained to deal with the imprecision of biological systems and the unpredictability of individual patient behavior. This meant that they were often the first to notice when study designs or research protocols were not clinically feasible. This deep understanding of clinical context and the related practical restrictions was understood to be one

of medicine's primary strengths. [15] When I asked Phillip to reflect on differences between medicine and engineering, he like Tom emphasized that medicine's adaptability complemented the more rigid approach of engineering: engineering was "based on equations and theoretical analysis, and medicine is more of an art."

*Negotiating Language Differences*

Group members from medicine and engineering were quick to note that they spoke different languages, and terminology often had to be negotiated in their shared work. For example, engineering and medicine often had different words to express the same idea, or more problematically, often used the same words to express very different ideas. Here, Ri gives an example of a typical language issue.

> For example, when we describe a model or something, we like to use engineering language. But Dr. Gavin says no, no, if you use that language, I mean, the clinical people will not know that. For example, in engineering, when we describe muscle deformation, we always use "strain" but generally if you tell "strain" –if you go to a conference with an audience of medical people, if you say strain, they have a general idea, they might not know exactly, but if you say "stress ratio" they know that. But "stress ratio" from an engineering viewpoint, that's not an accurate concept because stress ratio is just one-dimensional. Material is three-dimensional. But sometimes we have to find a way to convert engineering terms to make it suitable for medical people.

Ri explains how working with physicians requires that engineers sometimes change their language, even to the extent that the shared term fails to accurately capture phenomena for audiences in their own discipline.

These differences, while salient, were for the most part, easily negotiated. One discipline necessarily had to cede the linguistic reins. Sometimes the discipline that used the more precise term prevailed. Other times the decision was a function of who was taking the lead on the paper. But importantly, a sense of equality came through from members of both groups. Ri continued

[15] While the nurses also had clinical expertise, they alone mentioned this as a strength that they brought to the table.

our conversation about language by explaining, "Generally we use the medical term, but also, I think Dr. Gavin also, he has absorbed lots of engineering terms. I think he's a doctor, but he's very open to engineering, new ideas and new concepts." Other members also noted that language issues, while memorable, were relatively small in the scheme of things. Here, Carla, a physician working with the group noted that it was a testament to the group's success that relatively small differences—language being among them—are the ones that stand out.

> So, and it's the little things—it's often around language or small little—which probably tells you how well the group works since I'm not giving you great chasms of difference, it's all sort of small little incidents where you feel the bump.

Other times, the language barriers went beyond shared word use and were attached to disciplinary training and conventions. The engineers were challenged by the intricate anatomical terminology they had to master in order to successfully work with doctors. For example, Ri again shared his perspective as an engineering student:

> I think from my perspective, the biggest challenge is in the first few years I learned some medical terminology, and even now, if I'm faced with a cadaver, I still cannot easily distinguish what is what. Because every time when Dr. Gavin does a dissection, I stand beside him, he can still easily distinguish very small pieces, he can distinguish which muscle. I think because I never had medical training, that's very hard for me—also to memorize terminology.

Similarly, the physicians in the group had to come to terms with the fact that engineers spoke in terms of equations or mathematics when describing their ideas or processes. Tom explained that he and Phillip served as interdisciplinary translators to facilitate conversations between their research teams:

> The other thing that we had to do was to come to terms with the fact that engineers speak in mathematics. And that's a language that most of us do not understand. And so when one of the graduate students would go up to the board and start writing equations to make the point they were trying to make, the clinicians would be left out of the discussion. And so inherently what ends up happening is that Phillip and I are the translators in the beginning who say—

> Phillip would say, basically Tom, what that means is this is proportional to that, or this varies that way.

Language differences, like epistemological differences, were not insurmountable hurdles for these two disciplinary teams. The engineers and doctors worked together to overcome these obstacles to interdisciplinary work. Tom and Phillip's fluidity as disciplinary translators was mentioned again and again by the BIRG engineers and doctors. This revealed not only their interdisciplinary skills, but also their commitment to the interdisciplinary partnership. Phillip and Tom's commitment to each other as colleagues set the tone and paved the way for successful collaboration between their groups.

*Sharing Strengths*

It is significant that, even while the disciplinary groups saw differences, they were seen favorably. These differences were not described as deficits or inequalities—far from it. In fact, most often, the engineers and doctors spoke of differences in terms of "sharing strengths." When I asked BIRG engineers and doctors to describe their work in the group, I was struck by the degree to which each side spoke of the deep appreciation they held for each other's disciplinary perspective and dedication to the group effort. In *every* interview I conducted with BIRG engineers and medical researchers, team members spoke glowingly of their differently trained colleagues, frequently touting the virtues, or "strengths" of the other field. The engineering students and post-docs had specific technical and analytical skills that the fellows lacked, and in turn, the fellows provided the clinical expertise and anatomical understanding that the engineers did not have. But among the engineers and doctors, making disciplinary comparisons also had the effect of bolstering one's own sense of contribution and value in the group. Overcoming

difference was the very thing that made the BIRG unique. Together, they helped move science forward. Here, Sarah spoke about how disciplinary differences made the shared work stronger:

> You could be working at something and then say, say Brendan will say, oh, but we could do this, or why don't we look at it this way. And he'll look at it from a structural standpoint or a mechanistic standpoint that I wouldn't have looked at it from. And you know, when we're trying to refine the flow diagrams of Ri's birth model, and he'll have this beautiful diagram up there and then we'll say, really, actually clinically, that doesn't work or this doesn't work. And I think those different perspectives are key to actually having something that makes sense in the end. And I think that it's important that it's a comfortable environment to say that.

Sharing interdisciplinary strengths also helped team members forge dyadic partnerships on an individual level. Here, Jenni, an engineering graduate student reflects on her close collaboration with Laura, a former medical fellow. The two shared a personal connection, and "clicked right away," but importantly, they also complemented each other professionally and were able to generate several publications as a result. She explained:

> Laura, the doctor fellow, she's entering the group and she's from China originally, and in that sense we clicked right away and we start to develop within the group. The two of us became like a partnership in a way. So I'm like pretty good with the technical part of it, and she's pretty good with the clinical part of it, so between the two of us, we developed a very successful working relationship. I think we had six publications together, yeah, three I'm first author and three, she's the first author and I'm second.

Over time, each side also spent time training the other in their disciplinary approach, equipping the other side with a working knowledge of cross-disciplinary skills. The doctors helped the engineers to see things from a medical perspective, letting them sit in on dissections of cadavers to get a firsthand look at the anatomical structures of shared interest and teaching them about standard clinical practices to streamline their experimental research designs. Similarly, the engineers taught the doctors how to use 3D imaging software and beef up their statistical analyses of shared quantitative data.

Importantly, in the end, the two groups were on the same page. The disciplinary differences did not divide them, but rather provided shared strengths that brought them to the same scientific conclusions and moved their collective work forward. Here, Jane, a medical student, talked about the process of using differences, but ultimately transcending them to move the science forward.

> But I think where I was always fascinated with it, was here you have two different groups coming from entirely different perspectives and entirely different laboratories between the clinic versus the mat lab or wherever, coming together to the same problem, coming to the same conclusions. And it seemed somewhat improbable that they would have the same thoughts at the end of it, but you know, they were always pushing each other forward a little bit.

### *More Alike than Different: Creating Sameness in the BIRG*

While the engineers and doctors agreed on the objective benefits of an interdisciplinary partnership with each other, I discovered that larger narrative forces were also at play, helping to consolidate the bond between the two groups. By everyone's estimation, Tom and Phillip had a lot in common. By the time I arrived on the scene to observe the BIRG, Tom and Phillip had been collaborating with each other for almost 20 years. They were friends as well as colleagues. And while they were currently well funded under the IRSAG grant, their professional relationship had developed over years when they had little more than shared research interests keeping them together.

I soon learned that more than shared scientific interests and mutual respect sustained their union. Tom and Phillip saw themselves as more alike than different, or as Tom joked, "fused at the hip." Both of them recounted the story of their initial meeting for me more than once—it was kismet—they met by chance when they were both seeking the same cadaver. Professional

courtesy prompted a brief exchange (why are *you* interested in the specimen?), which led to a lunch meeting and a revelation of their shared family backgrounds and research interests.

When I asked Tom to reflect on what it was like to work across interdisciplinary differences, his first inclination was to note that he and Phillip were actually more alike than different. He went on to describe that they collaborated so well in part because of similar family backgrounds. Tom relayed that Phillip had an innate understanding of the vagaries of clinic life, and of working with urogynecologists in particular, because his father was an urologist who had struggled in his own research career to find engineering collaborators who understood the complexity of soft tissue. For his part, Tom's uncles were also engineers, allowing him to truly understand an engineer's perspective. Phillip corroborated this story of origin that cast them as natural collaborators. Phillip told me that Tom was a great "spatial thinker" and an "artist" in part because his father was an architect; these abilities allowed for an almost instinctual appreciation of engineering. So it wasn't just that Tom and Phillip had shared research interests and goals—they were in a weird way, like family.

To be sure, Tom and Phillip did have striking similarities in their family histories. But what interested me even more was how frequently they, along with members of their teams, focused on these overlaps. In fact, these uncanny similarities were referenced so frequently that I coded these ruminations "sameness stories" in my first analytic memos. By referencing shared backgrounds and family roles, Tom and Phillip created a narrative of sameness that I argue, both created a strong group identity and naturalized their professional and personal bond. So while disciplinary differences justified their interdisciplinary collaboration, these sameness stories explained how they were almost mystically connected to each other, thus strengthening their interdisciplinary partnership.

Interestingly, members of their research teams also told me these stories. Here, in a typical comment, Elaine shared, "I think that Phillip is quite unique in a biomechanics seat—because of his family background, his father—he gets medicine." In fact, I heard so many renditions of the cadaver story—cadaver stories are perhaps hard to forget—as well as secondhand recaps of Tom and Phillip's family overlaps that I realized these "sameness stories" served a symbolic purpose within the BIRG. For BIRG members from engineering and medicine, the stories conferred an almost predestined quality to their interdisciplinary union and also established an unofficial BIRG lore. Other team members also shared these coincidental family links, though interestingly, they often got the specifics wrong, again revealing the symbolic, rather than literal importance of these connections. In sum, the sameness stories capture the extent to which the BIRG doctors and engineers saw themselves as a cohesive, like-minded group. By emphasizing both their shared backgrounds and diverse professional lineages group members explained their commitment to differently trained colleagues and simultaneously created a new interdisciplinary identity in the BIRG.

But it was within this backdrop that I started to notice that there was no comparable point of connection between them and Anna, or between their disciplines and nursing. Even Tom noted that Anna grew up on a farm and so was different from Phillip and him in terms of family background, or as he put it, " a bit of an outsider." As I spoke to more and more BIRG members, some of whom were initially reluctant to speak with me, I discovered that not everyone felt a sense of belonging and shared group identity. Some group members felt unappreciated and devalued in the group, even victimized by the group's interdisciplinary agenda. While these perspectives were voiced by only a small subset of group members, it was hard to ignore that this

counter-narrative came from one camp—the group's nurses. I began to quickly see that all difference was not created equal in interdisciplinary science.

### *The Nurses as "Outsiders within"*

Instead of invoking a "different but equal" narrative, the BIRG nurses instead described their experiences in the group with great ambivalence. There were reasons to participate in the group, to be sure, but far from feeling appreciated and essential to the collective effort, the nurses described experiences of exclusion and inequality. In contrast to the dynamic partnerships forged between the engineers and doctors, the nurses rarely collaborated with other BIRG members on their scientific work. Though Anna interacted with Tom and Phillip at the investigator level in her role as PI, her team worked in relative isolation.

I discovered that some of her nursing research associates preferred it this way and resisted interdisciplinary overtures. Others, namely the investigators and junior scholars, felt left out, as if their collective voice wasn't part of the interdisciplinary conversation. When Anna's team did interact with other BIRG members, they felt their disciplinary perspective and values were routinely discounted, or worse yet, ignored. Instead of enjoying the mutual respect and sense of belonging that the engineers and doctors talked about, the nurses described feeling like "outsiders within," biding their time at the table while pursing their interests and professional fulfillment outside the BIRG.

#### *Working Alone*

When I first began observing the BIRG, I noticed that the nurses never attended the weekly muscle meetings, a robust site of interdisciplinary collaboration, I did not think much of

it. I assumed that I had not been there long enough to see all of the permutations of interdisciplinary exchange. I was new to the group and was sure that other interactions would emerge over time. I did see Anna regularly, as she interacted with Tom and Phillip at the monthly investigator meetings. Along with Karen and Elaine, the group's Co-Is, they would discuss progress on the group's various projects, budgetary matters, upcoming conferences, and publishing timetables and goals. I also saw the nursing investigators at the monthly "publications meeting," which was dedicated to moving the BIRG's writing projects along. In this setting, team members who were writing up data or refining an article for publication could consult with the PIs and other group members before submitting their work. Team members would consider the likelihood of getting accepted in various journals, talk about how to use outlying cases for descriptive pieces, and strategize catchy "hooks" to frame each article. But the publications meeting occurred much later in the pipeline so to speak—long after the scientific work was conceived and executed. It was primarily used to help package data already collected in ways that would culminate in publications.

As I spent more time observing the BIRG, I began to realize that I had not yet seen how the nurses' scientific work meshed with that of engineering or medicine. I rarely heard the nurses discussing the content of their research, or heard them hashing out their scientific ideas or interests. And I never saw them engaging in the rich, back-and-forth interdisciplinary exchanges that the engineers and doctors enjoyed during the weekly muscle meetings. Soon, six months had passed and I had not yet met some of the nursing staff members whom I heard mentioned in meetings. How do the nurses fit in to the group, I asked? With whom and how do they collaborate? As more and more BIRG engineers would casually tell me, "I'm not familiar with the nurses' work," or "I'm not really involved in their projects." I began to ask more

pointedly—when and how do the nurses collaborate with engineering and medicine? The answers I received were revealing in and of themselves.

Some BIRG members told me quite simply that Anna's team preferred to work independently: while Anna herself was interdisciplinary-minded, her projects, as they were currently conceived, had little to do with the biomechanical dimensions of birth injury—the primary scientific interests that Tom and Phillip shared. For this reason, she, as the nursing PI, was the primary interdisciplinary go-between who interacted with Tom and Phillip and other members of the BIRG. As the nursing Co-I, Karen also had reason to meet with the principal investigators at the monthly investigator meeting. But in practice, she was often too busy to attend and always arrived late if at all. Karen also supervised some of the group's clinical projects at the hospital, so I knew she interacted with other BIRG members there, though I was not privy to observe in the labor and delivery room.[16]

But importantly, the rest of the nursing team—Anna's research associates and students—did not work at all in an integrated or collaborative way with BIRG members from medicine and engineering. The robust unions between junior engineers and medical fellows that I saw in the muscle meetings simply did not exist for the nurses. When I asked Kristine, a nursing research associate, how she worked with BIRG members from engineering and medicine, she revealed the extent to which the nursing group worked alone:

> […] but we function with Anna and the BDEL[17] project and her other projects, very independently from over there. And we really don't have any hands-on, day-to-day run-ins with Tom's projects, or I couldn't even tell you what Phillip has out there on his projects. I know that we use one of his speculums! (laughs).

The nurses' scientific work, I learned, was conceived, negotiated, and produced solely within their disciplinary group. The ideas underpinning the research were Anna's. And she and

[16] These exchanges proved to be important, and I will discuss them in more detail in future chapters.
[17] BDEL was the name of one of Anna's projects in the BIRG.

her team met regularly to track the group's progress in the School of Nursing, by themselves. In these meetings, Anna's team discussed everything from administrative details and clinical complications, to the overall pace and recruitment on all of Anna's clinical projects. Unlike engineering and medicine, Anna did not have fellows, staff, or students working solely on projects funded by the BIRG. Rather her research team worked to coordinate and collect data on *all* of her research projects. This included her work with Tom and Phillip in the BIRG, but also a variety of projects funded by other grants, in various stages of completion.

The nursing group's lack of integration was important for several reasons. First, it meant that Anna bore the brunt of the scientific work for her BIRG projects alone. Both medicine and engineering had junior research associates—students and fellows—who did the lion's share of the scientific work within their disciplinary groups. Since they worked together, they shared strategies, goals, deadlines, and pushed each other forward. Affectionately, they were referred to as the "worker bees" of the BIRG, and they were incredibly productive. The nurses, by contrast, were expected to perform at the same level with comparatively fewer resources. While Anna had a small research staff that helped recruit participants and managed her clinical trials, she alone brainstormed her research ideas, analyzed data, and drafted publications for her projects in the BIRG.

This lack of congruence and support was not lost on the nurses. Kristine was bothered by what she viewed as an inequity in resources. She described the medical fellows as both "free help" and "slave labor," and was annoyed that Anna was held to the same standards of productivity without comparable research support. Anna herself corroborated this, lamenting that her scientific isolation and lack of help detracted from her productivity compared to the other disciplinary groups in the BIRG. She added that she couldn't attract doctoral students in

nursing to help either, because as she put it, "the whole world is open to nursing." Her research area, a rather narrow and comparatively biomedical topic, was largely unappealing to them. And besides, even if there were nursing students interested in helping her, she had no resources to support them anyway. So without the help of shared interdisciplinary collaborators, Anna was left with her small team of paid staff who worked largely on their own, and always felt like they were falling behind.

*Feeling Alone*

But the nurses did not just work alone, importantly, they also *felt* alone within the group. I learned that their physical isolation represented, but also fueled a sense of separation, as all the nurses described navigating scientific and socio-emotional barriers in the group. Because the nursing research associates were juggling all of Anna's projects, they did not view her involvement in the BIRG as especially important. They were nursing researchers first and foremost, not interdisciplinary ones. Since her team was stretched thin and did not have much interaction with other BIRG members, they focused on maximizing their time and energy across her projects. And because there was considerable overlap in Anna's projects, the nursing researchers were much more concerned with their way of doing things—their system of organizing data, subject recruitment, and clinical protocols—than with the larger interdisciplinary agenda of the BIRG. So even though the BIRG was by far the largest funding stream for Anna, in fact accounted for the bulk of her salary while she was on the research track, her team did not *feel* like part of the BIRG, and acted accordingly—being separate bred contempt.

Astutely, Anna recognized that her team's lack of integration in the BIRG was creating tension in the group. Months before I began observing the group, she had asked Erin, the then BIRG project manager, to address this issue by spending one day each week with her research team at the School of Nursing. This, Anna reasoned, would create a more inclusive spirit in her team. Since geographic isolation is often mentioned in the literature as an organizational challenge to interdisciplinary collaborations, Anna's instinct and approach was on target (National Academy of Sciences 2004). She also knew firsthand that bridging disciplinary divides required face time and building personal relationships. For years she had spent time "hanging at the table" in weekly muscle meetings, even though the more reductionist, biomechanical approach discussed there wasn't her cup of tea. Since the nurses did not actually work with the other BIRG members, having the project manager spend time at the School of Nursing was pitched as a stopgap solution to ameliorate tensions caused by her team's isolation.

But this plan didn't last. After just a few weeks, Erin stopped coming over and the divisions between nursing and the rest of the group seemed to grow. During my time observing the BIRG, Erin left the group and Nicole, a study coordinator, assumed the role of project manager. Nicole, who recounted this story for me, shared that nursing's lack of integration had long been a problem in the BIRG.

> Because when I first came on, they called themselves an interdisciplinary team, but they weren't working like an interdisciplinary team. […] there was never any cross-collaboration except among the PIs, which, they were great together, but they, the staff, there was really no cohesion and there was actually a lot of animosity towards each other.

When I asked Nicole what she thought was at the heart of the "animosity," she pointed to disagreements over resources and interpersonal dividing lines that result when people don't know each other. As she shared with me:

> I think that resources was probably one thing. You know, I mean, you know even though it's a multi-million dollar grant there's only so much money. And what staff is going to be supported at what percentage and what salaries, and you know, I think that's part of it. It was part of it. Even today to a small extent, it's there. But I try to make sure that that's not the case. And then also, you know, I think it was just people not knowing each other. You know? I think they become the "other" and you can't identify with them and know them and if you're not talking to them, just hanging out. You know, when I go over there, I'll just sit in Maggie and Kristine's office and just hang out and chat and get to know who they are. You know?

As project manager, Nicole sought to cultivate an inclusive atmosphere and improve on her predecessor's approach. She suspected that the nurses' physical isolation exacerbated the animosity between them and other BIRG members, so she made good on Erin's promise to actually spend time at the School of Nursing every week. But unfortunately, the problems were much deeper than even Nicole had suspected, and her solution backfired.

When I spoke to the nurses, they too volunteered that financial inequities were a problem. The nurses all spoke about having fewer material advantages than medicine and engineering, of always having to make do with less. And Nicole was also right that the division went beyond resources, that tensions were sustained by not knowing each other. But here was the problem: the nursing staff members did not want to be integrated in the BIRG. They preferred working by themselves and resented having other BIRG members in their space. Maggie, a nursing research associate, likened the nursing workspace to a sandbox, and noted that she and Kristine did not want to "play" with the other BIRG members. Kristine agreed, emphasizing that the BIRG was far from a collaborative effort. She described Tom as "authoritarian" and noted that other BIRG members, namely some of the group's medical fellows, only came by when they "needed us for something!" For her part, she avoided going over to BIRG offices in medicine like "the plague." Ironically, the nursing team even interpreted Nicole's interdisciplinary overtures as spying

expeditions. Kristine shared, "We just don't like to have her over here because she's basically over here to kinda spy, to see what we do to justify our time."

The nurses were right in suspecting that their practices were scrutinized. Efficiency was a hot-button issue in the group as everyone became aware of each other's different disciplinary practices and timelines to complete a project. Everyone agreed that Anna was overworked and, in a strict sense, underperforming in terms of her publication record. For a variety of reasons that I will take up later, nursing was less "productive" than either medicine or engineering. But failing to maintain a comparable level of productivity stoked other insecurities and also invited scrutiny. The nurses spoke of having to justify their methods and practices, why doing things their way took longer, but was still important, essential even, in their role as nursing researchers. Most seriously, the nurses worried that one of their primary disciplinary priorities, advocating for the patient population they served, was discounted as ancillary to the scientific enterprise. In short, they felt that what nursing brought to the table, their key disciplinary contributions, were not considered important within the context of the BIRG because they were not able to keep pace with the other disciplines in terms of getting papers "out the door."

Phillip and Tom saw the situation differently. Phillip, while acknowledging that Anna was overworked, took Anna's comment that it was easier "to do it on her own" at face value. From Tom's perspective, an easy solution was to increase administrative oversight of how her team was working—perhaps they weren't as efficient as they could be. So under Tom's direction, Erin sought to streamline the organizational practices of the BIRG. In reality, this meant trying to change the way nurses worked. When I asked Erin (by then the former project manager) to reflect on working across disciplines, she quickly volunteered that "cultural differences" between the disciplines created problems in the group. In theory, she was reluctant

to tinker with each discipline's system, especially if it had been working for them, but she couldn't help but being frustrated by the inefficient practices of nursing:

> Um, but the school of nursing staff, we'd have issues where, um, their research associate over there would walk every patient over to the hospital when they were seen, and we'd say the patients have already been here, they know where they're going, she doesn't need to come over with them, you know? And it was an efficiency issue, we were like, really she doesn't need to be walking the 20 minutes it takes her to get here from her building, all the way over? And then she would sit in the waiting area while the patient was having an MRI. […] So there were just some staffing issues that we didn't really agree with.

As Erin began to track hours and institute a system for accountability, the nursing staff resisted. They were resentful, angered even, by the demand that they justify their comings and goings. They complained that other BIRG members did not want to work with them so much as make them change their disciplinary ways. To them, interdisciplinary research meant increased oversight and a loss of autonomy, particularly from Tom and his administrators in medicine. As a result, they interpreted efforts at integration as thinly veiled attempts at subordination.

I soon learned that speaking in terms of "cultural differences" or characterizing the problem as an "efficiency issue" was euphemistic. The division went much deeper and represented much, much more. The nurses' version of Erin's story revealed that their disciplinary values were not considered as important. They explained to me that Anna's projects were all related—some of them picked up where others left off, looking at another dimension of birth complications. As a result, Anna's team would often recruit subjects participating in one study again, assuming they met the selection criteria for a new clinical trial. For this reason, her staff was careful to do everything possible to retain their research participants, including getting to know them on a personal level, taking time to accommodate their work and child-care schedules—in general, working around their individual limitations.

This very personal and hands-on style of research that emphasized relationships with their research participants was, according to the nurses, essential to their scientific success. Moreover, it was, at a very basic level, an integral part of who they were as nurses. Nurses cared for patients in clinical settings and in research, seeing them as individuals first and foremost. They recognized their practices were widely contested in the BIRG as others saw them simply, as a waste of time, but they balked at administrators from medicine telling them how to engage with their research participants. Ultimately, they dug in their heels: the empathetic dimension of nursing research was not up for negotiation.

This boundary did not merely mark disciplinary difference; it marked relative status too. As Erin explained her administrative overtures to enhance efficiency, she revealed that monitoring disciplinary practices was an imperfect system. She acknowledged that the engineers had more leeway because she did not feel qualified to evaluate them. The nurses, in contrast, were familiar enough to scrutinize. As she observed:

> Phillip would say in the meeting, oh, well the robot broke and (she laughs) he could have been telling me a total line of crap and I have no idea what he's talking about. He tells me the robot is broken and I believe him. So, yeah, so they (engineers) almost got left alone because nobody was qualified to ask those questions. The School of Nursing probably envied that because they probably wished I would get off their case.

This idea—that the nurses' expertise and autonomy were not as inviolable as that of their colleagues from medicine and engineering—became a dominant theme in my research. To be sure, BIRG members spoke about it in vastly different ways, depending on their position in the group. The nurses spoke explicitly of feeling like their opinions and professional expertise were discounted, that they were being second-guessed, watched, and evaluated. They were simply, not taken as seriously or given as much respect as other group members.

Other BIRG members unwittingly corroborated this story by claiming ignorance of nursing's actual contribution, thereby demonstrating nursing's marginal, or at least isolated, role in the group. At times, BIRG members interrogated nurses' practices without directly invoking the idea of status or disciplinary value. Like Erin, they would speak in terms of objective goods—organizational efficiency, rigorous scientific practices, or standards of professionalism—and then explain how the nurses failed to measure up in one or more ways. At other times, the criticism was more pointed and explicit. In these instances, negative comments about nursing described a deficient nursing culture that was rigid, hierarchical, and failed to attract independent-minded researchers. Some BIRG members went so far as to call the nursing culture "less scientific," a subtle but effective put-down that revealed a scientific hierarchy that rank-ordered contribution in the group.

While the nursing staff felt scrutinized and resisted integration into the BIRG, the nursing investigators, on the other hand, lamented being left out of the scientific collaboration. Having collaborated with Tom and Phillip the longest, Anna spoke candidly about this issue during our lengthy interview. When she first began collaborating with Tom and Phillip, over 15 years ago, first as a doctoral student and then later as Phillip's post-doc, Anna recognized the importance of forging relationships and sharing space at the interdisciplinary table. To that end, she made the effort to attend the muscle meetings every week. She explained, "And I was there every single Wednesday whether they wanted me to be or not. I had my butt in the seat." Anna took her role as an interdisciplinary researcher very seriously and she valued learning the biomechanical perspectives on her topic area. But as years passed, and even after she became an independent investigator with Tom and Phillip on the IRSAG grant, she never quite felt like she was an equal

partner in the science. She too saw that Tom and Phillip were kindred spirits—friends even—and she felt like a third wheel. As she explained:

> I think that the thing I talked about, that happened maybe two years ago, is when I really shifted to feeling not at all left out or threatened. Or not threatened by it, but still maybe left out sometimes—not just out of the fun, but of the science. Because when you're together, you talk work. I mean you can't help it. So there were these informal meetings (between Tom and Phillip) that would happen. The other thing that has happened is that the science is split out a little bit where the engineering stuff has become stuff that I don't want to be involved with. I sat and listened to engineering stuff for *so many years.* But it was hanging at that table. It's why I'm here now. But I don't need to hang at that table anymore. It's not nursing. It's not even clinical. It's very mechanism-based and that's the bench piece that I'm far less interested in. So it's okay with me if they go off and do that.

Though she claimed to no longer be threatened by Tom and Phillip's close relationship, Anna still admitted to feeling left out of the science sometimes. When I spoke with her, Anna was finally reconciled to the fact that she was always going to be a bit of an outsider; Tom and Phillip were not, and would never be, particularly interested in her scientific ideas. Now, as she felt more confident as a researcher, she wanted to spend her time and energy developing ideas and projects that were aligned with her own interests. She was frankly ready to do her own thing. Importantly, however, this calculation meant that at the investigator-level, Anna would pursue these interests by herself with her nursing team.

I heard the same story from Anna's colleagues. They confirmed that for the longest time, Anna chose not to strike out on her own and tackle her true interests, what really excited her, because she had a hard time getting support from Tom and Phillip. But just recently, the stories went, she had turned a corner and was less likely to defer to their interests, choosing instead to design studies that addressed what she was most passionate about. With the support of other nurses in the group, she finally came to see that she was better off pursing her interests on her own. Anna spoke at length about how important it was for her sense of self to have other group

members—namely other "women at the table"—with whom to voice her frustrations. Karen in particular had helped her work through her feelings, giving her language to describe what she felt. As she explained:

> Now, Karen told me just recently, it was very interesting—I thought it was very perceptive of her—she told me I have a victim-mentality.
>
> *A victim-mentality?*
>
> A victim-mentality. And I think it's probably true from those first couple of years. I did feel like a victim. I'd given up my individual R01, which is the only thing that counts in nursing. I lost tenure over this also.
>
> *Really?*
>
> Yeah.
>
> *I did not know that.*
>
> Yeah—there's a little more to that story, which I can tell you. And I kind of knew, well I knew that would be an issue. I lost the public perception that I was an independent investigator by putting my grant with the IRSAG. Now I gained a tremendous amount—I still think it was worth it—in fact, I know it was worth it. But it was a huge sacrifice. And Phillip and Tom still don't get that.

As I spoke with Anna, she explained the origins of her self-described "victim-mentality" within the group. She began working with Tom and Phillip as a junior investigator and struggled to be seen as their equal. Even now, years later, she still felt like an outsider, both in terms of her scientific relationship with Tom and Phillip, but also in terms of her own professional autonomy and security. And while Anna assured me that she had made peace with this, her detailed account of her multiple struggles in the BIRG, both past and current, revealed the depths of her vulnerability and sense of inadequacy within the interdisciplinary group.

Anna was not alone. Her junior nursing colleagues spoke of feeling like outsiders in the BIRG too. While Karen, Anna's Co-I, did not share Anna's long history with Tom and Phillip,

she too was frustrated by her marginal role in the group. As a practicing midwife and supervisor to some of the group's clinical projects at the hospital, she interacted with various team members in that setting, but importantly, felt her clinical opinion was rarely solicited. Though she conceded that she was technically junior in her research career, she felt as though Tom unfairly used that fact as a rationale to undermine her clinical expertise and other professional experience. When I asked her if she felt Tom valued her expertise in the BIRG, she made the following comment:

> You know, I would say he doesn't. And yet I've had other people say to me, no, he does, just not to you. So it's, um, I don't know for sure. […] You know, I've had those experiences with him and so then that's when I shifted and said I just need to maintain certain things on my own and persevere and not be so drawn into the group in some ways.

Nadia, Anna's doctoral student felt similarly. Before returning to pursue her doctorate, she was hopeful that in the context of research, especially interdisciplinary research, the nursing perspective would have an equal voice at the table. But in her opinion, this was not the case in the BIRG—nursing still deferred its collective voice to medicine. Though she believed Tom and Phillip were outwardly respectful, she was disheartened when she had seen Anna drop her research ideas and defer to their preferences when she did not get their support. Nadia held out hope that Anna was finally gaining both the confidence and professional status to hold fast to her beliefs and interests.

As I spent longer observing the group and talking to group members, I began to see how this lack of belonging influenced the nurses' self-perceptions and behaviors in the group. Karen decided that it was best to keep her larger research interests, not to mention her professional identity, separate from the group. Anna, who had much more invested in the BIRG, changed her strategy. Instead of letting Tom and Phillip shoot down her nascent ideas, she

refined them until they were relatively polished before introducing them to Tom and Phillip. Karen explained Anna's new approach:

> Because I think that's a real exemplar of when you have an understanding of how a team works and you know you're about to do something that's not consistent with how the team thinks. So do you bring it to the table and push it on your own? Or do you do what she did, which is to be strong enough in her belief that it needed to be done, develop and evolve it to a point where it couldn't be submarined.

So far from feeling like she could openly bring her ideas to the interdisciplinary table, Anna and the rest of her team kept parts of themselves hidden. They knew it was important to work within the context of the group, to be "at the table" in the well-funded BIRG, yet they were savvy enough to recognize that nursing's contribution wasn't equally valued in the group. In short, they felt like "outsiders within," championing values and research interests that they alone held, while working within the context of an interdisciplinary group.

**Conclusion**

In this chapter, I revealed that while the BIRG appeared "successful" from the outside, upon closer inspection, the group's story was more complicated. First, I discovered that the disciplines collaborated in unequal measures. The engineers and doctors worked closely together and were strongly committed to each other as they developed their shared science. In contrast, the nurses largely worked and felt alone.

Moreover, team member perceptions of difference and the group's interdisciplinary work varied wildly. When I asked BIRG members how they saw and experienced difference within the group, all group members reflected on disciplinary differences at great length. These differences, as the literature suggests, are particularly salient in an interdisciplinary collaboration

(Klein 1996; Lattuca 2001). But I quickly discovered that all disciplinary differences were not created equal.

The group's engineers and doctors worked seamlessly together, and their disciplinary differences, far from being barriers to collaboration, were often cast in terms of shared strengths. Tom and Phillip were effective leaders, but also translators as they helped their teams negotiate language barriers and other scientific differences. Not only did they share similar scientific interests, they also both adopted the same respectful approach towards each other and their team members. They had invested almost two decades on their shared work and were not about to lose time and energy to team members jockeying for self-promotion and control. As the group's leaders, Tom and Phillip had the power to eschew a rigid hierarchy in favor of an environment that thrived on mutual respect and egalitarian collaboration.

The egalitarian atmosphere that Tom and Phillip cultivated at the weekly muscle meetings set the tone for a respectful and rewarding collaboration between their teams. Junior investigators felt a sense of belonging, recognizing that their disciplinary skills and expertise made a significant contribution to the BIRG's scientific work. Not only did they get access to harmonious mentors who enthusiastically shared their knowledge and experience, but they were encouraged to grow personally and professionally, an uncharacteristically "benign" arrangement in the often competitive academic health sciences.

But while the engineers and doctors could enumerate differences, in fact, relied on them, they also saw each other as fundamentally, very much alike. They were quick to emphasize how much they had in common—that they were on the same page in terms of scientific interests and professional goals. Even Tom and Phillip's fated meeting and oddly similar family backgrounds were invoked by BIRG members to explain an almost cosmic brotherhood that further cemented

their bond as true interdisciplinary partners. Tom and Phillip trusted each other implicitly and relied on each other professionally. According to team members, the depth of their connection even had the effect of blurring disciplinary distinctions. By extension, members from these two disciplinary groups also felt bound together beyond the science. They too adopted this narrative of sameness to explain their deep connection and sense of belonging within the group.

In contrast to the physicians and engineers, the nurses shared a vastly different experience in the BIRG. Far from enjoying a robust collaboration with other BIRG members, the nurses worked largely alone, rarely collaborating on the level of scientific discovery with other group members. Though the nursing investigators chose their words carefully in describing their position in the group, they all shared experiences of feeling devalued and unappreciated. In their estimation, they were policed at the administrative level, and discounted at the scientific one. They had to justify their methods and practices to their team members, explaining why their approaches took longer, but were still important. Most seriously, the nurses worried that their biggest priority, advocating for the patient population they served, was discounted as ancillary to the scientific enterprise. In short, they felt that what nursing brought to the table, their key disciplinary contributions, were not considered important within the context of the BIRG. As such, they felt frustrated, even victimized, by the interdisciplinary enterprise. For them, difference felt like inequality; they were "outsiders within" the group.

These empirical findings substantiate several theoretical ideas about interdisciplinary collaboration in the sciences. First, the unequal integration among the BIRG disciplines reflects the idea that different "trading zones"[18] can simultaneously coexist within the same interdisciplinary collaboration (Collins et al. 2007). Collins et al. (2007) argue that perceptions

[18] These authors draw on Galison's (1997) idea of the "trading zone," which he characterizes as a space where communication must be negotiated between scientific perspectives.

of expertise fundamentally shape collaborative dynamics and structural arrangements in interdisciplinary science. As a result, interdisciplinary groups, while appearing cohesive to outsiders, may in fact be fragmented, divided into multiple sub-groups that are themselves characterized by different levels of integration. This theory helps to explain the very different experiences of collaboration offered by BIRG members. The engineers and doctors shared an appreciation for each other's scientific expertise—they saw their union as one of sharing strengths. Over the years, they became fluent in each other's disciplinary language and developed a "trading zone" based on shared representations that represented fundamentally equal scientific perspectives (Collins and Evans 2002; Gorman 2002; Collins et al. 2007). As such, they were able to transcend disciplinary barriers, developing a true collaborative partnership (Collins and Evans 2002).

The nurses, on the other hand, worked at the margins, largely alone. According to Collins et al. 2007, their different experiences in the group can be explained by the fact that their expertise was not recognized as important within the BIRG. So while they were at interdisciplinary table, their scientific contributions were suspect, and therefore not equally integrated within the group. In this way, they were outsiders, operating in a fundamentally different "trading zone" than their peers (Collins and Evans 2002; Gorman 2002; Collins et al. 2007).

This chapter also illuminates the complex identity work that BIRG members engaged in. Being "different but equal," or in other words, having their expertise validated, allowed the doctors and engineers to develop an interdisciplinary identity without having to disown or forgo their disciplinary affiliation. In short, their disciplinary contribution was congruent with interdisciplinary goals and ideals. So they valorized difference at the same time they developed

tropes of sameness within the BIRG. This stands in contrast to the BIRG nurses who felt like they were not true partners in the interdisciplinary exchange. Their disciplinary identity, I came to learn, was "spoiled" within the context of interdisciplinary science (Goffman 1963). And as a result, they experienced a much more fractured sense of self as they negotiated disciplinary divides within the group.

This is my point of departure. Interdisciplinary solutions are touted as essential to solving intractable problems in the health sciences. But what's lost if some voices are marginalized in these collaborations? This is the story I will tell in the remaining chapters as I largely focus on the nurses' experiences within the BIRG. What fueled the nurses' perception of inequality? How did they account for their lack of belonging within the group? In the next chapter, I will begin by examining the BIRG's institutional backdrop. I discovered that the structural origins of inequality were in place long before the three primary investigators began their scientific collaboration. Nursing's disciplinary vulnerability—their comparative lack of funding opportunities as well as their lack of resources as an institutional unit, along with other structural barriers that limited how nurses were able to work within the health sciences system—precluded an equal interdisciplinary collaboration from the outset.

# Chapter 4

## Origins of Inequality:
## How Structural Inequalities and Existing Hierarchies Shape Interdisciplinary Science

### Introduction

Interdisciplinary collaborations rest on the fundamental premise that while disciplinary perspectives offer different vantage points and strengths, they are equal contributors to the problem or topic under investigation. In fact, it is these very differences that offer the advantage over single disciplinary endeavors and facilitate innovation. In reality, however, power and status differences of individuals and the disciplines and institutional units they represent shape how those involved in interdisciplinary projects understand their roles and experiences within the group. In this chapter I introduce how existing structural inequalities and organizational hierarchies within the academic health sciences broadly, and the group's university environment specifically, emerged to shape the process and products of interdisciplinary science for the BIRG group. I explore how material inequalities among disciplines as well as existing professional, scientific, and academic hierarchies organize group efforts from the outset. While the group's principal investigators aspired to create an egalitarian atmosphere and champion a "different but equal" interdisciplinary ethos, I show that existing power imbalances and entrenched cultural beliefs prevented them from realizing this goal.

I begin by describing the existing structural impediments team members noted as salient in shaping the group's potential from the beginning. While most team members shared that institutional shortcomings and antiquated administrative structures slowed the group's work, in

practice, only the nursing project was delayed by these barriers. Medicine and engineering, flush with departmental resources, had financial safety nets to manage early crises that threatened the group's progress. Nursing, in contrast, was left with few options, and as a result, the nursing project alone had trouble getting off the ground and keeping pace with the others. Anna, the nursing PI, also struggled personally as she alone waited to get paid during the administrative complications. But even after start-up issues were resolved and grant funds were accessible to all three disciplinary projects in the BIRG, financial problems continued to plague nursing. Nursing still struggled to establish financial autonomy and secure much-needed funds within the BIRG group.

While financial issues were undoubtedly a source of frustration for the nursing researchers, material inequalities were not the only barrier to equality in the BIRG. Nursing, as a discipline, was plagued by other, less tangible disadvantages as well. The nurses lamented that their historical subordination to doctors in clinical settings followed them into the BIRG. In academic research medicine enjoyed many structural and cultural advantages that positioned them as "in charge," but this time they reigned supreme in a discursive hierarchy that further cemented nursing's relative disadvantage in the BIRG. Cultural beliefs about independence and professional autonomy also worked against the nurses as they fought to overcome stereotypes and the expectations of nursing's culture of deference in the BIRG. These beliefs ultimately shaped behavior and choices in the group, affecting the pace and products of interdisciplinary collaboration within the BIRG.

***Start-up Difficulties***

When I began researching the BIRG, the principal investigators were eager to bring me up to speed on the challenges they had overcome in their many years working together. In doing so, they each described the group's inception, in particular recounting the structural obstacles they encountered as they began to work together in a disciplinary world (Abbott 2001; Sá 2008). But as I heard multiple renditions of the same stories and reflections, I began to notice that there was less of a consensus among group members than I had originally thought. Below the surface, group members often interpreted even shared challenges quite differently. For some, the stories were merely accounts of a shared history, but for others, recounting past obstacles elicited strong emotional responses, revealing that some members believed they disproportionately suffered the brunt of interdisciplinary confusion. BIRG members also disagreed about the true nature of the problems, highlighting how members' relative positions influenced their perceptions and experiences within the group.

In the academic sciences, researchers spend innumerable hours crafting grant proposals in the pursuit of external funding against long odds. For many disciplines, external funding is the primary mechanism for supporting ongoing research, and also communicates value and status to others in the field (Lamont 2009). When the BIRG was first awarded the prestigious IRSAG grant from the NIH, they knew that five years funding was a triumph, but that also came with high expectations. If the group hoped to remain competitive for future grants, they would need to hit the ground running with their projects so they could demonstrate they were worthy grantees and that their scientific productivity was enhanced by virtue of the funding.

Unfortunately, the BIRG group was plagued by start-up difficulties. I learned that even after grant was dispersed, they still faced intra-institutional financial hurdles unique to interdisciplinary research groups. The PIs talked openly about the difficulties of setting up large

grants that straddled disciplines, acknowledging that the participating departments had vastly different systems in place for handling accounts and distributing money to faculty members and researchers. In practice these discrepancies impeded the flexibility of the group and became a shared frustration as internal administrative differences and accounting regulations at the university level delayed access to funds, hindering the group's work.

But as I talked to BIRG members about their experiences with the delay, I uncovered far more than outdated bureaucratic structures not yet nimble enough to handle large interdisciplinary grants. I discovered that group members had very different accounts of the initial administrative hiccup, and that these differences were shaped by existing power differences among the three disciplines represented in the group. The relative departmental wealth that medicine and engineering enjoyed compared to nursing gave Tom and Phillip ample financial room to maneuver as the team negotiated both university and federal requirements to access their NIH award. Nursing, in contrast, was financially unable to temporarily support Anna's research while she waited for the grant funds to become accessible. As a result, among the PIs, only Anna, who was at that point dependent on soft money, went almost an entire academic year without access to her BIRG research funds and personal salary after the grant was dispersed by the NIH, but before the monies were re-routed within the university for her use in the School of Nursing. She was understandably upset that this not only delayed her research agenda during this period, but rendered her personally financially vulnerable as well. She shared:

> I'm sure we got word in September, and I'm sure it was May, if not June when they got the accounts set up, and it still took another month to actually get a check. They did finally cut me a check off-cycle. But that took months and months. Oh it was awful! And obviously, to get the

> science up, amidst this…and that's why my project was so behind. It was very under-funded.

While all the principal investigators agreed that the delay was frustrating, they also had vastly different explanations for it, shaped by their unique institutional vantage points. Tom, the PI from medicine, saw the problem as a function of outdated structures. As the lead principal investigator over the entire grant, Tom enjoyed the institutional advantage that the IRSAG grant was organizationally housed in the College of Medicine. For him, the delay was frustrating, but the funds were distributed to his institutional unit first. His salary and research were largely unaffected as accounts were being established. Similarly, Phillip, a distinguished research professor in engineering, also enjoyed financial security during the transition. He had a secure salary as a full professor but also had preexisting grants and ample departmental funds at his disposal to make headway on the research during the interim. Anna alone, as an untenured research track faculty member, had a salary that was based entirely on "soft-money," meaning that she relied almost exclusively on promised funds from the IRSAG for her salary and research. For her, an administrative delay meant not only that her scientific progress would suffer, but also that she would fail to draw a salary for her work on the proposed research during this time.

When I asked Anna to explain the delay, I expressed to her my assumption that the various institutional units would be motivated to quickly iron out any difficulties so that they could all allocate such a large grant to the participating departments. She quickly volunteered that it wasn't just structural or administrative inadequacies that created the problem. Part of the difficulty, she believed, was deep-seated acrimony rooted in the long-standing divisive relationship between medicine and nursing. As she explained:

> There was huge animosity between the School of Nursing and Obstetrics and Gynecology. And engineering was a little bit less of a player in this whole battle thing.
>
> *And this whole animosity was…?*
>
> Historical. It was a perception, possibly correct, I don't really know—that nursing asked and asked and asked and never gave—from Ob/Gyn's perspective. From nursing's perspective, it was, those guys always get all the money and we're just the ones who end up being data collectors—also partially correct.

So while all three principal investigators remembered the administrative delay as a salient moment in the group's history, Anna alone perceived that the problem was exacerbated by entrenched power relations between institutional units. Coming from nursing, a discipline historically subordinated to medicine, Anna was familiar with the fallout of this particular power struggle (Anspach 2010; Freidson 1970). In this way, Anna's account reveals a theme I will develop throughout this dissertation—that power differences and status divisions, far from being merely background static, exacerbate existing organizational inequalities and individual insecurities to shape the process and products of interdisciplinary science. So while the BIRG's start-up problems demonstrated how institutional shortcomings hindered their interdisciplinary collaboration, Anna's perspective hints at how power and political factors shaped the group's work.

Her account also demonstrates another theme that emerged again and again throughout the course of my research: that team members not only had vastly different perspectives of the group's history, obstacles, and shared work, but that they also experienced different challenges and risks participating with the group. When the grant was delayed, Tom and Phillip were annoyed, but personally and professionally, they were buffered from the setback. For Anna, the initial delay represented nothing less than her inherent vulnerability as an interdisciplinary researcher coming from a less moneyed field. Not only did she struggle personally, foregoing a

paycheck while the accounts were being set up, but her scientific research also languished without necessary funds. This postponement of her scientific work proved to have additional consequences for Anna. Because scientific productivity was used as a proxy for success within the BIRG, Anna's roadblocks in getting her project off the ground set in motion cascading effects that created status implications and fueled her self-doubts as well.

***"The Paper Clip Issue"***

But even after the funds were released and technically available to each of the principal investigators as disciplinary project leaders, financial issues continued to emerge as salient markers of power, defining the haves and the have-nots and shaping the parameters of contribution within the group. In the monthly investigator meetings the PIs frequently joked about nursing's ongoing "paper clip issue." Because federal grants like the IRSAG did not cover incidental expenses, or "indirects" such as office supplies, the principal investigators were left to their own devices to provide these resources for their respective staff and projects. Here, another dividing line emerged as Anna worried about providing everyday necessities for her scientific work out of pocket (like paper clips) while medicine and engineering easily paid for incidentals from departmental coffers. Anna explained:

> So in the year before we put this grant together, I said, there is no way that at the School of Nursing, I will have any resources for any indirects. So in Ob/Gyn—paper, copying—you just do it—pencils, paper clips, even computers. They'll deny it, but they get computers pretty easily, frankly. All of that stuff they just go to the closet. I had no way—I called it "the paper clip issue." For 10 years I've called it the paper clip issue. I had no way to get a paper clip. …So I would go over to the Ob/Gyn office and fill a bag with supplies and walk them over here [to nursing]. For years I did that. Yeah. I couldn't get a ream of paper, I couldn't get a yellow pad, I couldn't get a pen, let alone a computer.

As I first listened to the PIs joke about nursing's "paper clip issue," I noted in my fieldnotes that the extreme financial disadvantage nursing experienced seemed to bolster a sense of group solidarity against disciplinary obstacles that threatened the team's work. But after more time passed, I discovered that the "paper clip issue" was not really funny to Anna. It actually was a sore spot that masked hurt feelings and deep-seated beliefs about science, professionalism, and gender. Going far beyond merely capturing the material inequality among disciplines, the "paper clip issue" became a symbol of the chronic, relative disadvantage of nursing that spanned both the macro and micro stages of interdisciplinary research. As a nursing researcher, Anna was all too familiar with the "paper clip issue" in her disciplinary world. She came from a relatively poor discipline. But because the "paper clip issue" followed her into the BIRG group too, it conferred an almost second-class citizen status and served as a constant reminder that she alone struggled to provide everyday expenses to facilitate her scientific project. Her sense of financial vulnerability further colored her self-perceptions of autonomy and value in the group, consolidating a sense of deprivation and hardship. Here she relayed her frustration at not being able to convince Tom and Phillip that she needed a computer, one that she had no other means to secure:

> And so when the grant came in, I had said, I have to have a computer and Tom and Phillip had both promised, "we will get you a computer." And they didn't. That's a sore spot with me still. That's still a sore spot. … I used a really, really old clunky one. This is an interesting interdisciplinary thing. So Tom is extremely conservative on money. That's just his lens. And Phillip will say, "well if you need it, then you spend it," but the next moment, the money you thought you were going to need and spend was spent over here in engineering. Because there was a need and it was important. […]but there's only one pot of money. And he [Phillip] did have a heck of a lot more power than me. So I had to go through sort of a permission process that Phillip and Tom didn't really need to go through. That's not the case anymore, but historically that was very much the case. […] So I was always saying I have to have the resources to do [my research]—and longitudinal projects are the most expensive to do. And Tom's view was that we may need the money for something later.

In this quote, Anna reveals that far more than mere money woes were operating to delay her scientific work within the group. While material differences at the macro-disciplinary level certainly shaped the principal investigators' experiences from the outset, financial inequalities among disciplines were reinforced on the interactional level too, as Anna struggled within the BIRG to argue for much needed resources. As a fellow PI on the grant, Anna was, at least in organizational terms, equal in her professional role to Tom and Phillip, yet she still saw herself as having less power than either Tom or Phillip within the group. Anna told me that the power relations in the BIRG were complicated in part because she had begun working with Tom and Phillip as a doctoral student decades earlier. But Anna's perception of deference and financial vulnerability persisted long after she assumed the role of PI in the group. She still had to fight for the resources she needed to be productive and effective in the group.

Reflecting on another incident, Anna again recounted her struggle to convince Tom and Phillip that she needed more resources from the shared pool, this time to reimburse her clinical trial subjects at rates comparable to medicine. Not doing so, she believed, adversely affected her ability to recruit subjects, and therefore the pace and success of her project. As she explained:

> And their [medicine's] research subjects were getting paid a hundred bucks to come in and get the urodynamic evaluation, which is highly invasive. Mine were getting $30 because I was doing a treatment so they (the subjects) have some gain from the treatment, [that] was the rationale. And I kept saying, "no, this is an experimental treatment and it's longitudinal." I have to keep them coming in for many, many visits. They got $30 on the first, and $10 for each of the others. And their people got $100 for the clinic visit and $100 for the MRI. And so my project was failing. So in the fourth year, I finally talked them [Tom and Phillip] into seeing I had to reimburse people [at higher levels] to get them in. And we jumped it [payments] up and recruitment went way up. And that's where this carry forward stuff was devoted to finishing my project. Because it's not that we didn't have the money! There was an *enormous* amount of money!
>
> *You talk about influence in this whole thing. It sounds like you didn't feel you had any influence in getting your basic needs met?*

Yeah, I felt like I didn't.

Here Anna demonstrates how individual perceptions of power influence the process and products of interdisciplinary science. Because she did not feel she was in a position to secure the supplies and resources she needed to effectively recruit subjects, the nursing projects she led suffered for some time. But she also suffered because she felt she continually had to ask, even beg, for what she needed. Simply put, she felt the sting of disadvantage in routine interactions within the group. Her account also points to an issue that I will develop in subsequent chapters: that scientific differences are not always equally valued within an interdisciplinary group. While the canon on interdisciplinary science concentrates on problems that emerge from cultural or scientific misunderstandings, Anna's comments reveal how the scientific preferences or biases of powerful group members can stifle equality at the interdisciplinary table, thereby shaping the direction of interdisciplinary collaborations.

Though I overheard much discussion about budgetary decisions and the group's finances during meetings, Anna was the only PI who described a sense of financial vulnerability in the group. She alone shared with me her deep-seated insecurity about money issues in interdisciplinary collaboration describing myriad instances where she settled for less throughout the years. It was only recently, she told me, that she had begun to stand up for herself to demand more for her project. BIRG staff members corroborated Anna's account, recognizing that nursing alone suffered material disadvantages within the group. Allison, the group's accountant, reflected on nursing's financial position within the group, as she explained that not having discretionary money created more "stress" for Anna.

> Well, it makes a difference whether you're in a department that has money or not—that has discretionary money…There's just less stress in engineering and the

> medical school than in nursing as far as how to— like in nursing, Anna's big thing was, how am I going to get a pen, how am I going to get a pencil? Here [in medicine] you go to a supply closet and you get it. There [in nursing], it's very much like, well, if you have enough money in your little pot that we've given you for those sorts of things, then you can get it, otherwise, I don't know. And so that certainly makes a difference—money. Money makes a big difference.

Anna was not alone in recognizing that financial tensions reflected unequal power among the PIs in the group. I heard repeatedly from the BIRG staff that the investigators hated to discuss money issues, preferring to focus on the science. While some speculated that the PIs had more scientific mindsets, and therefore could not be bothered with the mundane realities of finance and budgets, others suspected that their avoidance was linked to earlier financial conflicts, hurt feelings, and ultimately, unequal power relations among the PIs. Nicole, the group's project manager explained that while she had been with the group for years, the PIs had just recently formalized a system for approving unbudgeted expenditures when they exceeded any one PI's project funds. They finally had to address the issue explicitly, she said, because it was creating "some animosity and some tensions" within the group. When I asked her for more details, she said that the absence of a formal policy essentially meant that Anna was not getting her fair share of the resources. She noted that:

> You know, like Dr. Gavin and Phillip were just spending and Anna wasn't, you know? And so she's like, 'I'm sort of being a good steward and you guys are just doing whatever you want and it's not being brought to the group.'

Nicole continued to explain that historically, Anna had to "fight" to get resources in the group, but had recently become more confident in standing up for her financial needs.

> …when financial stuff comes up, Anna is usually fighting pretty hard to make sure she gets her fair share and portion of it. When we first got this IRSAG 2 as I started to take over as project manager…at that point I still saw Anna fighting a lot. But in the past six months or so, she's not. […]
>
> *So why do you think that she had to "fight"?*

> Again, I can speculate, I don't really know, um, but I would guess. […] I'm pretty sure that Anna got her PhD right before I got here. So I think that there was just a dynamic of you know, Dr. Gavin and Phillip already being in a certain hierarchy status and Anna not. And um, part of it was, you know, it's like in any human interaction. She might have put herself there, but they might have also put her in that step lower kind of position. […] But, yeah, I think she feels more comfortable now in standing up for what she needs. And five years ago she didn't.

Importantly, Nicole recognized that the principal investigators' hesitation to discuss financial issues was linked to the fact that money represented scientific autonomy and power for some, and dependence and deference for others. She also introduces an important point, and one that I will unpack more fully in the next chapter: that status markers often operated in concert with more concrete dimensions of inequality to compound a sense of vulnerability for certain interdisciplinary team members. In this instance, Nicole believed that Anna's position as a newly minted PhD emerged as a status marker that put her in a less powerful position within the group. So while on the surface it appeared that negotiating funds was difficult because it was hard to predict and reconcile the vastly different needs across disciplines as they emerged, Nicole astutely recognized that perceptions of status played into the mix, even offering a possible mechanism—that status hierarchies were mutually reinforced on an interactional level. This explanation dovetails with Anna's account, in which she describes not having the social standing within the group to effectively advocate for her financial needs, thus perpetuating her sense of powerlessness.

The financial abundance that medicine and engineering enjoyed over nursing was reinforced in other ways, some small and seemingly insignificant, and others, more fundamental and contested. During one investigator meeting, the group's leaders were discussing travel arrangements for an upcoming conference where some members would present on their shared work. Karen, Anna's nursing co-investigator, casually mentioned that travel was expensive for

her because she did not have departmental support to pay for the hotel room. At this, Elaine her colleague from medicine, quickly volunteered that she would be happy to share her room, which was paid through her discretionary travel funds from medicine. Karen expressed appreciation and the group went back to discussing the papers they would put forth. While this anecdote demonstrates the true collegiality among BIRG members, it also highlights the fundamental financial disparity among disciplines. Small exchanges like these were constant reminders of nursing's more tenuous financial position and dependence within the group.

Larger issues, too, such as the funding of support staff, also emerged to consolidate a sense of have and have-nots in the group. While the IRSAG grant was written in such a way to fund some staff positions for the project, engineering and medicine had other funding streams from which to support additional personnel. Engineering graduate student research assistantships funded students eager to work with Phillip on the IRSAG, and Phillip also had other grant funding to support post-docs and undergraduate research assistants on the BIRG research. In medicine, three rotating three-year urogynecology fellowships kept the medical project staffed with skilled workers—workers who were invested in churning out publications not only for the group, but also for their own curriculum vitaes. In engineering and medicine, students, post-docs, and fellows all designed pilot studies, analyzed data, and took the lead on drafting articles in their respective fields. While these personnel were often funded through independent channels, their efforts were critical to the BIRG's success.

In nursing, however, Anna was again left with fewer resources at her disposal. Though the IRSAG grant covered the part-time salaries of a few nursing staff members, these roles were largely to assist with subject recruitment and the day-to-day management of nursing's clinical trials. Anna alone designed the clinical studies, managed recruitment efforts, analyzed the data,

and wrote up the results. Anna did work with one graduate student, Nadia, but she had a limited role in the group. Nadia was technically supported through a graduate research assistantship, but Anna was careful not to abuse her time, and encouraged her to only work the hours she was paid for by the IRSAG grant. The rest of her time and energy, Anna frequently reminded her at meetings, should be allocated to her own dissertation research, on a topic distinct from the BIRG's research. But even as Anna protected Nadia from potential exploitation in the BIRG, she herself felt overextended, and anxious about the limited hours she had to allocate to writing.

When I asked Anna why she couldn't attract more graduate students to help her, she explained that there was just a "minutia" of nursing students who would be interested in the birth injuries, noting that it was considered a narrow, largely biomechanical field in nursing. She continued, "The whole world is open to nursing […] students are not particularly attracted here, especially at the doctoral level, the post-doctoral level. So I couldn't run the project with students. Still can't." And what about additional staff? Couldn't Anna use another person or two to help out with the scientific analysis or drafting publications? The answer was a resounding "yes!" But who would give up personnel or allocate more money to hire additional support staff for Anna's projects? The answer, I learned, was complicated.

***Productivity Problems: Structural or Cultural Origins?***

Anna's anxieties about lagging behind the productivity levels of both medicine and engineering were warranted. Tom and Phillip also worried about the BIRG's productivity, and both shared with me that nursing's output, in terms of lead-author publications, was, unfortunately, nowhere close to that of either engineering or medicine. Productivity, I quickly learned, was simultaneously the most important and contested issue within the group. Simply

put, demonstrated productivity was necessary for the group to succeed, and all the PIs acknowledged this was true—the NIH would only grant the team additional funding if they were producing novel, peer-reviewed work at an impressive pace. Other granting mechanisms would similarly expect to see an impressive publication record when making future funding decisions. In this climate, all group members felt the pressure to produce in this way. But here, nursing again came down on the side of the have-nots. With fewer support personnel analyzing data and drafting articles, publication rates were necessarily much lower than either medicine or engineering. And this is how productivity within the BIRG became a divisive topic.

This difference in support emerged as a sticking point and again revealed how the different disciplines perceived their relative advantages or disadvantages within the group. While Tom conceded that Anna did not have the support personnel he or Phillip enjoyed, he still could not help but express frustration that nursing's output was lower. In one investigator meeting, Tom, Anna, and Phillip began to explicitly discuss each group's summer manuscript progress. Tom said that they should "broaden our skill-sets" in order to get more papers out the door, suggesting that they should focus on time management and consider other ways to creatively utilize other staff members or other departmental resources. While he spoke in general terms, he was very clearly referring to Anna's progress, and everyone in the room knew it. When Anna responded that there was an administrator in nursing who could perhaps be called on to help, but explained that this person was shared with the entire School of Nursing, so using her would have "political" implications in nursing, Tom lashed out, obviously frustrated, "If we don't publish papers, there's no outcome! So we need to do what we have to, to move forward!" In yet another investigator meeting, Tom, visibly uncomfortable, asked that the door of the room be closed so he could freely share what was on his mind. He then went on to vent about Karen, a

junior co-investigator from nursing. He was frustrated about her inability to meet writing goals for papers she was taking the lead on. He conceded that while he knew she was busy juggling the many demands on her time, he still expected a higher level of output and asked Anna to speak with her about it.

Incidents such as these revealed that while there was shared understanding that nursing had a harder time producing at an equal level because of existing structural constraints (i.e. fewer project-funded support staff and nonexistent departmental discretionary resources), at the end of the day, *structural solutions* were never outwardly offered. For all of the hushed anxiety about nursing's lack of productivity, I never heard explicit mention of sharing the labor of the medical fellows or engineering graduate students, to help nursing get their papers "out the door." Gwen, a medical fellow, seemed an obvious choice. She adored working with Anna, considered her a great mentor, and was particularly interested in Anna's work. She told me that she wished they could spend more time working on her projects, but she was already overcommitted in medicine. The urogynecology fellowship she was funded through was technically independent from the BIRG. So while she worked with Tom and Elaine in the BIRG through her fellowship, her clinical commitments and research obligations were squarely in medicine. As a result, she only collaborated with Anna in relatively small ways.

As an outsider, I wondered: if Anna's productivity was lower due to legitimate disciplinary inequalities and staffing constraints, and this in turn diminished her productivity and threatened the group's chances of future funding, then why weren't other support staff being allocated to nursing? This was all the more interesting because the BIRG did have a regular "publications meeting" where members would strategize about how to frame specific articles, which journals to target, etc. So the group not only worried about writing and productivity, but it

actually went so far as to create a formal provision to support the writing process. However, these solutions stopped shy of leveling the playing field in materially effective ways. And though I saw productivity emerge as a hot-button issue in meetings, it was not until I interviewed group members that I learned each side's perspective varied wildly, as team members confided their anxieties and self-doubts related to this disparity.

The nurses were frustrated that they couldn't produce more, but they felt the deck was stacked against them and that they were held accountable to unrealistic expectations given their resources. Kristine, a nursing staff member, told me that it was impossible for Anna to generate the same number of publications as medicine, who relied on the "slave labor" of medical fellows. Karen, the co-investigator with whom Tom was frustrated, defended her own marginal contributions to nursing's meager output, obviously a sore spot for her, by saying that Tom did not realize or at least acknowledge that she was only working for the group as a small percentage of her overall salary. As an assistant professor, she was juggling teaching, committee work, and clinical duties, as well as commitments to many other research projects, all of which needed her attention and expected her output. Other nursing researchers told me a version of the same story—Anna worked too hard and lacked the scientific support that researchers in medicine or engineering received. Even Gwen confirmed this, by questioning how Anna was able to get anything done given all that she was juggling. She contrasted Anna's role to Tom's, noting that while Tom generated all the ideas, he relied exclusively on the fellows and medical students to take the lead on writing. Anna had no such arrangement. Eager to hear Anna's reflections on how her lack of support staff affected her research and collaboration within the group, I asked her to consider whether she had enough support staff in the following exchange:

*And so your staff, is it support enough? I mean, do you have enough hours of staff support that are comparable to engineering or medicine?*

No, No—their people are there full-time. Three or four—okay, they would argue with me—well, Phillip wouldn't. His fellows are there full-time and he usually has, well he's got post-docs. He usually has three.

*So expressly there to assist on this project, in whatever way he wants and needs?*

Yeah. I think, I mean, I'm pretty sure. And the fellows, they do have clinical responsibilities, but other than that, the reason they're doing the fellowship is research in Urogyn. They're there full-time whether, yeah. And I've never had any full-time people on IRSAG. And they don't—well, engineering does because of the GSRAs, but the fellows don't appear on IRSAG [grant] because they're funded separately, but their job is to do [the work], so they have free staff.

*So does that ever come up? Is that ever recognized in the group as being an inequity that's built in, and affects how the different projects can function?*

Yes. It comes up when we talk about learning to understand one another's cultures. In that the model in Ob/Gyn is different than the model at engineering, and the model at nursing is just a problem (laughs sarcastically)! It's because it's a model that requires money.

*Right. Right. But that's not even, I mean, there are cultural differences, but that's also a structural issue, at the level of resources, how the structures are set up.*

And it isn't just staff, it's still the A21 problem—I still have the paper clip issue. It's still an issue. It's not as severe an issue [as it was], but it's still an issue.

Here, Anna continues to describe how her financial inability to fund enough support staff adversely affected her progress in the group. So her financial problems did not end when she joined the BIRG. In fact, her sense of not having enough was compounded, rather than alleviated in the interdisciplinary BIRG. While she undoubtedly experienced similar financial challenges before joining the BIRG as a researcher hailing from a relatively poor field, being constantly reminded that her own situation compared unfavorably to that of medicine and engineering made these challenges all the more salient. Moreover, her involvement with the

group intensified the pressure to perform. Productivity was of paramount importance for the group's continued success, and she alone was expected to produce with far fewer resources.

Anna's comments also inadvertently revealed that while BIRG members conceded there were financial disparities between disciplines, they just as frequently characterized them as reflecting "cultural differences" instead of institutional inequities or material inequalities among disciplines.[19] Tom and Phillip agreed. They both explained to me that the "cultures" of medicine and engineering were better equipped than nursing to facilitate high-level research. Both disciplines employed traditional training structures, which relied on apprenticeship paradigms to support students and post-docs. They confirmed that independent, ongoing fellowships and other funding streams helped finance medical fellows, students, and post-docs, all of whom bore the brunt of the scientific work for their disciplines in the BIRG. The urogynecology fellowship was even rotating, so each year a new fellow arrived and could be trained in part, by the more experienced outgoing fellows. In contrast, nursing was relatively new to academic research at the independent-investigator level, and therefore had neither the historical precedent nor the resources to implement a comparable training structure.

*"Cultural Problems" or Structural Inequalities?*

I soon learned, however, that other factors slowed the nurses down. In addition to financial disparities and a lack of sufficient support staff, nursing was saddled with other "cultural" problems that were more accurately, vestiges of their historic subordination to medicine. While the doctors and engineers spoke at length about the egalitarian backdrop of the group, the nurses alone described how cultural patterns of inequality between medicine and

[19] This characterization is similar to the "culture of poverty" argument that explains the persistent poverty of African-Americans in the U.S. as a function of deficient cultural values. This idea first gained prominence in the Moynihan report (1965) but has been widely critiqued and debated since that time.

nursing permeated the larger context of the health sciences, and so still shaped the everyday experiences of researchers both outside and within the group. Far from mere reminders of a clinical hierarchy, they experienced these problems as ongoing and deeply entrenched in the health sciences. For them, inequality was diffuse; it was virtually everywhere. To the extent that there were solutions, these problems took time and energy to remedy. So while Anna and her team felt the sting of financial disparities, they also simultaneously struggled to overcome institutional impediments that slowed them down as they worked in the BIRG.

For example, Maggie, a nursing research associate, described how something as simple as email perpetuated unequal relations between medicine and nursing. She shared that nursing faculty members and their research staff were, not considered part of the health sciences system at the university, rather they were designated as "off-campus." This structural arrangement, she shared, keeping nurses separate, was rooted in the historical inequality of the nursing profession to medicine. And this designation came with consequences—being "off campus" prevented nurses from enjoying many of the everyday privileges that facilitated the research of their colleagues in medicine. In the first place, nursing did not have routine access to medicine's secure email system. In practice this meant they were unable to send and receive secure patient files, MRI scans, and other confidential information. For this reason, nursing researchers, regardless of their role or their project's focus, were not, by the nature of their work, granted access. Only those who collaborated with colleagues from medicine could request special permission to obtain a secure email address that allowed them to transmit and receive these files. This seemingly insignificant structural inequity was salient for the nursing researchers in the group. While they were easily given the email clearance given the nature of their work in the

BIRG, the fact that they were required to ask for formal permission perpetuated a sense of subordination to medicine.

Anna told me about another outdated barrier that effectively limited the freedom of nursing researchers. When she arrived at the university as a doctoral nursing student, and even years later when she began pursuing a tenure track position in the School of Nursing, nursing researchers who were not also nurse practitioners were not legally allowed to lead clinical research projects in the university hospital. While the arrangement was framed as a "union issue" designed to protect nurse practitioners from non-union nurses undercutting them in the university's clinical spaces, in practice this restriction also prevented nursing faculty members or other nursing principal investigators from directing clinical research projects.

As a result, nursing faculty who wished to pursue clinical research had to work under the supervision of a principal investigator from medicine, even if only in name. Both dimensions of this issue—the need for nurse practitioners to protect their rights as workers and the mandate that nursing researchers work under investigators from medicine—had origins in the nursing profession's subordination to medicine. But, unfortunately, as Anna noted, the system pitted nurses against nurses. She told me that while she considered herself "pro-union" she saw no other alternative than to "put on her activist hat" to challenge the legality of this outdated rule at the highest levels of the university. Her legal battle was ultimately successful and she secured the right for herself and other nursing researchers to lead their own clinical research projects at the university hospital, but it was not without a pang of regret that she had to undercut the autonomy of nurse practitioners to do so. Spearheading this legal challenge also took time and energy away from her scientific work, putting her further behind.

The preceding examples reveal how ongoing structural barriers at the institutional level worked in concert with financial limitations to consolidate the nursing researchers' perception of inequality. While these very tangible hurdles may have originated outside the group, their effect was felt within the group as Anna and her team were continually reminded that they were not fully autonomous, even as high-profile, NIH-funded interdisciplinary researchers. But I soon learned that nursing struggled in other ways too: nursing was not only materially deficient, but perceived as culturally flawed as well. As I began to analyze what group members meant when they spoke of "cultural" differences, I came to see that nursing's cultural deficiencies had deep roots. Despite group members' best efforts to achieve an egalitarian collaboration, nursing's historic subordination to medicine and its professional "culture of deference" were still salient within the BIRG's research context. Cultural beliefs about nursing emerged to mark nurses as less autonomous and less capable than their interdisciplinary colleagues. These cultural beliefs not only shaped how other BIRG members perceived their nursing colleagues, but also affected how the nurses participated in the group.

### *The Nursing Profession and a Culture of Deference*

Significant scholarship has been devoted to documenting the long-standing professional relationship between nursing and medicine, which in addition to a rigid professional hierarchy was also characterized by gendered inequality from the outset (Freidson 1970; Anspach 2010). Until late in the 19th century, women routinely worked as female lay practitioners and healers in the United States, often operating independently as the only health practitioners in rural communities around the country (Ehrenreich and English 1978; Rossiter 1982). In the women's health arena this was even more pronounced as female midwives exclusively assisted women

with labor and delivery and other health concerns unique to women (Donnison 1977; Ehrenreich and English 1978). As men became interested in the field, however, women were increasingly scrutinized and excluded from the healing arts. As the field of medicine was deemed lucrative and therefore "professionalized," women were increasingly excluded from licensure and training programs (Freidson 1970; Witz 2013). Those women who wanted to continue working as healers and lay practitioners were subsumed into the nursing profession, an all-female "helper" profession designed to serve and assist the male doctors in medicine (Witz 2013). From this moment forward, nursing as a profession was tightly regulated by medicine and nurses were vulnerable to the whims of individual doctors as well.

These changes were especially notable in the women's health arena. Before the professionalization of medicine, women's health in particular had always been managed by other women. Midwives exclusively assisted in the women's labor and delivery as well as most other women's health concerns. The emergence of the field of obstetrics in the United States, and its professional exclusion of women, eliminated the long-standing tradition of women taking care of other women during pregnancy and childbirth, especially in urban areas. Though midwives still worked in rural communities into the early 20$^{th}$ century, their experiential knowledge and lay practices took a cultural back seat to obstetrics' more modern approach to labor and delivery. By the 1950's, midwifery was rendered virtually obsolete even in rural areas.

In recent years, nurses have made strides to command more professional freedom and autonomy. News reports have emphasized that the shortage of general practitioners has resulted in increased professional autonomy of nurse practitioners (Vestal 2013). But more broadly, a rigid hierarchy, backed by extensive laws and licensing regulations, still structures an unequal relationship between nursing and medicine in clinical settings (Weston 2010).

While the BIRG outwardly espoused an egalitarian ethos, I found that the long-standing professional hierarchy between nursing and medicine still subtly shaped member beliefs and behaviors within the BIRG's research context. Not surprisingly, while many group members talked about the unequal relations between nursing and medicine, their perspectives varied tremendously depending on their disciplinary affiliation. Some BIRG members, namely the engineers, did not speak of it at all. For them, the nurses' research contribution, much less the historical subordination of nursing more broadly, was hardly on their radar. But for the doctors and nurses, this history was salient. A few BIRG doctors assured me that the long-standing collaboration among Tom, Anna, and Phillip meant that patterns of hierarchical relations must not affect the group—the personal respect that the PIs had for each other as researchers trumped the clinical power relations between nurses and doctors. Robert, a doctor working with the group, shared that while he saw nurses and doctors butting heads in clinical settings everyday, he had never seen this as a problem within the group. He offered an explanation:

> In the clinical practice of medicine, you run across this like everyday. […] I mean everyday you hear about it from nurses, like I don't like that doctor. But I have to admit, within the context of the research group…I wonder if it's just something that like, you know, when you've taken the time to apply to a fellowship or come here for six months or a year […] you've kind of really selected yourself out to say, like, you've come with so much motivation to say, I want to get something done here, that you're not in that rock-the-boat, this gets me frustrated kind of mode. And I think that's probably why [it is] something that hasn't come up as much.

Robert explained that the BIRG doctors do not invoke hierarchical privilege largely because they have self-selected into a group that has a culture of egalitarian relations between medicine and nursing, and that they want to "get something done." He acknowledged that assuming an authoritarian role, even though a physician might technically be entitled to do so, would interfere with the research at hand. Other doctors in the BIRG echoed this perspective.

Clinical relationships between doctors and nurses were structured by a rigid hierarchy, but the BIRG research collaboration was not affected by these patterns of inequality.

The nurses, as with most aspects of the BIRG's collaboration, saw things differently. For them, their history of subordination to doctors was still very much a part of their professional lives. In every interview, without exception, the nurses discussed that healthcare broadly, and women's health research more specifically, was a professional and scientific space already framed by power relations and occupational hierarchies between medicine and nursing. While the nurses acknowledged that other BIRG members were always pleasant, they saw vestiges of this hierarchy everywhere and felt that their perspective carried less weight within the group as a result. Part of this inequality, they explained, was due to nursing having less professional power and autonomy compared to medicine. The financial inequalities that I've already discussed certainly fueled the nurses sense of feeling less than, but they attributed much of their outsider status to ingrained cultural patterns of interaction and the general expectation that nursing defer to medicine.

But if there was no overt hierarchy in the BIRG, how did this hierarchy and long-standing tradition of subordination emerge in the BIRG? Gwen, a medical fellow, shed light on this issue, noting that interdisciplinary health research was still shaped by preexisting hierarchies in the health sciences. She explained that even though the premise of interdisciplinary research presupposes equality among researchers, there is still a discursive hierarchy where medicine reigns supreme. She links this hierarchy to money and power, noting that funding agencies still privilege a medical perspective. She shared:

> But the thing is, in the hierarchy of what we're doing and where the money is, in the grants we go for, medicine is still in charge. And that's what I see. And, yeah, to a certain extent, I think there probably is some hierarchy. Between the

> three of them [the PIs], they have so much respect, but I think in the discourse, medicine's probably the dominant paradigm. You know what I mean?

Gwen believed that Anna, Phillip, and Tom publicly espoused professional respect for each other and their respective scientific differences, but existing hierarchies within the larger context of healthcare research made it such that some perspectives were afforded more power within the interdisciplinary conversation (Anspach 2010).

The nurses did not disagree with this assessment, but for them, being limited by a discursive hierarchy in research was at once both more personal and more disappointing in part because they had had higher expectations of a research environment. Nadia, Anna's doctoral student, lamented her discovery that nursing's culture of deference extended to interdisciplinary research. Here, she explains how the cultural expectation of nursing's professional deference constrains her potential contribution in the group, and perhaps more broadly as a soon-to-be minted Ph.D. nursing researcher. As she explained:

> And I think, you know, the culture of nursing is such, is one of deference. […] part of going back to get a PhD, you know, I did think, I'm going to now be at a level playing field. But you know, it's not. As a nurse midwife—I loved, LOVED being a nurse midwife— but I was expressly told at a meeting one time, that at the end of the day the hospital I worked for was there for the physicians. And at the end of the day, whatever it is they want, that's how it's going to go. And I thought, you know, I want to be somewhere where you're valued for your education, for your expertise. And the reality is, in research, [in] healthcare research, it still is about the physicians. I think this group is better than—I mean I don't have any experience in another group—but you just look at the publications and things like that and it's still really is about, I think there still is that deference to physicians in the medical research that's made. You know? And in funding and things like that. That's not my own personal experience, that's just—I'm starting to see this glimmer of—it's not any different when you get to this [level], when you get to research. It's not.

Nadia shared that she naively believed that more education would put her on a more level playing field but was disheartened to learn that the hierarchical relations between medicine and nursing went beyond mere clinical deference, it extended to research too. From Nadia's

perspective, the group's priorities were biased towards a medical perspective, and this was fueled by funding mechanisms that privileged more biological or mechanistic approaches to the topic. Even though she understood why things worked the way they did, she was still disappointed to realize that her expertise and the nursing perspective were not considered equally important within the BIRG.

Nadia's account reveals that the inequality that characterized the professional relationship between nursing and medicine was very much alive in the BIRG, but instead of the explicit hierarchy at play in clinical settings, she invokes nursing's "culture of deference" to explain the dynamic (Witz 2013). The idea of cultural deference has been used by scholars in myriad fields to describe how a cultural group can internalize a sense of submission or respect, which in turn, manifests as deferential behavior. For example, theories of "cultural deference" have been used to explain everything from Congress's foreign policy failures to the recent the Fukushima nuclear disaster (Weissman 1996; Pidgeon 2012).

Nadia went on to explain how this dynamic played out in the BIRG. Since both sides had been trained to expect nurses' deference, it was reproduced during the course of routine interactions. Anna, she told me, had a hard time finding her disciplinary voice and often "deferred" in scientific conversations to Tom and Phillip who often were allied on one side of an issue and had more professional power within the group than she did. I too saw Anna defer in meetings, though it was usually over administrative issues in the investigator meetings. Reciprocally, doctors expected nurses' deference too. Perhaps not surprisingly, I discovered that expectations about nurses' cultural deference dovetailed with beliefs about their lack of independence and autonomy. For example, I learned that the very behaviors required of nurses in clinical arenas marked them as less creative and less independent in the context of research.

Whereas the BIRG nurses described themselves as practical, respectful of logistical concerns, and "playing fairly" within the context of interdisciplinary science, doctors in the group often interpreted this same dynamic less favorably, as evidence of a lack of creativity or independence, and a tendency towards dogmatism. When I asked Elaine, a physician co-investigator, to reflect on disciplinary differences within the group, she shared the following:

> You know I think the nursing perspective that Anna brings, […] they are very rigid in general. Nurses are very rule-oriented in that, this is the rule that you cannot leave this box on the counter—if a patient comes into a room, you throw it in the trash. But I'm like, well I didn't use it, it's still in a box. Nurses are like protectors of rules. And sometimes I disagree with that tremendously. And so Anna has, while she can be somewhat flexible, sometimes [she'll say] we cannot do that you guys—this is not what's in the IRB. This is not what the patient consented for. We cannot interpret this, and I won't participate in that. She can be very dogmatic. And most of the time she's right. But at other times, it can be like, come on Anna, lighten up a little bit. That's where Tom and I would be aligned completely on something, and be like, come on! And Anna is like, no, this is a rule.

In this exchange, Elaine shared how she considers nurses as a collective. In the examples she offered, nurses are depicted as rigid to a fault. She also described a typical situation where Anna would stand her ground within the group. But interestingly, instead of thinking that Anna's defense of principles showed independence or autonomy, Elaine interpreted these behaviors as reflecting the rigid, rule-oriented culture of nursing. Moreover, Elaine failed to account for power differences between nurses and doctors in her account at all. She and Tom, as physicians, felt at liberty to reinterpret clinical rules and even the parameters of the IRB application as needed. Anna, on the other hand, was marked as "dogmatic" for espousing beliefs about the very rules that nurses were accountable for upholding in clinical settings. In this way, Elaine captured a contradiction that emerged during in the course of my research. While doctors expected nurses to follow their orders in the clinic, the same "rule-oriented" sensibility made

them less viable as equal partners in science. Playing by the rules became synonymous with lacking an independent spirit, which marked them as second-class researchers and scientists.

Tom also spoke about the culture of nursing, and emphasized nurses' adherence to rules and hierarchy when I asked him about disciplinary differences. He acknowledged the role of hierarchy in explaining the relationship between medicine and nursing, but interestingly, he attributed much of the problem to the culture of nursing, which fails to attract independent people. Here, he shared his ideas:

> Well, it's, they deal with issues that have to do with nurses, which often times things like, um, providing advice to clients about specific behaviors and those kinds of things that tend to be more on the social science end of things. And Anna is more in the strict [sense], biological—and it's not that nurses don't do that kind of research, because they certainly do and are excellent at it, but, um, I think the other thing is that the nursing culture is one where hierarchy, not hierarchy, but the process of progressing through stages of development is very important. And you have to have done this kind of training before you can do this kind of thing. And then you have to have done this before you do that. Whereas in medicine and engineering, everybody just kind of dives in and gets to where they want to get by whatever path they want to take to get there.
>
> *Interesting. How would you account for that difference? Why would nursing be characterized like that?*
>
> Well part of the nature of the nursing culture, and one of the tremendous strengths of the nursing culture is the care and attention that nurses devote to following the orders that are written out for the patient [by doctors]. And so, you know a nurse is very meticulous about exactly the right drug dose and documenting what's done. And so it is kind of a regimented culture in that way and in terms of patient safety, that's a very, very good thing. [But] It tends not necessarily to primarily attract people who have an independent spirit that want to break out on their own.

Tom's reflections help to explain how the nurses' contribution to the BIRG, even in high-level research, might be limited by the perceptions of other group members. From his perspective, the hierarchy that stifled nursing was interestingly not imposed by medicine, but rather was a byproduct of an innately "regimented culture." And this belief extended to individual nurses as well. Through self-selection, nurses were more likely to be people (read:

women) who lacked an independent spirit, whereas engineers and doctors were culturally more enterprising and maneuvered by hook or by crook. Ironically it was nursing's distinguishing characteristics as a discipline that made individual nurses ill-suited for challenging, independent work.

However, I soon learned that even more was operating under the radar to fuel the nurses' perception of an unequal partnership. A closer read of Tom's comments reveals a tacit scientific pecking order too. Tom noted that Anna's biological interests and talents set her apart from most of her nursing colleagues, who were more interested in purely "social science" issues. While Tom intended this as a compliment to Anna, by distinguishing her from the majority of her colleagues, his comment reveals how deep-seated beliefs about nurses, nursing culture, and even the social sciences, pervade the health sciences and can influence interdisciplinary collaborations. He raises questions about typical nursing interests and by extension, their scientific abilities too. By conflating nurses' more behavioral or "social science" interests with their lack of independence, Tom inadvertently demonstrates how intersecting status beliefs combined to work against nurses in the BIRG. It was difficult to specify exactly where nursing's cultural deficit was located. Were nurses less independent, less scientific, or both? Comments like these proved essential to understanding how BIRG members understood and experienced disciplinary difference in the group.

As an engineer, Phillip had little personal experience working with nurses other than Anna, whom he greatly admired. Even so, he also saw nursing as a discipline in a less than favorable light. When Phillip was recounting his version of the BIRG's start-up difficulties, he attributed the delay to nursing's "hunger" for overheads, which reflected the larger, cultural problems of nursing. In this exchange, he explained his thinking on this matter:

At the very inception of IRSAG, about something like 11 months went by getting the accounting organized between the School of Nursing, the College of Engineering, and the Medical School. There was a huge problem with people being jointly appointed—with Anna actually, having a joint appointment. Because I think that the nursing school didn't think she should be earning so much more than the other faculty in nursing.

*And how was that ultimately resolved?*

You'd have to ask Tom. I remember it going around and around and there were whole problems with overheads. The School of Nursing doesn't have a lot of external funding, so they're very hungry for overheads. So there's a different culture. For example, in the college of engineering, we get something like, 6% of the overhead. In the nursing school, I don't think they get any of that […] So there are differences in culture. In the nursing school, they have almost no money for paper clips.

*And do you think that's largely a function of, like you said, their not having a lot of external funding?*

Yeah, yep. So that was a big problem at the beginning of the first IRSAG, getting all of the accounts set up properly. I think that in the School of Nursing, you know, the concept of collaboration, it is there, but you know, there's been a lot of, I think there's a lot of jealousy over there among various factions in a way that in this department, is not. People are, in mechanical engineering, it's an extremely positive place to work. People are very collaborative and collegial—they'll help one another, lend one another equipment, you know. That culture [of jealousy] is pretty far into the school of nursing, so.

*So how does that affect your group?*

I think it affects Anna, because she doesn't get the support she should get.

*I wonder why there's the jealousy?*

You probably should ask Anna. I mean I can guess. Ask her about it. I mean I have a pretty good idea of why. (Phillip laughs).

*Can I hear your idea too?*

Yeah, I think it's a predominantly female organization. And I think that can breed problems with collaboration. I mean…I'm not… I have four sisters, I'm very much pro-women's health, but I think it's... I mean in our department we have probably, there are 60 faculty and maybe 10 of them are females and the females help the collaboration here. I mean they're actually wonderful colleagues.

> They're great people. They're great parents, they just are wonderful people to deal with.

In this brief exchange, Phillip explained that while the Anna's "paper clip issue" had financial origins, it really reflected a deeper, more intractable cultural problem resulting from a factious, female-dominated department. While Phillip assured me that he liked working with the women in his department, too many of them together in one place bred jealousy and unprofessionalism. He too held nursing accountable for Anna's difficulties. By failing to support her, they also undermined the BIRG's scientific success.

Through Phillip's lens, we begin to see how Anna's financial dependence and professional vulnerability is linked to deep-seated cultural beliefs about nursing, but also to ideas about gender and work. Phillip was reluctant to talk about the gendered dynamics and problems of nursing, but they were certainly on his mind. In theory, he valued an inclusive, professional environment marked by collegiality among equals. But these ideals were often put to the test in practice. Some colleagues, Phillip shared, were not collegial at all, displaying jealousy and a lack of professionalism from the outset.

In his defense, Phillip was not the only group member who held negative beliefs about the culture of nursing. In fact, this particular issue arose on a few occasions, as team members volunteered that the "cattiness" in nursing was a significant problem, an obviously gendered slight to the predominantly female profession and scientific culture. What varied considerably, however, was how individuals explained the cattiness. Was it the cause or effect of nursing's problems? Some, like Phillip, attributed the dysfunction in nursing to a lack of professionalism and understanding of how science worked. Others explained that the cattiness originated from a lack of power and status. Allison, the group's financial manager, reflected on her previous position working in the School of Nursing to explain the pettiness of all-female groups:

> I mean, I'm sure that you could have a group of three women all working together and they could respect each other, and I hate to—being a woman—I hate to say that that wouldn't work. But just in my experience, that seems to— more often that runs into trouble than if it's men or if it's a mix. And I wish I knew a better way to, unfortunately it just seems like I've just noticed a little more pettiness, you know, with worrying about if people are doing what they're supposed to be doing, and that sort of thing, than with the men. I think some of it maybe is just that some of these women that have gotten to where they are—and I don't know if they've had to fight more for being where they are, and then they just have had to be tough and they just continue that over there.

Invoking her identity as a woman, Allison was uncomfortable that this depiction portrayed a female-dominated professional environment in an unfavorable light. She did, however, believe that difficult circumstances and nurses' chronic struggle probably accounted for this dynamic. Anna herself acknowledged that many of her nursing colleagues were "catty in the extreme," but she too recognized that this cattiness originated from limited opportunities and a lack of professional independence. She explained by saying, "and to give some of those women credit, they came up in an era when you had to fight for everything. No one understood us as a unique individual profession in academics. They'd been through their own battles."

Allison and Anna both understood that nurses' "catty" behavior was linked to, if not a direct effect of, nursing's historical subordination to medicine, and also to its contested status as a legitimate perspective in the academic health sciences. Gender scholars have offered similar explanations finding that women at work are often caught in a double bind. While professional success is defined in terms of masculine norms, as women, they are simultaneously held accountable to feminine standards. So when women act aggressively in traditionally masculine ways, they are penalized for not being feminine, but when they act in traditionally feminine ways, they are perceived as less competent. Women's assertive behavior is also more likely to be called "aggressive" or otherwise labeled as deviant, as it does not conform to gender

expectations. (West and Zimmerman 1987; Pierce 1995; Ridgeway 1997; Fletcher 1999; Williams 1995).

These cultural beliefs about nursing, though rarely explicitly invoked, were not lost on the nurses who discerned from off-hand remarks and symbolic acts of exclusion that their disciplinary approach and scientific perspective were considered inferior to those of medicine and engineering. So while the rigid professional hierarchy between medicine and nursing did not organize professional relations in the BIRG, deep-seated cultural beliefs about nursing as a rule-oriented and less professional discipline remained. At the same time, the nurses felt they were still expected to defer to the physicians' ideas, both scientific and administrative, within the BIRG. So the BIRG nurses were caught in a catch-22: cultural stereotypes portrayed them as lacking independence, but the expectation of cultural deference perpetuated this very stereotype. This explains why Anna's pleas for much needed resources were often ignored, but also why she was pigeonholed as a "dogmatic" nurse when she did challenge the authority of her colleagues.

But cultural beliefs about nursing did far more than just shape how Anna was seen within the group. Assumptions about nurses' deference to physicians also influenced how Anna was seen in her home department. By collaborating with Tom and pooling her grant with the IRSAG, in the BIRG, Anna lost the public perception of being an independent researcher. Tom explained:

> And I think within nursing there is this natural, cultural thing about nurses taking orders from physicians. And so when people are looking at independence, what they're saying is you're functioning separately from a physician hierarchy. Which Anna certainly does, but people on the outside who see it don't perceive it that way.

I asked Tom to expound on this tack, and to reflect on the relative contributions of group members. While he conceded that he and Phillip, both Anna's former advisors, were implicated

in her sense of being less than fully independent, he still believed it was largely the external evaluations of Anna's colleagues at the School of Nursing, and their inability to accept her independence and understand the value of her scientific contribution that created career obstacles for her. Here, he spoke how organizational structures and cultural hierarchies affected Anna both inside and outside the BIRG:

> Yeah, it's not as horizontal as it could be. And I think it's just again, the natural hierarchy or when people come into the group and how far along in their training they are. It's been a…Phillip and I were Anna's PhD advisors, so often times the way that things go is not the way that we would necessarily choose to have them go, but um. Anna's independence has always been something that isn't as automatically accepted as Phillip and I. And I think that—I try to work hard at saying Anna needs to absolutely be as independent as we are and, because that's the position that she's in. And she's run into career problems with it because people in the school of nursing say, well you don't really have your own R01, even though she applied for and was given an R01 that became one of the IRSAG projects. And when the IRSAG got funded, the understanding is from the NIH, is that you have to take the IRSAG funding. And that, Anna has been very, very, very generous in saying I'll take one for the IRSAG. And it's been difficult because often times, in the School of Nursing, they haven't been understanding. And here's somebody that has a letter demonstrating that they have a funded R01 and yet the perception there, when it comes time for tenure review and everything, is that she doesn't have one.

The irony, of course, lies in the fact that both Tom and the School of Nursing, Anna's institutional home, saw her as lacking independence. While Tom conceded that this was in part true—that he and Phillip had perhaps unwittingly perpetuated Anna's dependence in the BIRG—it is exactly on that criterion that he argued the School of Nursing unfairly denied her tenure. Tom also implicitly invoked two separate systems of evaluation. The first was a system whereby academic researchers were organized by rank and experience; he considered this to be a "natural hierarchy" and therefore legitimate. Because Anna started working with Tom and Phillip as a junior investigator, she was on some level "naturally" less independent than either of them. The second system, which Tom considered unjust, was the School of Nursing's determination that

Anna's work and scientific contribution were not self-directed or independent because she received her grant through the interdisciplinary IRSAG mechanism instead of an individual R01. Anna was awarded an individual R01 at the same time, but she had to decline it when her project was simultaneously funded under the interdisciplinary IRSAG. In short, choosing to submit an interdisciplinary grant with Tom and Phillip was at the same time, her professional undoing. It perpetuated her professional dependence and deference within the BIRG, but also ultimately cost her tenure in her department.

Tom recognized the professional hit Anna took by submitting her obviously fundable project with the IRSAG, and he was genuinely frustrated by his inability to protect Anna. Generally a soft-spoken man who carefully chose his words and tone, Tom became increasingly animated during this portion of the interview. He cared about Anna's professional success and was angered that she lost credibility for pooling her research with the IRSAG grant in the BIRG. He could hardly mask his distain for the School of Nursing, a culture that simply did not understand how science and especially high-status, NIH-funded research worked.

But fundamentally, Tom failed to recognize how his own limited beliefs about nursing also hurt Anna professionally. He did not know—or at least not did not share with me—for example, that she felt that she struggled within the BIRG as much as she struggled outside it. He also did not see how his own position as a physician perpetuated the hierarchical relations between medicine and nursing. As he reported it, it was the nurses who were "hung up" on hierarchy: the nurses were to blame.

Anna relayed the same story about losing tenure as a result of pooling her project in the IRSAG. The loss of her professional status and position was personally devastating, but her sense of vulnerability was compounded within the BIRG. Because Tom and Phillip blamed the

parochialism of nursing for Anna's loss of tenure, they did not reflect on the BIRG's own complicity in her "invisibility." As she shared with me:

> Well from their (Tom and Phillip's) perspective, as academics, it [the School of Nursing denying her tenure] doesn't make sense. They said, 'you have a piece of paper that says you got the R01 funded.' But from the eyes of people making these decisions, they see…one person said to me, 'Anna, you're invisible. All we see are Tom and Phillip.' (pausing and sighing deeply) Yeah. Now I could never have gotten the individual R01 without Tom and Phillip—they were on it, it was the same grant, but […] I'd given up my R01. So that was going on, and I couldn't get any money. I couldn't get enough to have staff, to do a longitudinal trial—you have to staff-up for these things. They (Tom and Phillip) hadn't done longitudinal trials, they still haven't done longitudinal trials and I had. I'd run Julia's projects all through my doctoral career. Anyway, so that's where the victim mentality comes from. Now I don't feel like a victim now. I really don't. And like I said, there's been a switch, but it probably—you probably hear it come through. Definitely Karen told me she hears it come through. And she said that she and Nicole were talking about it coming through, which is fine, I'm glad that they were able to help me articulate it too. You know, that feedback to me was actually quite helpful in making me aware and making me think, I need to stop that, because I'm not a victim anymore. But it felt like it.

Here we see how Anna's lack of power, on multiple levels and in different arenas, shaped her unique experiences as an interdisciplinary nursing researcher within the BIRG. While the exiting institutional systems were ill-equipped to support interdisciplinary science, Anna alone saw that the problem was exacerbated by the long-standing power relations between nursing and medicine. Anna had no funds without the grant money, so she alone struggled as she waited for the money to hire staff, buy supplies and equipment, and reimburse clinical subjects. Her project was behind, and therefore her productivity levels lagged behind engineering and medicine from the beginning.

But even after the funds technically became available, Anna still struggled to access resources *within* the group to support her scientific research. Her perceived lack of power relative to Tom and Phillip shaped her approach to asking for money, which again, slowed her progress and detracted from her sense of autonomy. The nature of the interdisciplinary grant

necessitated that each of the PIs share one pot of money, and Anna was conditioned to avoid asking for much. As a PI spearheading one of the three projects of the IRSAG grant, Anna should have had equal access to the funds, but her perception of her own lower status within the group detracted from how she advocated for her scientific needs and ultimately how she felt about herself and her standing in the group. At the same time, as Nicole helped to explain, these perceptions were not Anna's alone. Tom and Phillip also "put her in that step lower kind of position."

Anna was also frustrated that her senior collaborators, Phillip and Tom, could not fully relate to her experience of professional vulnerability within the group. If Anna had just submitted her project as an R01 grant instead of combining her proposal with the larger interdisciplinary IRSAG grant, she would not only have had the ultimate power to spend money as she saw fit—whether and when to buy much-needed supplies, or hire the staff necessary to support her longitudinal work—but she also would have gained the public perception of independence and most likely, have been awarded tenure.

While Anna acknowledged that Phillip and Tom were deeply invested in her success as a collaborator, they were not able to fully appreciate the professional sacrifice she made by foregoing her individual R01 grant to work instead as one of three principal investigators on an interdisciplinary team. The fact that Anna's disciplinary home, the School of Nursing, failed to recognize and honor the significance of her funding through the IRSAG seemed unreasonable to Tom and Phillip, and according to Anna, they dismissed it out of hand.

As a junior scientist in a low-status discipline, Anna was not in a position to brush off the perceptions of others so easily, and she was hurt by Tom and Phillip's inability to empathize with her position. What mattered most to her home discipline—and by extension, to Anna, as a

junior faculty member still being evaluated in that disciplinary world—was not important to them because they perceived it as small-minded and irrational, yet more evidence that nursing was preoccupied with how things appeared and failed to understand how science actually worked. While Anna also recognized she was unfairly evaluated by her nursing colleagues, she was hurt that Tom and Phillip could not, or chose not to empathize with her vulnerable position, and she managed her disappointment alone—an outsider to her colleagues in nursing, but also an outsider within the BIRG. Though Anna remained adamant that her choice to submit her project with the interdisciplinary IRSAG grant was "the right choice, the team thing to do," she was also acutely aware of how interdisciplinary power relations and gendered expectations complicated her professional relationships and career outcomes. Anna was caught in the middle of a "gendered" interdisciplinary system (Ridgeway and Smith-Lovin 1999; Ridgeway and Correll 2004).

**Conclusion**

In *Men and Women of the Corporation*, Rosabeth Moss Kanter (1977) describes how workers at the Indsco corporation were labeled as either "superstars" or "stuck." These designations, once mobilized, were largely self-perpetuating. "Superstars" were put on the fast track. They received frequent raises and unwarranted positive evaluations, and were even offered unadvertised opportunities and promotions. Those who were "stuck," in contrast, found their work lives characterized by struggle. After realizing the futility of fighting against others' negative appraisals, over time they too saw themselves as "stuck" and ceased trying to change their colleagues' perceptions or pursue opportunities in the firm.

In many ways, Kanter's characterization could be applied to the BIRG. From the outset, BIRG members in engineering and medicine were the "superstars." Abundant material resources and institutional advantages buffered their teams from interdisciplinary start-up difficulties. Having financial security afforded Tom and Phillip the freedom to focus on their scientific projects, which fostered interdisciplinary integration between their teams and enhanced their professional success from the get-go. In contrast, Anna was "stuck." Because she came from a relatively poor discipline, Anna lacked financial security and alternate funds to support her work while the group waited on the grant money to be dispersed. This backdrop compounded a sense of deprivation as she alone struggled to get the resources to pursue her scientific agenda. Thus instead of focusing on her scientific ideas, Anna became preoccupied by the logistics of supporting her projects. She worried about having enough resources—staff, computers, even paper clips—to successfully complete her work and contribute as an equal participant in the group's shared science.

But Anna was stuck in another way too. Cultural factors also emerged in the BIRG to bolster existing hierarchies and further stratify the experiences of group members. While BIRG members aspired to cultivate an egalitarian atmosphere that was inclusive of all disciplinary perspectives, the larger context of the academic health sciences presented obstacles to equality (Anspach 2010; Atwal and Caldwell 2006; Whitehead 2007). Many group members spoke openly of the occupational hierarchy between nursing and medicine in clinical arenas. But group member accounts diverged on whether this long-standing inequality affected the BIRG. According to the group's doctors and engineers, the BIRG's research agenda transcended these differences—science did not discriminate. In contrast, the group's nurses described how a discursive hierarchy still subordinated their collective voice in interdisciplinary research. They

could not seem to shake their legacy of inequality and others' limited perceptions of nurses. They felt like cultural outsiders in the BIRG.

As in Kanter's original analysis, these disparities between the "superstars" and those who were "stuck" were perpetuated through routine interactions. Anna's financial dependence bolstered an already ingrained disciplinary deference that affected her ability to voice her concerns, ask for much-needed resources, and complete her work in a timely manner—all of which affected her productivity in the BIRG. As her productivity lagged, she felt even worse about herself and her contribution in the group, developing a self-described "victim mentality." Later, when she was denied tenure in nursing, she realized that interdisciplinary science had rendered her effectively "invisible."

Kanter's analysis is however, inadequate in one key respect: she famously discounted the role of gender (Williams 1989), and Anna's situation was "framed" by gender from the beginning (Ridgeway 2009). While Tom and Phillip both understood the material and structural dimensions of Anna's problem, they largely blamed the School of Nursing for Anna's troubles. They conflated Anna's situation with their own gendered beliefs about nursing's flawed culture. For them, Anna's "paper clip issue" stemmed from financial disadvantage, but it also symbolized (and reproduced) deep-seated beliefs about nursing's cultural inadequacies. And nursing's inadequacies were fundamentally gendered. Tom saw nurses as rule-oriented and lacking an "independent spirit" while Phillip saw them as jealous and unprofessional, invoking stereotypes used against women in the workplace. Anna's nursing colleagues also employed gendered stereotypes when they denied her tenure. By pooling her grant with the IRSAG, Anna confirmed suspicions that she was working for—not with—Tom and Phillip. Expectations of nursing's disciplinary deference to medicine were so ingrained that Anna's deference to Tom was inferred.

While many scholars have highlighted the risks inherent in interdisciplinary collaboration (Rhoten and Parker 2004; Klein 1990; Pfirman and Martin 2010), only a few have explored how disparities in power at the interdisciplinary table differentially affect team members and shape interdisciplinary science (Miller et al. 2008; Gardner 2013; Collins and Evans 2002). To date, researchers have not considered how interdisciplinary science can be viewed as a "gendered system" of inequality (Ridgeway and Smith-Lovin 1999; Ridgeway and Correll 2004). This theoretical model sees gender as far more than a categorical distinction or marker of difference. Rather gender is conceived of as an entire system of unequal social relations and processes that is perpetuated at structural, cultural, interactional, and individual levels simultaneously. As such, it is particularly durable and self-sustaining despite changes at any one level.

The nurses' experience of inequality within the BIRG can be seen as reflecting this system. On one level, they were saddled with a cultural legacy of subordination and the associated status beliefs about nursing as a female-dominated profession. In this frame, they were culturally inscribed as mere supporting cast, their discipline neither the professional nor scientific equal of medicine or engineering. At the same time, however, nursing's cultural origins of inequality were embedded in structural constraints. Financial disparities among the disciplines, as well as other institutionalized barriers that limited nursing's independence also reflected nursing's gendered disadvantages, but also perpetuated them by further limiting the nurses' productivity and standing within the group. Expectations about nurses' deference shaped behaviors as Anna deferred to Tom and Phillip in scientific terms and also hesitated to ask for what she needed to succeed. Over time, as Anna internalized a victim mentality, the gendered disadvantage was reproduced at the cognitive level and further shaped her behaviors in the group.

But the gendered system subtly shaped her colleagues expectations as well. Anna was hurt that Tom and Phillip seemed unable to fully understand what she sacrificed to work with them, but she instinctively knew that their lack of empathy was related to their low expectations for nursing as a discipline. Nursing's decision to deny Anna tenure "didn't make sense" to them, but they also weren't surprised that a factionalized, jealous, and female-dominated culture failed to understand the demands of high-stake science. This seemed to confirm their suspicions that nurses were far from their scientific and professional equals. By blaming nursing for Anna's problems, however, Tom and Phillip failed to see how they too were complicit in the gender system that plagued Anna. While they dismissed nursing's assessment that Anna lacked independence, they ironically made a similar judgment, justifying Anna's lack of autonomy and authority in the BIRG in terms of a "natural hierarchy." Because Anna started working with them as a doctoral student, her lack of independence in the group seemed normal to them.

While Anna saw that her role as a junior investigator contributed to her struggles in the group, she also saw that her vulnerability as an interdisciplinary researcher was fundamentally gendered. She valued her working relationship with Tom and Phillip, but felt they not only discounted her gendered predicament, but fundamentally contributed to it. Anna was "framed" by gender beliefs attached to nursing's history of deference, but she also felt limited by other gendered status beliefs that Tom and Phillip unconsciously carried into the BIRG's scientific collaboration (Ridgeway 2009). Her nursing colleagues also described their experiences of inequality in the group as fundamentally gendered. For them, gendered status beliefs intersected with other low-status positionalities in the BIRG to limit their contribution in the group. In the next chapter, I will continue to explore the gendered status intersections that plagued Anna and

her nursing colleagues as they struggled to find their scientific voice and autonomy within the BIRG.

# Chapter 5

## Status Matters: How Perceptions of Status Shape Interdisciplinary Science

### Introduction

Thus far, I have demonstrated how preexisting structural inequalities and cultural hierarchies shaped the backdrop of the BIRG's interdisciplinary collaboration. In this chapter, I turn my attention to matters of status. While only a subset of BIRG members talked openly about how status perceptions adversely shaped their experiences in the group, status was salient for everyone in the group. Most often, team members would ruminate about the status hierarchies in science, or the status implications of working with such a prestigious group. But I quickly learned that status shaped the group's internal processes too, though often implicitly.

Status influenced perceptions of contribution in the BIRG, marking whose voice mattered and whose ideas were worth pursing. By extension, status also shaped individual autonomy and opportunities in the group, tacitly marking who was allowed in certain spaces and who escaped scientific scrutiny. But importantly, I learned that status arrangements were far from fixed in the BIRG's interdisciplinary context. Intersecting status markers were often ambiguous and group members struggled to negotiate them in various ways. In some moments, a particular status marker would prevail, but would not register in another interaction. Some status markers were intelligible to everyone, while others did not seem to matter in the BIRG. Moreover I found that BIRG members actively negotiated conflicting status markers as they constructed a sense of self in the group. Some group members chose among their status positions to align themselves with

their high-status colleagues. But other BIRG members had less leeway. The nurses, I learned, were saddled with multiple, intersecting low-status positions, which consolidated their sense of being "outsiders within" the group (Collins 1990). They too sought to construct a sense of self within this backdrop, often by emphasizing their gender identity and the advantages of cultivating relationships with other women in the BIRG.

### *Seeing Status in Interdisciplinary Science*

By virtue of being the BIRG's scientific leaders, Tom, Phillip, and Anna also enjoyed status that came along with being PIs in a high-profile research group. As PIs, they "owned" their own projects and this came with both scientific autonomy, but also prestige. The PIs also enjoyed high-status for being relatively famous researchers in their field. One BIRG member wanted to make sure I knew that Tom was "really a pretty famous guy in his little domain." And Nadia, Anna's nursing student, recalled proudly flaunting her association with him at a conference because it enhanced her status. She shared:

> And to be able to say, well yes, I'm here with Dr. Gavin! (laughs) You realize the opportunity in the field of pelvic floor research. Like everybody knows his name. …He really is world-renowned, so it's funny!

Phillip, I was told, was also "famous in the field" and a "really big-deal." Interestingly, though, when group members talked about Anna's status, they often went further to contextualize it. For example, Anna enjoyed status beyond nursing because she was a nurse who could "cross." Gwen, a medical fellow, told me that because Anna's research was more biomedical than other nursing researchers who worked on "just nursing" topics, she was "very well respected" and along with Tom and Phillip, one of "the people setting the agendas" at the NIH.

In other instances, however, there were signs that not everyone agreed with the legitimacy of status relations within the group. One nursing staff member somewhat disparagingly referred to the PIs collectively as "the upper echelon," while characterizing the staff as mere "peons." Other group members thoughtfully considered how status hierarchies were at cross-purposes to interdisciplinary science. Nicole, the group's project manager, spoke explicitly about the role of status in the group at various points in our interview. In the last chapter, I shared her thoughts that Anna had less power and status as a PI than either Tom or Phillip in part because she began working with them as doctoral student years ago. But Nicole also realized that existing status arrangements in the health sciences worked in other ways to shape how the group worked together. This, she explained, surprised her when she first joined the group.

> When I first started working here, I mean, I came from academia, where you know, your professors are like your professors, but they're your colleagues too because someday you're going to be working with them and so while there is a hierarchy, it's not really clearly defined or even adhered to, you know? And then I came here and it was like, this is your boss and this is the person in line, and da-da-da-da and these are doctors and you're not and… and I just don't work like that and I found it very difficult when I first started because of that. You know, people wanted to know what kind of degree you had or what your background was and, it still does exist, but I'm more used to the culture at this point and also because I'm now the project manager, I try not to follow that culture to tell you the truth.

When I asked Nicole for an example of how she saw this status hierarchy playing out, she recounted her first experience with the BIRG's annual Birth Muscles Research Group (BMRG) Symposium, a university-wide event where scholars studying birth injuries from a variety of disciplines were invited to present on their work and update colleagues on progress in their respective fields:

> When we had the BMRG symposium the first year I was here, and they set the chairs up in rows and all the doctors sat at the front, and all the staff sat at the back. And I was like, what was that about! (laughs) You know? That's not okay with me. First of all, why do they get the better seats, you know? Why are they up front? And I didn't like that. So I actually complained about it. And so now, whenever we have meetings, or whatever, I want to make sure that it's a culture of being open and that there's blending of each other.

In explaining the status hierarchy in play, Nicole alludes to the status distinctions between doctors and others in the health sciences community. Not only was she bothered by what she perceived as an unfair rank-ordering of doctors first, followed by other health researchers, and lastly staff, but she importantly recognized that while this hierarchy might be normative in the health sciences community, it was at cross purposes with the supposed egalitarianism required for a successful interdisciplinary exchange.

Other staff members were also sensitive to the status of doctors within the group. Allison, the group's accountant told me that when she was considering joining the group, she was wary that everyone called Tom, "Dr. Gavin." She had worked as an administrative professional for many physicians and research collaborations in years past, and Tom was the first doctor whom everyone actually called "Doctor." She explained:

> Dr. Gavin is the only professor or doctor that I've ever worked for that I didn't call by their first name […] But, other than that, he doesn't come across as, 'I am higher than you.' I think that's just developed over the years. Because I remember asking specifically when I first interviewed, asking Nicole—because I would hear people refer to him— I'm like, 'what do you call him?' 'Oh, we call him Gavin or Dr. Gavin'—and when he'd emailed me a few times he'd written Dr. G, or Gavin, like he never signed…
>
> *It was never Tom.*
>
> Yeah, and it's Phillip and Anna. Now granted, he's a medical doctor and they're not, but there's other medical doctors that I've interacted with and they're first names, so now I haven't, like I said, right now I'm venturing out where I'm going to start interacting with a lot more of them and so we'll see. But that was something I wondered about in coming to a place where I'm working with

> medical doctors and not just PhDs and whether that was going to be… like I worked with someone who used to be in surgery, and certainly in surgery you end up with a lot of people with fairly large egos (laughs), so I wondered, but so far I don't see that.

So status was very much on Allison's mind as she considered whether to take the job with the BIRG. She had heard that the BIRG was a great group to work with, yet even still, her antennae were up; titles communicated status and as a professional herself, she was not interested in taking a job that would brand her as a low-status staff member. The "Dr." title vexed others in the group too. Some noted that Elaine was a doctor too, but she never went by Dr. Johnson in the research group. Even Anna admitted that she *still* didn't really know how to address Tom. This was in part related to her long history with him. She reflected:

> … and I still stumble, you'll notice that I rarely call him a name in person at all because it's just one of those things, like is he still Dr. Gavin, or do I call him Tom!? (laughs). After all of these years!

In fact, I discovered that only Phillip and Elaine, Tom's fellow PI from engineering and his Co-I from medicine respectively, confidently called him "Tom." Everyone else called him "Dr. Gavin," or just "Gavin," giving me my first clue that status markers beyond just those attached to organizational roles and position mattered in the group.

### *Beyond Nursing's Cultural Flaws: Disciplinary Status Problems*

In the last chapter, I chronicled how nursing's professional subordination to medicine extended into the research arena in subtle ways. The BIRG nurses saw their inequality in the group as an extension of nursing's "culture of deference." They lamented that even beyond clinical spaces, nursing was expected to defer its collective voice to the more biomedical agenda driving the BIRG's research. From this perspective, "interdisciplinarity" was yet another mechanism by which medicine subordinated nursing, this time using a discursive hierarchy

rather than rigid professional conventions to undermine their autonomy. Beliefs about nurses being less independent and ambitious also affected Anna's confidence and sense of autonomy in the group. She struggled to be seen as an equal and as an asset to the group, and admitted to developing a victim mentality over the years within the BIRG.

But I discovered that long before Anna struggled within the BIRG, the seeds to her victim mentality had already been sown. The first slights she suffered were rooted in a lack of status. Anna, I learned, was marked as not "right for the science" from the beginning. Before the BIRG had been awarded the IRSAG grant, Anna was a newly minted PhD, developing her own research ideas and preparing to submit an R21 grant proposal to fund her work as a new investigator.[20] Tom, her former advisor, and by this time, long-time collaborator, was developing research ideas with her until he was approached by a group of physicians that also wanted him to collaborate on submitting a grant for a similar topic. Anna reflected on the moment when Tom broached this with her:

> He said I'm getting a lot of pressure from another group to put in the same kind of grant. So he was feeling a tug between a couple of teams he was involved with over who gets to put in this cutting-edge idea. And it was non-traditional again—for a nurse to be putting in something with an MRI—not an obstetrician, not even a midwife. In many ways I looked like the wrong person to do it. But I wanted to do it and it was an obvious next place to go in the research. And I really am good at running longitudinal trials. And not a lot of people have experience with [that]. So what I responded with at that time was, 'let the best man win!' So I'm going to put this grant in, and you can have the other team put the grant in too.

Anna went on to explain that the other group had a history of not including any nurses at the investigator level. She remembered that there were "four strong nurse researchers in incontinence" who would have been natural collaborators given the topic, and "should have been tapped," but the other group "would not put any nurses on it." But for Anna, the worst part was that Tom himself was anxious about collaborating with a nurse too. She reflected:

[20] The R21 is an exploratory/developmental NIH grant that is often pursued by new investigators.

> He was working with both of us, and I think, very conflicted and I think very genuinely conflicted if it was right for me, or for the science [for me] to lead that grant. Also, I think he would have liked to have led that grant because it was such the obvious next step and he was more junior in where he was [back then]. But he was not the right person to do a longitudinal trial. It's very different. And he didn't want it to be longitudinal. He wanted it to be the design that he'd always done his designs on, which were case control studies. He's very comfortable in that design. I'm very comfortable in longitudinal studies.

Ultimately, Anna told me, the other group, "never went anywhere […] it was the obvious idea but it's very, very difficult to get up and running." Anna on the other hand, submitted the grant and "got funded in the first round." That she was awarded the grant was validating, but the memory of this experience, and especially Tom's doubts about whether she should lead the project still bothered her. She realized that her position as a nursing researcher was a liability in that some physician-led groups would always view her as an outsider to the science. While this was frustrating, she half-expected it from medical researchers who didn't know her or her work. But Tom's reservations stung. He, along with Phillip, knew her work better than anyone. If he didn't think she was right "for the science" with all of her experience in conducting longitudinal trials, how did she stand a chance with others? Here, she continued to reflect on these early struggles to get support from Tom and Phillip:

> What happens over there [in medicine] and what happens over here [in nursing] are sort of two different worlds that Dr. Gavin has had to bridge. I don't think that's always been easy for him. I don't know a lot about it. But I think that at that point in time it was—I guess that it was one sentence that he said. If you asked him, I doubt if he would remember it that way, but I think he was pretty critical [of my pursuing the grant]. And I just kept moving it forward. I would go away from most of those meetings in tears. They [Tom and Phillip] saw the tears. They saw me frustrated. But it was—I've always said, if I could get things past my best critics here, which were Phillip and Tom, I'm going to do well at NIH.

Importantly, Anna recognized that a preexisting bias against nurses exacerbated her struggles as a junior health sciences researcher exploring interdisciplinary problems. Regardless of her

talents and abilities as a researcher, status perceptions mattered. She still had to fight to be seen as "right for the science."

She also recognized that the different worlds Tom had to bridge were not equal. Medicine had the privilege of status, while nursing was marked as inferior—professionally, culturally, and scientifically. Though he never said it directly, Anna surmised that his reservations were "clearly because I was a nurse." Anna knew that Tom was worried about the perceptions of others. He was torn because it just *seemed* better, or more natural, for the physician-led group to submit the grant. That made more sense to him in terms of what was "right for the science" even though it was Anna, with her nursing skills and experience in longitudinal research that made her the "best man" for the job according to the NIH.

Though she ultimately didn't let Tom's reservations about nursing deter her from submitting the grant, his vote of no-confidence profoundly affected Anna. Her feelings were hurt, and she knew pursuing her research interests would always involve a struggle for legitimacy both within and outside the group. Being a nurse, plain and simple, made her an outsider to the science, at least in the perceptions of others, and this detracted from her confidence as she worked to establish herself as an independent researcher.

But the longer I spent with the BIRG, I realized Anna's status problems were complicated. What did it mean to be "right for the science?" And exactly how did Anna and her nursing team fail to measure up? I began to see that it wasn't just vestiges of the clinical hierarchy that perpetuated nursing's low-status position, beliefs about gender and science also worked to undermine nursing's approach, choices, and authority in the group.

### *Scientific Status Markers: Nursing's Problems Continue*

In previous chapters, I've shown how certain scientific differences transcended discipline, making natural partners out of BIRG doctors and engineers, while casting the group's nurses as outsiders. These lines of demarcation were also organized by intersecting status divides. While the nurses recognized that some of their outsider status in the group was linked to their long-standing "culture of deference" and a history of subordination to medicine, they also saw how specific scientific status markers also worked to flag them as outsiders.

Part of Anna's problem establishing scientific legitimacy in the BIRG was related to the perception that nursing was relatively new to scientific research. While nursing enjoyed a long tradition of observational and patient-centered research, they had only recently pursued topics in bench science, adopting a more "biomedical" approach. This too detracted from the perception that Anna was a legitimate scientist. When I asked Phillip to reflect on disciplinary differences in our interview, he shared how he and Tom had to teach Anna, and even her nursing mentor Julia, a lot about the process of doing science. He explained:

> […] it took a while for us to train up Anna and Julia in terms of hypothesis testing, and you know, the scientific method. That was something that was probably foreign to them both when they started [working with us]. […] Nursing in general, I don't think, has that, particularly, as part of the culture.

Anna repeated this anecdote to me, almost verbatim, revealing it as both part of the group's shared story and her cross to bear. According to Anna, Phillip considered mentoring her as his contribution to the field of nursing. Once she was properly trained, she could in effect serve as a "scientific emissary" to nursing, bringing them knowledge of the scientific method and rigor often missing from the nursing research tradition.

To be sure, Anna valued Phillip's scientific mentorship, but while she appreciated his attention and training, she understood that perceptions of nursing as "new to science" came with a considerable downside in an interdisciplinary collaboration—it cast her as a perpetual protégé,

and thereby diminished the autonomy and authority of the nursing perspective within the context of the group. So instead of the nursing approach being regarded as "different but equal," it was often depicted as "less scientific" or comparatively inexperienced.

Not only were Anna and her team suspected of needing help in learning how to do science, but they also lost status because of their scientific interests. Given the gendered stratification of the disciplines represented in the BIRG, it was not surprising that gender emerged as a salient marker of difference in the group (Ridgeway and Correll 2004). In the last chapter, I introduced the historical exclusion of women from medicine, the creation of nursing as a "helper" profession for women, and the subsequent culture of deference that emerged. This system of gendered organization persisted as a cultural reference point, shaping the backdrop of the BIRG. So nursing was gendered feminine because of their gendered history of occupational subordination but also because as a discipline, it was an overwhelmingly female-dominated field.

But nursing's epistemological orientation also marked the nurses as feminine. The nurses valued a patient-centered, more feminist approach to studying women with birth injuries, which was considered subjective and "soft" by their colleagues (Miller et al. 2008; Hamilton 2009). Their style was also often contrasted to both the more "authoritarian" approach of medicine and the more neutral, or detached approach of engineering. In this frame, medicine and engineering were both coded masculine even though they represented or characterized different masculine traits (Keller 1985). The BIRG members confirmed these gendered stereotypes as they spoke about disciplinary differences in the BIRG. Here, Maggie, a nursing staff member, talks about nursing, but in doing so, reveals how gender shapes her thinking about medicine too. She explained:

> We're the nursing side—it's always the more—and I hate to say this, but we're more compassionate to the patient than a lot of times Ob/Gyn is going to be, because that's more male-dominated.

By invoking a dichotomous and gendered relationship between medicine and nursing, Maggie reveals one way that gender mapped onto disciplines in the group. She also demonstrates how group members use both gender and disciplinary affiliation simultaneously to construct a sense of self and other in the group. Maggie at once identifies herself as a member of the nursing group, but also attributes her shared value of compassion for patients as a function of being a woman, a gender identity she shares with her nursing colleagues. Interestingly, she sees compassion as a disciplinary characteristic of nursing, but also a strength linked to biological sex. In doing so, she links three gendered signifiers—nursing, being a woman, and compassion—when constructing a sense of disciplinary self in the group.

The gendered contrast between medicine and nursing was mentioned repeatedly during the course of my research. Nurses in particular, but some doctors too, referred to medicine as having a "masculine" or "authoritarian" culture. Engineering was also characterized as masculine in terms of its disciplinary adherence to impartiality, objectivity, and scientific neutrality, traits scholars of science have shown represent masculinity (Keller 1985; Harding 1986).

These gendered characterizations, I learned, were not neutral, but communicated status too. Nursing's focus on compassion, prevention, and how science could improve the lives of real women was also, I learned, a low-status interest in the unspoken hierarchy of the sciences in the larger health sciences community (Miller et al. 2008; Hamilton 2009). Here, Anna's student Nadia introduced the connection between nursing's history of cultural deference, limited political

power, and low scientific status. She also connected these larger issues to nursing's diminished voice in the BIRG:

> I think it's the culture of healthcare. […] it's been very much a physician-dominated field. And when I was in nursing school, I went to nursing school 20 something years ago, the big thing is that nurses can't diagnose. So you couldn't even say, you know, 'patient's sleeping.' You would say in your charting, 'they're resting with their eyes closed,' because you can't diagnose. So you take that sort of culture, where as a nurse you can't make a decision, and it's really hard to bring it beyond that. You know? And it's political too. You look at the level of nursing involvement in legislation and lobbyists versus physicians and it's just, it's the culture of medicine. And I think it is changing very slowly, but it was a bit naïve of me to think that it wasn't going to impact research. That still physicians would get the, that we're considered, you know, soft science, and nursing is harder to quantify so I think that the things we want to study aren't so easy to measure.

Nadia explains that while nursing has cultural and political problems, it also struggles for legitimacy on a scientific front. She was not alone in seeing that nursing suffered based on status perceptions. All of the nurses spoke of an implicit scientific pecking order that permeated the BIRG culture. And though their accounts highlighted different aspects of it, they were clear about one thing: nursing was at the bottom of the status hierarchy. Other BIRG members reflected on nursing's status problems too. Jane, a medical student working with the group, shared that while Anna's research actually had the potential to change real women's lives for the better, her questions and scientific approaches were discounted within the status hierarchies of the sciences. She explained:

> But when you think about translational research and how do you get to affect people's everyday lives, how do you get it to affect people's interactions with disease and their disease narratives, I think that that's largely undervalued by almost everyone I've ever met in the medical community.
>
> *And why do you think that is?*
>
> You know, I think traditionally people look at that as fluffy research, whether or not it is. It's not hard science. You can't do case-controlled, gold-standard studies on stuff like that generally. And I think that because of that, you have a lot of—at

> least medicine in general tends to value these people who are, [who] have very scientific studies that have objective data that you can show if you administer this medication you are going to lower someone's systolic blood pressure by 10 points. And then they realize, you know, that goes into peoples' lives. But you know, it's the same reason that they don't look at why blood pressure medication gives people headaches, for example, or at bad side effects—they don't care about that. And I'm not entirely sure why it's undervalued, but it has always bothered me.

Taken together, Nadia and Jane's ruminations shed light on nursing's status problems. Nursing's research concerns are too "soft" and hard to quantify or measure. Not only do they often study "fluffy" issues like prevention or quality of life, but their study designs are also lacking in "hardness." Instead of using case-controlled studies focusing on the mechanisms of the disease process, they often use longitudinal designs and qualitative methods that can capture the disease narrative, or the patient experience, but are considered far less "hard" topics in the scientific pecking order. In short, nursing's scientific status issues were gendered.

Jane's comments also help explain why Anna had such a hard time getting Tom and Phillip to understand the challenges of her longitudinal projects: case-controlled studies were considered higher status. But Tom and Phillip, of course, never said so much. When these issues did come up in meetings, they emphasized the importance of efficiency and productivity. Simply put, longitudinal studies took longer to complete, and therefore were not as efficient as other designs. Here Karen, Anna's colleague from nursing, clarifies why Tom and Phillip's disliked Anna's longitudinal projects. She shared:

> The dynamics of recruitment and retention and those kinds of things were not areas that they focused on, like if you look at any time we've proposed longitudinal work, they don't like it. They're very cross-sectional, get em' in, get em' out. Following a sample is not something [they like to do].

When I asked Karen why Tom and Phillip wouldn't like longitudinal designs, she answered saying:

> They would argue from a cost and outcome perspective that it would not generate the type of discoveries in the same way in the most efficient manner. So it would be a—they would discourage it as a process and try to look at other ways of trying to answer questions in a way that wouldn't involve that kind of design.

Karen recognized that Tom and Phillip disliked longitudinal projects in part because they were inefficient, but this scientific decision-making was also organized by status. Productivity was an important goal within the BIRG because publishing papers was the only pathway to secure further grants, to maintain the group's funding. But the types of papers published and the kinds of studies funded were also influenced by these same status assessments. Here, Jane continued to reflect on the differences between the disciplinary groups in terms of securing funding:

> I think, well, in the small subset of people who fund this research, Tom really was going to be published, because of the hard-core science. Which is objective findings that tell you what is going on in MRI or in clinic, or surgical outcomes. That's what people are looking for, as people who fund it. I think in the larger perspective, if you look at a population study, the people who are interested in this research are the women who have problems with prolapse or incontinence or all that. And that's what Anna Jeffries' research really talks to. And I feel like if women were to find her articles, they'd find them accessible. You can read them, you can understand about how to deal with stress urinary incontinence and Kegeling exercises and all of that. That's where you have the real everyday application. I think that, you know, Dr. Gavin's research itself, or the fellows' research itself is relevant to the surgeons who complete these operations and you know, it's definitely groundbreaking, but it's groundbreaking for a very small subset of individuals across the country, or globally, who actually do these operations or take care of these patients.

Jane explained how status affected the funding of scientific projects. Simply put, granting institutions that fund health sciences research also prefer "hard core science," so projects employing these approaches get a disproportionate amount of money. And money, especially in terms of independent grant funding, begets higher status in the health sciences. This, Jane noted, happens despite the fact that Anna's projects are, ironically, of more use to real people, not just to other researchers or surgeons in a very specialized area.

Methodological differences were also salient markers of status in the group, and they too, I found, were marked by discipline and gender. The nurses' preference for qualitative data, which helped "give voice" to the experiences of the patient population they served, were also considered by Tom and Phillip, as well as other members of the group, to be less rigorous, less scientific. Karen spoke frankly about feeling that Tom would often dismiss her qualitative skills as unimportant, or at best, easily appended to existing projects. She explained:

> I know at times I get—you know it's frustrating to have someone tell you how to do qualitative work when your dissertation was qualitative and what they're basically telling you is all you have to do is write down these little quotes and you're kinda like, oooo-kay (laughs sarcastically). […] Or reduce something down that you have as a project to 'well we can just go to the clinic, hand out 50 pages of paper, have women write a sentence and that's enough.' You know, I've had those experiences with him and so that's when I shifted and said, I just need to maintain certain things on my own and persevere and not be so drawn into the group in some ways.

Karen knew that Tom did not value her qualitative expertise as important to the BIRG's scientific work, so she chose to emotionally distance herself from the group and pursue her primary interests elsewhere. Here, she shared her frustrations in trying to get Tom to sign off on a prospective project she had in mind. From her perspective, he dismissed what was of value in her approach to the topic. She explained:

> When I first came on, a big piece was to do these interviews with women about their experience of pelvic organ prolapse and the post-childbirth experience and body image stuff. And every meeting I would sit in at the beginning, I would be told okay, this is how we're going to do it. So I'd go away and I'd write up the protocol, and I'd come back and it'd be 'no, no, no, we're not going to do that.' And he kinda boiled it down to, you know, I've got a bunch of charts, just go ahead and talk to a bunch of women that I've already pre-selected. But it's like, you can't do that—there are a whole lot of problems with that, plus, it undervalued what I was basically making an argument for, which is that women have a very different experience of this. And in that scenario he could say, listen, I've been in the clinic for years, I already know what women think. And I was junior in the scenario, and didn't work in the clinic in the same way, and worked from a different perspective, so in that scenario, the project just got let go.

Karen believed that the nursing perspective, one that offered a feminist, patient-oriented approach was actively discounted in the BIRG. What she thought was most important—talking to real women and including their experiences in the research on birth injuries—was considered by her interdisciplinary colleagues to be less important than drawing from the more authoritative perspective of medicine. Being junior didn't help Karen either; she lacked the professional status to champion her ideas. Karen's reflections highlight an important, yet often ignored problem in interdisciplinary science: when certain disciplinary perspectives and scientific approaches are considered less important, and individuals hailing from those disciplines are less powerful or have less status in the group, ideas and approaches can get left at the table (Miller et al. 2008). When this happens, interdisciplinary collaborations in the sciences do not truly reflect all the voices at the table.

Later in our interview, Jane offered another insight about status in the group. As she reflected on her medical training, she shared her frustration that interdisciplinary perspectives were still considered less important than biomedical ones. She explained:

> You learn about health disparities in medicine, whether it be women's health or, you know, different cultural influences on health care or LGBT healthcare. And while I think that these weeks are important, and while I think they make the med school curriculum sound a lot sexier because they say that, 'oh yeah, we teach these things,' so much lip service is given to the education that they actually give us in those weeks. Because as students, these weeks are regarded as here's your fluffy week off—time to relax and take a test which is open book and not heavily graded on health issues that "don't really matter" (used air quotes) as much as the pathology of Crohn's disease or something like that. And I always found it very frustrating to have these weeks where we're just (pauses)… I think it almost turned my classmates off to interdisciplinary research and interdisciplinary healthcare because they're like, oh that doesn't matter as much. We don't have to learn that. We don't have to be tested on it. Oh, you know, it doesn't matter. And that was always frustrating. And I think that the undervaluing of our education in interdisciplinary studies within healthcare is really underlined by the fact that when we're learning cardiovascular physiology, we need the Ph.D. cardiovascular physiologist to teach us because they're the one who knows everything about it. However, when we're learning about, you know, the care of

> African-American women in healthcare, there are fantastic Ph.D.s who live two blocks away that would come to the medical school and teach this to medical students as a group. But instead, what they have is an internal medicine doctor who happens to be African-American teach us this. It's not entirely the same emphasis that's placed on it.

Here, Jane introduced several important points. Her medical education teaches that there are more or less important perspectives in healthcare. Approaches that emphasize cultural components to illness are less important than understanding disease processes and specific mechanisms that explain pathology. These beliefs reflect a hierarchy well explored by interprofessional teams and scholars of science and knowledge production (Hamilton 1993; Keller 1985; Lamont 2009; Albert et al. 2009). In this paradigm, the more seemingly objective and quantifiable the approach or method, the more scientific it is.

This schema is not without critics. Feminist scholars have demonstrated that even the most "objective" science is shaped by individual and collective biases that influence how problems are conceived, the manner in which they are studied, and how the scientific evidence is interpreted (Keller 1985; Harding 1986, 1991; Haraway 1989). Jane notes that while experts in gendered or raced perspectives on health and illness work mere blocks away, the topics were not deemed important enough to warrant instruction by experts trained on those cultural or more social scientific topics. As a result, medical students are turned off to more holistic, social scientific, or interdisciplinary dimensions of health and illness in part because they are afforded *less status*.

The nurses were also acutely aware of how intersecting status markers diminished their voice in the BIRG. For Kristine, the group's status arrangements reflected the status-consciousness and priorities of high-stakes research. Here, she shared how her participation in the group compares to her clinical collaborations elsewhere. She explained:

> I just see…that they [doctors] just really have to—and subservient is not a good term to use—but it just seems like with medicine, okay this is Dr. Gavin, he's the PI, and you kind of got to fall into, kind of got to do as I say and you are not "the" doctor (adding air quotes to "the"). I see him as more, old-school physician. And he's very nice, you know, very helpful. But that's just my perception of things. Whereas—like I practice clinically as a nurse practitioner at a free-clinic—everybody's a volunteer, it's physicians, there's practitioners, nurses, PAs—everybody there's seeing patients. Everybody's on the same level. You collaborate together. But I just see here, because it is the research and because it's NIH dollars and prestigious, because you are sitting in an endowed chair, you are up here, and everybody else is a slot below you."

For Kristine, tacit status hierarchies, instead of rigid structural ones, emerged to shape perceptions and behaviors in the BIRG. Though she described Tom as "nice" and "very helpful," she still saw him as an "old-school physician" who expected cultural deference in the group, even without mandating it. Importantly, Kristine relayed that it wasn't just the existing hierarchy between nursing and medicine that shaped the group's interactions, rather it was status markers attached to NIH-funded research that exacerbated the inequality between disciplines.

In this exchange Kristine also introduces a theme that I will develop throughout this chapter: That is, that multiple status markers intersected to magnify advantage, or conversely, compound disadvantage for group members. According to Kristine, the long-standing clinical hierarchy between medicine and nursing alone did not fully explain her sense of inferiority in the group—simply put, other status markers mattered too. Kristine saw that her lack of value was a complicated equation, a function of intersecting low-status markers. In contrast, she saw that Dr. Gavin's power was legitimized and enhanced by a variety of high-status positions. He was more than just a doctor, he was the lead principal investigator of the BIRG, but also held a position as an endowed Chair in medicine, a status marker that arguably did not have any direct bearing on the group's research, yet for her, still mattered. Notably, she compares her experience working in the BIRG with other, more collaborative clinical experiences elsewhere. From her

perspective, status distinctions between nurses and doctors are *more* salient in the BIRG than in her other clinical interactions because of the prestige of the group's research. It wasn't just material deficits and preexisting professional hierarchies that contributed to the nurses' sense of inequality in the BIRG, it was their relatively low status that compounded the nursing team's experience of inequality within the context of interdisciplinary science.

### *An Interdisciplinary Status Advantage: Collaborating with Engineers*

In stark contrast to nursing, engineering enhanced the group's scientific status. Medicine and engineering shared many high-status scientific interests in the health sciences. They were both interested in uncovering the fundamental mechanisms to explain birth injuries; they worked on the "discovery" side of things, focusing on the physical properties of muscles and connective tissue. They also preferred highly objective quantitative data, cross-sectional research designs, and cutting-edge technological approaches to better understand injury patterns. All of these preferences and scientific choices were high-status orientations within the context of the health sciences (Lamont 2009; Harding 1986, 1991). And while medicine had discursive authority in the health sciences, the engineers cornered the market on scientific expertise.

Like Anna, Phillip, the PI from engineering, was universally well liked in the group. BIRG members described him as "calm," "selfless," "sage-like," and one nurse even described him as "a doll." But Phillip differed from Anna in one key way: his scientific skills, projects, and approaches were never questioned or discounted. Rather Phillip was widely considered to be the group's scientific expert. Every group member I spoke with, without exception, talked about Phillip's scientific abilities. He was a natural "problem-solver" who brought more to the table than mere engineering experience. Karen explained his contribution like this:

> Phillip is really the science at the end of the day. Like he doesn't say a lot, but what he says is really critical to the scientific effort. He really brings that forward. And I think that's the way that he and Tom work together. […] You know, Tom will throw an idea out and immediately Phillip is sketching how to do it. So you see that interaction all the time. And I think that Phillip brings that real core. And even in other ways, he can ask questions about the science you're doing in a way that does bring in different disciplinary perspectives in a distinct way.

Other group members agreed; Phillip was nothing less than the embodiment of the scientific perspective in the group. Moreover, Phillip had seniority on his side too; he was a senior, "distinguished" research professor of engineering. When Phillip began working with Tom, almost twenty years earlier, he already had a long-history of successful grant funding and an extensive publication record. In fact, Tom himself was quite junior to Phillip in terms of independent research and funding when they began collaborating.

Within the group, Phillip's skills at problem specification and quantitative analysis, along with his aptitude for making precise measurements also helped bring both rigor and scientific status to the group's efforts. The doctors lauded the engineers for helping convert medicine's subjective findings into analyzable data. In short, engineering made medicine even more scientific. Here, Jane offered her take on how engineering helped to quantify medicine's more subjective data:

> I think part of where having Dr. Andrews was very helpful for Dr. Gavin was we'd have all this raw data with different points, about where they [the pelvic floor muscles] moved and all that, but by talking to Dr. Andrews, we could figure out what to do with that data. How do you analyze all of these points that you have in a three-dimensional structure on a two-dimensional plate that are moving around? And how do you analyze that while having a reference point and making sure it's statistically significant and all of that? And I think that, you know, he was really good, because you know, I guess that's engineering. He gave you ideas with what do you do with these observations, which might have really been the benefit of having the two groups together is having someone tell you, how do you analyze this. Here's this stuff that we've been noticing and how do you put numbers to it—how do you find a correlation between it. How do you make all of the subjective data, that we collect in the clinic, that we collect in the OR, into an objective finding?

I soon discovered that the BIRG's disciplines were arranged on a scientific continuum. Engineering was the most quantitative, objective, and detached—that is, the most scientific. Nursing, at the other end of the spectrum, had multiple problems that detracted from their "scientific" status. Not only did they use less than the "gold-standard" in terms of research designs and methods, their orientations to the research subject also introduced a level of subjectivity that was deemed "less scientific." Medicine sat between the two. As a discipline, medicine provided clinical skills that could detect "feasibility," but by adopting an authoritative approach to its patient population, maintained a more neutral or "scientific" orientation to their research question and participants than nursing. So while medicine's scientific perspective was perhaps more subjective than engineering's, doctors were careful to not let themselves get too mired by the patient issues that were a status-drain for nursing. At the end of the day, Phillip and his team brought skills that were not only valuable to the collaborative effort, but importantly, they were high-status too. By collaborating with engineering, medicine—already a powerful player in the health sciences—enhanced its disciplinary status even further.

***Gender, Status, and Identity in the BIRG***

I soon learned that gender signified much more than just disciplinary approach and scientific practices. Gender acted as a diffuse status marker within the group that variously signified smartness, efficacy, emotional intelligence, and egalitarianism. I was also struck by how frequently female BIRG members talked about the importance of having "women in the group" or prefaced their comments by saying "as a woman." Many of the women in the BIRG also invoked a female gender identity to justify an embodied advantage over their male colleagues. They argued that a female standpoint allowed for an experiential understanding of

birth-related injuries, enabling them to empathize with the group's clinical participants and the real women afflicted with complications. Similarly, they would cite that a female gender identity allowed them to relate to other women in the group too.

Gender and feminist researchers have long disrupted the idea of a monolithic gender identity, arguing that similarities conferred by biological sex are not experienced in the same way by all women (Collins 1990; Butler 1990). Race, ethnicity, SES, and sexual orientation, as well as other identity categories and status characteristics, intersect with biological sex to create infinite experiences of "being a woman" (Choo and Ferree 2010). That said, *all* the women in the BIRG spoke in some way about their gendered experiences, often emphasizing a shared gender identity even as they'd go on to describe different gendered experiences from their colleagues. So "being a woman" had meaning, even if individual gender identities were variably constructed in the BIRG.

For example, many female BIRG members confided to me that having "women at the table" allowed for a more egalitarian collaboration. Women, I was told, weren't as hung up on hierarchical arrangements that often defined relationships at work. When women were in positions of power, they often institutionalized egalitarian working relationships. Elaine from medicine attributed the BIRG's success to the fact that, Julia, Anna's mentor from nursing, was involved in setting the research agenda from the beginning. She was more senior than Tom, and so was able to establish a respectful working relationship between the two disciplines from the outset. Elaine shared:

> […] Julia who was in the group [from the beginning] and was very senior too. And I think that [her being involved] allowed for that too, I mean, she was doing research. She had funding before Tom. So she came in as a senior person, as a nurse. So I think that changed the dynamic than if just a nurse had come in at the level of a nurse. So I think that was a key for the starting of this—that Tom was

> below her at the time. So that's why I think it's evolved a little better than some other groups.

Both Kristine and Maggie also described how much they enjoyed working "with"—note, not for—Anna. They described their nursing research group as a "hardworking," yet casual team, and contrasted Anna's laid-back style of management to the more masculine approach in medicine that mandated accountability and relied on established hierarchies. Kristine particularly appreciated that Anna didn't feel the need to micromanage them, trusting that they would get their work done. She explained:

> Anna is more laid back, not a clock-puncher. You know, you get your work done, and it doesn't matter when and how, just get it done. Whereas I think over in medicine they are more, I guess I would say they appear to be more authoritarian. Like I want to know more when you're here and what you're doing. And I live over here. I don't have an office over there. I'm not over there probably hardly ever. But it just seems like they have to have a lot of face time regardless of what they're doing. And we don't have to as much, you know, play that game.

According to Kristine, medicine's "game" was all about keeping up appearances and reproducing status hierarchies. Anna, on the other hand, was all about the "work," not the status. Anna's other full-time research associate, Maggie, also spoke at length about the equality and respect that characterized her working relationship with Anna. She reflected on her job interview with Anna years ago, telling Anna that she wasn't going to change who she was to get the job; she'd "been around and seen too much" to play the game. If Anna wanted her for her skills, for what she brought to the table, then that was great, but if not, then that was okay too; but she wouldn't assume a deferential role in the group. She simply had too much self-respect.

In practice, Anna encouraged her nursing team members to consider themselves equal participants in the scientific work, and they took her up on it. I experienced this egalitarian working style firsthand when I sat in on my first nursing research meeting. When I arrived, Anna greeted me at the door, and leaned in close to whisper, "you'll notice that things are done

very differently around here." Though I didn't know exactly what she meant, I was eager to find out. Within seconds, I recognized that the environment was decidedly more casual than the muscle meetings I routinely observed. Someone had brought a homemade cake to share, and the early-arrivers were laughing loudly at a story about someone's child as they passed pieces across the table. This was already a far cry from the always-professional tone adopted by participants at the weekly muscle meetings.

As the meeting went on, I noticed another salient difference. Maggie and Kristine, Anna's staff research associates, had tremendous license and authority in the group. Instead of assuming a deferential tone to Anna, they spoke confidently—at times even assertively—as they explained their perspectives and argued their ideas. In one moment, Maggie loudly challenged her colleagues at the table, including Anna, who wanted to change a small detail in the clinical protocol. She was adamant that it couldn't be done because it would violate the spirit of the consent agreement on the IRB. What ensued was nothing less than a spirited argument as the women discussed both sides. In the end, Anna's position did not prevail as she agreed to amend the IRB and institute the change later.

I wrote in my fieldnotes that if someone had just happened upon the meeting, it would have been hard to discern who was actually in charge. Anna led by consensus and her team had total freedom to disagree with her. I could not fathom a comparable exchange occurring within the context of a muscle meeting. Though the engineering students and fellows raved about the egalitarianism between their groups, tacit hierarchies still organized social relations between Tom and Phillip and their team members. There was never a doubt that Tom and Phillip were in charge. And their students and fellows never once argued against their professional opinion in the meetings I observed.

At first glance, the difference between how Anna interacted with her nursing team, and how Phillip and Tom interacted with their respective teams could be explained in terms of gender. Perhaps women did really employ more egalitarian working arrangements than their male counterparts. But this difference could also be explained in terms of status and authority. Anna had deep reservations about her own status position in the group and I wondered how much her own self-consciousness shaped her leadership style with her nursing team. Maggie and Kristine also knew her self-doubts and the extent to which she struggled to have her authority recognized by Tom and Phillip. Was it possible that they were exploiting this? Was it also possible that Anna's ethic of "egalitarianism" was really the effect of her low-status in the group? In the next chapter when I discuss the nurses' different status strategies I will revisit these ideas.

*Gendered Emotion Work in Interdisciplinary Science*

Having women around the table did more than just encourage a more consensus-based, egalitarian style of collaboration. I also learned that the women in the BIRG thought it allowed for an emotionally enriching professional experience. While all BIRG members talked about the importance of having good relationships with their colleagues, women in the BIRG often went further and spoke about the importance of having emotionally supportive relationships with other women at work.

While Gwen, a medical fellow, valued her professional relationship with Tom, it was Anna's mentorship that she emotionally relied on. This, she attributed to Anna's more nurturing style of professional support. Anna was "an unbelievable mentor" in part because she helped shepherd Gwen's personal research interests, moving them "from point A to B." Tom, in

contrast, was more "big picture" and did none of the relational mentoring that she valued from Anna. Tom was also not particularly interested in what fired her up—urogynecological repairs for impoverished women in developing nations. She explained that as long as she met deadlines on BIRG projects first, he did not balk at her taking time to do her own thing. This alone, she remarked, was gracious compared to other medical research supervisors who essentially exploited fellows' labor to further their own research. But still, Tom's style of mentorship was a far cry from Anna's personal investment in her success. Gwen joked that she had told a new fellow who needed more hands-on, nurturing support that everyone "needed an Anna."

Maggie, Anna's research associate, also explained that she and Anna had a reciprocal relationship where they offered each other emotional support. In our interview, Maggie admitted that her interpersonal style sometimes rubbed people the wrong way. She pointed to a sign in her office that read "51% sweetheart, 49% bitch" and said that "sometimes it was the other way around." Maggie appreciated that Anna routinely defended her abrasive style, and would "smooth things over" for her with other colleagues. In return, Maggie acted as "a cheerleader" of sorts for Anna. She told me that Anna was at a point in her career where she needed someone to encourage her, build her up a bit. So Maggie saw part of her role as someone who encouraged Anna to "stand up for yourself!" pushing her to just "do it, let's take the risk." In myriad comments like these, women in the BIRG revealed the importance of having strong, emotionally supportive relationships with other women at work.

But more than anyone else in the group, Anna herself talked about the importance of having other "women at the table." She had long felt like an outsider in terms of being the only female investigator in the group, and mentioned repeatedly that things improved when Elaine

and then later Karen joined the group as co-investigators. Having other women at the table feminized the interpersonal dynamics of the group. Anna explained:

> The whole dynamics, maybe not the whole dynamics, but a lot of the dynamics, the structure of the group, I think is a much more male-based structure. And I'm fairly comfortable in that actually. I've always tended to hang with the guys. And my own style tends to be a little more that style. Some other women can't handle that style. I'm pretty comfortable in that style. On the other hand, some ways of communicating really are—I think—different. And the way we—you know, the hand down of decisions…hmm, that's a tricky one to get into language, but I can tell you it really made a difference when Elaine was at the table! (starts laughing loudly). And now it makes a difference when Karen's at the table.

When I pressed for more details or an example, Anna volunteered that having more women at the table made easier for her to understand how emotions were affecting the collaboration. She explained:

> You know what that looked like, part of what that looked like is you know, call it gossip, or call it caring—when a meeting would go not so good and we'd up and all leave. Elaine and I would look at each other—and this was not real routine—but once in a blue moon we'd meet in the hall and say, does Tom seem really stressed to you today? What's going on? And it's the kind of thing that I would *never* say to Phillip. I would never say to Tom, does Phillip seem really stressed today, what's going on? It was partly because we're women, I think. And that made a difference. You could sort of get to the level of what's underneath—the emotions that would sometimes come out around a team table. And the guys aren't comfy with that. The women… I think if it was all women, we might be able to say, you know, I know you got two kids trying to get into school and one was out partying last night and you seem really stressed. That level never—and I think it's 'the men thing' (said in a hushed, 'you know what I mean' tone). So it's really nice to have Elaine there for that kind of thing. It made a difference. I think it made the relationships improve.

When Anna was the only female investigator in the BIRG, she often felt stifled and silenced by Tom and Phillip's more masculine style of communication. Moreover, she was often frustrated by their unwillingness to consider how emotional stress and personal problems adversely affected the collaborative atmosphere and the group's science. Having other women "at the table" helped Anna to give voice to these concerns and better cope with her own

emotional challenges at work. It is worth emphasizing that Anna had long relied on her close professional relationships with her staff and students and other BIRG administrators, but it was the support of other female *investigators* that finally gave her a sense of validation and enhanced her own satisfaction in the group.

*"Don't be Such a Girl": Negotiating Multiple Gendered Identities in Interdisciplinary Science*

While there were advantages to sharing space with other women in the BIRG, gendered beliefs about professionalism, work, and best practices had a shadow side. Even Anna's previous ruminations allude to gender status problems by hinting that women's emphasis on emotional connection and communication are sometimes derided as "gossip." By engaging in frank discussions about the role of emotions at work with other relatively high-status women, Anna was able to legitimize these relational tasks as important not only to her, but to the group's scientific success. In others instances, however, Anna was not able to garner support from her high-status female colleagues. Sometimes, her feminized behaviors were seen as nothing more than low-status liabilities.

In one investigator meeting, BIRG members were going around the table checking-in about the status of their various projects when Anna admitted that she hadn't pushed hard enough to get feedback from someone, and as a result, her work was delayed as she waited on the reply. As if sensing everyone's thoughts or an impending reprimand, she turned to Elaine, the female co-investigator from medicine and asked, "What was it you said to me, Elaine, 'don't be such a girl'?" Elaine smiled, and added and "if they haven't said 'no' then you haven't asked for enough yet." The group all laughed and quickly moved on, but I was struck by the blatantly gendered content of the exchange. This conversational snippet revealed how Anna saw her own

gendered role and liabilities in the group, but it also offered a glimpse of how shared beliefs about gender emerged during the course of routine interactions.

Not only was Anna self-conscious about acting too much "like a girl," but she had obviously been warned against this type of gendered behavior, at least in jest, before. I've already described how Anna struggled to defend her woman-centered scientific choices and deflect disciplinary criticisms that her status as a nurse was a liability to the group, but here it was Anna's professional behavior, independent of her scientific approach, which made her a less effective colleague. On at least one previous occasion, Elaine had taken it upon herself to counsel Anna on how to act less deferentially to be a more effective interdisciplinary colleague. Anna was too quick to take "no" for an answer. She was simply acting too much like a girl. Ostensibly, if Anna had just downplayed her "femaleness," she could have achieved a more professional and—most importantly—male standard.

This exchange also illuminates how Anna anticipated and then enacted a gendered self in the group. Anna had explained at length how she struggled to find her voice in the group, and overcome her victim mentality. But in this instance, she too participated in reproducing gender status beliefs by publicly soliciting Elaine's help to act less "like a girl." Perhaps Anna calculated that if she jokingly solicited her own gendered scolding from her female colleague she would avoid more pointed criticisms from Tom and Phillip. While there is no way to know her exact motivation, one thing was clear: in trying to deflect an implicit gendered criticism, Anna helped to reify the very stereotypical beliefs about women that already undermined her sense of success and autonomy in the group.

Thus far, I've separated status liabilities for the purposes of introduction, but this exchange in particular shows how multiple gendered status markers combined to adversely affect

Anna's autonomy in the group. Her gendered professional behavior dovetailed with already negative gendered beliefs about nurses to create a durable status burden for Anna. I came to see this dynamic play out again and again as the BIRG nurses talked about negotiating multiple gendered barriers simultaneously. Gendered beliefs about women in general and women at work, combined with gendered stereotypes about nursing and science to create rigid status boundaries for the nurses in the group.

Most of the time, as in the preceding example, these beliefs were subtly deployed as a joke or funny story. When members talked about them in any serious way, they were most frequently couched in terms of productivity or efficiency, which I've already introduced were considered legitimate reasons why certain low-status nursing practices should be eliminated. But occasionally, negative gender beliefs and stereotypes were not cloaked in the veneer of scientific legitimacy or soft-pedaled in the form of a joke. Sometimes, they emerged blatantly and meanly to mark gendered bias and exclusion within the group. My interview with David, the BIRG's statistician, demonstrated this point most dramatically.

The BIRG did much of their own quantitative analysis, but still needed help with the sheer volume of collected data, and so employed David to clean, organize, and analyze much of it. But David, I soon learned, rubbed some of the female group members the wrong way. Long before meeting him, I noticed that whenever his name was mentioned in meetings, some of the women in the room would roll their eyes, or mumble a dismissive comment. It was clear—they did not like him. Though David never attended the meetings I observed, I asked to speak with him to investigate what was going on behind the scenes. During our interview, I quickly realized why some of the BIRG women did not care for him. I also heard firsthand, how status beliefs

about science and gender could intersect to shape understandings of self and one's coworkers in an interdisciplinary group.

In describing his role with the group, David told me that he enjoyed working with Tom and Phillip, as well as many of the medical fellows, who were "very bright" and understood quantitative data. Yet he continued by saying that he was often frustrated working in the group because "some of the women there don't really have a clue how to deal with data and they drive me nuts sometimes." He then added that they did "dumb things with the data." When I asked him who these women were, and what would constitute a "dumb thing" he chose not to name names, but explained that these "research-assistant types" failed to understand the nature of the group's quantitative work. Here he explained:

> Oh, you know, […] they just don't understand that, we're dealing with numbers here and they just somehow don't pick that up. They'll change a form and they'll add two items to an existing form, and they don't tell me that they do that. And so I'll take it to the data entry people and I'll get a phone call saying, they changed the form. If they would have told me that, first of all, I would have discouraged it, because in point of fact, once you start a project, you've got half the data collected, getting a couple of extra variables on the second half is not going to help much. The idea is that you decide ahead of time what you're supposed to collect and then you do it. […] Because it's not going to do you any good. You've got a data set with 200 cases and you're not going to publish anything on this data set with 40 cases. They're going to say well, why didn't you do this on the other 160, you know? It's just a lack of understanding of how quantitative research is done, but that's why they hire me, because I have knowledge of that, and they don't. But they sort of sometimes go off the reservation, so to speak, and make decisions and not communicate them to me. And they sometimes write down stupid things on data forms.

David's reflections demonstrate one way in which gender beliefs and intersecting status hierarchies operated in the group, becoming part of one's identity and crystallizing into explicit disdain for others who have different skill sets and research approaches. First, David was proud to offer his quantitative skills to the BIRG—"that's why they hire me." As a statistician, he felt

important, necessary even, for the group's success realizing that he had a sought-after scientific skill. But he went much further by labeling "the women" who lacked this knowledge as "stupid." His identity, in part a function of both his quantitative skills and his specific role in the group, limited his abilities to conceive of why other group members might be interested in collecting data in a different way.

While observing meetings, I learned firsthand why some variables were added late in the game: as pilot data for future projects. In contrast to David's story, the group was very aware of power analysis and the cases or "numbers" that were needed in order to publish their findings. The "stupid things" on the data forms were not random, but rather prospective questions for future studies. The PIs agreed that it was a good idea to explore new questions with already consented participants.

Moreover, "the women" collecting the data were certainly not acting on their own to add the variables late in the game. David brazenly scapegoated the all-female "research assistant-types" even though he later acknowledged when I pressed the issue, that it was actually Tom who authorized adding the variables. Nevertheless, David was invested in a rigid and gendered scientific dichotomy. His not-so-hidden gender beliefs were essentially this: that men were smart and quantitative and women were stupid and bad with numbers.

I argue that David reacted so strongly to the women's behavior because it afforded him an opportunity to distinguish himself from them in terms of status, both on gendered and scientific grounds. As a staff member employed to execute the PIs research agenda, David actually had much more in common with the female "research assistant-types" than he did with either Tom or Phillip. But by choosing to highlight his scientific and gender identities, instead of his formal role within the group, David positioned himself as sharing space and status with Tom

and Phillip, the scientific and male members of the group who "understand" quantitative data.

Interestingly, Elaine, the high-status female co-investigator from medicine was the BIRG member most frustrated by David's dismissive behavior. She was particularly angered that he ignored her calls and emails, and she experienced the slights as insubordination. She recognized that David's behavior had something to do with status beliefs and she suspected that he only replied to Tom because he considered him "the boss." But she was clearly annoyed that he failed to see her as someone worthy of deference in the BIRG. Though Elaine did not mention gender explicitly among David's possible status motivations, had she been privy to his unabashedly gendered rant about quantitative data, she might have attributed his failure to return her calls to her being a woman.

To be clear, during my time with the BIRG, I never saw an interaction or heard a firsthand report that even came close to capturing the disdain David seemed to harbor against female group members. If other BIRG members held similarly extreme beliefs, they concealed them during meetings and certainly chose not to share them with me in interviews. David was an outlier in another way too. He was a peripheral group member, who only worked with the group as a consultant on an as-needed basis. So perhaps it was his distant organizational role that emboldened him to talk in a way that he might not have chosen to do if he worked full-time with one of the BIRG's disciplinary teams. Regardless, David's extreme status beliefs about gender and science still made their way into the group and affected group morale.

And while the BIRG nurses never spoke to me about being on the receiving end of such overtly negative or disrespectful behavior, they *did* feel that their scientific interests, research designs, and qualitative methods were devalued in the group. What's more, they sensed that some of the disregard for their approach was linked to a targeted dismissal of their discipline's

gendered questions and feminist orientation. So even without overt discrimination or pointed criticism like David's, they still felt the sting of gendered status slights in the BIRG.

*Gender as an Intersecting Status Marker*

Throughout this chapter, I've slowly been introducing how gender often intersected and was embedded within other status markers to shape the BIRG's understanding of and production of science. David's comments help bring this issue into drastic relief. But as Anna continued to talk about the importance of having women at the table, I realized that the BIRG's gendered status story was more complicated still. Gender was a salient status marker that intersected with other status categories to shape individual experiences, behaviors, and perceived contribution in the group.

As we spoke in our interview, Anna revealed how her multiple low-status markers limited her gendered voice in the group. She went on to explain that Elaine was far more than just a sounding board. In practice, she served as a go-between, giving voice to Anna's concerns by communicating with Tom directly about stress or other emotion-laden topics affecting the group. Anna explained: "Yeah, I mean Elaine had the kind of collegial relationship, especially with Tom, where she could go and say, are you okay? And I got to get the news of, oh, it wasn't about me." I asked Anna why she wouldn't have said something directly to Tom. She answered without hesitating:

> It would have been out of role. It's partly because I'm junior and I can appreciate that. I think it would have been out of role. And it crosses the two things, junior and gender. And the other thing is the disciplines—engineering, medicine, and nursing—nursing has obviously had a historical difficulty of being on the same playing field.

Here we can see that Anna believes the group is better off for having women at the table to help manage emotions. She is grateful to share the table with Elaine, who as another woman, also understands that emotions and relationship management are important for effective collaboration and ultimately the science. As a fellow physician, Elaine can talk with Tom about what's really bothering him whereas Anna's not comfortable doing that herself, revealing that not everyone has equal power to communicate about emotions. Interestingly, Anna explains how gender combines with other status markers to shape not only her perspective, but also her contributions at the interdisciplinary table.

As both a junior researcher and as a woman, Anna was not the right person to discuss emotions with Tom. Showing concern about his stress level would have been "out of role." She also recognizes that nursing's historic subordination to medicine added yet another barrier to equal communication within the group. In her experience, these intersecting status markers—gender, rank, and discipline—combined to consolidate her sense of being a status inferior within the group.

This instance also reveals how intersecting status markers serve to rank order group members within the group. Tom and Phillip—as principal investigators, males, and senior research professors—were at the top of the status spectrum with multiple, high-status markers. Anna was also a principal investigator, but her multiple intersecting low-status markers—her relatively junior status, her gender identity and her disciplinary affiliation—were enough to diminish her voice in the group. So although she was, an equal to Tom and Phillip within the research group's organizational hierarchy, she was still junior, female, and a nurse.

Interestingly, in the BIRG's tacit status matrix, Elaine, came out ahead of Anna in status terms even though she was neither a principal investigator in the group nor had she secured

independent funding on the magnitude of the IRSAG grant, another status marker often spoken about in the group. Yet even so, her status as a physician trumped other status liabilities to make her, in this instance, more of an equal to Tom than Anna.

This exchange also highlights how emotional labor is shaped by intersecting status markers. While the hidden work of emotion management is often relegated to women in mixed-sex groups, within the BIRG, emotional labor was allocated based on one's intersecting status markers (Hochschild 1983). The group's emotional work was shared by both Elaine and Anna—they both managed emotions behind the scenes—but when it came time to broach the topic or take action, only Elaine had the status to do so. Anna's voice was again limited, but this time as a result of having too many low-status markers. To engage in an explicit conversation about emotions (acting like a girl) while she was already too gendered in terms of being female, a junior researcher, and hailing from a low-status and gendered discipline would have been too much. Anna was too much "like a girl" already. While Elaine was female, and thus skilled at emotion work, she was buffered by, and therefore legitimized by, her other high-status markers.

### *Ambiguous Intersections*

Far from representing stable identities, intersecting status markers proved hard to pin down. Individual roles and status markers were constantly in flux as team members negotiated multiple differences in various situations and contexts within the group. The very nature of interdisciplinary work meant that in some instances, some status markers were salient and in others, hardly recognizable. By revealing the fluidity and ambiguity of status markers as they shaped individual identity within the group, my research not only offers empirical support for the

idea of a fluid identity, but also highlights the role of context in shaping individual identity construction and meaning-making.

For example, Carla, the group's radiologist, offered her experience of status intersections in the group. In one conversational tack, she expressed frustration that Tom did not defer to her expertise and high status as a radiologist, but instead assumed a paternalistic tone as he tried to mentor her on his way of doing things. Tom was, in her mind, ignorant of her area of expertise and training—she was the specialist in reading MRI images, not him. So even though Tom was the PI and she was just lending her expertise to the project, Carla still expected his deference to her knowledge in the area. Also within medicine, she pointed out, radiologists enjoyed higher status than obstetricians. So for both reasons she expected more professional deference when it came to interpreting the scanned images.

Moreover, not only did Tom fail to defer to her expertise, Carla was also appalled that he dared to mentor her. She was his age, his equal—if not his superior—and so balked at his attempts at mentorship. She explained:

> Tom Gavin, who I think at one time saw himself as the doer of the science and as the writer of the papers, has now gotten sort of further up the food chain or further up the complexity cycle where he's able to see himself as coordinator of the science and mentor. And [he] takes that role of mentoring very seriously—applies it pretty much uniformly (said sarcastically) but takes it very seriously. And you know, I smile, because I find it humorous because we're the same age and he's always trying to mentor me. And I'm going like, NOOOOOO. I don't need to be mentored today! Let's not put your mentoring hat on. But I just recognize that that's the way he's going to react to me.

Carla found his behavior annoying, and gendered, but conceded that she was not alone. "He does that to everybody," she explained—with one key exception—Phillip. Phillip was his status equal in the group. Carla shared that other group members told her she should get Phillip on

board if she needed to convince Tom of the importance of something. Phillip was nothing short of Tom's scientific barometer. She explained:

> The only person I see him treat as an equal is actually Phillip Andrews. And to their…it's how he uses Phillip. Phillip is—and several people have pointed this out to me… For example, when I was having trouble with them understanding that all this stuff that we see with the musculoskeletal MR techniques is not some sort of wild, crazy voodoo that a couple of docs here at the university are kicking around, but is actually *real* science, someone said you need to get Phillip over to sit and watch you read as a group, as a clinical group. Because if Phillip tells Tom Gavin that this is okay, then he's more likely to buy into it. Because they've worked so long together, there's a level of trust. And he sees that Phillip is the one with the more engineering, technical mind. So if Phillip thinks it's okay, then, you know, it will help Gavin make that decision—if he's sitting on the edge.

Carla's reflections help to illuminate a few important points about status in interdisciplinary groups. First, status assessments were often ambiguous and had to be negotiated in the BIRG's interdisciplinary context. She was the expert in radiology and also felt that she had a leg up in terms of status too. But importantly, Tom was blind to these distinctions and her status appraisals. As PI, he assumed her deference and adopted a paternalistic orientation to her within his group, despite competing status hierarchies that might have existed beyond the boundaries of the BIRG. Second, Carla's ruminations show how Phillip's scientific status and professional history with Tom gave him the power to green light projects and scientific decision-making far beyond his area of expertise.

But perhaps no example demonstrates the variability of status intersections better than a comparison of Karen and Elaine's experiences and perceived contribution in the group. I've already shown how Elaine helped Anna work around her status problems by acting as an emotional liaison between Anna and Tom. But while Elaine mitigated Anna's status issues by sharing a female perspective, Karen as an even more junior nurse, exacerbated them.

Just as Anna appreciated having Elaine "as another woman" at the table, Anna spoke just as effusively about the advantages of having Karen in the BIRG too. When Karen joined the group as a nursing co-investigator in the second round of funding, Anna finally had a disciplinary ally who was a vocal advocate for the nursing perspective. Moreover, Karen was experienced, having worked for years as a nurse-midwife before returning for her Ph.D. And unlike Anna, Karen assumed much more of an authoritative persona at investigator meetings. So her confidence and direct conversational style gave the nursing voice a megaphone of sorts at the interdisciplinary table. Karen also worked behind the scenes as Anna's personal cheerleader, encouraging her to put her ideas into practice. But while Karen was a huge help to Anna, her presence at the table as a co-investigator also complicated the group's established status arrangements. Anna often was put in the position of defending Karen to Tom and felt that at times, Karen's expectations were unreasonable. Anna explained:

> And so I do believe in critical mass, that it has been helpful to have another nurse at the table. And so I've enjoyed having Karen at the table, but on the other hand, Karen is very junior in her research, and so I'm walking a bit of a funny path there. Because I definitely want her at the table, and yet there is this other thing—Phillip and Tom and I are ultimately responsible for the IRSAG. We are leading the different projects, so the buck stops with us. The buck doesn't stop with Karen. She doesn't have the experience there. So I think she wants an even playing field, but isn't really an even player.

Karen had many years of experience as a midwife, administrator, and women's health advocate and activist, but she was still junior in terms of research experience and independent research funding. This alone, according to Anna, diminished her voice in the group. Anna was not alone in perceiving Karen this way. In fact, over time I came to see that she was taking her cues from Tom. When describing Karen, Tom was careful to evaluate her strengths, but also the ways in which her junior status diminished her voice in the group. He explained:

> Well Karen is, as many people who are nurses who do their PhDs midlife, that she is a very experienced individual and has a lot of administrative experience, a lot of clinical experiences as a nurse midwife, has many leadership roles and many different things, but has only been an investigator for a few years. And so Karen jumps right into the administrative stuff because that's something she has a lot of expertise in, and we've benefited a lot from that. And it's hard for all of us to remember that she's only a few short years out of her PhD. So from an investigator standpoint in terms of the number of publications she has and independent funding and those kind of things, she's fairly early in her career, but you know, she's run doula programs and practiced in Honduras and managed a nurse midwifery service and done all those other things, so.

Tom's assessment was not lost on Karen who correctly perceived that Tom considered her inexperience as a researcher to be her defining trait. By focusing on her lack of research experience, he ignored all the other experience that she brought to the table. As a result, Karen told me that she felt marginalized and that her expertise was devalued. Here she explained:

> Well, I'm pretty, very much on the margins of influencing the group. A piece of that is being newer to the group. Another piece of it is not fitting quite in the mold, like coming in senior. He [Tom] tells the story over and over, and over again (laughs), that I'm analogous to this old medical student and that everybody assumes this older guy knows everything, but they're really new to the process. And so, but yet he has lots of life experience, so he brings certain things that other students don't. If you knew Tom, it's like, I'm not going to take this as negative, but it's kind of patronizing. Anyway. So it's his way of saying, you're new to research, so I'm going to tell you what to do there. But it's sort of a message too—like I'm going to tell you what to do this way and you have to listen to me because I'm going to one-up you on this tier. At the same time, I've been practicing obstetrics longer and more recently than he has. So when it comes to clinical questions about how things operate in the delivery room or my knowledge of systems or ways in which we can draw on across campus activities and things like that, that's more than his [knowledge]. But that's how he frames it. I'm in that awkward scenario.

But interestingly, the same "junior" status slight did not adversely affect Elaine, who was also a co-investigator but enjoyed much higher status in the group. Like Karen, Elaine was more junior than Tom, Phillip, and Anna in terms of her research record and she too had not yet secured independent funding. But her lack of experience and funding did not diminish her voice in the group, in fact, far from it. She was considered an equal, and as I've already demonstrated,

sometimes even enjoyed more power than Anna within the group because of her high status as a physician. Here Tom explained another reason that Elaine was essential to him. By taking on many of his clinical commitments, he could allocate more of his time to research. He shared:

> The other big landmark was the department's commitment to hire Elaine. Because I was the gynecology director and the director of OR services and had a lot of other administrative posts and having another mid-career competent urogynecologist and somebody with administrative stature that could run the gynecology division was necessary for me to have enough time to do something like IRSAG. And so, Scott Sparrow committed to finding a person, and we knew it was Elaine and it took a year and a half to recruit Elaine. And in retrospect, you know, Elaine is just fabulous. And in retrospect that was an absolutely necessary thing. If there wasn't a good person who could carry the load and do everything then I'd end up falling back into that position anyway. And if it wasn't a urogynecologist, there'd still be so much clinical work to do that I couldn't just say I'm going to be 60% research and 40% clinical.

In marked contrast, Tom's unique professional relationship with Elaine helped mitigate some of the same status reservations he had about Karen in the BIRG. He considered her first and foremost a valuable asset as a colleague in medicine. In that arena, she was not only a status equal, but was personally helpful for him in that she freed him up to pursue his funded research agenda. Even though she too was just a Co-I, her voice and contribution was valued despite her "mid-career" status and lack of independent funding.

And far from feeling devalued like Karen, Elaine considered herself an important player in the BIRG. While she saw herself as a peripheral member of the group, or as she put it "second tier if I could classify it as that," she was quick to volunteer that she contributed at a very "high-level." She explained that while she was not a "PI per se," she was quick to clarify that "as a Co-I and an investigator on several of those grants I participated in many of the conversations on determining the specific aims and direction of the grants." In short, her voice was included at the ground level and as a result, she felt validated in the group.

While both Elaine and Karen described themselves to be "second-tier" or "marginal" players in the group, they experienced these roles in fundamentally different ways. Elaine saw herself making a valuable contribution to the group at a "high-level" and correctly perceived that other group members valued her unique clinical contribution. Karen, on the other hand, felt like her own clinical experience was devalued in the BIRG. For Karen, ambiguous identities worked against her. Though she had years of experience as a nurse midwife and successful administrator, those experiences were not valued by Tom. And though Anna valued having Karen as another nurse at the table most of all, since she still struggled with managing her own status problems in the group, Karen seemed to make them worse.

Contrasting Karen and Elaine's roles and self-perceptions illustrates how intersecting status markers variably conferred value in the BIRG. But other group members also navigated ambiguous and intersecting status divides. The position of the medical fellows perhaps best captured the nature of ambiguous identities in interdisciplinary group. The BIRG fellows were funded by an urogynecology fellowship and were working for Tom and Elaine respectively. In this way, they were junior investigators within the context of the BIRG, and their role, like that of the engineering students, was a temporary one. But from the perspective of the nursing researchers, they were still doctors and therefore technically could wield power over them. Gwen, one of the medical fellows, spoke to this from her perspective, emphasizing that she still struggled to earn the trust of the nursing staff and Anna's doctoral students because of the ubiquitous perception among nurses that doctors were "assholes." As she considered her different relationship with Anna and Karen, she was struck by the ambiguous nature of professional relationships in the group. She explained:

> In the School of Nursing, they probably would have to realize that I'm not an asshole doctor, you know what I mean? …that you respect what I do as a nurse

> and you're not going to come in and tell me just because you're the doctor, you're not going to…not with Anna, I mean Anna is so much more senior than I am and I have so much respect for her. But I think that her other graduate students and her staff sometimes… I have to overcome maybe a little bit of prejudice there, but never from Anna. I mean, Anna is senior to me, and she always will be, you know? There's no way in hell I'll ever be…I mean, I would be happy to be a peer.
>
> *So it sounds like seniority on some level—or rank—outranks discipline in the hierarchy of interdisciplinary science?*
>
> Right. 100%. Cause it's academic medicine. But in clinic, Anna is the Ph.D. nurse and I'm the doctor. Right? And Karen is the midwife, I mean she's a Ph.D. nurse midwife with funding. I don't have any of my own funding. But to a certain extent, you know, if the patient needs a c-section, she needs me. […] I mean the other day, she had a third degree laceration and she said, hey, are you doing anything? The patient doesn't want a man. So like could you come over and give me another set of hands while I do this? And so that kind of thing.

Here, Gwen explained how intersecting status hierarchies create ambiguous identity questions for members of the BIRG. She noted that while she was definitely junior to Anna in terms of her academic research, she was still the MD, even if she was far less accomplished in clinical research. Her ruminations about identity and her intersecting roles also shaped her relationship with Karen, the nursing co-investigator for the BIRG, in the clinic. While Karen also had more power in the organizational hierarchy of the BIRG as a Co-I with funding, and as a seasoned clinical midwife she had many more years experience delivering babies, she still, at times, deferred to Gwen in her role as physician, especially if she needed help with a birthing complication.

Gwen was not alone in noting that intersecting hierarchies often made for confusing identity work in the group. The other physicians in the BIRG also remarked on how intersecting hierarchies created ambiguous understandings of self and other within the group. In all instances, however, the physicians assured me that they would never abuse the power afforded them by their title with other BIRG members. Sarah, another medical fellow noted that while

she technically had more power than the nursing staff, she would never resort to playing that card in the BIRG. Similarly, Robert, another junior physician who collaborated with the group similarly volunteered that physicians who insisted on maintaining hierarchical relationships with nurses would never be attracted to the egalitarian nature of the BIRG group from the outset.

Though these comments support the egalitarian ethos of the group, they also reveal the salience of negotiating power dynamics and status intersections in interdisciplinary contexts. These group members knew that relying on existing hierarchies to understand themselves and others was neither sanctioned nor effective in an interdisciplinary context, but ignoring them resulted in ambiguity. Much of their professional lives, they reminded me again and again, occurred in arenas where rigid hierarchies were still very much the norm.

### *Marginalized Voices: Dangerous Status Intersections for Nurses in the BIRG*

The BIRG nursing group members experienced these ambiguous intersections in a decidedly different way. For them, existing hierarchies and intersecting status deficits proved to be huge obstacles to their equal participation in the group. For Anna, gender markers consolidated an already salient sense being an outsider as a nurse and as someone who did science differently. Gendered distinctions were often invoked to explain one's disempowered role within the group, often as it intersected with other low status markers to consolidate disadvantage for some group members. But I soon learned that perceptions of status also emerged to shape individual understanding and the interdisciplinary endeavor more broadly.

Anna explained that there were only two places in which she "hit a wall." The first, was when Tom was unsure of her being "right for the science." She explained that "that one, was clearly because I was a nurse." The second time when Anna remembered hitting a wall was

when she asked Tom if she could observe in the operating room to actually see the pelvic floor. She remembered:

> Phillip has been in there, but I've never even seen a dissection. Tom is so polite and discreet, so it's not as if he said, 'no you can't go in there because you're a nurse,' but I also know him well enough to know that that was why. He also said, well you won't be able to see much. But the fellows, what do they see? They observe. The med students certainly observe. He has people observing surgeries all the time.

I asked her why Phillip would have been allowed in the operating room. Anna answered:

> I think it's roles. It may simply be a list of who gets to. They have a different relationship and that's partly allowed because they're male. I don't want that relationship with either of them, I'd feel uncomfortable with that. So they're truly friends and have a little more license with each other because of that, I think. Two factors: I'm female and I'm junior.

In this exchange Anna reflects on her own intersecting status markers combined to justify her exclusion in this instance, offering empirical evidence for how women in the sciences are multiply-marginalized and limited at the team level. Initially, her role as a nurse was salient—nurses, even Ph.D. researchers were not allowed as observers. But later as she recalled that Phillip, an engineer who had no clinical expertise or training whatsoever was invited, she began to make the connection that in practice, her exclusion was based on much more than strictly disciplinary lines. Her gender identity also contributed to her exclusion. Tom and Phillip were both male and "truly friends."

Here we see how intersecting status markers affect participation in real spaces. Symbolic exclusion based on some social categories manifest as tangible boundaries in interdisciplinary collaboration. Conversely, other status privileges grant access in new interdisciplinary spaces. While Phillip, as an engineer, had fewer jurisdictional rights to the operating room, or in any other clinical space compared to Anna, he was granted access because of his other high-status

markers—he was senior and male, and so was able to transcend some of her intersecting limitations, being junior, female, and a nurse.

Anna also acknowledged that starting off on the research track further put her in a status deficit. The reliance on soft money built in more disadvantage. She explained:

> It's the third layer—okay so I had a gender issue, I had a junior issue, and the research track at the university is a very disempowered track. It's extremely disempowered. It's considered inferior to the tenure track. It's thought of as, well you must not be able to make it on the tenure track. It's often, people go—it's kind of thought of as a long-term post-doc sort of thing. You can be a research scientist or a research professor. And the research scientists are viewed as lab rats basically.

While a few other female BIRG members from medicine and engineering discussed various aspects of gender in the group's collaboration, only the BIRG nurses spoke of fighting against negative stereotypes and gendered expectations. Anna even articulated the mechanism. She saw that multiple status markers worked in tandem to effectively diminish her power and overall status in the group. Importantly, some of the more justifiable status markers like rank or research track, worked to disguise the effects of gender. This happened in two ways. On an interactional level, because rank was widely acknowledged as a legitimate sorting tool that represented the length of time invested in one's career, incremental evaluations of one's peers, and by proxy, one's publication record and scientific quality, it appeared as a legitimate criterion by which to regulate access and autonomy in the sciences. So excluding Anna on the grounds of rank appeared reasonable, natural even.

But Anna's experience shows how her rank itself was fundamentally shaped by gendered expectations. She was denied tenure based on perceptions of independence, not the absolute quality or quantity of her publications or her ability to secure outside funding. Anna's rank was gendered at a macro-structural level too. Scholars studying gender equity in the academy have

shown that women are disproportionately represented at the junior level and in more disempowered research track positions across disciplines (Roos and Gatta 2009). So Anna's rank was also part of a gendered system whereby women were overrepresented in low-status positions and underrepresented at higher levels. So in summary, gender was embedded in, and intersected with their other, already low-status markers to create boundaries to inclusion, but it also structured arrangements and expectations at a more impersonal, systemic level.

**Conclusion**

In previous chapters, I showed how existing inequalities—structural barriers and cultural hierarchies among disciplines—shaped the BIRG's collaboration from the get-go. But I quickly learned that the nurses' sense of disadvantage within the BIRG had deeper roots. Negative stereotypes about nurses also worked to undermine their authority in the BIRG. Nurses as a group were described as less innately independent and ambitious than their colleagues from medicine and engineering. This discovery—that the BIRG nurses were plagued by assumptions about their talents and abilities based solely on their disciplinary affiliation—emerged as a significant, if not surprising finding in my data. Simply put, the BIRG nurses suffered status slights in addition to more formal barriers too. But I soon discovered that status matters in the BIRG were much more complex and far more extensive than I originally assumed. Although Anna's position as a junior researcher and former advisee of Tom and Phillip was often used to justify her lack of equality or autonomy in the group, I learned it was but one of the many status beliefs working against her.

Multiple status markers were operating together to create durable barriers to the nurses' equal partnership in the group. As I spent more time observing the BIRG, I discovered that

status perceptions were not limited to disciplinary affiliation and rank. Rather myriad status markers, some obvious, some hidden, combined to mark contribution and shape understandings in the BIRG. Anna's status slights, I learned, were intractable in part because she suffered so many simultaneously. The nursing approach was deemed "less scientific" and Anna's team "inefficient." Nurses had their own culture and ways of doing things that were, in the BIRG's interdisciplinary context, less rigorous and less productive.

But other status problems, like gender, were more insidious and harder to tackle. Many of the women in the BIRG spoke about gendered dynamics in the group and in their careers more broadly. For example, having women at the table was important. But it was the group's nurses who struggled against gender status slights because a devalued feminized approach to science was also embedded in their disciplinary orientation. So the nurses not only described feeling silenced as women "at the table," but their feminist research orientations and scientific perspectives were also discounted on gendered grounds. Their scientific methodologies were deemed "soft" and "fluffy," and their interpersonal investments in their female subjects considered a "waste of time" and "unprofessional."

Analyzing status intersections in the BIRG helped me to illuminate the ongoing identity work inherent in interdisciplinary science. Status was always salient, but in flux. Status intersections were often ambiguous and up for negotiation in the BIRG's interdisciplinary context, often changing from moment to moment or across settings. Sometimes a group member had high status in one area, but low status, comparatively speaking, in another. Team members worked to enhance how they were seen by emphasizing their high-status affiliations or distancing themselves from low-status others. In other moments, a status deficit was interpreted quite differently depending upon one's other status placements. Elaine and Karen, both

relatively junior co-investigators, had vastly different experiences in the group. Multiple low-status markers combined to make Karen feel marginalized and devalued, while Elaine was buffered by her high-status affiliation with medicine and so felt instrumental to the group's success.

But while some group members experienced ambiguous status intersections, the nurses almost always came out on the losing end of intersecting status markers. I found it was these intersections, the places where multiple low-status markers merged, that constituted the *real* hurdles for the nurses in the BIRG. It was the combination of their disciplinary affiliation, their scientific approaches and methods, their feminist values, *and* their being women in the academic health sciences, that created a durable barrier to the nurses' equal collaboration in the group. For them, this cemented a durable low-status identity that was inherently gendered.

In the next chapter, I will continue to explore the consequences of these gendered intersections. I came to realize that many of the nurses' behaviors and self-assessments were reactions to feeling "less than" within the BIRG. They adopted various "face saving" and resistance strategies, as they negotiated their chronic and durable low-status position in the group. In a context where their multiple marginalities precluded an equal scientific partnership, the nurses engaged in identity work to construct their own meanings, define their own sense of purpose, and reclaim their lost voice within the group.

# Chapter 6

## Saving Face, Resisting Status, and the Making of a Symbolic Divide

### Introduction

In the last chapter I described how status appraisals influenced BIRG member assessments of disciplinary and scientific value, as well as individual contribution to the group. I showed how these assessments shaped team member self-appraisals, behaviors, and ultimately, nothing less than the scientific direction and outcomes in the BIRG. In this chapter, I continue to explore the effects of status in interdisciplinary science by linking status appraisals to the emergence of a symbolic rift in the group.

The nursing team, a group plagued by multiple and intersecting low-status markers, engaged in various strategies to save face within the group. The BIRG nurses felt that they were not valued and knew that they were seen as outsiders to the science. For these reasons, they engaged in various strategies to deflect criticism. At first, they explained their delays and diminished productivity. Limited resources, a lack of support, and not enough time to devote to the project, were all offered as reasons they were underperforming compared to their interdisciplinary colleagues. They also justified the time-consuming nature of their work as a function of their disciplinary culture, methodological choices, and commitment to the research subject.

As the nurses realized that their scientific perspectives were not just devalued but stifled in the BIRG, they redirected their efforts. Anna chose to plug away at her true interests, developing her ideas under the radar with support from her disciplinary team in nursing. Her

nursing colleagues had less invested in the BIRG and therefore adopted different strategies altogether. Her staff resisted interdisciplinary overtures and BIRG colleagues' status-conscious expectations, digging in their heels as they felt their autonomy diminished in the group. Other nursing investigators chose to keep many of their ideas and professional identities hidden from their interdisciplinary team members, pursing them outside the BIRG.

Perhaps most interesting, however, was the discovery that the nursing team also engaged in symbolic boundary work within the BIRG. When I first heard the nurses' talk about their woman-centered orientation and feminist values, I categorized these ruminations as evidence of their distinctive "epistemic culture" (Knorr-Cetina 1999). The nurses' woman-centered approach distinguished them from their BIRG colleagues and was understandably salient for that reason. Over time, however, I realized their accounts did not merely reflect existing differences, but rather were their attempts to actively reify or reproduce them. And while I first thought this characterization looked like routine scientific boundary work (Gieryn 1983, 1999), the division was deeply gendered and morally charged. I soon came to see this division as a true symbolic rift that I began to call the "woman-science divide." The nurses not only defended their disciplinary values, but they actively juxtaposed them against the more "scientific" approaches and priorities of their colleagues.

Moreover, this symbolic boundary was fueled by the nurses' perception that they had little status or power in the group. The nurses would valorize the very low-status qualities that they felt were actively dismissed in the group. Drawing from the nurses' own accounts, I demonstrate that it was *because* their collective voice was silenced within the BIRG that they chose instead to focus on their differences, refashioning them into a moral purpose. Reframing

their role as fighting for women helped to legitimize their exclusion and recast their outsider status as a moral stance.

***Productivity as an "objective" status marker***

In the last chapter, I demonstrated that while BIRG members outwardly espoused a collaborative ethic and egalitarian ideals, status emerged as a true interdisciplinary problem for some of the group's members. The nurses were overwhelmed by status deficits. Though they felt their vulnerability most acutely along disciplinary and gendered lines, they explained that it was often the confluence of multiple and intersecting low-status markers that effectively silenced them at the interdisciplinary table. And while their colleagues from engineering and medicine were largely blind to the nurses' status concerns, there was one status marker that was salient for everyone: productivity.

Researchers have long documented that productivity is tantamount to success in the academy and this is especially true in the academic sciences (Xie and Shauman 1998; Long 1978). Peer-reviewed publications, especially well-placed and oft-cited ones, mark research progress within and across fields, but also bring status to individual researchers and teams (Cole 1973). As health science researchers, all of the BIRG PIs touted productivity as an important goal for the group. Publications helped them to internally measure whether they were making headway on their research aims. But more importantly, putting their findings in peer-reviewed journals was the only way they could prove their progress to the outside world. They wanted to make a contribution and be "agenda setters," and for that, they had to be on the record. Moreover, establishing an extensive and distinguished publication record would help them

secure additional funding. This had worked for them before. They were on their second 5-year IRSAG award during my time with the group.

For a variety of reasons, BIRG members were especially sensitive to the challenges of publishing their interdisciplinary scientific findings. Tried and true disciplinary journals were not always receptive to interdisciplinary approaches and perspectives (Pfirman and Martin 2010). And the disciplines had vastly different conventions and expectations regarding what constituted a legitimate or meaningful contribution to their respective and shared research canons. But there was one other reason productivity was salient within the BIRG. The engineers and doctors were simply much more productive than Anna's team in nursing, effectively making productivity a powerful status marker within the group too.

Anna also recognized the importance of publishing, but felt that the interdisciplinary deck was stacked against her. She struggled to keep pace with Tom and Phillip amid structural impediments, cultural biases, and the weight of her intersecting status deficits at the interdisciplinary table. She saw how these barriers limited her productivity, but because productivity was touted as an objective marker of success within the group, she still felt pressure to produce at a comparable level. This finding supports other research that exposes how unacknowledged inequalities and hidden biases adversely affect women's productivity in the sciences (Pfirman and Martin 2010; Xie and Shauman 1998). Scientific productivity is not only shaped by existing biases and inequalities, but, because of its ostensibly "objective" and quantifiable nature, it also masks them.

And while Tom and Phillip acknowledged Anna had borne the brunt of "interdisciplinary confusion" at the inception of the group, they now saw the playing field as level, or at least as level as it ever could be. Not only did they fail to appreciate how she still struggled with low

status and diminished power within the BIRG, but they often attributed Anna's productivity problems to the culture of nursing. As a discipline, they explained, nursing had lower expectations for productivity than medicine or engineering. And because Anna already outperformed her disciplinary colleagues in terms of her publication record, her department saw no need to offer her additional support to facilitate her research in the BIRG. Tom saw this as reflecting nursing's ignorance of how science worked.

By not keeping pace, Anna confirmed Tom's initial status anxiety about collaborating with a nurse. Perhaps nurses weren't quite up to the challenge of being equal collaborators in high-stakes science. Engineering and medicine both enjoyed high status as disciplines, but objectively speaking, they appeared to earn their status in the group by maintaining high levels of productivity in the BIRG. In contrast, nursing was already seen as a "less scientific" culture from the outset, but by not producing at a comparable level, Anna helped to consolidate her discipline's low-status reputation within the group.

While Tom's status anxieties about nursing might have originated at the cultural level, I most frequently saw them framed in terms of productivity. In meetings, I made extensive notes about how nursing's recruitment numbers were considered "disappointing" and their projects were almost always "behind schedule." Tom would routinely ask Anna why nursing failed to meet their target recruitment numbers for any given month or quarter, and often in the same conversation, ask how her team was spending their time. He also asked the BIRG project managers, first Erin and later Nicole, to monitor nursing's practices, often asking whether Anna's group couldn't perhaps become more "efficient"? And in terms of scientific discovery, when Tom and Phillip would discourage Anna from pursuing an angle in a project, the rationale

they gave was almost always because her approaches would take too much time or were inefficient in their use of resources.

And when tempers flared in the harmonious BIRG—a rare occurrence to be sure—it was almost always Tom who would, for just a moment, lose his composure about nursing's lack of productivity. In these instances, Tom would implore Anna to get more help so she could more effectively get papers "out the door." In one investigator meeting he responded in frustration to Anna's explanations about her delays by cutting her off mid-sentence. If ideas weren't published, he exasperatedly challenged her, they effectively "didn't matter." On another occasion, Tom asked Erin to shut the door during a meeting to discretely, but angrily vent about Karen's seeming nonchalance about publication deadlines and the implications for the group's progress. In these instances, Anna was always quick to promise that some plans were in the work to move things along. She would, for example, be able to devote extra time with the upcoming break or at the end of the semester. Moreover, she was always chosen as the go-between to deliver bad news to Karen—in this instance, promising that she'd "talk with her."

Over time, I began to see that Tom and Phillip's struggles with nursing's productivity problems reflected deeper anxieties about collaborating with lower-status colleagues. For the engineers and doctors, interdisciplinary collaboration was a potential status leak, especially if their lower-status nursing colleagues were chronically under-performing. Regardless of their disciplinary publication records, the BIRG was still evaluated as a group by the NIH, and their collective output shaped how they group's research was perceived in the larger health sciences community. Moreover, because group productivity also influenced future funding decisions, collaborating with slower, lower-status colleagues was financially risky as well.

If the high-status BIRG members had something to lose by collaborating with low-status nurses, then at least theoretically, the nurses had something to gain. Since they were already considered relatively low-status within the health sciences, "crossing," or incorporating an interdisciplinary approach, potentially enhanced their status and funding opportunities (Collins 1992). In this way, they benefited from being at the table. But at what cost? While Anna was frustrated by, but committed to the BIRG, her nursing colleagues had deep reservations about pooling their scientific agenda with high-status colleagues who did not value their perspective.

***Interdisciplinary Status Strategies: Managing Status Leaks, Saving Face, and Resistance***

BIRG members' different status positions correlated with fundamentally different status strategies. As I have just outlined, the engineers and doctors sought to minimize and thereby manage the status leaks of their nursing colleagues by encouraging them to be more efficient and more productive. The subtext in the investigator meetings was always the same: the nurses needed to get their act together and streamline and professionalize their operation. The nurses, on the other hand, sought to save face by explaining their delays and diminished productivity in the group.

As a PI and a long-time collaborator with Tom and Phillip, Anna was deeply invested in the BIRG's success. She had forgone her R01 to submit her project with the interdisciplinary IRSAG grant years ago, and was thoroughly committed to her interdisciplinary colleagues even if it meant that she struggled to be seen as an equal within the group. She sought to explain the causes of her power and status imbalances by highlighting how limited resources and multiple, intersecting status hurdles adversely affected her confidence, power, and productivity within the group. She also felt compelled to defend her research choices and practices, acknowledging that

while longitudinal designs and qualitative methodologies were time-consuming, accounting for the needs of real women was important to nursing researchers. Despite multiple challenges, she kept pushing her research forward, taking resistance from Tom and Phillip in stride.

Her colleague Karen also sought to save face by linking her lack of productivity to the competing demands on her time, a problem that researchers have shown disproportionately afflicts women in the sciences (Xie and Shauman 1998). She explained that when she began working with the BIRG, the IRSAG grant only covered 5 percent of her salary. As a relatively disempowered research assistant professor, she had to cobble together a full-time salary by pursuing funding on many different projects. She noted that Tom and Phillip, who enjoyed tenured positions and full-time funding, failed to appreciate that she had other things vying for her time too. She explained:

> And I think that was also hard for them to understand. They're not used to people doing more than one thing. So 5% was not the 50% I needed so I also had [to pursue] my own funding [working in other projects]. I couldn't just sit for hours in meetings and you know, hang out. So that was hard. I think if I had more time to just solo in that area then I probably would have been more successful in terms of getting some productivity that they would have been more likely to have been positive about.

Now that the IRSAG was renewed for a second funding cycle, Karen's work with the BIRG covered 20 percent of her salary, which made it easier to spend more time on her work with the group. But even so, she still resented that there was no effort to link one's available time and competing constraints with their output in the group. Moreover, even though Karen was now better compensated for her contribution to the BIRG, she still felt largely unappreciated and underutilized in the group. As a result, she kept parts of her professional identity and research agenda hidden in the BIRG, seeking recognition and appreciation elsewhere.

But while the nurses felt pressure to justify their delays and explain their lack of productivity, they also actively problematized how status shaped the interdisciplinary scientific terrain. In addition to saving face, they engaged in myriad acts of real and symbolic resistance to reclaim their marginalized nursing voice in the interdisciplinary BIRG. While some of Anna's nursing research associates actively resisted their colleagues' interdisciplinary overtures, citing them as oppressive and high-handed attempts by medicine to control their scientific process and perspective, others defended woman-centered language and time-intensive woman-centered research approaches. Some even actively resisted the idea that more science—in terms of publications—was necessarily better. The nursing researchers believed their priorities lay with the women involved in the clinical trials and more broadly, in the patient population that struggled with quality of life issues as a result of birth-related injuries. They realized that what they cared about—the women—was a low-status concern in the BIRG because it effectively detracted from productivity at every turn. By casting productivity itself as a crass goal that actively undermined the nursing perspective and real women's interests, these nurses quietly touted a dissonant, feminist voice in the group.

### *Resisting Status and the Emergence of the Woman-science Divide*

I first noticed Anna's staff resisting interdisciplinary overtures. While the nursing investigators lamented their scientific exclusion, Anna's staff members Maggie and Kristine longed to be left alone. When Nicole, the BIRG project manager, tried to ease disciplinary tensions and foster inclusiveness by spending one day each week working in the School of Nursing, they balked, interpreting it as a "spying expedition." They resented having to account for their time and justify their way of doing things and did not want anyone looking over their

shoulders. They felt devalued and scrutinized in the context of the BIRG and wanted to retain their disciplinary autonomy by keeping others out "of their sandbox."

Throughout our interview, Kristine explicitly talked about status markers and status consciousness in the BIRG context. She found collaborating with high-status others oppressive because they simply expected the nursing group to care about the trappings of status too. For example, Kristine openly disparaged the appearance-oriented priorities of her BIRG colleagues and administrators who were concerned with looking "professional." She cited nursing's lack of dress code as evidence that they were down-to-earth and not status-conscious like other BIRG members, explaining, "Like I'm dressed up for the day. A lot of the time in the summer we come in shorts, we come in jeans, we don't necessarily have a dress code and that does not fly over there." She also balked at other "professionalizing" gestures such as Tom's suggestion that BIRG staff members create their own poster presentations to highlight their work at an upcoming conference. She dismissed it out of hand. He did not really care about what they did; the poster presentations merely made the group look polished. It was just for appearance's sake.

More seriously, Kristine and Maggie thought the BIRG's interdisciplinary status hierarchies changed their job for the worse. They both shared that Anna's comparatively low status as a PI left them vulnerable within the BIRG's interdisciplinary context. Anna was technically their boss, but in the group's status hierarchy, she often deferred to Tom and Phillip, which created a trickle-down status effect that created stress and complications for them. Simply put, outsiders' status appraisals affected how Anna treated them and how their disciplinary team worked. It was only when Anna was getting pressure from Tom, they confided, that she assumed a more authoritarian persona and started acting "like a boss." Kristine shared:

> I still see her sometimes as she won't have a backbone and standup to them because she came to the university in a position that she was getting her Ph.D. here, so she started working with them in her doctoral candidate role and then now she's bringing in her own dollars, she still, I think, falls back into that role. You know sometimes she'll stand up to them, but sometimes, she just, we like to say she'll just throw us under the bus to appease them.
>
> *Can you give me an example?*
>
> Well, there are a lot of times when the budget issue comes up and they will say can you justify, and it's not so much my percentage because I am not a big percentage, but can you justify the time? Like Maggie's time. Can you justify it? We don't know what she's doing over there that she should be on this much. So sometimes Anna will say well, we do this, this, this, and this. But sometimes she'll be like, yeah, I understand, and then she'll have to come back and have a conversation about, well they're questioning your percentage and what you're actually doing instead of [Anna] just saying, okay I understand your concern, but back off, it's my staff, I have a staff of 2 ½ . You know, you've got all these fellows helping you out and you have students and everything, so just trust that I'm not padding the budget. We're not overpaying. We're not underworking.

Here, Kristine explained how Anna's low status created a problem for their research team. She felt that the interdisciplinary collaboration changed the way that Anna managed her disciplinary group. In short, Anna felt pressure to comply with her higher-status colleagues' requests and justify her team's efficiency and productivity in an effort to save face. Because they saw her behavior as inauthentic, and a far cry from her typical egalitarian working style, they felt empowered to resist other interdisciplinary overtures when they could.

Maggie also resisted the BIRG's interdisciplinary expectations, but in a more outwardly "aggressive" way. Nicole, the project manager, struggled with Maggie's brash and antagonistic style, attributing her obstinacy and communication problems to her "difficult personality." But Maggie relished this characterization, almost spoiling for a fight. She knew that her behaviors as clinical coordinator were under scrutiny but she refused to change her ways. She valued her autonomy in nursing and her working relationship with Anna. For Maggie, resisting an oppressive interdisciplinary agenda handed down from "big brother" in medicine was justifiable.

Nursing had long struggled against medicine's power monopoly within the hierarchy of the health professions, so to her, interdisciplinary research was just another battlefield. Moreover, she also interpreted her resistance as a way to indirectly support Anna, who was often powerless to "stand up for herself."

When I attended my first meeting at the School of Nursing, I experienced Maggie's resistance firsthand. I arrived early and sat in the corner making notes as Anna's team trickled in. Before Anna had a chance to formally introduce me to her group, Maggie entered the room and quickly registered her disapproval of me. She approached me brusquely saying, "I don't know you" instead of saying "hello" or introducing herself. Anna quickly jumped to my defense, explaining that I was a sociology student studying the larger interdisciplinary BIRG. But this explanation did not satisfy Maggie. She continued to glower at me disapprovingly throughout the meeting. I feverishly wrote in my field journal: "Why the chilly reception? What does it mean?"

By that point, I had taken for granted that I was welcome as an observer in the group. Anna would affectionately call me her "cat in the corner," and Tom and Phillip would routinely solicit my social science opinion or ask me the definition of a large word (sociologists are known as great wordsmiths, don't you know?). In short, the PIs were happy to have me studying their group and eager to learn my findings. I was also warmly received by the medical fellows and engineering students whom I routinely observed at the weekly muscle meetings. But to Maggie, I was an outsider. I sensed I had violated a boundary of sorts, but it wasn't until much later that I was able to fully understand this event as marked by status and interpret Maggie's behavior as a type of resistance.

Over time, I learned that Anna's staff viewed me with the same suspicion they reserved for other BIRG members. I was an interloper whom they assumed would not only be observing them, but likely evaluating and judging them too. This, I gleaned, was an effect of the nursing team's feeling devalued by the long-standing BIRG practice of assessing efficiency and productivity within the group. The nurses already felt singled out, and their defensive behavior was one way to resist the negative appraisals. In this context, resistance to interdisciplinarity became a subversive act of solidarity by the low-status nursing staff in the BIRG.

But I soon recognized that the nurses' status problems inspired resistance at the scientific level too. While Tom and Phillip and their high-status disciplinary teams touted efficiency, productivity, and scientific discovery as the BIRG's dominant values, the nursing group pushed back and instead valorized their roles as feminists and patient advocates. But they went even a step further, often juxtaposing the high-status "scientific" interests of their colleagues against their woman-centered orientation. Over time, I began to see that this emergent cleft became a true symbolic boundary in the group, one that I came to characterize as the woman-science divide.

According to the nurses, the engineers and doctors cared about birth injuries for the thrill of scientific discovery and more crassly, the acclaim that came with it. Pelvic floor injury was simply a theoretical problem to be solved, or an anatomical injury to be fixed. In contrast, the nurses saw themselves as squarely devoted to the real women whose lives were affected by birth-related complications. For them, a feminist or woman-centered orientation was of paramount importance both from a philosophical standpoint, but also as it shaped their research practices and interactions with their clinical research participants. At first glance, the woman-science divide I uncovered seems to merely reflect existing disciplinary differences, which, as I've gone

to great lengths to explain, were salient from the outset in the interdisciplinary BIRG. But as I poured over the data, I began to see that it was feeling devalued and ignored in the BIRG that *propelled* the nurses to resist their colleagues' conventional scientific markers of success and bolstered their sense of moral obligation to their patient population. Simply put, the nurses' status deficit within the BIRG exacerbated their already different perspectives, creating nothing less than a symbolic impasse. If they couldn't win in terms of scientific status and output, they could redraw the goal of interdisciplinary science to be about standing up for what was morally right. What had been feminist leanings became a moral imperative to defend feminist ideals and practices in interdisciplinary science. In this context, they doubled down on their woman-centered disciplinary focus, often invoking a narrative that pitted their feminist priorities against the science—at least science as it was undertaken by their BIRG colleagues.

### *Seeing Clearly: A Vantage Point Untainted by Science*

One way the nurses mobilized the woman-science divide was by invoking their embodied advantage over their high-status male colleagues. In these instances, it was by virtue of their biological sex that they naturally understood real women, and by extension, what was scientifically appropriate or feasible, far better than their male colleagues. In this way, the nurses invoked a feminist standpoint to justify their unique vision. According to this theoretical lineage, subordinated positions often come with the gift of insight (Smith 1989; Collins 1990). Those who are marginalized can see how structures of power and status oppress in ways that the privileged, or those outside a specific standpoint, cannot fully appreciate.

My conversation with Joanna, Karen's nursing research assistant, best captured this embodied advantage as she talked about socializing with her nursing colleagues outside of work.

She explained that when they would get together, they would often "chat about life and laugh and tease each other about different interactions we've had with Dr. Gavin or Dr. Andrews, you know (laughing), the big guys." When I asked for more details of these events, Joanna explained that "the girls" would almost always would joke about the project ideas that Tom and Phillip would dream up, emphasizing that as women, they just knew better. She shared:

> Oh just—some of their wants and desires for different projects are just way off the wall for any woman to ever agree to. You know Dr. Gavin has this idea for measuring pelvic floor muscle tone where it takes—I think a discussion of four different sets of wires that had to be put in the vaginal area and we were all like, no woman would EVER sign up for this! She had to have all these wires and then she had to lie still for two hours, be in an MRI machine. We're going, nobody would ever, ever sign up for this! They would hear the first two sentences and be like, why do you guys even have a project like this? You know, it's torture! So we would tease each other about [things like that]. And just the difference of a man's view of what do you offer to a woman and a woman's view of being like, you guys are completely bonkers! And we would never say that to their faces, that they're completely insane, but we would lovingly tell them that, (in an affected tone) 'Are you sure that that would work?' or 'Isn't there a better way to do this?'

Though she was expressly talking about the importance of socializing as she reflected on the cohesiveness of their disciplinary team, she inadvertently revealed how she and her nursing colleagues transformed being a woman, a traditionally low-status position within scientific and professional contexts, into a privileged standpoint that actually trumped scientific knowledge. Joanna also subtly explained how other status markers shape access to this knowing. A close read reveals that the nurses' woman-centered orientation had cachet as more "real" *because* it was devalued within the BIRG's scientific pecking order. Her casual reference to Tom and Phillip as "the big guys" not only invokes their maleness, but their "bigness" or high-status in the group. By doing so, she inadvertently traces an inverse relationship between scientific knowledge and male privilege on the one hand, to woman-centered knowing on the other.

It was ironically Tom and Phillip's high-status positions—as both scientists and men—that made them unable to see and understand the "real" female body. And importantly, when Joanna parodies the nurses' feminized, yet deferential response, she provides more evidence to the gendered status arrangements in the group. By describing how the low-status nurses "lovingly" challenge their high-status colleagues' wildly inappropriate scientific ideas, instead of directly countering them, she shows how gendered styles of communication and expectations of nursing's deference both structured and further shaped the nurses' collaborative experience at the interdisciplinary table (Hochshild 1983).

By recasting their devalued, woman-centered perspective as superior, the nurses both mobilized a face-saving strategy to defend against their status loss in the group, but also effectively redefined their role in the group. Their embodied female vantage point, coupled with their woman-centered disciplinary values, made them natural protectors of women within the BIRG. As they continued to champion their moral responsibility to women in the group, I saw that they were not just emphasizing their role, but constructing a new symbolic boundary to demarcate their space and purpose in the BIRG.

***Resistance as a Moral Imperative: Protecting Women vs. Getting the Data***

In addition to resisting BIRG administrative initiatives that promoted accountability and efficiency, I learned that the nursing researchers also resisted how their interdisciplinary colleagues engaged in scientific work by directly invoking a moral argument. The nursing staff members spoke about maintaining their disciplinary autonomy in its own right—having the freedom to work how and when they wanted, for example. But they just as frequently cast their resistance to the BIRG agenda in terms of moral choices, equating compliance with the BIRG's

interdisciplinary goals as tantamount to abandoning the female participants and leaving them defenseless in the context of interdisciplinary science.

In meetings and interviews, nursing researchers often pitted their woman-centered approach against the more detached approaches of medicine or engineering. They were crassly interested in using the women as data, with little to no regard for their comfort or personal experiences. Here, Kristine shared her thoughts on defending women within the context of the BIRG's scientific agenda:

> As a clinician, I err on the side of being a clinician instead of being a researcher and get the data, data, data at all costs. I will get the data, but I will—if need be—skip the data if I feel that it's causing, and I don't want to say duress or harm, but if it's causing any sort of discomfort, be it mentally, physically, whatever for the client. And I know they do not do that over there at medicine, especially the fellows. When they do data collection, because something as simple as when we do this measurement, it's called a pop-q, and you're measuring for prolapse. To just keep it simple for you, one of the things you have to ask the women to do is kind of bear down and push hard so you can truly get the level of prolapse. Well, if somebody seems to be postpartum and uncomfortable bearing down, I do not force them to push harder. Whereas Anna has told me that the fellows really have them pushing because they really want to get that prolapse measured correctly. And some of our prolapses are probably actually more, or greater, than what we record because I'm not putting a woman in a little bit of pain or discomfort to get the data.

While Kristine acknowledged that her approach yields less robust data, her priority as a nursing researcher was to protect the female patient. The safety and postpartum comfort of the women in the study was far more important than getting the "data at all costs." Importantly, she juxtaposes her woman-centered approach to that of medicine. Her measurements were more conservative than those of her counterparts in medicine, but that was because the fellows prioritized data collection—or science over women. Her science may have suffered, but her moral obligations to protect the women took precedence over research goals. By constructing

this moral division between commitments to science on the one hand, and to women on the other, she resisted the expectation that she work like her colleagues in medicine.

The nurses' concerns for the female participants also extended to the real lives of the women in the clinical trials too. Kristine described her colleague Maggie's role in the group as advocacy work:

> Maggie absolutely is an advocate for the research participant. From down to screening, sometimes to a fault, where the PIs and the rest of the group over at medicine will be like why don't we have more participants? Because Maggie will tend to over-screen because she wants to protect [them] and not bring somebody in who there may be potential issues for.

Maggie also saw herself as much more than a mere clinical coordinator for nursing; her most important role was to know and protect the women in the studies. She took a personal interest in the research participants' lives, proudly knowing their names, not just their subject numbers. But she went even further. She felt that she truly established relationships with them during the screening process, so that by the time the women arrived to begin the clinical trial, it was as if they were friends. She explained:

> I am the only person they actually physically see and talk to for long periods of time. So when I meet them, pay for their parking at U-hospital, right in valet, I meet them inside for the first time, it's not like, oh hi Mrs. Smith. It's like, hi Jane, how are you doing? I'm Maggie. We finally get to meet. Because you've already spent 45 minutes on the phone with these women finding out very personal things.

Moreover, Maggie rigorously screened potential research participants to make sure that not only were they right for the project, but that the project was right for them. She knew that she was often accused of "overscreening," but to her, that meant she was doing her job well. Like Kristine, Maggie thought that medicine and engineering saw the women merely as data and they wouldn't hesitate to use vulnerable women to reach their quota, to make their numbers. So she wasn't the least bit surprised that they thought she should be able to recruit women faster.

But she refused to do it. She was the "face" of the science and with that came responsibility. She saw herself as nothing less than the moral guardian of the nursing projects.

By describing how her lack of scientific training gave her a clearer, untainted vantage point, Maggie offers further insight into how the symbolic woman-science divide was differentially mobilized by members of the nursing team. She shared:

> It's hard to get the scientists out of their tunnel vision and to come out of that science. I understand that, and they always look at it in the science, but I think that that's why you have coordinators and project managers because they will be there—and my first thing, just like the IRB, I protect that human subject. So, if you want your science, and you want to do research, you have to have your data. And that comes from—in our world—a subject. So you better revolve around and keep that in mind. You know I don't go to a lot of meetings anymore because I always play devil's advocate and say, excuse me, excuse me, 'where is the subject in this?' you know?

At first glance, it appears that Maggie references a dichotomous relationship that pits science against women's real interests. But in the last chapter, I shared how she used the same polarizing language to juxtapose nursing against medicine. In that characterization, Maggie explained that nurses were more compassionate than doctors because they hailed from a discipline that valued empathy, but also because they were women. Being women, I was told, gave them a richer, more real-world understanding of the topic at had. Here, Maggie utilizes the same argument, but goes even further by invoking a woman vs. science boundary that even transcends discipline. In this conceptualization, it is now science itself that is fundamentally at odds with a woman-centered, or feminist perspective, and she alludes to the moral risk that occurs when scientists forget the "subject."

By divorcing science from the ability to see real women, Maggie demonstrates the variability of the woman-science divide. Though it reflects and is shaped by status arrangements, it did not neatly map onto existing disciplinary differences. Rather it was a newly

emergent symbolic boundary that both captured the effects of multiple, intersecting status markers and reflected a complicated moral continuum in interdisciplinary science. In other moments in our interview, Maggie went to great lengths to defend Anna, but here she claims an even greater moral authority than her nursing PI because she, as a low-status staff member, is even less contaminated by the science. While Anna, as a nurse and a woman, was considered better able to see the needs and interests of the female subjects than Tom or Phillip, who embodied a purely detached, scientific perspective, Maggie, as a self-described "peon," who hailed from the lowest status disciplinary team, understood and could therefore protect the women in the study best of all. Her distance from the science in terms of both disciplinary status and organizational role, made her see the research participants most clearly. At its most extreme incarnation, the woman-science divide excluded all scientific perspectives.

Both Kristine and Maggie knew that Anna was under tremendous pressure to be productive in the BIRG, and they recognized how some of their practices detracted from nursing's bottom line. But importantly, they felt morally justified in not cowering to the whims of her interdisciplinary superiors. They saw their role first and foremost as women protecting women. They had a moral obligation to their clinical participants. Maggie wasn't going to rush the pace of recruitment to get the numbers, and Kristine, as nurse practitioner, refused to put women in discomfort during clinical exams even though that would yield more impressive scientific results. Maggie and Kristine actively eschewed scientific status, but importantly, invoked the moral high-ground in doing so.

Although this moral stance might be seen as detrimental to Anna's standing in the group, it is interesting that Maggie and Kristine also saw their obstinacy as helping Anna too. Both Kristine and Maggie reframed Anna's chronic struggle with productivity into nursing's moral

mission. Taking longer became equated with protecting women. By encouraging Anna to stand firm in her convictions and not bow to medicine's agenda, they helped her to remain true to real women too. Moreover, by acting out in ways that Anna could not afford to behave, they saw their behavior as supporting her as she struggled with her own status issues in the group.

Status perceptions and the woman-science divide were inextricably linked, but it was in instances like those I shared above, that I realized just how the woman-science divide was variably deployed and multiply constructed by the nurses in the group. Not only did one's position within the group's larger status matrix influence one's orientation to the woman-science divide, but one's moral responsibility was also in flux depending on the context and the situation at hand.

***Symbolic Rendering: Talking about Birth Injuries***

The nursing investigators also engaged in acts of interdisciplinary resistance, but more frequently this interdisciplinary resistance took place at the level of discourse. During the course of my time with the group, the nursing investigators repeatedly questioned what was at stake in talking about birth injuries in ways that discounted women's experiences. Importantly, they knew that language had power, and they resisted how their colleagues would speak about the research participants or characterize birth injuries in the context of their interdisciplinary collaboration. While the engineers and doctors easily negotiated language as they used each other's respective terminology, the nurses felt there was much more at stake in ceding the linguistic reins. Nadia, worried what was lost when nursing's feminist terminology had to defer to medical discourse in the group's IRB applications:

> I don't know if I stayed [in the group] for a long time if it would be hard for me, philosophically. And this is a simple thing, but "subject" versus "participants." And I have this thing about—they're participants! I went through and changed it all [to subjects] for the IRB, but I changed it right back again because I don't—you know it matters.

For Nadia, words were important. Far from representing mere disciplinary convention, they conveyed how the women in the study were regarded. The nurses repeatedly clarified that the women volunteering with the BIRG's clinical projects were "research participants," not "subjects." These women were people and should be respected as individuals first and foremost, not used in the name of science. Importantly, here Nadia also links how loss of disciplinary status further bolstered the woman-science divide in the group. The nurses' more feminist preference—to call the women participants—was overruled in this instance. Though Nadia changed the wording back after the IRB was submitted, she worried that these philosophical differences might be too much to bear if she stayed in the group much longer.

Julia, Anna's nursing mentor, also reflected on the role of discourse in shaping science as she too shared an incident that captured the symbolic differences behind medicine and nursing's disparate use of language. She recalled that years earlier, she and Tom were brainstorming to come up with an acronym to represent her project designed to study how women best recovered from labor and delivery. Tom wanted to use the letters P.U.S.H., but she remembered thinking this was exactly contrary to what the nursing perspective wanted to promote. She explained:

> The early part of that [research project] had to do with trying to understand the kind of support that women receive in labor which has historically pretty much denied the innate bodily urges [of women]. It's like women have this urge to push, and it's kinda like they'll be told, try not to do that now, or okay, now your uterus is contracting, so push, and she may not have any sense of the contraction at that point. A lot of times the actual urge doesn't happen until the uterus is pretty well contracted, so to allow the woman to work with her body is something that providers, in general, haven't been doing. […] At one point, I think Tom had on the table, "P.U.S.H" as the acronym and I said, 'No, No, No, No—that's exactly what we don't want to say!'

While they saw things very differently, Julia found that Tom was receptive to her point of view in this instance, and added that "for the most part, I think there's a real recognition and understanding" in the group. But she did think this exchange was ironic. The very thing she wanted to interrogate—the potential harm caused by physician-directed pushing—was lost on Tom. The entire thrust of her research had been to deemphasize the role of forced pushing and here he was offering it up as the acronym! For her, this instance perfectly captured the different ways that medicine and nursing understood birth injuries, but it also revealed the origins of the symbolic divide I traced in the group. The nurses' feminist leanings took precedence in how they viewed and studied birth injuries. So while the BIRG interdisciplinary context provided them the funding to investigate this dimension of birth injury, they still lamented having to explain and sometimes justify the very point of their philosophical orientation to their colleagues.

It is also worth pointing out here that Julia was in many ways senior to Tom, and was the only nurse in my study who felt her perspective was taken seriously and valued in the BIRG. Remember it was she who worked with Tom to develop the BIRG research agenda from the beginning. But even she conceded that the nursing perspective wasn't taken seriously elsewhere, explaining, "I know that there are groups of scientists who say, 'you know, if you're talking about a feminist perspective, we're talking hard science here', you know, so we don't need to get all fuzzy." Here, she inadvertently revealed how status mitigates symbolic divisions within interdisciplinary collaborations. Julia, unlike her other BIRG nursing colleagues, had the power to assert her opinion in the group. She was equal, if not senior, to Tom from the outset, and this gave her the confidence to defend her feminist language choices and her disciplinary ground.

Julia's junior colleagues in nursing did not feel this way, often confiding that the gulf between their feminist orientation and science as usual was cavernous. Nadia explained:

> You know the struggle for me, quite honestly, is you know, look at what we're studying. To me, birth is so incredibly important and here we are studying the trauma. And you sit in a meeting and you hear...And I have a women's studies background too, so you hear "trauma, trauma, trauma, birth trauma." And radiology, you know Carla Nolan's great, and she's very easy to talk to and down to earth, but from her, it's "injury" and "trauma and injury" and I want to stay true to…To me it's amazing, women's bodies are amazing. And Anna gets that, but I wonder sometimes. You know, here I am part of this group, and obviously I'm a very tiny part, but what are we, what's the message we're giving about birth? Do I really want to be a part of this?

Here, Nadia references the woman-science divide as she continues to reveal her discomfort of working with a group that doesn't see women's bodies as sacred. Looking at birth as a medical event that was fraught with potential "problems" and "trauma" was anathema to her midwifery perspective. She worried about the larger message that the group's research communicated, that birth was a dangerous, medical event, and also feared that her collaboration somehow made her complicit in every aspect of the BIRG's interdisciplinary agenda.

If the nurses felt that birth was sacred, the engineers represented the opposite end of the woman-science divide. For them, birth injuries were a topic to be studied, biomechanical problems to be solved, pure and simple. Or borrowing from Durkheim, merely a "profane" challenge (Durkheim 1995). The nurses were worried that a woman-centered approach was compromised with the wrong language, but the engineers, in contrast, were dispassionate about wording, so long as it was precise. These opposing approaches clashed in dramatic fashion at the group's 2009 annual conference. In her keynote address, Cilla Barrow, a visiting physician, spoke about the importance of discursively shifting the emphasis away from injury to focus on "pelvic floor changes" over a woman's life course. This gave voice to a concern the BIRG nurses had discussed repeatedly—that the women who have these birth injuries according to clinical criteria, don't always experience them as a medical problem.

Many of the nurses in attendance lauded her approach to the topic. Julia was among many who thanked her for the refreshing change of perspective in this research area—putting the women first. After receiving a wellspring of support from the nurses, Phillip, visibly annoyed, spoke up. He took issue with this characterization, saying that it worked against the science. He explained, "We have to call a spade a spade. If we don't, then we can't fix it." For Phillip, ambiguity about birth injuries meant that it would be harder to specify them as medical problems. Moreover, he went on to say, it would be nearly impossible to get projects funded if there was nothing to "fix." This exchange revealed not only the symbolic boundary at play, but also that the very language required for funding was at cross-purposes with how the nurses saw the topic. Once again, the nurses were warned that their woman-centered approach was a low-status choice that would leave them bereft of resources.

***Birth as a Sacred Experience***

The woman-science divide, however, never played out more dramatically than in the context of the delivery room, where real women, giving birth also shared space with the researchers. In earlier chapters, I showed how space was used to communicate a sense of belonging and mark exclusion in the group. Some spaces seemed to enhance collaboration whereas others were not available to everyone and communicated strong boundaries. Anna shared, for example, that the operating room was a space cordoned off by status markers she did not possess. The nurses too saw their "sandbox" as an inviolable physical space, though their lack of power often meant that they had to convey exclusion by other means. Maggie did not have the power to exclude me from the nursing meeting outright, so instead she brusquely greeted me, clearly communicating her disapproval.

In a similar way, the BIRG nurses asserted a moral claim on the delivery room, enacting the woman-science divide in a space in which they worked, but did not completely control. One of the nursing projects prospectively assessed birth injury risk during labor and delivery. Karen supervised this project and she, along with her research assistant Joanna, collected the data on women when they consented to have their birth experiences measured. Like Kristine and Maggie, both Karen and Joanna also saw their primary role as protecting the women's experience during labor and delivery. They viewed birth as a sacred event in a woman's life and data collection as a secondary goal. When Bae, one of Phillip's engineering graduate students, developed a "camera project" to record the pelvic floor muscles as they were stretched during delivery, tensions flared and the nurses mobilized the woman-science divide to stake a moral claim to the delivery room.

Bae planned to recruit women already participating in one of nursing's clinical projects by having the nurses ask them if they'd consent to have their birth filmed. But his project brought up a host of problems. First, the camera, which the engineering team had affectionately named, "Agnes," was large and obtrusive. The nurses felt it was an eyesore that detracted from the peaceful and nurturing environment they thought women deserved during labor and delivery. Joanna shared her thoughts:

> I have a love-hate relationship with that machine. I just, as a person who looks at women's health as very intimate issue and you're going into an intimate environment and asking people to be photographed during birth. And it's an atrocious machine (says laughing)! It's like five feet tall, and it has like a four and a half foot arm that comes out and there are three cameras stationed on it that are all pointed at the vaginal area during birth. And you ask women [if they mind being photographed] and they go, oh yeah, that's not a [problem]. Pictures during labor aren't a problem, you know. You tell them that their face isn't going to be on them, and then they bring in this machine and they're like, it's this big!? And I'm like yes, this is not my design. This isn't *our* design, we're trying to make it as un-invasive as possible, but this is coming from an engineer's concept and we're trying to implement it into a woman-centered situation. So it's difficult.

Joanna's comment captures not only that the machine was awkward and off-putting, but also that she and Karen did not have a say in its design. She saw its presence as in opposition to creating a woman-centered atmosphere. Karen went even further in expressing her reservations about the project. She explained that naming the camera was the engineers' idea, but that she and Joanna continued to call it "Agnes" in an attempt to make it more appealing to the other nurses who worked in the labor and delivery room. They too thought it large and inappropriate. But the real problem, she revealed, went much deeper; the camera was intrusive not only because of its unwieldy size, but because of the assumptions that lay behind its design:

> They named it in the engineering lab. So we just call it that, and have continued to do that as a way to try to get the nurses to warm up to this thing that everybody looks at and they're like, what the hell! So that's an example—the engineering perspective and Gavin—the idea that women will just A) birth in a set position, that B) be willing to accommodate whatever's needed for the science over their own experience.

It is significant that Karen felt that the camera's design was fundamentally disrespectful of women giving birth, but even worse, the camera represented engineering and medicine's detached and dismissive view of the birth experience. Here she also invoked the woman-science divide by juxtaposing the nursing perspective, which held women's birth experiences as sacred, to that of engineering and medicine, which viewed women's experiences as ancillary to the demands of science.

Bae's naiveté about laboring women and what was appropriate in the delivery room also rubbed the nurses the wrong way. He was studying birth injuries yet he was totally ignorant of the birth experience, much less the cultural and feminist nuances so important to the nurses. When I spoke to Bae, he too shared that he was a fish out of water in the delivery room, but focused on his experience of feeling frustrated about the real-world complications of his topic.

While he thought his work with the group was "interesting," he lamented that his data collection was slower than he expected. The pressures of productivity loomed. Experimental tests on human subjects were not possible, he told me. And unlike rats, he could not "control" when potential research subjects went into labor. Moreover, getting real women to consent to being videotaped during labor and delivery was turning out to be more difficult that he expected. In sum, things could have gone more quickly if he'd just chosen a different, less sensitive topic. There was nothing about women's birth-related injuries that was of particular importance to him.

Bae was soft-spoken and polite, and he realized that his project had somehow hit a nerve with the nurses, though he was not quite sure why. When the camera was not working as expected, Bae suggested to Joanna that he come in and set it up when a birth was scheduled. She remembered the incident:

> And the grad student on the project, he received the pictures and looked at them and was like, why did this one shut off? And why did this not work ? And maybe the next time you have a birth, the next time a birth happens, I can be there and I can help you set up. And I go, well, we can't schedule a birth! They just…if they happen, they happen! And if a woman who fits our criteria is in the right room, then we can offer the camera, we can bring the camera, but she has to say "yes." And birth isn't predictable. And in talking with him, [I realized] he's never been in a birth before, he's never experienced birth.

Karen also mentioned this episode, but bristled with anger at his ignorance, thus revealing a deeper symbolic issue at play. As she reflected:

> He said to Joanna one day, you know, my research assistant, you know I could come and help you set it up before she delivers, not understanding that she's in the room too, you know, the woman is in the room too! You can't just waltz in, set all this shit up and call it a day! (laughs). You gotta actually know how to *be* in that space and that's how we've sold it to the women in terms of my project. You know Joanna's a young woman who's a doula and is calm, and quiet, and reassuring. If I say I'm bringing in a 6'2 male engineering student who's going to set up a camera to look at your vagina, you know, *whole-different-message*! So it's just hard to sometimes have them understand the interpersonal dynamics that have to go on for that level of research.

For the nurses, the intrusive "Agnes" symbolically violated the privacy and sacredness of giving birth. And Bae's not "getting" that he was intruding in this space made it worse. On the surface, it appeared that Karen was annoyed with Bae, but truth be told, he was not the real target of her frustration. As someone who lacked any experience with laboring women, she felt he had no business being in the delivery room. However, she was actually angry with Tom and Phillip. They had green-lighted Bae's clinical project without considering the ways he would inadvertently violate the sacredness of the birthing experience. But importantly, she was also offended that they failed to consult her on the design of the actual apparatus or ask for her opinion as they implemented the project. As the team's nurse-midwife who was the sole member in the BIRG actively delivering babies and supervising the clinical aspects of this trial, *she* was the expert in this space and could have provided logistical guidance and coached Bae to help his project run more smoothly.

Phillip and Tom bypassed her altogether; she was simply left out of the interdisciplinary conversation. In terms of her organizational role and power, Bae's project did not need her stamp of approval to proceed. Phillip was Bae's supervisor, and though he had no professional knowledge of delivery rooms, he relied on Tom for clinical guidance. Since Tom and Phillip were PIs, they could easily make decisions without consulting Karen. But it was her diminished status in the group that effectively silenced her in this moment. When I asked Karen why she wasn't consulted, she said that it reflected the fact that Tom did not value her expertise within the group. In his mind, the nursing perspective had nothing to add to a physician's knowledge of labor and delivery. If they thought Karen had something important to contribute, she would have been consulted. Karen not only found being ignored personally hurtful, but in practice, it served to bolster the symbolic differences between their approaches. She was more adamant than ever

that her woman-centered approach to birth was necessary and was a world apart from Tom's more detached, scientific style.

I draw out these points to trace how Karen's lack of power and status exacerbated existing differences, essentially transforming them into a symbolic boundary. On one level, she was personally angry that her diminished status meant she was left out of the interdisciplinary conversation. But on another front, she was also morally outraged that a woman-centered approach was effectively ignored too. Bae inadvertently stumbled across the moral divide in the group; he had no way of knowing that his project's attempt to "objectify" the very personal and sacred moment of a woman's labor and delivery made him emblematic of the woman-science divide in the group. And once this symbolic boundary was salient, his being a man—and a tall one at that—also emerged as important because those characteristics further marked him as representing "science" in the woman-science divide. Bae was caught in the symbolic crossfire as the nurses assumed the only authoritative position they could muster, that of the moral authority.

### *Going Forward: Moral Reservations and Moral Obligations*

While Anna was deeply invested in the BIRG, the other junior nurses questioned more fundamentally, whether they could really work here. Because their disciplinary voice was subordinated and their feminist concerns were ignored, they began to question if being at the table was really useful at all. What was at stake by having their collective voice diminished in the group? The nurses were also worried about the BIRG's collective contribution to knowledge production in the area. What hidden dangers to women's health might be promoted as a result of the group's research findings? If the BIRG discovered, for example, that the mechanism behind pelvic floor injuries was only definitely avoided by preemptive c-sections, the landscape of

women's health would change. The nurses feared the group's scientific discoveries would be abused by physicians who saw nothing wrong with further medicalizing birth. Nadia pointed to obstetrics' historic overuse of episiotomies as evidence that unsubstantiated procedures are routinely use by medicine to hurt women in the name of science. She was aghast to discover that Tom saw preemptive episiotomies as helpful even though no evidence supported that theory:

> For example, I know from talking to Anna that Gavin thinks episiotomies are preventive. They are so not! (laughs). And I could see if it came down to it, we would have a definite difference of opinion about that because I think the evidence is overwhelming that they are never a good thing unless it's absolutely necessary!

While Nadia was uncomfortable collaborating with researchers who did not share her woman-centered ideas about women's health, there was a lot at stake in abandoning the group's research too. The BIRG not only set the research agenda in the field, but their findings had the power to influence medical practices that affected real women. On the one hand, Nadia worried that the group's overall approach framed birth as a problem to be fixed, that vaginally delivering babies fundamentally injured women's bodies. This was hard for her to reconcile as a nurse-midwife. On the other hand, if clinical procedures and protocols were hanging in the balance, and if the nursing perspective, though marginalized in the BIRG, could influence this conversation at all, wasn't it their moral responsibility to stay? Perhaps avoiding discomfort wasn't as important as staying at the table. Nadia reflected:

> And is it irreconcilable difference or should we stay at the table? Should people like Julia and Anna and Karen and myself, who really believe in women's bodies, should we stay at the table and have a voice, or should we say I can't, I can't put my name on something that says women's bodies are so injured by birth that people are going to take it as…And they have already. [A reason to] section everybody. You know?

Karen also worried about the implications of the collective nursing and midwifery voice being silenced in the BIRG's research. She was frustrated that in order to pursue funding with

the BIRG, she had to adopt the language of a medicalized perspective. This, she said, was at odds with how she actually saw childbirth, and also went against her national reputation in the field. Contorting her beliefs in exchange for funding felt a betrayal of her real constituents: birthing women and other midwives. Like Nadia, she feared that the BIRG's research violated what was sacred about giving birth. As she explained:

> If you look at the arguments that I make in the grant writing for the work to do within this group, I have to say childbirth is a bad thing for a lot of women. And yet nationally what people hear me saying is that we have a lot of opportunity to change this misperception of this being an injury. And that by focusing solely on injury emphasis, what we're basically saying is that women should not give birth vaginally. As a midwife, that's heresy.

Here, Karen invoked the symbolic dimension of the woman-science divide by likening the logical extension of a medicalized approach to birth injuries—that women should forgo vaginal deliveries—to nothing less than heresy. She, like Nadia, worried that her voice did not carry much weight at an interdisciplinary table with colleagues who had fundamentally different orientations to birth. But she still saw her involvement as important, framing her work in the group as a type of undercover, feminist activism. She saw herself as a canary in the coalmine of sorts, as she warned her midwifery and nursing colleagues at various national conferences that the BIRG's cutting-edge science was out there and had to be reckoned with. As the BIRG gained more notoriety and provided more objective evidence for the mechanism behind birth injuries, their research would surely affect practice protocols and treatment recommendations for laboring women, the female population she felt professionally obligated to protect. Staying in the BIRG meant that she had a unique vantage point. She could use her position to warn women's health advocates what was being studied, and what was likely coming down the pipeline.

As Nadia questioned the larger implications of silencing her feminist vantage point in the group, she also pointed to what might be lost by participating in the BIRG. In her opinion, framing birth as potentially injurious not only violated the sanctity of birth by medicalizing it, but even more insidiously, it might give legitimacy to the commercialization of the idealized female body. As a feminist, she was mortified that the group's science might be used to justify a medicalized approach to childbirth by encouraging preventive c-sections. While she acknowledged that c-sections would prevent pelvic floor injuries she felt that it reflected a fundamental disrespect for women's bodies and the sacredness of giving birth and was already abused for cosmetic reasons. She intuitively saw the connection between science about birth injuries and larger misogynistic cultural trends, but because she suspected that many of her BIRG colleagues wouldn't share this concern, she was reluctant to bring it up.

> And here's my whole take on it— there is a small subset of women that choose an elective c-section. And they may choose it saying, you know, I don't want the pelvic floor damage that may cause incontinence later in life. But in actuality, there's a body image piece to that—I don't want my vagina to be stretched out, I don't want to look different, I don't want to… And I think that there is a significant number [of these women] because I saw them in my practice. And you read about it in *People* magazine, you know, the entertainers. And I think that, for me too, do I even want to bring that up as something [we should consider]? But it's out there. It's out there. We need to acknowledge that we have this ideal for women's bodies that includes every part of their body and that it's not really compatible with birth anymore.

But there was hope on the horizon. While Anna may have historically deferred to Tom and Phillip in areas of science, Karen was optimistic that Anna was gaining status and confidence and was "really coming into her own in the group." "I think she's a lot stronger," Karen said, and better able to "say something at the table." This corroborates Anna's account that she was finally able to overcome her self-described "victim mentality" by relying on the support of her female colleagues. Here, Karen develops this idea, but also shares that she too

learned a lot about how to work at the interdisciplinary table under Anna's direction. She recalled that:

> So at times when I didn't always understand and would get frustrated with the dynamics of the group, she (Anna) would be able to say, you know, this is where you just wait, it's going to come back around or something. You know, she was able to coach me through how to best work in the group. And at the same time, I was able to coach her towards, you have some space and opportunity, you are no longer junior at this table and need to not be treated like that.

While Karen counseled Anna to overcome her marginalized status so they could champion a more woman-centered research agenda in the BIRG, Anna taught Karen that cultivating patience was crucial for low-status members in an interdisciplinary group. By supporting each other, they were finally able to develop more woman-centered approaches and projects within the BIRG. Recently, Karen and Anna had been working together to expand a project to focus on prevention and recovery, the dimensions of birth-related injuries that most focused on women's experiences. In doing so, they were careful to employ a feminist or woman-centered approach from the outset. Karen shared:

> Anna and I work pretty closely about how you frame the language because originally she was calling them traumatic births and I was saying, you can't use the word trauma or traumatic because that has a whole different connotation outside of birth injury in terms of the pelvic floor. The other thing is, it's a physical trauma to muscle but that's very different than how the woman may have perceived it, and so we have to integrate those two components and so we call them complex births. And we talk about a cascade of events that lead to a complex outcome.

Karen was excited about the new dimensions to this project. She felt empowered in a scientific sense because she was finally able to incorporate her feminist ideals and give voice to the women who struggled with birth-related injuries. By eschewing a medicalized view of birth injury, she and Anna were effectively rewriting the script in the research canon. But she knew there was likely to be backlash when Tom and Phillip realized exactly how they were

conceptualizing their new project. Tom and Phillip's approach was contingent upon a traumatic view of birth injuries. For them, a debilitating injury was necessary to legitimize a funding-worthy problem to "fix." Karen explained: "And that's where the rubber is going to meet the road—how you argue injury or not. So I think it's going to be interesting. And it's going to be uncomfortable." So while Karen was encouraged that she and Anna were finally able to develop their ideas as they liked, she expected that they would soon encounter resistance in the group. Tom and Phillip would not be happy that they were proceeding with a blatantly woman-centered conceptualization of birth-related injuries.

While Karen thought it was ultimately best to stay at the table and advance her ideas under the radar, she remained guarded, hinting at the complicated nature of her reservations. Pursuing her ideas in the BIRG had financial advantages to be sure; they were a well-funded group and her qualitative, woman-centered focus would be harder to fund on its own. But on another level, hiding her real self and her real interests seemed inauthentic and reminded her of her lack of status and power in the group. As a junior investigator, she recognized that her formal role contributed to her marginalized position, but the thrill of scientific discovery was tainted by constantly having to justify her approaches and values. Choosing to focus on the moral dimensions of her research was a salve of sorts that helped her to reclaim her lost voice, which gave purpose to an otherwise frustrating collaboration. But at the end of the day, she still felt like an "outsider within" the BIRG.

**Conclusion**

Anna and her nursing team arrived in the BIRG eager to join in the interdisciplinary conversation. However, they quickly realized that their scientific approaches and research

priorities were devalued in the BIRG's interdisciplinary context. This confirms the findings of other researchers studying how status shapes contribution in interdisciplinary teams (Albert et al. 2009; Gardner 2013). At first, they defended their practices and justified the delays that came with longitudinal designs, time-consuming qualitative methods, and woman-centered approaches. But upon realizing that their diminished productivity still marked them as less scientific and afforded them less power within the BIRG, the nurses began resisting interdisciplinary overtures in a variety of ways.

Anna was committed to Tom and Phillip and their shared funding through the prestigious IRSAG grant. But because she struggled with multiple status deficits and feeling like she had a "marginalized voice" in the group, she ultimately opted to develop her ideas quietly, with help from her disciplinary colleagues so that they couldn't be preemptively "submarined" by her more powerful fellow PIs. In this way, she resisted status appraisals indirectly, opting for a strategy that reflected her interests in "social mobility" (Tajfel and Turner 1986). Her nursing colleagues, however, were not as invested in the group's research agenda and engaged in more direct acts of resistance. Some of Anna's colleagues actively avoided interacting with other BIRG members, seeking to maintain their disciplinary autonomy. Others kept their real scientific interests hidden from other BIRG members, pursuing them outside of the group.

But my research also uncovered that the nurses engaged in moral identity work to save face and bolster their perceived value in the BIRG. Instead of adopting the normative values of their high-status colleagues who prioritized efficiency and productivity, the nurses instead championed protecting the female patients and defended their feminist values and approaches. At the same time, they explicitly emphasized the moral shortcomings and potential damage of their colleagues' high-status yet narrowly mechanistic or biomedical perspectives—something that the

doctors and engineers simply did not do. This mirrors Albert et al.'s finding that social science interdisciplinary researchers were more likely than their biomedical counterparts to adopt an overtly critical view of their colleagues' approach to science (2009). However, the nature of my multi-method case-study approach allows me to go even deeper.

I discovered that the nurses' defensive posturing was not an end in itself. Rather it led to and represented a symbolic boundary that I came to characterize as the woman-science divide. The nurses recast their marginalized position as somehow privileged because it was untainted by the trappings of scientific status. As they reluctantly realized that their contributions were likely to be forever devalued in the group, the nurses embraced their marginalized identities, often invoking a feminist standpoint to explain how their intersecting low-status markers—as women, qualitative researchers, feminists, nurses, and patient-advocates—made them *better* able to help the women whose lives were affected by birth-related injuries. While some of Anna's team members were tempted to leave the group because of their diminished voice, they ultimately saw themselves as morally obligated to stay and fight for the women. Being at the interdisciplinary table, they reasoned, meant that they were privy to the scientific conversation. As outsiders within, they could see what was coming down the pipeline and warn other women-centered health researchers of potential dangers. They would work from the inside to protect women from the group's science.

Given the power and status differences that organized the BIRG from the outset, one might reasonably ask: but weren't different ideological standpoints shaping the group's disciplinary vantage points from the beginning? In fact, one might argue, isn't that the very point of interdisciplinary collaboration—that different voices weigh in with their respective strengths to make purchase on intractable problems? The answer to these questions is an

unequivocal "yes." Throughout this chapter, however, I make the case that it was the nurses' lack of a voice at the table that exacerbated existing differences and inequalities. It was because the nursing perspective was devalued in the BIRG's interdisciplinary context that Anna's colleagues had little to lose by recasting their collectively marginalized status as a moral advantage. Without external status or material power, they mobilized their voice on behalf of the underrepresented women, thus giving new purpose and meaning to their work in the group.

On one level, by constructing a symbolic boundary the nurses helped define a strong ideology. By reframing their own role in the group, they were able to "give voice" to their own experiences as nurse researchers, and thus "buffer the impact" of the BIRG's negative climate (Settles et al. 2007). But at the same time, however, I argue that this decision came at a cost: the nurses' moral identity work was based on the premise that they were outside the science. Though identity scholars have shown that female scientists often struggle reconciling feminist and scientific identities (Settles 2004), by juxtaposing their woman-centered approach against the more "objective" scientific tack of their colleagues, the nursing team members who opted for resistance strategies did more than just reify existing disciplinary differences, they ironically contributed to their own marginalization in the BIRG. Given that women already face multiple barriers in the academic sciences, creating a symbolic impasse around the very differences that are used to silence or discriminate against them from the outside is a risky proposition. By casting themselves as outside the science, the nurses, in a way, made their "outsider" status a fait accompli.

## Chapter 7: Conclusion

In interdisciplinary scientific collaborations, team members must capitalize on different perspectives in order to make headway on a shared problem or scientific interest. While disciplinary differences are perhaps the most salient distinctions at the outset, other differences also emerge as important in understanding oneself and others in the context of group work. Scientists working in disciplinary arenas know exactly who they are and what is expected of them in terms of research focus, methodological approach, scientific priorities, and productivity. When these same scientists begin to work across disciplinary borders, things become more complicated. How are they perceived or evaluated in an interdisciplinary context? What strengths do they bring to the interdisciplinary table? Moreover, what other differences might prove important within this new context? All of these questions not only get at how individuals working in interdisciplinary collaborations negotiate scientific differences, but also hint to the identity work involved within the context of interdisciplinary science.

I first learned about the BIRG when I was looking to study a "successful" interdisciplinary team that had overcome the obstacles I had witnessed in a previous case study. The BIRG, I was told by many of my previous research contacts, was a group that "got it right." Not only had they been successful in securing two multi-year NIH grants,[21] they had an illustrious track record in other respects too. Their collective output in terms of publications was impressive, and they had an international reputation as "agenda setters" in their research area.

[21] As I mentioned in the introduction, I have since learned that the BIRG was recently renewed for their third IRSAG grant.

Moreover, they were widely known as an incredibly collegial and harmonious group. By all appearances, they had seemingly managed to sidestep the well-documented pitfalls in interdisciplinary science (Pfirman and Martin 2010; Sá 2008; Rhoten and Parker 2004). After a well-known gatekeeper in the health sciences community brokered an introduction, I was on my way to investigating how individuals in a "successful" interdisciplinary group negotiated gender[22] and other differences within the context of their shared work.

But I soon realized that things were not quite as idyllic as they initially appeared. The engineers and doctors worked closely together, but the nurses seemed to work largely by themselves. When I asked BIRG members to reflect on important differences, these observations were cast into drastic relief. The engineers and doctors spoke at length about what their colleagues brought to the interdisciplinary table. They emphasized sharing strengths, often touting how distinctions of discipline expanded their collective ability to see or create innovative leaps in their research area. Salient disciplinary differences also helped to organize their understandings of self and other within the group. They both felt essential to their shared science, and this worked to bolster their commitment to each other in the BIRG.

While they valued their differences, the doctors and engineers also emphasized their points of commonality. They shared "sameness stories" to highlight their similarities, and in this way, actively crafted an interdisciplinary group identity. The doctors and engineers saw themselves as kindred spirits in science—interdisciplinary-minded and open to different scientific perspectives. Mutual respect and a lack of hierarchy, they explained, enabled them to work across disciplinary divides. The groups' leaders, Tom and Phillip, also spoke of each other with deep reverence. They were compatible on both professional and personal levels. They took

[22] Gender emerged as important analytical category in my previous case study of an "unsuccessful" interdisciplinary group. As the team began floundering, intedisciplinarity was cast as relational work, deemed ancillary to the science, and largely delegated to women in the group.

pride in being interdisciplinary "translators" for their respective teams, and interdisciplinary mentors for their students, fellows, and post-docs. In this way, Tom and Phillip's union actually transcended disciplinary borders as they relied on each other's expertise for interdisciplinary innovation (Collins and Evans 2002). For all intents and purposes, the engineers and doctors were "different but equal."

The nurses, however, shared a different interdisciplinary story. Far from experiencing the deep integration and mutual respect enjoyed by their colleagues, the nurses felt that their scientific priorities and perspectives were devalued and marginalized within the BIRG's interdisciplinary context. While collaborating in the BIRG had advantages, they did not feel like they belonged or were equal participants in the group. Moreover, they often felt silenced in the group, and so kept their best disciplinary ideas to themselves, or pursued them elsewhere. In short, they felt like they were "outsiders within" the BIRG. But why were their experiences so different? Why did the engineers and doctors enjoy a robust and rewarding collaboration while the nurses felt alone and marginalized? Throughout this dissertation, I have unpacked the answer to this question as I traced the nurses' sense of disadvantage on multiple levels. I briefly summarize those findings here.

Some of the nurses' struggle was undoubtedly financial as they worked with fewer resources to meet their basic needs. As a discipline, nursing was comparatively poor, and so Anna and her nursing research team received no departmental assistance to cover research-related costs. When the IRSAG grant was delayed at the outset, Anna became dependent on the generosity of her interdisciplinary colleagues. While she was grateful for their help, this dynamic perpetuated a scientific deference that persisted long after funds arrived. But even after the grant was dispersed, Anna still struggled to make ends meet. Medicine and engineering

enjoyed departmental support as well as other funding streams to defray the cost of students, fellows, and post-docs. Anna, on the other hand, had trouble paying for office supplies since the grant did not cover incidental expenses. Her staff members bristled with anger that she was expected to produce at a comparable level without the support Tom and Phillip enjoyed. They argued that Anna needed more help, perhaps someone akin to a medical fellow who could exclusively work on data analysis and writing. At the same time, other institutionalized constraints at the university level also undercut the nurses' autonomy within and beyond the group. Until Anna put on her "activist hat" to challenge an outdated rule, only nurse practitioners could independently work in the university's clinical spaces. This effectively mandated the disciplinary deference of nursing investigators by requiring that they work under the institutional authority of physicians. Anna, I learned, began to internalize these structural hurdles and developed a "victim mentality."

The nurses experienced "cultural" problems too. The nurses' history of professional deference followed them into the research arena, but here it manifested as a discursive hierarchy that subordinated nursing's woman-centered perspective to the biomedical agenda shared by medicine and engineering. Some of the nurses felt like there was an implicit expectation that they should defer, that deference was insinuated by their very participation in the group. At the same time, their colleagues unwittingly confirmed this implicit hierarchy by characterizing nurses as excessively rule-oriented, lacking in independence, and unprofessional. These diffuse beliefs also shaped the nurses' own perceptions of autonomy in interdisciplinary research.

As time went on, I realized that the nurses' experience of inequality in the BIRG was even more complex. Status, I discovered, mattered tremendously within the BIRG's interdisciplinary context. In fact, the more I spent time observing and speaking with BIRG

members, I realized that status, in its many manifestations and intersections, was perhaps the biggest obstacle to equal interdisciplinary collaboration in the BIRG. Because many status markers were not openly acknowledged as legitimate dividing lines, they festered, working under the radar to organize perceptions of difference and bolster symbolic boundaries within the BIRG.

Team members had their own beliefs about what constituted "good" science or a "real" contribution, but they also instinctively knew the relative status of their scientific approaches within the BIRG's interdisciplinary scientific context. As BIRG members worked across disciplinary divides, they relied on disciplinary stereotypes and intelligible status markers to help make sense of their colleagues' behaviors and ideas. For example, the nurses described how the BIRG's high-stakes research put their qualitative, longitudinal, and woman-centered approaches at a status disadvantage. Their epistemological orientation, methodologies, and research designs were discounted as "less scientific" than those of engineering and medicine. Because these larger status orders preceded the group, they had little power to contest them. So while the nurses personally disagreed with their colleagues' assessments of their work and contribution, they were still embedded within a system that rank-ordered disciplinary approaches.

But while scientific differences served as important status markers within the group, other intersecting markers of differences also emerged to confer value among BIRG members. Anna's rank compromised her sense of autonomy and self-worth in the group. She was junior to Phillip and Tom—in fact, she had started working with them as a doctoral student over a decade earlier. So while she theoretically should have enjoyed equal power as a PI in the group, because she was still relatively "junior," she struggled to stand her ground and ask for what she needed.

Gender was another unacknowledged status marker that operated behind the scenes to structure opportunities, and perceptions of contribution in the BIRG. From the outset, gender

was important in the BIRG. Not only was the BIRG a mixed-sex group, its topic, women's birth-related injuries, also made gender salient (Ridgeway and Correll 2004). Perhaps most important, however, were the gendered positionalities of the disciplines at the interdisciplinary table. Not only was nursing a female-dominated discipline, but its legacy of professional subordination to medicine also meant that nursing represented the "soft," feminized counterpart to medicine's "hard," more masculine culture. At the same time, group members characterized nurses using negative feminine stereotypes; nurses were lacking in ambition, obsessed with hierarchy, jealous, and unprofessional. Their research interests were also gendered, reflecting low-status, woman-centered, and feminist approaches to scientific knowledge production. On a personal level, Anna's leadership style was also taken to task. She was reprimanded (seemingly in jest) for acting too much "like a girl." The nurses recognized that gender status beliefs that portrayed women as less competent than men (Ridgeway 1991) put them at a considerable disadvantage in the BIRG. They were inherently, multiply, and inescapably gendered.

Importantly, these gendered intersections remained hidden, masked by the seemingly objective status marker of productivity. Because nursing was considerably less productive than both medicine and engineering, enhancing the nursing team's productivity became a constant concern and topic of conversation. However, a focus on productivity meant that the very things that mattered to the nurses were scrutinized. Protecting clinical participants, including women's voices in their research designs, and maintaining the sacredness of birth within the context of interdisciplinary research, were all time-consuming and detracted from the nurses' efficiency and productivity. The nurses realized that their woman-centered orientation was considered unimportant in the BIRG and they felt micromanaged and discounted. So while Anna originally

traced her productivity problems to her material inequalities and structural impediments[23], she realized that gendered status markers also emerged to silence her at the interdisciplinary table.

The nurses' multiple disadvantages—their material inequalities, structural impediments, and cultural barriers, coupled with their status and productivity problems—shaped their experiences in the BIRG. They felt left out of the science and devalued within the BIRG's interdisciplinary context. Anna was deeply invested in the BIRG, so she worked hard to save face and keep pace with the demands of interdisciplinary science. While she was slowly overcoming her "victim mentality," a deep sense of inequality had historically shaped her contributions and voice in the group for years. I learned, for example, that while Anna was really interested in pursing research on prevention, she had not yet done so because Tom and Phillip did not share her interests in this area. She "deferred," I was told, to Tom and Phillip, who preferred research projects that first specified the "trauma" under investigation, and then went about measuring or "fixing" it, cultural and scientific priorities that both medicine and engineering could get behind. In this way, over time, Anna's disciplinary voice had been muted within the group.

While Anna prioritized getting along, her nursing colleagues, in contrast, often adopted strategies of resistance within the BIRG. Some pursued their real interests outside the group and recast their involvement in the BIRG as an activist mission of sorts—they would use their position to warn others in their professional networks about the group's science. Others resisted interdisciplinary overtures and expectations outright. In an attempt to manage their "spoiled identity" in the BIRG, they went so far as to construct a symbolic boundary that pitted their woman-centered approaches against the BIRG's science (Goffman 1963). Though this

[23] Xie and Shauman (1998) showed that sex-differences in productivity were in fact explained by women's structural inequalities in the academic sciences. So in this way, Anna's structural disadvantages were at their core, also marked by gender.

construction granted them the moral high ground, it did so by reifying the very gendered boundaries used to marginalize them within the group.

*Theoretical Contributions*

Throughout this dissertation I have demonstrated that the nurses' experience of inequality in the BIRG was, at its core, a story of gendered intersections. The nurses' problems were not just complicated by preexisting gendered arrangements in the health sciences, they were fundamentally shaped by gender status beliefs on multiple levels. In each chapter, I unpacked how the nurses' experience of inequality was simultaneously reproduced and sustained at structural, cultural, interactional, and cognitive levels in the BIRG. Much of the gendered bias the nurses experienced was subtle and unconscious, "institutionalized" within various structures and embedded within the seemingly objective values of scientific excellence and professionalism. In this way, my research empirically contributes to the canon that looks at gender as a system of inequality (Ridgeway and Smith-Lovin 1999; Ridgeway and Correll 2004; Acker 1990). By illuminating these processes, my research contributes to scholars looking to isolate the mechanisms of gender inequality in the workplace (DiTomaso et al. 2007; Reskin 2003), in the academy (Roos and Gatta 2009) and more specifically, in the academic sciences (Stewart et al. 2007; National Academies of Science 2007).

By mapping the "gender system" in a specific interdisciplinary context, my research also makes several important contributions to researchers exploring inequality in interdisciplinary science. While a few studies have shown that status differences among disciplines can shape individual perceptions of collaboration and thereby the process and products of interdisciplinary groups in the sciences (Gardner 2013; Miller et al. 2008), to date this research exclusively

focuses on epistemological differences. By revealing how gendered status distinctions intersect with other salient markers of difference to shape group member experiences, behaviors, and ultimately outcomes in an interdisciplinary research group in the health sciences, I help fill a considerable empirical gap in this area (Rhoten and Pfirman 2007).

Similarly, other scholars have called for a radical reconsideration of how expertise shapes the process of scientific knowledge production within interdisciplinary science (Collins and Evans 2002; Gorman 2002; Collins et al. 2007). This tradition too neglects the role of gender in shaping these processes. While these theoretical formulations consider how expertise is variably constructed, valorized, and deployed in newer, more multi-vocal, techno-scientific contexts, my research shows how gender status perceptions fundamentally shape the internal politics and potential of interdisciplinary "trading zones.[24]" Within the BIRG, the engineers and doctors collaborated effectively not just because they shared scientific sensibilities, but also because they enjoyed gendered advantages that *shaped* their perceptions of expertise from the outset. As men, Tom and Phillip were seen as "natural" leaders, so their authority and expertise were not questioned. Historically too, their disciplinary perspectives were shaped by masculine privilege that reflected an "objective" approach to science (Keller 1985). Their understanding of the BIRG's agreed-upon boundary object—the pelvic floor—was similarly divorced from the embodied messiness that characterized nursing's subjective and feminized approach. For these reasons, their scientific claims for expertise were buoyed at every level by masculine privilege.

In contrast, the nursing team suffered multiple intersecting gendered status slights that worked to delegitimize them as scientific equals, despite the group's interdisciplinary rhetoric and "successful" track record. As I have gone to great lengths to explain, nursing's disadvantage

[24] As I introduced earlier, these authors draw on Galison's (1997) idea of the "trading zone," a space where communication must be negotiated between scientific perspectives.

is best understood in terms of the "gender system" (Ridgeway and Smith-Lovin 1999; Ridgeway and Correll 2004). Vestiges of nursing's professional legacy of subordination to medicine shaped the BIRG from the outset the nursing group struggled to get institutional support and resources both within and outside the group. At the same time, the nursing team fought against gendered status beliefs that portrayed nurses as unprofessional and lacking independence. While it is widely acknowledged that interdisciplinary researchers often struggle to have their work recognized by scholars in their own disciplinary communities, my research showed that this process was also fundamentally gendered. In a bitter twist of irony, Anna's nursing colleagues denied her tenure because they doubted her autonomy as a nurse working with a physician in an interdisciplinary group.

Anna also struggled in the BIRG's interactional context to be seen as "right for the science," a reservation that not only reflected gendered doubts about nursing's disciplinary expertise, but also encompassed worries that Anna acted too much "like a girl" to be an equal interdisciplinary partner. That nursing's scientific claims were shaped by feminist sensibilities and rooted in woman-centered concerns further marginalized Anna's team and nursing's scientific contribution in the BIRG. At a cognitive level, Anna internalized these beliefs, began doubting her own efficacy in the group, and ultimately developed a "victim mentality," which shaped her subsequent behaviors in the group, thus perpetuating her deference in the group. For all of these reasons, I argue that the construction of expertise in the BIRG was inextricably linked to the gendered organization of interdisciplinary science within the group.

My findings also demonstrate the importance of including individual perspectives when studying interdisciplinary research collaborations (Kumar 2012). At the group level, the BIRG was, by all accounts, "successful." But upon closer examination, I found that some group

members experienced considerable challenges within the BIRG. While BIRG members often relayed the same events or experiences in their shared history, they highlighted very different understandings of the episodes. Individual perspectives, I found, were linked to personal experiences of power and status in the group. For example, Anna saw how political divisions between medicine and nursing, disparities in disciplinary resources, and cultural expectations of nurses' abilities as researches all contributed to her diminished power and autonomy in the group. Tom, in contrast, did not reflect on his own power or privilege in the interdisciplinary arrangement, or his own role in perpetuating the animosity between medicine and nursing. In this way, I show that focusing on group outcomes alone can effectively erase the experiences of marginalized members in an interdisciplinary collaboration.

By highlighting the emergence of intersecting status markers in the BIRG's interdisciplinary research group, my research also gives contextual purchase to the largely experimental canon on status. Within the BIRG's interdisciplinary context, no single status marker organized behavior and understandings in the group, rather my research uncovered that multiple status markers intersected in dynamic ways. While some research suggests that an individual's organizational role is often the most salient identity or status marker in a work group, I have shown that Anna's experiences were shaped by much more than her role as PI. Moreover, gender, far from being a diffuse background identity or status belief, was deeply embedded in other status markers too. In the nurses' lived experiences in the group, gender was everywhere.

By revealing the ambiguity of status intersections, my findings also highlight the potential for resistance and change to status orders. I showed, for example, that BIRG members were not always sure where they stood in status terms within the group. The group's radiologist

was frustrated that her high status in medicine did not automatically grant her more authority in the BIRG. Similarly, the medical fellows had more authority than Anna in clinical settings, but in academic research, she was a PI with her own funding, and so technically enjoyed higher status. Other members with the same organizational role had different experiences in the group, largely as a function of their different status intersections. In this way, my research demonstrates that within interdisciplinary groups, local status arrangements have the power to disrupt larger status orders (Ridgeway and Correll 2006; Berger et al. 2002). For scientists seeking respite from more hierarchical contexts in the academic sciences, this ambiguity holds transformative possibilities (Rhoten and Pfirman 2007). Because status orders in interdisciplinary contexts are in flux, individuals have the potential to resist negative status appraisals but also frame their contributions in ways that highlight important status advantages. Nursing's scientific approach may have been low-status within existing scientific hierarchies, but it was the longitudinal, woman-centered nature of the nursing projects that helped distinguish the BIRG's research as fundamentally interdisciplinary in the eyes of the NIH. Anna felt marginalized in many ways, but still never lost sight of the fact that at some level, her research was necessary to help legitimize the group's interdisciplinary agenda.

At the same time, however, my research reveals that interdisciplinary contexts can also magnify or exacerbate existing status orders, compounding a sense of inequality for marginalized members in the academic sciences. The nurses' multiple low-status intersections worked to mark them as outsiders to the science. Ironically, even high-status markers sometimes worked against them. When the BIRG was awarded the IRSAG grant, the prestige of the award enhanced the group's national reputation and its status in their local health sciences community. In theory, all of the BIRG PIs should have benefited equally from this prestigious grant. But as

the group gained national recognition, Anna was denied tenure in her department. The gendered status order between medicine and nursing was so ingrained that by submitting her proposal with the IRSAG, Anna confirmed suspicions that she was working for, not with, Tom and Phillip. Her collaboration with a physician implied deference, plain and simple. This instance demonstrates how multiply marginalized individuals face the great risks in interdisciplinary groups—even when they are conventionally successful.

In this way, my research is in conversation with studies that demonstrate the importance of context in determining women's outcomes in scientific settings (Ridgeway 2009; Smith-Doerr 2004; Whittington and Smith-Doerr 2008). While diffuse gender beliefs shape the background gender frame that people reference when they interact with others, more local "institutionalized" frames, often carry more weight in shaping social relations in specific contexts (Ridgeway 2009). Unfortunately, Anna fell short of expectations in both arenas. In the BIRG, productivity reigned supreme. Anna's lack of productivity fueled existing gender status beliefs and justified her diminished autonomy within the group. In nursing, establishing independence from medicine was of primary importance. No one denied that Anna's research productivity was high, in fact it far exceeded that of most of her disciplinary colleagues, but in this context, it was her choice of collaborators that marginalized her. In this way, my research contextualizes the idea of productivity in interdisciplinary science. One's comparison group matters greatly in terms of assessing research productivity.

While Anna felt like a victim in the group, by demonstrating how she and her team negotiated their intersecting status differences in the BIRG, my project also reveals the role of agency, even among those who are marginalized in a scientific collaboration. The nurses actively engaged in various strategies to deflect and manage negative appraisals, thereby

establishing their own sense of meaning and purpose within the group. Anna was committed to Tom and Phillip as colleagues, and so adopted an incremental approach to inclusion, resigning herself to slow but steady gains. As a relatively high-status nurse, and PI of her own project, she adopted what social identity theorists refer to as a "social mobility" strategy (Tajfel and Turner 1986). Over time she had fought for and gained independence within the group, even though her scientific voice was still relatively marginalized. She remained confident that the BIRG was still the best place to pursue her scientific interests, citing that the larger culture of nursing failed to recognize or appreciate her unique scientific contribution. Through support from her female BIRG colleagues, Anna felt she was gaining power and influence, and was increasingly able to ask for, and receive, what she needed to effectively pursue her work in the BIRG.

Her nursing collaborators, however, chose different strategies, reflecting their own lower-status structural positions and different levels of commitment to the group (Branscombe and Ellemers 1998). Anna's staff members had nothing to lose by actively resisting interdisciplinary overtures. As the "hired hands" of scientific research, they saw no possibility for upward mobility in the BIRG, so they politicized existing differences and created a moral boundary between the BIRG's larger scientific agenda and nursing's woman-centered approach. Karen and Nadia, Anna's Co-I and graduate student respectively, were caught somewhere in the middle. They were less committed than Anna was to the BIRG, but they still recognized the value of developing their interests within the context of a well-funded and prestigious group. But because they were also developing their own scientific careers and identities, they were careful to distinguish themselves personally and politically from the more medicalized scientific agenda of the BIRG. In the end, they adopted a hybrid strategy. Karen and Nadia opted to

continue working in the BIRG for pragmatic reasons, but politicized their contributions and actions at the same time.

By combining observational and interview data, my research shines light on routine identity processes showing how individuals go about enacting and understanding their identities in a new professional context. I reveal that one's identity, far from being a fixed and immutable personal state, is a process that is constantly negotiated and refined as it is shaped by various situational factors and relationships to other team members. This project also illuminates how multiple and intersecting identity markers work in tandem. I argue that the doctors and engineers enjoyed their work in the BIRG largely because their disciplinary and scientific identities were validated in the BIRG's interdisciplinary context. The nurses, however, were positioned as outside the science from the beginning. In this way, it is not surprising that the nurses ultimately engaged in identity work along the same line of demarcation, enacting a woman-science divide as they struggled to define a sense of self in the BIRG.

My research also illuminates how differences become symbolic impasses. By linking status perceptions, moral boundary work, and identity processes in the BIRG, I show how being devalued in the group shaped the nurses' identities. The nurses were not merely navigating scientific divides, they were each actively constructing their identities as researchers, nurses, women, and scientists within the BIRG's interdisciplinary context. All of the nurses agreed that they were devalued in the BIRG, but they negotiated different paths as they worked to manage or deflect the negative status appraisals of others. Some of the nurses chose to emphasize, rather than disown, the very distinctions that marked them as outsiders in the group. Reclaiming their disciplinary voice through moral identity work was an act of resistance that served to buffer the nurses from negative status appraisals in the BIRG, but it also served to position the nurses as

outside the science. By emphasizing a feminist identity and disavowing the group's dominant scientific one (Settles 2004), they reclaimed their own sense of purpose and voice in a group that was largely hostile to their disciplinary priorities.

*Implications*

This study highlights the organizational and individual consequences of inequality within interdisciplinary groups. Gender biases and barriers threaten the collaborative potential of diverse groups (DiTomaso et al. 2007). If some voices at the table are devalued or silenced, then the group's products are neither as interdisciplinary nor as potentially innovative as they might otherwise be. My research also demonstrates how already marginalized individuals (by virtue of gender, race, or some other marker of difference) may be doubly vulnerable in interdisciplinary groups. The demands and goals of interdisciplinary collaboration are already often not aligned with disciplinary expectations and reward structures (Sá 2008; Pfirman and Martin 2010). These disparities leave marginalized individuals at risk of falling short in multiple arenas. Individuals must on the one hand, adhere to their disciplinary expectations to secure tenure. But they must also simultaneously negotiate and manage how they are perceived and valued by their interdisciplinary colleagues. While this problem has been widely theorized (Pfirman and Martin 2010; Rhoten and Parker 2004), empirical studies exploring these dynamics within the context of one interdisciplinary group are rare and qualitative studies that incorporate ethnographic and interview data are virtually nonexistent. By tracing how Anna's performance fell short of expectations both within the BIRG, but also as she was evaluated for tenure in her department, my research offers a warning to scholars who might think of interdisciplinary research collaborations as a safe haven (Rhoten and Pfirman 2007).

Research suggests that women are more likely than men to participate in interdisciplinary research collaborations (van Rijnsoever and Hessels 2011; Rhoten and Pfirman 2007) and more generalized research paths (Leahey 2006). Some studies have found that women fare better in interdisciplinary collaborations that have a more network-based organizational structure (Smith-Doerr 2004), while other research demonstrates that scholars who choose more generalized research topics do so at a great professional risk as they are less productive than those who choose more specialized paths (Leahey 2007). While the verdict is still out as to whether participating in interdisciplinary scientific collaborations in the academy ultimately helps or hinders women's career outcomes, by revealing how gender operates on multiple levels to shape perceptions, opportunities, and the processes in one such collaboration, my project sheds light on potential pitfalls in these research contexts.

Finally, my work also highlights the importance of decoupling gender as an analytical category from "women" when studying women's experiences in the sciences. While I have argued that the nurses' experiences of inequality in the group were fundamentally gendered on many levels, they were the *only* women in the group who felt silenced and marginalized in the BIRG.[25] While gender was salient for all of the group's female members, it was only the nurses who described gendered hurdles. Female engineers and doctors—at all ranks and in all roles—felt supported and valued in the group, as did BIRG administrators. In fact, these women thrived. Instead of experiencing the BIRG environment as "chilly," they described it as inclusive and supportive. Instead of hoarding opportunities for a chosen few, Tom and Phillip appeared equally invested in their male and female protégés, spending countless hours pouring over their

[25] It is of course possible that other women felt devalued too, but chose not to share those experiences with me. The one BIRG member who did not want to speak with me on the record was a young woman of color who worked as a research assistant on the clinical projects in medicine. She too may have felt marginalized in the group, but since I was unable to speak with her, this is purely speculative.

students' presentations and papers, helping them to refine their ideas and develop their professional careers. This finding further highlights the importance of considering individual experiences when evaluating interdisciplinary teams. Perceptions of status and power shaped individual experiences of interdisciplinary collaboration in the group. In the BIRG's context, women's voices, perspectives, and expertise that did not threaten the scientific norms, epistemological ideals, and larger status arrangements of the group were valued. In this way, my study shows that women within the same research context can be more or less privileged.

*Limitations*

Despite my project's many contributions, my research has limitations. First and most obviously, while I chose a case study design (Yin 2003) to explore the contextual nuances of how individuals negotiated difference within an interdisciplinary group, this choice precludes me from generalizing my specific findings to other interdisciplinary collaborations in the sciences. However, by illuminating the mechanisms of gender inequality and the processes involved in interdisciplinary meaning-making, identity work, and boundary construction within the BIRG, my research suggests that the fundamental nature of these processes would emerge in other groups, though undoubtedly in contextually specific ways. While I highlight that many of these processes can be understood by adopting a "gender system" approach, examining these processes in other contexts will further explore the mechanisms of gendered exclusion and disadvantage in interdisciplinary science.

Second, while I set out to incorporate an intersectional approach by inductively considering how team members negotiated difference in an interdisciplinary scientific group, my analysis was limited by the demographic composition of the BIRG. I was able to analyze how

many intersecting status markers shaped the nurses' experiences of inequality, but I was unable to incorporate one critical marker of difference—race. The BIRG was overwhelmingly white, so race did not emerge as a salient dividing line among group members. The three non-white research participants I spoke with worked with the engineering team and were international students—all Asian. While they did not talk about race as a salient marker of difference, it might have been my own position as a white researcher that deterred them from speaking about this dimension of their experience in the BIRG. I feel certain that my female gender identity made it more likely for women in the BIRG to discuss gendered experiences with me. Similarly, these BIRG members might have been more likely to broach these or other dimensions of difference with someone they perceived as sharing their background or experiences. Moreover, the one BIRG member who chose not to speak with me on the record was a woman of color, so I wonder how her perspective might have altered the nature of my argument. Racial minorities are underrepresented in the sciences but there is evidence that they experience widespread bias and discrimination in scientific contexts. This is particularly likely for women of color who experience both gender and racial disadvantages simultaneously (Collins 1999). While both quantitative and more targeted qualitative studies chronicle the disadvantages of minorities, and especially women of color in the sciences, because they are also a statistical minority, exploring the effects of race within the context of a single case study is difficult.

*Future Research*

This dissertation encourages additional research in many areas. While gender emerged as an important status marker within the BIRG's research context, the team's gendered dynamics were undoubtedly shaped by the disciplines involved and the BIRG's unique topic in women's

health. Additional studies could further explore the effects of gender in interdisciplinary science by investigating how gender intersects with other status markers in various contexts. Under what circumstances does gender emerge as a status marker within interdisciplinary collaborations? Are some status markers contextually dependent while others prove relatively durable across settings? Comparative research designs of interdisciplinary teams would also help isolate the effects of intersecting status markers and the mechanisms of inequality in working groups.

By exploring the experiences of marginalized group members, my research demonstrated that perceptions of belonging and inequality shaped individual and disciplinary contributions and ultimately the direction of the group's science. Future research could continue to explore this finding by focusing on how power and status shape the process of knowledge production in interdisciplinary scientific groups. Interdisciplinary science is not divorced from status arrangements, but rather shaped by them. Proponents of interdisciplinary science could continue to investigate how existing power relations shape the potential and products of these innovative groups.

This project also inspires additional naturalistic explorations of status and identity. By revealing the ambiguity of existing status orders in an interdisciplinary context, my research demonstrates that further studies are needed to explore how status arrangements are transferred to and interpreted in new arenas. Not only would additional research shed light on the routine identity work individuals engage in as they negotiate a sense of self and other in new contexts, but it could also help specify the relationships between status orders, the self, and symbolic boundary construction. What processes do individuals engage in to save face or preserve a sense of self when they experience challenges to their authority or expertise in new contexts?

Similarly, under what conditions do mere differences solidify into symbolic boundaries? Future studies could help explore these and other questions.

## Appendix A: Reflections on my Position as a Researcher

Like many feminist researchers who have rejected the idea that knowledge is impartial and has no personal story or bias that shapes its origin, I too believe that everyone's knowledge is "situated"—that it comes from somewhere (Haraway 1988). As a student interested in the theoretical and empirical problems associated with gender inequality, my analytic eye was necessarily sensitive to these issues. This focus was enhanced by my previous case study findings that showed gender was a salient marker of difference for interdisciplinary researchers in the sciences. However, I felt that an inductive exploration of other differences was also important, as ethnographic studies of interdisciplinary groups were, and still are, underrepresented in the literature.

As a graduate student in the social sciences, I was at once an insider to scientific knowledge production, but very much an outsider to research in the clinical health sciences. I was often ignored in meetings, but in other instances, Tom, Phillip, or Anna would take time out of their agenda to explain the finer points of their research to me, or even occasionally, to solicit my social scientific opinion. They knew broadly that I was studying "barriers" to interdisciplinary collaboration, and so would often pause to describe in great detail the institutional hurdles that they faced as they first received funding. I learned early on that administrative and other structural impediments were considered the "real" obstacles to interdisciplinary work, or at least the "safe" ones to discuss in mixed company.

I was also humbled to realize that I too experienced the variable and shifting identities BIRG members described as I worked in the field. After spending months negotiating different

spaces, I realized that I was far from just a participant observer; my identity and positionality shifted depending on situational and contextual variables as well as the interpersonal dynamics at play in any given meeting. Sometimes, I was an outsider, or as Anna affectionately took to calling me, "the cat in the corner." In other moments, however, I realized that I was far more than just a sociology graduate student taking notes. Though my biological sex and assumed gender identity was always arguably salient as a background identity, at other times it emerged as particularly important. When female researchers would duck in close to share a conspiratorially gendered observation, or nod in shared recognition with a "you-know-what-I-mean" glance, I knew that my being a woman gave me unique insider's access, especially with the all-female administrators. And in interviews, many of the women in the group led with gendered anecdotes. I doubted that this would have happened as consistently as it did had I not been a woman myself.

At other times, I felt like an "outsider within." Before and after meetings, and certainly at the annual BMRG meetings, group members would let their guard down and discuss all sorts of personal and professional details that enriched my understanding of the group and its participants. While these ruminations helped to situate and contextualize my work, it was in these moments that I felt particularly uneasy, experiencing ethnographer's guilt. Here they were opening up, and I was taking notes.

And finally, it is worth mentioning another unexpected consequence of studying a scientific working group: the PIs wanted to help promote my scientific work. On more than one occasion, Tom volunteered to introduce me to people who would be interested in my work, or suggested journals that would publish my findings. Last year, he emailed me to direct my attention to a call for submissions on interdisciplinary perspectives in a journal in women's

health. He wanted to check in, but was also eager to hear of my research progress and thought that the journal would be a great opportunity to publish some of my findings. By carbon copying a former colleague of his who had co-authored publications with the BIRG, he also used the email to broker an introduction between us (I actually already knew her from my previous research connections). He knew that she was currently living in my city and thought we might have professional interests in common. Tom took mentoring seriously, and wanted to help my work along too.

When I replied that while I appreciated his introduction and his willingness to vouch for my research to the journal's special issue editor, I could not take him up on it because it would be a conflict of interest. I also pointed out that I was trying to disguise the group in my writing to preserve the confidentiality of the BIRG and individual team members. He replied, as he had once before in a similar exchange, that he would be happy to check with Anna and Phillip, but that he was all but sure that they too would be okay if I published about the group using their real names and identities.

This incident highlighted for me some potential problems in studying elite groups. First, in Tom's estimation, as PI he had the ultimate right to nullify the consent agreements that I had made with each of his group members. While I had ensured each BIRG member that I would do my best to disguise their identities as I reported on my research findings, he felt that if the investigators failed to see a problem in outing the BIRG as the subject of my case study, then why would anyone else? This exchange illuminated a deeper issue of research ethics that had bothered me from the beginning. When I originally sought to study the BIRG, I was granted permission by the PIs. They alone had the authority to let me observe their team. Though individual members could decline to speak with me in an interview setting, as workers, students,

and research associates they had little choice to opt out of the observational portion of my research—at least not without directly asserting their rights not to be studied and perhaps risking their jobs and positions. As I described in earlier chapters, there was one instance in particular where I realized I was unwelcome at a meeting. My email exchange with Tom reminded me that while my observational protocol met the letter of the law in terms of IRB consent, within the academic sciences, the power of principal investigators still trumped individual rights.

This email exchange also highlighted an issue that dovetails with my own research findings. It occurred to me that another reason why Tom might want me to reveal the BIRG's true identity is that it might enhance the group's perceived status. The BIRG was already successful in terms of grant funding and publications, but if an objective outsider wrote about them as an exemplary interdisciplinary research group, they might have more to gain in terms of reputation. This idea is purely speculative. But Tom's enthusiasm for my work, and his interest in my revealing the BIRG's true identity does suggest that he assumed my findings would be wholly flattering to the group.

## Appendix B: Participant Descriptions

| BIRG Team Member | Discipline | Formal Role in Group | Research Orientation or Approach | Rank and/or job details | Other Characteristics and Status Markers High (HS) Low (LS) |
|---|---|---|---|---|---|
| **Anna** | Nursing | Principal Investigator | Woman-centered, Longitudinal Research Design | Junior; untenured faculty | Soft money (LS) Denied tenure (LS) Non-academic background (LS) |
| **Tom** | Medicine | Principal Investigator | Mechanism-oriented, Cross-sectional Research Design | Senior | Research professor (HS) Male (HS) |
| **Phillip** | Engineering | Principal Investigator | Mechanism-oriented, Cross-sectional Research Design | Senior | Distinguished research professor (HS) Male (HS) |
| **Karen** | Nursing | Co-I | Woman-centered, qualitative, Feminist | Junior; untenured faculty | Midwifery background (LS) Qualitative (LS) |
| **Elaine** | Medicine | Co-I | Mechanism-oriented | Mid-career; tenured | Secure career standing (HS) |
| **Julia** | Nursing | Peripheral Member at time of my research | Woman-centered, Feminist | Senior | Founding Member (HS) Anna's Mentor |
| **Nadia** | Nursing | Graduate Student | Woman-centered, Feminist | Junior | Midwifery background (LS) |
| **Maggie** | Nursing | Research Associate | Woman-centered | Staff | Self-described "peon" (LS) |
| **Kristine** | Nursing | Research Associate | Woman-centered | Staff | Nurse Practitioner |

| | | | | | |
|---|---|---|---|---|---|
| **Gwen** | Medicine | Medical Fellow | Mechanism-oriented but also woman-centered | Junior | PhD in humanities (HS) |
| **Sarah** | Medicine | Medical Fellow | Mechanism-oriented | Junior | Engineering background (HS) |
| **Carla** | Medicine | Consultant | Mechanism-oriented | Senior | Radiologist (HS) |
| **Robert** | Medicine | Peripheral Member | Mechanism-oriented | Mid-career | Male (HS) |
| **Jenni** | Engineering | Graduate research assistant; Post-doc | Mechanism-oriented | Student Early career | Statistics background (HS) International student |
| **Bae** | Engineering | Graduate research assistant | Mechanism-oriented | Student | Male (HS) International student |
| **Ri** | Engineering | Graduate research assistant | Mechanism-oriented | Student | Male (HS) International student |
| **Joanna** | Nursing | Research Assistant | Woman-centered, Feminist | Student | Doula |
| **Chelsea** | Engineering | Undergraduate Research Intern | Mechanism-oriented | Student | Visiting Student |
| **Nicole** | Administrator | Project Manager | Self-described as ID oriented | Full-time with group | Former study coordinator in BIRG; Academic background |
| **Erin** | Administrator | Former Project Manager | N/A | Full-time with group | |
| **Alison** | Administrator | Financial Manager | N/A | Part-time | Professional Accreditation CPA (HS) |
| **Jane** | Medicine | Summer Research Assistant | Self-described as Woman-centered | Medical Student | Women's studies background |
| **David** | Statistics | Statistician/ Consultant | Quantitative | Part-time | Quantitative methods (HS) Male (HS) |

## Appendix C: Interview Schedule

*I. Background questions:*
*Thanks for agreeing to speak with me about your involvement BIRG. Let's begin with a bit of background information about your involvement with the BIRG:*

* First, could you tell me a little about your disciplinary background and training? What are your professional credentials in the health sciences?

* Could you tell me how you originally got involved with this group?
    - What is your specific role in the project?
    - How has your training prepared you for your work with this team?
    - Specific relationships you had with other project members at inception?
    - How do you all work together on this group? How are your interactions structured?

*II. Interdisciplinarity:*
*Now I have a few general questions that deal with interdisciplinary work – both in a general sense and, more specifically, in terms of your experience of it with this group:*

*What makes scientific work "interdisciplinary"? What does that mean to you?

*What do you think of interdisciplinary research in general?
    - Have you been involved in other interdisciplinary projects?
        1. If yes, what drew you to interdisciplinary work?
        2. If no, why now?
- To what degree is your discipline already interdisciplinary?
- What is the key difference between interdisciplinary research and traditional disciplinary research? Does it need to be differently organized or planned?
    - Could you tell me a little about how the collaborative work required of interdisciplinarity and the competitive nature of science work together in this interdisciplinary research group?
    - How 'scientific' is interdisciplinary research?

*Describe your overall experience working on this interdisciplinary project.
    - What works well? What does **not** work well?
    - How does your work on this project "fit" with your work in your home discipline?
        1. How does it fit intellectually?
        2. How does it fit structurally (in terms of time commitment, respect in your home department, with your chair, -- are you supported? Is it considered 'good work' by your colleagues from your home discipline?)

*III. Challenges in Interdisciplinary Research:*

- What do you see as the special challenges of interdisciplinary research?
  - How are they different from those you've experienced in disciplinary research?
  - Can you tell me about a specific challenge you've encountered working with this interdisciplinary group?
    - How did you respond to that challenge?
  - What other kinds of things hinder cooperation among team members?
    - How do status differences among disciplines affect interdisciplinarity?
    - What about disciplinary differences in methodologies, assumptions, approaches to the scientific method, languages, and perceptions of the target population?
    - What strategies do **you** or others on your team use to manage disciplinary differences?
    - What about other social and cultural characteristics of researchers and disciplines such as (race/gender/tenure/ other social status markers, etc).

*IV. Relationships/Personnel Issues:*
*Your interdisciplinary project, like all projects, involves working with others. I have a few questions about "working together" on this project.*

*Describe your interpersonal interactions with others in the project – both the positive and fruitful and the negative and counter-productive.

- Have you formed any significant working relationships as a result of this project?
- How would you assess the level of commitment of **other** researchers on the project?
  - How did this compare with **your** level of commitment?
  - How do you explain differential commitment by other team members?
- What is your assessment of the leadership of this project?
- Are the requirements of leadership different for an interdisciplinary project?

*V. Final Assessment:*
• Is there anything that we haven't talked about that you believe is critical to understanding interdisciplinary research in general, or as it is practiced in this group?

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