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Lost Talent: Women in the Sciences,
by Sandra L. Hanson. Philadelphia:
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Women are much less likely than men to major in or pursue careers in engineering, math, and science. This is usually explained as a consequence of the social barriers women face and the various choices women make (such as child bearing), which limit their participation in science careers. These choices, in turn, are explained by powerful gender roles learned by girls and boys (Zuckerman, 1991). Many researchers have focused on the science education "pipeline" and the role of early educational choices in shaping larger education and career options. Girls are less likely than boys to take high-school math and science classes, in part because they are not perceived as "useful" and in part because math and science are perceived as male terrain (AAUW, 1992). In *Lost Talent: Women in the Sciences,* Sandra Hanson draws together factors identified in earlier research to explain the attrition of talented girls and women from the science pipeline.

Hanson seeks to evaluate both the extent of this talent loss and the process by which women leave science by focusing on the time period from junior high school through college. Assuming that talent is equally distributed between the sexes, Hanson argues that "young talented women are more likely to leave the sciences than are young men because of structural barriers and selection processes." Her conceptual framework proposes that attrition from science can be measured by nonparticipation in a variety of math and science experiences. She posits that variances in science experiences are the consequence of both gender and differential access to resources. She then investigates both the direct and indirect effects of gender through an extensive array of family, school, and individual resources. This book is situated in the social stratification tradition (and also explores the role of race and class) rather than in the attrition or the career development literature.

Hanson relies on three nationally representative longitudinal survey data sets for this book. Primarily, she uses the NCES High School and Beyond (HSB) data, focusing on the high-school sophomores, who are surveyed four times at two-year intervals (1980, 1982, 1984, 1986). These data are bolstered by the National Educational Longitudinal Study (NELS) of eighth-graders at two time

points (1980, 1982) and the Longitudinal Study of American Youth (LSAY) of seventh-graders for four years (1987-1990). In combination these data sets provide information on the goals and experiences of young people from seventh grade through four years after high-school graduation.

The contribution of this book is its ambitious attempt to describe the complexity of young people's educational experiences by bringing a large number of variables to bear as both outcome and causal measures. As a result, it is full of tables, which provide a detailed look at the data that underpin the conclusions. Hanson introduces complexity in three important ways.

First, she looks at both math and science, instead of one or the other. Second, Hanson emphasizes a longitudinal process by exploring how young people's experiences change over time. Hanson's dependent variable is participation in the "science pipeline," by which she means an array of experiences with science. She categorizes these experiences into four "experience pipelines": achievement (grades, achievement test scores, postsecondary education, and work in a science field), access (math and science courses taken and planned, college major, and work in a science field), attitudes (positive feelings about math and science courses, career and educational goals), and activities (use and access to calculators and computers).

Third, she correlates these experiences with a wide range of resources — family, school, and individual — as well as with gender. She finds, for example, that women who pursue science are more likely to have parents who are highly educated and who are involved in their children's social and academic lives. Although there were few in the sample, young African American women with the same resources as other women are more likely to participate in science, which she correlates with strong encouragement and role modeling from their mothers.

Hanson's efforts are well intended and point researchers in an important direction. However, the limitations of the HSB data hinder the testing of her model, leading to questions about the findings.

Hanson's distinctions between attitudes, access, and achievement are never clearly delineated. Without a clear conceptual definition, the allocation of the various measures into categories is unclear. For example, should planning to take additional high-school math and science courses be categorized along with actual course taking as "access" or along with expectations for getting a college degree as "attitudes"?

Furthermore, several of the measures used to describe "achievement" are measures of general academic achievement (e.g., attending a postsecondary institution) not of achievement in science or math. This undermines our ability to distinguish between achievement in science and achievement in school. Other research has shown that more women than men are now attending college, which helps explain Hanson's finding that young women score well relative to young men in this dimension.

After operationalizing each pipeline at each of the four time points, Hanson plots various pathways (or "trajectories") in each pipeline. These trajectories represent profiles of student experience. Students can, for example, stay in or out of the pipeline at all four time periods, or begin in the pipeline and leave at a later time point, or move in and out erratically. (Being "in" the pipeline is defined as being in the top quartile of a composite scale of all the measures at one time point.) Seven trajectories in each pipeline form the backbone of Hanson's

data analysis. The connections between gender and family, school and individual resources, and the various trajectories are described in depth.

Although this is a useful conceptual initiative, its operationalization is hampered by the limited number of proxies of each dimension of experience, particularly in the later years of the data set. The access dimension, for example, is represented by five measures in the 1980 survey, nine measures in the 1982 survey, but only four in 1984, and two in 1986. These few measures do not allow for clear distinctions between pathways and lead the reader to wonder about the conclusions based on them.

These caveats aside, the important contribution of this book is the effort to draw a dynamic picture of experiences in order to capture the complexity of students' life paths. Hanson provides an intriguing glimpse of the ways in which students can simultaneously act like and unlike proto-scientists. Next we need more data to identify what experiences and resources are critical in pushing students in different directions. An empirically grounded model of common pathways and decision points will be a useful tool to policymakers interested in reclaiming lost talent. Future researchers will be able to build on Hanson's ideas to provide the outlines of such a model.

Hanson provides ample evidence that gender plays a strong direct and indirect role in women's attrition from the sciences. The next step is to move beyond the identification of critical factors to an explanation of the causal process. How is it that students come to decide to leave science? How do young women leverage resources to persist in science? This step will help move us to a workable theory of talent loss.

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A Blueprint for Action

Service learning engages students in community service that is meaningful to the community and to student learning. It has gained an impressive degree of momentum during this decade and, particularly during the past five years, has emerged as an educational force to be reckoned with. The question Tom Ehrlich raises in the foreword of Jacoby's book, "So what took so long?" is interesting and provocative. Both sacred (e.g., private liberal arts colleges) and secular