Enhancing Research Capacity: An Ethnographic Study of
Women Faculty in STEM and Psychological Need Fulfillment
at Montana State University

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Abstract
Montana State University is representative of many US college campuses where women faculty, especially in the STEM disciplines, are not only underrepresented but are underutilized as grant-active researchers. In an effort to broaden the participation of women faculty in STEM, the ADVANCE Enhancing Research Capacity and Opportunity Initiative institutionalizes systemic support for women in STEM seeking funded research by offering psychological need support; such need fulfillment is posited by Self-Determination Theory (SDT) to result in more creative outputs and higher job satisfaction. These three primary needs are: autonomy or the experience of acting with a sense of choice and volition and fully embracing one’s actions, relatedness or feeling valued through the experience of connecting with colleagues and mentors in meaningful ways, and competence, or the belief that one has the ability to influence important outcomes through subject matter mastery and reaching established benchmarks of success that are peculiar to a field. This ethnographic study of 12 women faculty in STEM at various career stages reveals the ways in which the three psychological needs either enhance or constrain success in research. Qualitative analyses confirmed that autonomy was central, especially in the theme of “Intuition and Risk: Decision-making in the Early Career Stage,” that relatedness was central, especially in the theme of “Critical Transitions: Support that Makes Success Possible,” and competence was central, especially in the theme of “How High Can you Go?: Finding the Moving Bar of Success.” Results illustrate nuanced differences in need support and fulfillment as a function of career stage; as women move into more established phases of their career, participants report an increase in feelings of autonomy and free expression of self, both personal and professional, as well as paradoxical and continued expectations of self-sacrifice for the greater good by way of assuming administrative burdens. Importantly, results revealed that despite dwindling funds and barriers in the grant review system, women exerted exceptional effort to contribute to the research enterprise of Montana State and beyond.

Keywords
Self-determination theory, women in science, ethnography, research capacity, institutional transformation
Underutilization of Women Researchers and Uncaptured Potential

As part of the Research Capacity and Opportunity initiative, this project sought to survey successful women scientists to ascertain the ways in which they overcame obstacles, primarily as a means to guide and assess the impact of programs like ADVANCE, and to serve as a road map for up and coming women in STEM/SBS who will likely face similar challenges. In particular, women who manage to transcend the “leaky pipeline” where attrition accounts for a significant loss of their female peers, find that the expectation to secure grant funds for their research are further complicated by complex submission requirements and the daunting need to connect with senior colleagues as collaborators (Ono & Hardcastle, 2014). Women are needed in research – this much is clear – and yet the data does not support the conclusion that they are sufficiently valued for their contributions.

Even though more women than ever earn STEM degrees, their representation in faculty positions and participation in associated activities such as academic conferences, and serving on influential committees is seriously lacking. This also means that role models are difficult to locate and in addition to family-friendly policies, women, especially women in male-dominated departments require mentoring and networking opportunities (Ono & Hardcastle, 2014). Compounding this is a funding environment where for every available grant are thousands of competing applications, and once an application is in the review process, it is subject to subtle biases that hurt its chance of being awarded (Howard & Laird, 2013; Beyond Bias and Barriers, 2006).

The numbers reflect this and a recent analysis of institutional data shows that from January 12, 2011 when MSU officially received its Carnegie ranking, to July 1, 2014, women from the STEM colleges submitted nearly 1000 (924) proposals for a proposed total of $176,522,743, where in a world where all things are considered equal, represents an ambitious number that could benefit MSU and the region significantly (Office of Sponsored Programs data, 2014; MSU Planning and Analysis, 2014). These submissions resulted in a known $35,948,157 in active research project expenditures with some yet to be reconciled, meaning the final figure could be much higher (Office of Sponsored Programs data, 2014; MSU Planning and Analysis, 2014).
At present, women represent 37% of the total faculty body (which has steadily increased since 2011, in large part due to ADVANCE) and are responsible for an estimated 12-15% of research expenditures (Office of Sponsored Programs data, 2014; MSU Planning and Analysis, 2014). Total research expenditures for 2011-2013 came in at $308,827,583 and women were responsible for approximately 12% of this activity, possibly more. When considering the impact women could have when they receive opportunities for training, connections with other researchers, and even the future consideration of a review process that mitigates bias, universities and their constituents stand to benefit significantly.

The ADVANCE Research Capacity and Opportunity Initiative
The Principal Investigators of ADVANCE predicted that by providing formal psychological need supports in research endeavors, that women would not only increase their grant preparation skills and therefore feelings of competence, but by facilitating connections that relatedness would also increase (Smith, et. al., 2011). The Research Capacity Initiative sought to make connections for women faculty through a Grant Facilitator Network and provided direct assistance and training in the grant submission process.

As a result, from January 2013 to August 8, 2014, 90 faculty at MSU made direct contact with the Grant Submission Training Coordinator (GSTC) for assistance with their grant submission. These contacts resulted in the submission of 109 grant proposals to federal, state, and internal funding mechanisms. 60 of these submissions were from women in STEM, 13% of which are known to be funded with 65% still pending. The 22% that were submitted and returned received positive review scores and were considered overall “good,” “very good,” or “excellent.” While many of the 109 grants are under review (pending) we do know that 10 proposals have been awarded funding, 7 pre-proposals were accepted for the full submission process, and one NIH K-grant was successfully transferred from another institution. 100% of those with returned proposals stated that they would revise and resubmit to the initial agency and to other sources of funding.
The impact of the Research Capacity Initiative was broadened through the provision of training and technical assistance through events and workshops and the MSU faculty community engaged in 17 major research capacity events including a Grant Writing Boot Camp, NIH Mock Review Panel, and a number of NSF Web-based Workshops. Through these events, 88 faculty received direct training related to the grant submission process. 32 women in STEM engaged in these events and received training on the grant submission process and went on to submit, in most cases, at least two grant proposals after the event. The ADVANCE internal evaluation shows that the Grant Writing Boot Camp, in particular, positively impacted the competence of women faculty participants with participants reporting that they felt more equipped to express their ideas, felt more confident in their grant writing and felt more likely to apply for external funds. To date, all 17 women in STEM/SBS who participated in the Boot Camp went on to submit at least two new proposals after the event commenced, some submitted as many as four or five.

92 faculty registered to utilize the Grant Facilitator Network in the capacity of facilitator, submitter, collaborator, or a combination of these roles. 81+ pairs or research partnerships have formed out of these connections, and 24 of these pairs or collaborative groups have submitted proposals for external funding which make up a portion of the total 109 proposals submitted. 30 women in STEM are actively utilizing the GFN as facilitators, submitters, and/or collaborators, some engaged dynamically in one or two roles.

A number of large faculty groups such as the Early Stage Investigators, Women’s Faculty Caucus, and a newly formed Interdisciplinary Research Group receive direct support from the GSTC. 9 women faculty were awarded a diversification mini-grant. All in all, researchers and program staff expended an exceptional amount of energy, and yet traces of discouragement linger after grants are submitted, and many new female PI’s acknowledge the slim chances of their research being supported in the current environment. The take away from all of this is that the Research Capacity Initiative has gone a long way in building the knowledge foundation of MSU’s early investigators, and if and when the climate shifts, that faculty will be prepared to respond and reap significant rewards.
For women faculty who spend countless hours preparing excellent grant proposals, this is cold comfort. Each one of these returned proposals represents a cherished idea that could better conditions and solve problems. It could mean jobs created, quality of life improved, or the environment healed in some tangible way. A 2013 article in *Nature* aptly decried institutional sexism in the sciences as directly responsible for the “potential waste of human talent” and when you put it simple economic terms, the denial of women in science hurts everyone (“Science for all,” 2013). Even though controversial due to its west-centeredness, the Dalai Lama’s statement at the Vancouver Peace Summit that “The world will be saved by the Western woman” should alert all of the importance of women (Chan, 2010). Despite the discouraging odds, a small number of women do persist in their field and go on to accomplish a great deal, but how exactly? This study seeks to answer that question by assessing the ways they met the three critical needs, namely, the need for autonomy, relatedness, and competence.

**Self-Determination Theory (SDT) and Women in the STEM Disciplines**

Self-Determination Theory underpins the ADVANCE grant with its focus on three needs that when supported by a given environment, foster sustainable creativity, performance, persistence, and organizational loyalty (Deci & Ryan, 1985). These needs are:

- **Relatedness** - the experience of having satisfying and supportive social relationships and connections.
- **Autonomy** - the experience of acting with a sense of choice and volition and fully embracing one’s actions.
- **Competence** - the belief that one has the ability to influence important outcomes (Deci & Ryan, 1985).

SDT is well established and offers well-validated measurements that can be used to assess not only the outcomes of the transformative initiatives (did the program work?) but also the process of transformation (why did it work?) (Smith, et. al., 2011). The qualitative process was designed with this framework in mind, and individual questions solicit information related to these particular needs. For example, under “Need 1: Relatedness…” question #5 asks, “Do you see programs like ADVANCE as important in facilitating social or professional connections, or do you think the onus is on the
individual?” (Young, 2013). Questions of this nature will help the ADVANCE team further understand how to best provide support to women in STEM/SBS, and increase the likelihood of ADVANCE’s success as well.

In one sense the outcomes of this study will act as a form of mentorship for women in STEM/SBS, and in another as an educational tool to reach non-STEM/SBS audiences who may influence the ways women move through the STEM/SBS pipeline. Audiences encountering this work will have an opportunity to ‘meet’ the women who make STEM happen at MSU, a rural land grant setting where succeeding as an underrepresented member of a profession is perceived as particularly challenging.

**Research Methods**

An initial literature survey was conducted with the input of project advisor, Dr. Jessi L. Smith and the majority of the articles were selected from the repository of sources that inform the ADVANCE grant. Additional resources that pertain to feminist ethnography were selected to aid in the design of surveys and the format of the interviews. The core ADVANCE sources such as Virginia Valian’s *Why so Slow? The Advancement of Women* and the National Academies Press, *Beyond Bias and Barriers: Fulfilling and Potential of Women in Academic Science and Engineering* are particularly relevant. A number of complementary journal articles were also selected for the study. An initial focus group with ADVANCE participants, a group of women of various rank, were brought together to review the initial survey and provide feedback. The comments from this group were integrated into new iterations of the survey. Participants also suggested other candidates for the study, thus resulting in a snowball sample of associated researchers. All participants agreed that if achievable, diversity was key and that the participant sample would ideally consist of women of all ages, professional rank, and as much as possible, racial, ethnic, and family status. After these consultations with potential participants, the author then proceeded with the Institutional Review Board (IRB) application for use of human subjects in research. The IRB application was drafted in early spring, 2014 and submitted two months before the interviews began in the summer session of 2014. Other necessary components of the study were executed as follows:
Institutional Data: The data curated for this project originated from the current Montana State Office of Sponsored Programs ePCF system where grant data is tracked and displays activity by year and Principal Investigator, proposals submitted, approved by the institution and awarded or declined. Grant activity data from January 12, 2011 (immediately before MSU received its Carnegie ranking) to July 1, 2014 (end of ADVANCE project year two) related to women faculty activity was collected from this system and provided to the Office of Planning and Analysis so that gender status could be coded. The data was sorted and analyzed according to these time perimeters and grants from women faculty that submitted, awarded, and declined were evaluated. The client activity data for the Research Capacity Initiative resulted from tracking of women STEM/SBS clients over the last two project years, and information related to the grants they submitted was reconciled in the ePCF system. To date, a large number of awards are still pending and will require reconciliation as review processes make final determinations.

Participant Demographics: A select group of 12 tenure-track women in STEM/SBS fields representing both junior and senior-rank faculty were identified based on significant contributions to their field through a combination of publications, teaching, service, grant-funded projects and community consensus of success as evidenced by widespread recognition as successful scholars. The majority of participants have interfaced with or are actively engaged in the ADVANCE project. The participants range in disciplines, age, family status and rank. All of the women but one are Caucasian and range in age from their mid-thirties to sixties. The majority of them have families that contain at least one child, with two participants having three children. All but a few of them are married to partners that are engaged in academic careers. All but two of the women are from out of state and came to Montana State to accept a faculty position.

One-on-One Interviews: Participants were notified of this survey to assess initial interest in participation, and after IRB approval were officially recruited to participate in the interview process by direct outreach from the Grant Submission Training Coordinator. One-on-one meetings between the Grant Submission Training Coordinator and faculty
were arranged through email or phone correspondence, and before meeting interviewees received the consent form, list of questions, and any other information they requested. Before the interview began, the signed consent form was explained verbally and the form was collected upon consent by signature. The PI (Smith) will receive final copies of the signed consent forms at the conclusion of the interview phase. The interview format consisted of an in-person, semi-structured interview that was relatively conversational in tone and followed the order of the survey questions. The interviews were scheduled to be one hour in duration and were recorded and transcribed for later reflection, coding, and analysis by the interviewer and PI. The coding scheme was based categorically on each need (autonomy, competence, and relatedness) and sub-themes were identified for each major category. The paper reflects this natural organization and follows both theme and time progression or, early career-autonomy, mid-career-relatedness, and advanced career-competence.

Focus Group: At the conclusion of the one-on-one interviews, the participants were brought together to informally dialogue about their reflections of the interview process, perceptions of the state of women in the sciences, and the kind of needs support requisite for success. The focus group interview was scheduled in the same manner as the one-on-one interviews, and the Grant Submission Training Coordinator and PI arranged for an event in a public venue.

Results and Dissemination: After the interviews were analyzed and transcribed, a white paper version was drafted and submitted to the PI for review. After receiving her analysis of the document, the draft was re-written and provided to the subjects for approval and comment. A final draft will then be generated and provided to the ADVANCE Social Science Team to gather insights before a final ‘story’ of women in STEM/SBS research at Montana State University is produced by the Grant Submission Training Coordinator and PI. Any requests for changes will be made within two weeks of receipt of comment, and a final draft will be re-submitted to the team and participants. Upon approval of the draft, the Grant Submission Training Coordinator plans to devise a plan with the ADVANCE communications team to publish the story. The final draft will also be posted
to the program website for review by the NSF Program Officer. For the purposes of anonymity, the individuals are identified by rank and more generally by discipline.

**Intuition and Risk: Decision-making in the Early Career Stage**

In the graduate school years, often in the later stage of PhD studies, a number of the participants had a niggling voice that urged them to make an against the odds career decision, or commit to a secondary passion that competed for their attention. This meant that in most cases, women went against the advice of a mentor or member of their PhD committee in order to pursue a goal that was important to them, even though they generally credited their mentors as being supportive and highly influential to their careers. At the time, there seemed to be very good and logical reasons for why they should not pursue their own course of action, but a subtle inner voice instructed them to persist in spite of those supposed ‘good reasons’ offered. In a few cases, a challenge to autonomy incited outright rebellion and of those who experienced this, the clear response to naysayers whether they vocalized it or not was, “Oh yeah, watch me.” Ryan and Deci would attribute this exercise of autonomy to the forces of extrinsic versus intrinsic motivation wherein an individual may be extrinsically or externally motivated to do something, but will be far more motivated to accomplish goals that are intrinsically motivated due to their natural interest in them (Ryan & Deci, 2000). A state of intrinsic motivation is described as one that is healthy and creative which would naturally create conditions of commitment and ultimate persistence to complete the task or goal (Ryan & Deci, 2000).

In 100% of the cases, the decision that at the time might have carried them off the tried and true path, yielded substantial professional rewards by way of locating an important niche, filling a significant deficit in the field, and by way of personal and professional satisfaction. In all of the cases, talking with an earnest colleague who was genuinely interested in the individual’s happiness and well-being and more importantly, from someone who really knew the individual, helped finalize the decision by affirming what they already believed to be true. Many of the participants reflected with a bit of surprise in how even well-meaning mentors could have steered them astray by insisting that they adopt a suggestion that was contrary to what they truly wanted for themselves.
Not one participant stated that they regretted the decision to act autonomously and follow the intuition that the goal would be meritorious.

One professor recalls how her encounters with well-meaning male colleagues and other senior scientists have been characterized by silencing with suggestions to “Keep your head down and toughen up.” The *keep your head down and focus on your work* directive is pervasive in the sciences, and those who dare to (to use the image provided by this participant) stick their neck out like a giraffe, while the others have their head buried in the sand like ostriches are at risk for repercussions, which in promotional terms in academia means lab space not secured, projects not funded, collaborations shunned (Valian, 1998).

This individual recalled that even in graduate school, she bravely took up a case against a new hire who demoralized his female students and publicly humiliated his spouse. Her advisor who is still in contact with her wistfully recalled, “what gumption and balls she had” as an undergrad. For her, a risk-taking, outspoken approach to her work and life was never optional – but according to her inherent in who she is. She cannot recall one single event or person to credit for her tenacity, but her responses reveal that this self is deeply motivated by love – her love of her department that was sullied by the presence of this individual; love for her discipline and the belief that everyone should have the opportunity to experience it, especially talented passionate women, and in her words, love for justice, even at the expense of giving up certain privileges. She recalls her experience of being invited into the social setting of influential male researchers, or as commoners call it, “The good old boys club” but then losing that privilege because she voiced dissent of their exclusionary practices.

I experienced, in the sense of autonomy, the good old boys network a few years ago and it’s awesome and I was like, “I like this old boys network. Sign me up.” But now it’s gone. So I was in this sort of sweet spot where I was in the good old boy network, literally one of the only women who goes to these meetings informally. I don't play golf so you know, I don't drink whiskey and these are all strikes against me, but wow! What access and autonomy to make your own path and have access to information that helps guide you.

Virginia Valian, author of *Why So Slow: The Advancement of Women* attributes this exclusionary behavior to bias towards women participating in traditionally male-dominated fields (Valian, 1998). When women are already a part of a “gender unfriendly”
environment, speaking out for oneself or others leads to not being supported by the group and eventual attrition (Valian, 1998). Oddly, Valian suggests that the only way, at least at this historical moment, is to behave in a “neutral and friendly” manner so as to not emphasize stereotypical feminine qualities that are associated with incompetence (Valian, 1998). This would also explain why other women in the STEM disciplines police those who go against this advice because they perceive that it could create problems via creation of negative stereotypes for them as a minority of their department. This hegemonic way of operating apparently helps women “survive” in a male-dominated environment, but it is questionable how it serves women in the long-term. This individual has taken a risk and benefitted as a result by immersing herself in a research agenda that is agreeable to her disposition and beliefs, leading to the award of large grant through the NSF and assignment to special roles in the university.

Even though colleagues thought they were being helpful by literally kicking this woman under tables at departmental meetings, they failed to consider the advantages of an individual who is willing to take risks for her authentic passions that ultimately made her successful, thereby benefitting many. While the other researchers are equally passionate about their research, their experiences with saying “No” in their own self-interest to well-meaning advisors who would dampen their autonomy was a bit more subtle with biases being harder to detect. It is in this less certain territory where decisions with high stakes become harder to make. What may appear to be an opportunity can act as a trap in disguise that directs an individual through the duration of their career. They may commit a lifetime to a path that feels somewhat satisfying at the time, but may forgo an alternate path that was in fact better for them and more suited to their individual talents and propensities.

Another professor and director of a prestigious institute had the good fortune of coming from an academic family. Her father, a medical researcher, was highly supportive of her career and introduced her to the formal and informal aspects of academic life, including thoughtful people who frequented their home to share friendly conversation and enjoy family activities. Although entering medical research and medical school seemed like a natural choice for her, she decided to pursue physical sciences after enjoying positive experiences in the field. In the full course of the interview, she did not
describe any direct discouragement in relation to her decision but stated abruptly, “I left the medical school path.” Surely this decision raised eyebrows when she entered into a field that was particularly male dominated and she experienced some alienation from male peers and supervisors. It might have seemed easier to just go back to medical research where she had ready-made support networks, but her love for being out in the field and interacting with the science of geology was just too compelling. Fast forward 20 or so years and she is now a prominent scientist in her field, working on NSF funded projects that involve students and faculty both nationally and internationally. She has become one of the household names for science at MSU and beyond, and researchers speak with distinct pride if they are fortunate enough to know her or work with her.

All of the participants gave their mentors and senior supporters their due for their success by providing opportunities, yet stated that for the most part, they commanded their career path. They also recalled how mentors with good intentions either gave them opportunities or advice that was not entirely beneficial to their intended path, or discouraged them from making choices that seemed right for them. Two of the participants recall the time when choosing their specialization was met with resistance and how listening to their own intuition paid off in the long run.

An Assistant Professor and early career biological scientist credits her mentors and their unabashed passion for science for her own decision to pursue an academic career. She also acknowledges that her own determination to pursue a minor in statistics gave her a competitive edge. Her primary mentor offered unfailing support for her decision and according to her, his support and encouragement bolstered her belief that she could accomplish her goals. Other members of her committee ever so slightly discouraged her by stating, “No one from your department has ever majored in statistics” with the sub-message clearly being, “So what makes you think you can do it?” She wasn’t discouraged by the resistance but instead saw it as presentation of an interesting challenge. She states that,

The coursework was really challenging and I had to work pretty hard to show myself how it would be relevant to my life because a lot of it was theoretical mathematics and I wasn't really sure at face value how that was going to help me in my career path. That just meant that I had to take the initiative to see that connection for myself. There was this other layer on top of the coursework and that was me feeling like I had to make it relevant to my life. The oral and written exam part of the PhD, the comprehensive part of
the exam, were also very challenging. But in the end, having that background is one of
the things that got me one of my first faculty jobs.

It is interesting to note that at the time of making the decision, it was not entirely
clear how the risk would ultimately pay off. In this professor’s case, members of her
committee were discouraging her and she contended with her own internal dialogue
questioning how theoretical mathematics would benefit her. This type of ambiguity could
easily lead to thinking that “committee knows best,” and the decision maker was trying to
stretch some justification in order to be contrary. It would be even easier to back down
from this challenge, thereby subjugating your own importance and autonomy which
shares similarities with self-silencing. Virginia Valian might say that she exercised one of
the survival skills, that being to “Be impersonal, friendly, and respectful” (Valian, 1998)
instead of directly facing off with detractors. According to Valian, in a climate that can be
hostile at any moment, it is best to quietly bypass whatever barrier is in your way instead
of confronting it directly.

Women who are successful in STEM, at least in this sampling, persist in spite of
challenges to their autonomy and the rewards are substantial. In the case of the previous
subject, this decision led to her first faculty position and it continues to pay off as she
creates relevant and interesting statistics approaches in her grant funded research projects
and is working with her students to incorporate statistics in their work, which just so
happens to be a skill that is increasingly in demand from those in biological sciences.
Similarly, a mid-career Associate Professor recalls a time when she was faced with
making a choice at a critical point in her career.

As a high school math teacher concerned with the success of other math teachers,
this particular participant initially wrangled with the decision to pursue a PhD in
mathematics. Initially, she expected to return to a high school classroom. Once she
decided to make a career in academia, she encountered yet another challenge in deciding
her emphasis. At the time she was employed by a national lab on an internship when
presented with the question of whether to stay on as a ‘hardcore’ (her words)
mathematician at the lab with immediate financial benefits or pursue studies on math
education. Again, all the logical reasons were offered to her as to why being, and this
term is important, a ‘hardcore’ mathematician made more sense. According to this logic,
she would make more money, have a secure position, and practice what some perceive as ‘real’ mathematical research. She wondered seriously, “Do I do an applied math route or a math education route?” To this she responded,

I had a really interesting conversation with someone I worked with at the lab who said, you know, if you go out and do the research mathematician (route), you will be just another research mathematician, but if you take what you learn and go and work with teachers you will be really great. It was neat to have someone else voice that, because it was kind of what I had in my head, and not that I was thinking in terms of greatness, but in terms of influence and where my knowledge would do the most good.

Her advisor did not fully understand her decision to enter a teaching rather than research institution, or as she describes her advisor’s reactions, “He’s an applied mathematician who was completely supportive of me in graduate school, but I don't think he ever knew what to make of it when I decided to go to a teaching institution rather than a research institution since those in research institutions think we are just building clones of ourselves.” Her decision to switch from publishing in applied math research and instead focus on math education research also caught him off guard. Despite this reaction, she persisted on her self-determined path.

From her perspective, she could continue to do math research and also improve the field of mathematics by working with teachers. Like the previous participant, her choice ultimately paid off in terms of a rewarding career at the university where she occupies a special niche in her department. Upon filling this needed function, she enjoyed other benefits such as a number of grant-funded projects focused on improving math education and more recently was awarded a Fulbright to focus on improving the preparation and professional development of math teachers. Her decision was also timely as federal initiatives to improve math education with substantial financial backing are on the increase. She recently received news that her NSF proposal was awarded and she and her research team will engage teachers from a network of schools to create professional development opportunities, a formal support network, and sustained partnerships.

In many instances, a female scientist can pinpoint one or two or a few individuals who subtly discourage them from a decision to persist in a pursuit of value, but what we must remember is that women are discouraged more diffusely by societal norms. Another Assistant Professor and early stage investigator recalls how she hadn’t assumed in her early years that she could be a professional academic.
“We are not indoctrinated to think you can be a professor” she says as she looks directly at me and then shrugs. She described her decision making path as one of step-by-step progress and simply taking the next logical step up the career ladder. She met her partner in graduate school and they acted as support for one another and helped each other progress. Despite these pervasive societal messages that women cannot be successful scientists, women like this participant continue to defy the odds and engage in activities that are beneficial to the research community. This particular participant is also associated with a prestigious scientific institute and runs her own lab at MSU. She has been very active with grant submissions, and in balance with her teaching, research, and family responsibilities has submitted a number of research proposals to NSF, USDA, and other agencies. In describing her acclimation to academic life, she brought up the additional challenges connected to family life and a professional academic career.

Having dependents presents an additional barrier for women to include the perception that you can’t be a successful scientist and look after children at the same time. She thought creating awareness within the faculty community could act as an effective remedy for those who balance an academic career with family responsibilities. She and others do not state that it cannot be done, but that we need to reexamine expectations and even allow flexibility in daily routines in the academy. By and large, these women managed to nose ahead by protecting their sense of autonomy, thereby fortifying this very critical need. Deci and Cascio might explain these women as exercising a protection of the locus of causality or motivational sense that is controlled internally (1972). In this foundational theory, a shift in the locus of causality could result in loss of intrinsic motivation, which for highly motivated individuals who are intent on their career path, would be disastrous (Deci and Cascio, 1972). In lieu of relinquishing this sense of motivation related to what is perceived as valuable, they instead managed to disregard the negative feedback that would have undermined them. Perhaps there is something extraordinary about these women who are so resolved in their path, which seems to be the case, but perhaps there are also factors like positive supporters that tip the power scales back the other way?
**Critical Transitions: Support that Makes Success Possible**

By far the strongest theme that resulted from this study is the importance of support networks, especially in times of transition or as a senior scientist puts it, “Be strategic and find people who don’t make you feel lousy.” Faculty commonly consider support from others as a “network,” which rings a bit too business management for some academics. Ryan and Deci would describe this in terms of relatedness, which in their theoretical context is a critical need that directly influences one’s feeling of belonging and significantly affects personal well-being and in turn professional performance (Deci & Ryan, 2000). Individuals who feel related are more likely to persist in a challenging environment and report greater feelings of loyalty to an organization (Deci & Ryan, 2000). What is interesting is that this group’s characterization of an effective and supportive network is not one large, one-dimensional network, but in fact multi-level, multi-functional, and evolutionary in nature. All of the participants reported that without their support networks, they would not be where they are today. Over time, these networks only grow until they become so vast and deep that like a long-lived, firmly rooted tree, the individual becomes connected at the individual, familial, collegial, regional, and international levels. There is also a correlation between the depth, size, and quality of the network (degree of relatedness) with feelings of autonomy in decision-making and career mobility.

One major transition in the career of women scientists is her move from the institution where she obtained her PhD to the new institution where she will start her first faculty position. Even with the obligatory tour around campus during the hiring process, it is difficult to anticipate the kind of environment that awaits the new hire. Nearly all the respondents described the somewhat blind leap required in following a passion to an actual career academic position. They say that they loved their discipline and did not think as much about what kind of connections they would have with their new colleagues. Upon arrival at the new institution, the importance of connection and a good support system became immediately clear as they overheard officemates talking about grants they were pursuing with colleagues, or about mentors who had opened doors for them. Some describe the discomfort of breaking ties with previous mentors as they struggled to prove that they were independent researchers.
An Assistant Professor and early career investigator recalls with a chuckle in her voice about how strong-armed and convincing her mentors were when she initially resisted the academic path. She had not anticipated, much like her peers, that she was suited for professional academics even though she excelled at math and science in high school and college. At a critical point in her developing career, she had to make a decision between entering industry which she did not necessarily want to do and entering into academics. Again, she reacted to her mentor’s suggestion with surprise as if he were simply off base in his assessment of her abilities. Fortunately she discovered that she was in fact a talented researcher and teacher, and more importantly, that she really enjoyed the autonomy and excitement that came with academic life. She believes that without the intervention from her mentor, that she may not be where she is today – a successful scientist on the verge of exciting new discoveries and accomplishments.

Puzzling through the best route to take from budding scholar to independent researcher was common to all the participants and a cultural tension now exists in the academy because of the expectation to conduct collaborative research. The innovation that results and coincidental reduction in research grant funding drives this impetus and while collaborative research is expected, faculty must prove that they are also independent researchers.

Part of this severing process occurs when the faculty leave their graduating institution and begin their first faculty position. They are expected to separate from their PhD mentors in order to claim their independence. This presents a special challenge as producing publications without the weight of an established researcher’s name can be especially difficult. Also, with each research agenda being so individual, parting ways with a mentor who shares your specialty seems counterintuitive.

A professor and senior scientist talks about the difficulty of moving to a new institution and of the importance of her support networks.

I would say that the part that was confusing was when I became a professor, (there) was a push from the discipline to no longer work with your advisor or past mentors and if my former PhD advisor was on a paper, the assumption was that it really was her idea or her work and that I needed to demonstrate that I am an independent researcher and in fact, that’s the same in that I was explicitly criticized for that at the time of retention and tenure, and so there is a disconnect in that the reality is that you do team-based science and you develop these connections and collaborations that last a lifetime and there is this moment in your career where they say, “Now stop. You must show that you are an
independent scholar, and so in that way, in response to how the reality matches the expectation, was not met. With that said, it just meant that the burden was on me to cultivate new relationships while weirdly ignoring the old ones and then (upon receiving tenure) it was, “Ok, game back on.” I am now allowed to connect with these people who I had to ignore for years.

Two women in the biological sciences describe their multi-level support networks as a result of the way their disciplines operate, in that researchers make every attempt to get their science to the agency-level beneficiaries and on-the-ground stakeholders. An Assistant Professor says of her network(s), “I feel like it’s different networks for different things,” and how her most satisfying research collaboration to date involved a local agency biologist and a faculty member in another discipline.

I sought them out professionally because I wanted to work with them, but have grown to really appreciate them personally as well, and that makes the work really fun and even more rewarding. So it’s been fun to watch the relationships grow into future research and connections that have come as a result of those initial collaborations.

A Professor in the environmental sciences describes a similar arrangement where in her department a great deal of the research that occurs makes its way to practitioners such as farmers, ranchers, and agency personnel. For her, these additional layers in her network are greatly rewarding and she credits an early mentor for encouraging these kinds of connections. One of her mentors, an agricultural experiment station director, told her she should get involved in some regional projects that were relevant to her research and she said, “I did, and I just went to my 30th meeting with them.” Many of the connections she made early in her career are still intact, and with her teaching network, she co-developed a database of teaching materials that are published for use by the public. Like many of the others, she talks about the growing value of her network and how what begins as a professional relationship eventually becomes a genuine friendship, making the research all the more enjoyable.

Perhaps we don’t need theories to tell us that humans deeply value connection to other humans and that these connections influence an individual’s decision to persist with a co-valued activity, but in any case, Deci and Ryan attributes goal attainment and internalization of goals with a sense of belongingness to other individuals or larger groups of people (Deci & Ryan, 2000). They give an example of a student that feels valued and respected by his or her peers and the consequent decision to continue a task
that is encouraged by the group. In the process of defining a research agenda, women scientists find that not all collaborators share their values.

Perhaps one caveat to the networks discussion is that not all collaborations are made equal. Earlier in their careers when women reported feeling less autonomous, they each experienced entry into research relationships that were not beneficial to them. The most common reason for this is again, a feeling of urgency in making connections that produce results and a sense of autonomy that is still developing. The collaboration that originated from the network typically went wrong on behalf of personality conflicts, but mostly because of misalignment of values. Participants asked editorial caution is exercised in this area, so identifying content will contain even less specifics and will discuss general circumstances.

Four participants, two early career researchers, a senior researcher, and a mid-career researcher describe an incident when a relationship that grew out of research interests became more of an onerous time and energy drain than a benefit. These incidents typically took place fairly early on in their careers when they were eager to secure funding for their research and began to cement collaborative agreements. The senior researcher saw the major issue as personality-based and that as a highly motivated person, the collaborator’s failure to deliver on time was aggravating. They began to experience some dysfunction in their relationship and she decided to end the relationship despite similar interests and the benefit of continued access to the project results. She reflects that now as a tenured faculty with a more secure level of autonomy, that disengaging from these unhappy research marriages circumvents long term suffering for both parties. She even suggested that disengaging from or avoiding these types of arrangements altogether would be preferable, even in the early career stage. She thought that those in the early career stage are more likely to tolerate bad behavior or an awkward pairing because of dependence on the outcomes. This can also result from attachments to large, high-stakes projects and pressures from administration to secure grants.

Another participant described a large, multi-year project with a high dollar amount attached when she was on the cusp of the transition from early- to mid-career. She described the experience as very unsatisfying. Although securing this type of research support is financially beneficial and offers a well-defined research agenda for
years, the participant felt that the personal cost to her in terms of stress and lack of enjoyment due to misalignment of values was exhausting and greatly increased the amount of effort she expended on the project. For her, it was a lesson in carefully choosing collaborators and making sure that sufficient commonality exists between her and another researcher before signing on for a project. Two early career women described similar scenarios where in one case, the participant went through a lengthy grant proposal process with a would-be co-PI and felt by the end, because of the personality differences, relieved when the project was not selected for funding.

In a challenging research funding climate where awards are dwindling, university administration has begun to place pressure on faculty to make up the difference. Nearly every new faculty that consulted with the Research Capacity office expressed some anxiety over securing grant funds, even though they had just started their positions. This is aggravated by the institution-wide anxiety over maintaining the Carnegie Classification for “very high” research activity (Strategic Plan, 2012). The professor in environmental sciences discussed the do-it-yourself cowboy culture of Montana State University with high workloads and pressure to produce on your own and how this intensity strains young investigators. She noted how the high expectations to produce, produce, produce create a neurotic culture where people do not take the time to stop and talk to one another, or linger over coffee, which means missed connections that could actually be valuable. Anecdotes of strings of sleepless nights and frenzied activity by day only increase and she said, “That’s why we are a Tier One School, because we are very driven… but I think there is some psychosis that goes with that.” It could also lead to hasty decisions about collaborations with unintended consequences.

An early career woman, due to departmental pressures hastily selected a research partner who in her words “checked boxes” on the career advancement sheet, meaning he was more interested in conducting research and publishing for promotion and tenure purposes than for the sake of doing interesting, quality work. She expressed frustration at finding good collaborators especially since her commitment to producing valuable discoveries not only for the academic community but also the public is such a high priority for her. She has expended exceptional effort in putting an interdisciplinary research team together and produced a manuscript and a TedTalk. Unfortunately, a
negative interaction with a collaborator who did not share her values has made her a bit wary. When she discovered that a would-be collaborator carelessly borrowed ideas from others without crediting them, she disengaged from the relationship permanently.

The university funding environment influences the decisions of women faculty, and like Howard and Laird discuss in their article, young faculty are becoming so overwhelmed by this environment that attrition becomes inevitable for many (2013). This can be especially problematic for women faculty who bear the brunt of family responsibilities and are as tradition dictates, expected to be super teachers and make themselves eternally available to their students (Deutsch & Yao, 2014). The successful senior scientists confirm that not all collaborations are made equal and that one must be strategic when selecting co-researchers if one wishes to form extensive, complex, and enduring networks.

From the time she was a budding scientist in high school one senior scientist had a support network. Her first supporter, which as an aside, testifies to the importance of an equitable and quality STEM education, was her high school science teacher. Even after years of practicing science, she still recalls the quality of this relationship and how the encouragement of this individual introduced her to her first science competition where she won a top award that provided the opportunity to compete in an international event. Today she is an international expert in her field and was recently selected for a prestigious position. Her accomplishments are notable; to date she has been the principal investigator or co-principal investigator on numerous grants, and written nearly 150 scholarly publications.

At the beginning of her career, she was relatively unaware of the collaborative nature of her field. She recalls that it was “her style” to have that level of interaction with others, and the entirety of her career reflects that preference. If anything, she states that she cannot see any other way. One of her few truly negative experiences was an isolating one where she was “dumped in the lab and left alone” as an early career intern. At this point in her career, she is proud of her well-established support networks that span across the world. Although she is a highly autonomous individual and would say that she always has been, her connections with other researchers are critical to her success and bring a great deal of personal satisfaction. Regionally, she is engaged in collaborative research
arrangement with regional Native American tribes, and has extended her network to include Native American scholars. An early mentor introduced her to the practice of successful mentorship and ensured that she had social connections during conference events. She credits good mentors for successfully transitioning her through various critical stages of her career and models this for the students she mentors. In a parallel disciplinary universe, another senior scientist describes her networks as beginning very early on and becoming increasingly complex, diverse, and widespread.

This scholar’s portfolio of accomplishments rivals that of the participant mentioned previous to her, and she is nationally and internationally known for her work. She has published over 150 research articles and her research sites are located in countries around the world. Her labs employ a large number of students, postdocs and host visiting scientists. Through the years she has received grant-funded support for her research and serves on review panels for major funding agencies. Much like her colleague, she recalls exceptional support in her youth, primarily from family members and friends of the family who were of the academic pedigree.

This upbringing gave her a unique perspective on academic life and she says, “I always had that view that research was very collegial and just really a lot of fun beyond being scientifically interesting.” During the critical transition stages, her support network was built in, she knew from first-hand experience what was expected of her, and she consulted with trusted mentors to review grants and manuscripts. These individuals helped her navigate the uncertainties and challenges of the male-dominated field of geology in the 1980’s when she was coming up through the ranks.

According to her, all of these mentors share the characteristics of kindness and encouragement and she says, “You are always strategic in life, so you meet those few people you connect with, whether they are fellow students or inspirational advisors who you can relate to. I think, just be strategic and don't work with people who make you feel lousy. Find people who think you are great.” She characterizes her support networks as beginning with the unfailing support of her father and becoming more and more diverse as the years passed. She described the core of her support network as “heroes” who inspired her with their passions and became as close and trusted as family; she affectionately referred to one mentor as her “Dutch uncle.” For her that core network of
close supporters must be in place before the remainder of the network can grow or as she says,

> You can share that germ of a grant proposal or that first draft of a manuscript with those people and they give you really good feedback. Without them, I don't know. It would have been really tough. If a person went through their career without having those heroes, then I don't know how she would make it.

Every single respondent confirmed the importance of healthy and positive relationships in terms of long-term happiness, well-being and success, or as Deci and Ryan would say, relatedness was central to these women’s lives. The quality of these connections was critical and it mattered little how qualified, smart, or influential the collaborator was if they were demeaning or did not appreciate the contributions of the particular individual. If the connection went sour due to misalignment of values, usually related to the collaborator valuing superficial or self-serving goals, successful women would disengage for the sake of self-preservation, or to put it more bluntly and a bit crudely, I heard on more than occasion, “I refuse to work with assholes.”

**How High Can you Go?: Finding the Moving Bar of Success**

The rubric of academic success has remained consistent for the last half of a century; publish or perish, cultivate new researchers, secure funding, and earn tenure. It seems relatively clear what is expected but like any contractual language, the devil is in the details. Nearly all of the respondents expressed uncertainty over what exactly constitutes success and competence and as a result, expended a tremendous amount of effort to go above and beyond the bar of success. Even though the majority had trouble answering the question, “Do you think women in STEM must work harder than men to prove their competence?” and expressed uncertainty over the truth inherent in this question, they all detailed the exceptional amount of effort they put into their careers. For example, if “publish or perish” is the golden standard, they would ask “How many articles per year?” and “Do I need to make sure I make it into that top tier journal?” They would receive dismissive answers such as “Two per year” or “If you can,” which isn’t entirely helpful.

One professor recently came up for promotion to full professor and previous to this, she set a goal to publish 13 academic articles in one year. She describes this experience as,
So I am up for review for promotion to full (professor) and I was talking to a colleague of mine who is already a full professor and I was saying, “Oh, it’s really nerve wracking. They are asking you to be excellent and what is excellent? I don't know. My bar for excellence is different than other people’s bar for excellence, and you think, “I never did get a publication in that one journal that is the be-all, end-all journal, even if my materials are submitted,” to which this professor said, “The role and scope says that you should have one to two peer-reviewed publications per year and this year alone, you published 13 papers. So I ask myself when you only have to have two, why do you have 13?” Without missing a beat he says, “Must because you are a woman,” and I was like, “Yeah, why is that, truly? I had 13 in part because of all of these relationships that are good and thriving, and I will never have 13 in one year again. I have peaked and that is fine. In addition to grants and all of these things, I am good, but in part, why? I could have spaced them out over a period of 13 years, but I think that's what it is. There is this sense of if I am going to be respected and the bar is at my nose, I am going to pretend it’s over my head so that there is absolutely no question about my competence and abilities.

Researchers Yao and Deutsch explore attrition in the academic institution and describe the unequal evaluation of women and men in the promotion and tenure process, which partially explains the moving bar phenomenon (Yao & Deutsch, 2014). In their research, they examine the specific reasons for women receiving a biased evaluation and find that women are far more likely to experience work-life conflicts and are assigned to lower-ranking positions within their field (Yao & Deutsch, 2014). It is plausible that the women had a difficult time answering the question of whether women work harder than men because they could not locate in their memories one or two isolated incidences where a male ‘perpetrator’ explicitly prevented a women from advancing in her career. This is also the reason we always find safety or sexual harassment training videos amusing because they fail miserably at capturing the subtlety of real life and make caricatures out of real people. The effect is the same. The fact that women must work harder than men is a systemic issue and tends to hide bias in impersonal structures like policies and processes, thereby making individuals inculpable for their actions (Smith, et. al., 2011).

This is the reason projects like ADVANCE are promising catalysts for change since they look at transforming entire institutions vs. individuals. Bias can be hard to detect and the hegemonic nature of bootstrap STEM culture is really good at making lagging productivity appear to be an issue of personal motivation when it really is an issue of adequate support and failure to consider work-life matters. This doesn’t mean that the need to exert extraordinary energy isn’t warranted, but more a matter of
responding appropriately as an institution to the limitations and barriers placed before women. Similarly, nearly all of the respondents expressed some discomfort with the question, “How do you define competence and what does it look like in your area of study?”

Of all the questions, this one received the most “Um’s,” “Uh’s,” “I guess” or general hesitation and increased length of time to respond. A mid-career professor thought that the difficulty of this question could be attributed to the “imposter syndrome” that runs rampant in the academic environment where faculty are constantly questioning whether or not they were competent enough. The more senior faculty held to the fairly rigid and traditional definition of competence in terms of publishing, cultivating students, and getting grants. Even if slightly unexamined, it seemed like a far more sane approach than the constant self-doubt than can creep in at any moment, which also explains why they persisted so long and why researchers like Xu liken success in the academy to survival (2008). Similarly, not one of them said that someone explicitly explained the expectations to them in their early career years. Again, this becomes more of a structural problem where the culture is unwilling to explicate the rules, and when you don't know the rules, it’s awfully hard to win the game.

An early career professor expressed how helpful it would be to have a clear dialogue with senior faculty in order to learn exactly how they navigated hurdles and barriers. Knowing the struggle is a shared experience and learning strategies could be a resource for up and coming women in the STEM disciplines or,

Learning more about people who look like they are doing it all well but knowing they had struggles and that you are not the only one would help. It would help to know that it's a shared experience because there are so many established people here who make things look easy, but knowing that they have concerns is helpful. Everyone second guesses themselves, and whether it is having people talk about their experiences, or mentorship programs where established people talk about their uncertainties throughout their careers when they didn't feel competent and how they dealt with it could be a way to deal with uncertainty.

A mid-career professor attributes persistence partly to an individual’s intestinal fortitude, which nearly all the respondents agreed with, to success and proving your competence.

It’s like what I was saying earlier in that the women who have had to overcome those mini-barriers along the way, that accumulation of bias tend to be the ones who turn out to
be super competent and yet they don't feel super competent. So I don't think that it is anything explicit in that someone has set a higher mark on me but I think women who are able to reach a higher bar are the ones that end up successful because we have the attitude of “Watch me. I’m going to do it.”

The uncertainty that accompanies groping for the bar was remedied in many respects by the respondents’ networks. When I asked how they dealt with this feeling of not knowing, they said that they sought clarification from senior mentors in their network and that provided them with attainable metrics. A number of subthemes emerged and it would be worth further explanation to look at how unbalanced expectations follow women into their tenured years. While men are intently focusing on their research agenda, women are expected to take on the administrative burden of looking out for other faculty. Perhaps they are the best ones to do it, but not at the cost of their own passions that got them there in the first place. It’s as if the authoritative voice of autonomy prevails in the end and yet this matron-like expectation to be everything to everyone also persists. To address this problem as well as the ones mentioned earlier, the successful women in this study gave the following advice, which was crystallized into a readable list for the purposes of this paper.

**Advice for New Researchers from Established Researchers**

- So the worst advice is “Well, I’ve had it tough so you gotta’ pay your dues, and its years in that matter, so keep your head down and toughen up and it’s hard work” and people give that advice, and it’s terrible advice. I say stick your neck out. The image that comes to mind for me and I am stealing this from a panel I sat on once, one panelists advice to women was “Ostrich” – stick your head down, keep it low, focus on your work and no one will deny how great you are. Next panelist: “Be a giraffe. Stick your neck out. Look long, eyes open and have a big full picture view” and I’ve always loved that image.

- I chose my field because I was excited about the things I could learn and that is going to keep you fueled in your profession. Whatever that is, being excited about your discipline and what you can learn and contribute and not all the things that are going to be hard, or all the obstacles that are going to get in your way. Find
something that you are really excited and passionate about and when there are hurdles (because there will be hurdles and hardships) no matter what you choose, but if you don't love it, it makes the day to day really hard. Choose something that is going to get you through the difficult times.

- In finding your niche as a new researcher, you need to identify your primary value to your department and pursue that. Think about not just sitting around doing your science, but finding a way to put it in an academic context.

- I mean I think the biggest thing for me is support networks. I think being open (is important) and I would say get involved. Go to workshops, as many as you can fit in. Even if you don't think that they are very interesting. Go to the groups and events offered by Center for Faculty Excellence or go to social events and networking. Find people who are supportive and focus on your students so that you are valued and you will have very strong support. It is important to have your research labs functioning well and focus on the dynamics that are going on in the research labs, and make sure your students are feeling competent, autonomous and related, and if you do that you will have a really productive lab. You have a lab that people want to join and you can make collaborations and you end up with a lot of people who want you to be successful.

- Go visit with the senior guys. Even though they should be asking you to coffee because you are the new person, you sometimes have to take that role.

- Don’t let yourself get in your own way. For example, if you assume “They think I am a girl who can’t do anything” that is what will happen versus going into it being curious and assuming that they will treat you well, then that is likely what will happen. If you go in with the, “This is an old boys club and they are not going to be nice to me” then that is what will happen. You have to be smart about it and be willing to take any opportunity you are offered. Don't turn something down because it is outside of your comfort zone. If there is someone you are connected to, go to them because they will help you more.

- A lot of women are doing great science but they are not actively promoting their research like going to a conference and speaking about the awesome work they are doing. Talk about the awesome research you are doing.
• Identify your support network and use it whether it’s your friends or advisors or colleagues or whomever. Also, focus on what you enjoy and try not to get too involved in the politics. It is easy for a young person to be overwhelmed and oppressed by negative departmental and university interactions. The successful people put on blinders and just keep going. Just work on your stuff. Worry about the politics when you are tenured. The early part of your career is the time to build bridges.

• It’s hard. Don't expect that this is going to be handed to you. You are going to be forced to make decisions about priorities and you will have to decide at every point in time. You don't have to be one-dimensional, and you can have interests outside of science.

• Let’s go full circle here. Be persistent. There is grit. I am a huge John Wayne fan, and there is grit in life and you have to have that. Work hard, trust your instincts, don't be afraid to be wrong and don't be afraid to speak up. Don't be afraid to go after something you want, and don't be afraid to ask for help. And be collaborative.

**Reflections on the Process**

The idea for this study emerged from the ADVANCE collective after a series of particularly engaging yet surprising “meet and greets” with new female STEM faculty and a well-timed conversation with the Program Officer of the ADVANCE grant in operation at Montana State University. Teamed up with research capacity partner, Office of Sponsored Programs director, the new faculty meet and greets took on a predictable format. Meeting notebooks tucked under our arms, we negotiated whatever temperamental weather was thrown our way in an early spring Montana semester and took shelter in the offices of women faculty that were scattered across campus. As soon as polite conversations took a turn from how their previous institution or hometown compared with the wintry extremes of Montana, we found that we were leaning in, sometimes anxiously, to know the conclusion of harrowing tales where labs were non-existent or not at their functional ideal but were now up and running or the other myriad struggles that confront women in STEM.
We probed further into the methods they employed to secure funding after years of dwindling federal support available for their research, or how they managed to appear so chipper and accommodating after waking at 4:00 am to review lesson plans and grade papers before their kids woke up expecting breakfast. But unlike what many would assume, these women described all of this with a chirp of laughter in their voices or calmly and matter-of-fact as if the world of scientific research as obstacle course was actually matter-of-course. We agreed that a formal qualitative study involving MSU’s successful woman researchers would be beneficial and the Program Officer agreed. These women were not those demanding extraneous accommodation or privilege, but in fact were concerned with how to nimbly respond more creatively with less. And yet, they were the last to echo the ‘pull yourself up by your bootstraps’ chant coming from the old guard choir, but instead encouraged well-conceived strategizing, thoughtful networking, and constant assessment of self-efficiency to overcome the challenge of being a woman in the STEM disciplines.

This cohort of women had become expert at stretching their time and energy, and in creating connections with others in order to meet their personal and professional goals. In an undeniably difficult funding environment, where labs are closing and grant proposal submissions far outstrip available grants by the tens of thousands (Howard & Laird, 2013; Bias and Barriers, 2006) these researchers have become perfectly poised and ready to adapt and even thrive in an environment where ingenuity, flexibility, and resource-leveraging with others represents the new norm. All that said, they are collectively aware of the subtle biases and limitations that lean against them on a day-to-day basis, yet are thoughtful enough to navigate these challenges with skill and grace.

As soon as the last interview concluded, it was perfectly clear why and how this group of researchers succeeded. Aside from the aforementioned skills and abilities, success was due to them because quite simply, their work is timely and relevant to our region and in many cases, to the international community. They are committed researchers, teachers, administrators, and dedicated community and family members, point being that they shatter the assumption of the solitary investigator burning the last light in the high rise on campus. Quite the opposite and in fact, to achieve their level of success they have become deeply connected and embedded in the fabric of society. Self-
determination theory would explain this as the phenomenon of being both extrinsically and intrinsically motivated because they are aware of their value to others whether that is a significant other, a group of friends, or an entire culture. Feeling related, respected and cared for is associated with high levels of motivation and therefore success (Ryan & Deci, 2000).

As an up-and-coming woman in the social sciences attempting to earn my doctorate degree in a highly interdisciplinary, and some would say slightly schizophrenic program, my position as ethnographer was slightly non-traditional. I was not entering their sphere as an equal but more like ‘fictive kin,’ or embodiment of the spirit of a younger sibling (Warren & Hackney, 2000). Perhaps they could not fully confide in me as peer and reveal all they wished for belief that my developing and sometimes hobbling lexicon would not quite grasp the meaning, but I desperately wanted to hear what they had to say. I approached them with an acute thirst for their guidance, and I listened hard. My insides surged with curiosity as I wondered ‘How the heck they did it’ while bleary-eyed, I slugged my third cup of coffee after a late night and early morning reading articles and battling a grumpy toddler. I just had to know what it was that brought them to this place of confidence and ease, and how they managed their lives on the day-to-day to make this all possible. What misfortunes befell them that they overcame and how? Who helped them, instructed them, and showed them the way? How did they map this all out? I can safely assume that other women in my position are asking similar questions and are equally eager to hear their answers and to thumb through their maps, so perhaps I am indeed the right person to ask these questions and am grateful that I was given the opportunity.
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