ASU ADVANCE
SOCIAL SCIENCE RESEARCH PLAN
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The social science research project utilizes a life course theoretical framework (Elder 1994), to examine the academic life course, with attention to how agency, lifelong development, interdependence, and historical time and place affect its structure (Bozeman et al. 2001; Hermanowicz 1998, 2010; O’Meara 2015; O’Meara et al. 2008; Zippel 2017). The emergence of a new academic context—the explicitly interdisciplinary research university exemplified by ASU—provides a new opportunity to understand how the development of the academic life course is affected by interdisciplinarity (Leahey et al. 2017; Rhoten and Pfirman 2007). Furthermore, intersectional theory demands that we consider that the organization of human lives and opportunities vary according to known and intersecting bases of identification and stratification (Acker 2006; Browne and Misra 2003; Collins 1990; Romero 2018). In this social science research plan, we propose a mixed-methods social science research study to investigate how intersectionality and interdisciplinarity affect the organization of the academic life course. Specifically, we are interested in how STEM faculty develop their academic careers in an explicitly interdisciplinary university, and how their career experiences differ based on intersectional dynamics as they emerge in the academic life course. Consistent with our ADVANCE project as a whole, we are interested in the academic life course from beginning to late career, and will ensure that both quantitative and qualitative components include faculty members at each stage of the academic life course.

Theoretical Orientation of the Research Plan and Research Questions

To summarize an abundant literature on scientific trajectories in the United States: Academic faculty in STEM fields are disproportionately male, White, Asian, and able-bodied (NSF 2017); they tend to achieve academic milestones more quickly than others and face fewer barriers on the path (Long and Fox, 1995; Xie and Shauman 1998). Women, members of domestic racial and ethnic groups, and people living with disabilities, are significantly underrepresented among academic STEM faculty (NSF 2017). To complicate matters still further, individuals can have multiple identities and statuses: The empirical examination of intersectionality is still young, but the theoretical framework properly problematizes the idea that one can occupy only one disadvantaged status at a time (Acker 2006; Browne and Misra 2003; Collins 1990; Romero 2018). A major contribution of our research project is that it will use a mixed methods design to enable us to evaluate multiple and intersecting bases of theoretically relevant differences in the organization of the academic life course.

Interdisciplinary scientific research is a critical component of the nation’s scientific investments, yet relatively little is known about how it functions, particularly with respect to intersectional equity concerns documented in other aspects of the academic enterprise (e.g., career trajectories, intellectual property, and publication productivity). Furthermore, a hierarchy of disciplinary prestige means that in the academic research university, disciplinary perspectives constitute context-specific bases for social stratification—even within an explicitly interdisciplinary university. Finally, the development of the later academic career—including the multiple leadership trajectories that are possible—is understudied in general and especially with respect to intersectional equity and interdisciplinary concerns. The research project will make original theoretical, methodological, and empirical contributions to the international literature on higher education, interdisciplinary science policy, research management, science indicators, and science studies, as well as the burgeoning literatures on intersectionality in the context of the academic life course and interdisciplinarity in the context of academic science.

Our research approach takes an explicitly intersectional life course theoretical orientation that considers how individual agency, lifelong development, interdependence of human lives, and historical
time and place affect the timing, pace, and pattern of human lives (Elder 1994). The life course framework was originally developed without attention to the ways in which gender, race, ethnicity, class, national origin, and sexual orientation may affect how professional and personal life courses unfold. Several scholars of academic scientists have taken the life course theoretical perspective in their work, with varying degrees of attention to the challenges of an intersectional perspective (Armstrong and Jovanovic 2015; Bozeman et al. 2001; Bozeman and Gaughan 2007, 2011; Gaughan et al. 2017; Hermanowicz 1998, 2010; Zippel 2017), or the ways in which interdisciplinarity affects the organization of scholarly lives (Leahy et al. 2017; Rhoten and Pfirman 2007).

Life course theory takes an inherently contextual, social approach to understanding human lives. Intersectional theory demands we consider that the organization of human lives and opportunities vary according to known and intersecting bases of stratification. Finally, the emergence of a new academic context—the explicitly interdisciplinary research university exemplified by ASU—provides a new opportunity to understand how the development of the academic life course is affected by interdisciplinarity. Our overarching research question is:

*How does a consideration of intersectionality in an interdisciplinary environment affect our knowledge about patterns and outcomes in the academic life course?*

This general overarching question gives rise to several specific research questions our research plan is designed to address:

**Research Question 1:** What are the varieties of leadership pathways in an interdisciplinary academic environment?

**Research Question 2:** What are the perceived opportunities for and barriers to career management and advancement in an interdisciplinary environment?

**Research Question 3:** How does the academic life course in the explicitly interdisciplinary environment of ASU differ from academic career trajectories in other research universities?

Cutting across all three of these research questions is:

*How do gender, race, ethnicity, foreign-born status, sexual orientation, and disability—and their intersectionality: 1) explain differences in the pattern and velocity of the life course; and 2) structure the varieties of actual and perceived leadership opportunities?*

To summarize, we take an intersectional life course approach to theorize about and empirically evaluate determinants of academic career paths and outcomes in an interdisciplinary environment.

**Social Science Methodology**

Life course analysis and intersectional analysis share common conceptual concerns with the role of human agency, timing, the interdependence of social lives, and the importance of social context. Intersectionality is a concept developed in law to highlight the legal complexity of occupying multiple marginalized statuses (Crenshaw 1991). African American feminist theorists further developed intersectionality to show how lived experience is comprised of multiple interacting factors that combine in complex ways and depend on specific social contexts for salience (Browne and Misra 2003; Cho et al. 2013; Collins 1990; Collins and Bilge 2016; Davis 2008; Dill and Zambrana 2009; Romero 2018). Intersectional analysis focuses on the interaction among statuses, not just on direct effects (Bowleg 2008; Choo and Marx Ferree 2010; Weldon 2008). From a quantitative perspective, this implies the need for large samples, which are difficult to accomplish in higher education given the well-documented distributional inequities (Leggon 2006). A recent paper by co-PI Gaughan used intercategorical analysis
of multiple groups strategically (McCall 2005) to test hypotheses about how professional social network resources and intersectionality influence scientific productivity (Gaughan et al. 2017).

Population and Sampling

Our study population uses a census of STEM faculty members from the College of Liberal Arts and Sciences (CLAS) and the Ira A. Fulton Schools of Engineering, which together represent 42% of ASU faculty and the majority of STEM faculty members at ASU. The census is possible because institutional data and academic curricula vitae are available for every faculty member. Institutional data will be the primary way we evaluate representativeness of participants in the qualitative arm of the study. For the qualitative arm of the study, we will employ purposive sampling to ensure that a variety of faculty (e.g., by gender, race and ethnicity, rank, disability status, and sexual orientation) are represented in the semi-structured interviews. Some of these target participants will be identified by institutional data (e.g., rank, gender, race and ethnicity), while other target participants (e.g., faculty with disabilities and LGBT faculty) will be identified through snowball sampling. This modification of the successful Netwise II (Gaughan et al. 2017) sampling plan will result in a qualitative sample size of 120, which will ensure theoretical saturation along the bases of gender, race, ethnicity, sexual orientation, foreign-born status, and disability.

Data Sources

Curriculum Vitae Analysis for the Study of Academic Trajectories

To study interdependence, timing, and institutional change, we will use the academic CV in tandem with institutional data (for timing of academic reorganizations and family leave) to understand how timing of macrostructural changes interact with personal and professional life course timing; the timing of life course transitions often differ by statuses of intersectional theoretical interest. We use the curriculum vitae as a de facto prospective source of longitudinal academic career data; to date, the CV has been used to study the academic life course, with a particular focus on gender (Gaughan 2009, 2017b; Gaughan and Ponomoriov 2008; Gaughan and Robin 2004). Recent work uses survey data combined with the CV to explore the later career path, including the intersectional bases of gender, racial, and ethnic stratification in promotion to the full professor position (Gaughan 2017b), and how these bases of stratification affect scholarly productivity throughout the academic life course (Gaughan et al. 2017). At Arizona State University, every faculty member posts a current curriculum vitae on the institution’s publicly accessible website. These updated CVs will form the baseline for the CV component of the analysis, with later multi-method data collection techniques focusing on updating the life course data. Concepts to be captured from the CVs include educational history, prior employment, timing of transitions, order of trajectories, and leadership pathways; specific methodological details are well described in Canibano and Bozeman (2009), Dietz and colleagues (2000), and Gaughan (2009).

Gaughan’s current work uses sequence analysis (Abbott and Tsay 2000) of academic positions throughout the academic life course using the CVs of 2400 academic scientists in four scientific fields. The sequence analytic work constitutes a critical comparative basis for our planned analysis of ASU CVs, which will enable us to compare academic career trajectories in the explicitly interdisciplinary environment of ASU to those observed at other research universities, and to assess the extent to which the academic life course—with a focus on the post-tenure career—varies by gender, race, ethnicity, foreign-born and disability status.

Semi-structured Interviewing to Study Intersectionality, Barriers and Opportunities

Intersectionality theory recognizes that multiple identities operate for individual people and that the salience of these identities, and of the ways in which they intersect, vary not only between individuals, but in different social contexts. These ideas have been well articulated theoretically and qualitative research demonstrates that person, context, and timing all play important roles in how intersectional identities and attributions are activated (Acker, 2006; Browne and Misra, 2003; Crenshaw, 1989; Collins, 1990). It is extremely difficult to conduct quantitative intersectional analysis in samples of academics.
because of the “small n” ethical problem that necessitates suppressing subgroup analysis in the interest of protecting subjects (Leggon 2006). The Netwise II project achieved large enough subsamples to explore intersectional hypotheses quantitatively (Gaughan 2017b; Gaughan et al. 2017); however, even assuming recruitment of every faculty member of color and LGBT at ASU into the research study, we will not have sufficient cell sizes for quantitative analysis of all intersectional bases.

Given the difficulties of using quantitative analysis for intersectional analysis, we propose to explore intersectional dynamics using qualitative semi-structured interviewing to understand how professors construct their life course in the ASU interdisciplinary environment. The project interventions are designed to help STEM faculty with this process, while the evaluation plan is designed to document what impacts the interventions have. The semi-structured interviews provide an opportunity for exploring in-depth how faculty perceive and experience opportunities and barriers to advancement in the rapidly changing interdisciplinary environment, and to explore how intersectionality affects career decision making and planning among faculty. An important structuring device for interviews will be the participant’s curriculum vitae (which will have been collected in the earliest phase of the research). The CV constitutes a professional record of professors’ work, but it is socially constructed by norms that may not reflect the actual work the professor does in his or her “workload” (Initiative 1 of the ADVANCE intervention project will be an important source of institutional information about these social processes in faculty evaluation and workload allocations). The CV will help the interviewers to ask about what is present and what is not present in the CV. For example, we know from other work (Gaughan and Bozeman 2016) that publications alone are not a sufficient indicator of collaborative scientific work. Because collaboration is often an integral component of interdisciplinary work, understanding its dynamics requires moving beyond the official record. Furthermore, the CV provides at best minor clues about gender and other intersectional dynamics: Scientific work presented on a CV is work that has occurred in a gendered and racialized environment, which will be interrogated in the semi-structured interview format.

The interviews are the means for exploring how identities operate and interact to affect perceptions, aspirations, and advancement in the interdisciplinary environment. The semi-structured interview protocol will be developed using: 1) field notes from our ongoing discussions among stakeholders in developing this proposal; 2) the results of the CV trajectory analysis described above; and 3) reference to other qualitative work on the academic life course (Fox and Colatrella 2006; Hermanowicz 1998, 2010; Gaughan and Bozeman 2016; Gardner and Blackstone 2013; O’Meara 2015), including other NSF ADVANCE projects that have employed semi-structured interviews (e.g., Seattle University, University of Maryland at College Park, University of Delaware).

**Relationship of Research Plan to Evaluation**

As described in the main body of the proposal, the programmatic innovation is to develop an integrated digital platform for the delivery of both didactic and interactive training and mentoring, as well as digitally-enhanced administrative monitoring and accountability. This platform will be used to collect data related to both the evaluative and research components of the project. In the main body of the proposal, we discussed how the platform will be used for evaluation and monitoring of the project in more detail. The planned research interviews will provide an opportunity to ask whether and to what extent faculty members perceive ASU ADVANCE as a resource for their own career development (faculty will be recruited for interviews whether or not they participate in training interventions). Finally, co-PI Gaughan will serve as the primary project liaison with both the Internal and External Evaluation Teams. An early activity of the project will be for these three teams—Social Science Research Team, and Internal and External Evaluation Teams—to plan and coordinate data collection and curation activities.

**Measures**

Our work takes into account the dynamic nature of the academic life course in changing institutional contexts. We will explore constructs from several theoretical domains of social science research: Life course, intersectionality, and interdisciplinarity. Furthermore, we will measure these
constructs using both qualitative and quantitative methods and sources of data. The table on the next page shows in the left column the major construct categories. The middle column indicates variables to represent those constructs; the right column identifies the data sources that will be used to derive specific measures of the constructs.

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<thead>
<tr>
<th>Construct</th>
<th>Variables</th>
<th>Data Source</th>
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<tbody>
<tr>
<td>Life Course</td>
<td>Positions, Promotions, Leadership</td>
<td>Curriculum Vitae (CV)</td>
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<td></td>
<td>Leave Taking and Accommodations</td>
<td>Institutional Data</td>
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<td></td>
<td>Mentoring and Advice Networks</td>
<td>Semi-structured Interviews</td>
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<td></td>
<td>Timing of Institutional Changes</td>
<td>Institutional Data</td>
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<td>Intersectionality</td>
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<td>Identity Groups</td>
<td>Semi-structured Interviews</td>
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<td></td>
<td>University Units</td>
<td>Curriculum Vitae (CV)</td>
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<tr>
<td>Interdisciplinarity</td>
<td>Interdisciplinary Affiliations</td>
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<td></td>
<td>Interdisciplinary Collaborations</td>
<td>Semi-structured Interviews</td>
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Analysis
We will conduct comparative sequence analysis and event history analysis of CV data to answer research questions related to how interdisciplinary trajectories differ from more traditional disciplinary trajectories and—to the extent possible given sample sizes—to evaluate how intersectionality and interdisciplinarity interact to explain differences in such trajectories. The comparison group for the sequence analysis relies on 2400 CVs collected by members of the research team over the last ten years.

When permitted by participants, interviews will be recorded and transcribed; otherwise, interviews will take place in pairs of investigators, with one person playing lead interviewer and the other playing the role of note-taker. We will then use thematic analysis of the semi-structured interview transcripts (or notes) to answer the research questions related to how faculty members negotiate intersectionality and interdisciplinarity in their career planning and advancement.

Research Team
The lead investigator for the social science component of the project is co-PI Monica Gaughan, who applies life course models to the study of scientific careers. Her expertise is in sampling and statistics, with an emphasis on over-sampling scientists to attain adequate cell sizes for intersectional analyses by gender, race and ethnicity. She also has extensive experience interviewing scientists and engineers. ASU Professor Mary Romero is the president-elect of the American Sociological Association. She specializes in intersectional approaches to understanding occupations and the workforce, with a focus on Latinas and other women of color. Her methodological expertise is in participant observation and semi-structured interviewing, with attendant expertise in grounded and thematic content analysis. She is the author of a new book, *Introducing Intersectionality* (2018), published by Polity Press. ASU Regents’ Professor Barry Bozeman is the creator of the public values theoretical perspective that informs our project’s theory of organizational change (Bozeman 2007); in addition, he is a leading scholar of science policy, with a focus on the interface between interdisciplinary careers and institutional environments. He is an innovator in using the academic CV to study scientific careers, and has interviewed more than 1000 scientists over the course of his career. Details about the qualifications and experience of the social science research team are available among the biosketches.