

Family Background and Early Influences

Nature, Nurture, and Family Niche

Much of what we currently know about the early lives of women mathematicians comes from a psychological study conducted in the late 1950s by Ravenna Helson and her colleagues at the Institute for Personality Assessment and Research at the University of California at Berkeley (Helson 1967, 1971). At that time, it was estimated that there were approximately three hundred women mathematics Ph.D.'s in the United States—including nearly all of the women who earned mathematics Ph.D.'s in this country in the 1940s and 1950s. Helson's work is interesting and important for many reasons, not the least of which is the considerable overlap between her subject pool and the women I consider in the present study. Indeed, many of my interviewees identified themselves as participants in Helson's project.

Helson's goal was to understand "the creative personality" in mathematics and in particular to ascertain the distinguishing characteristics of creative women mathematicians. She made a careful study of forty-five women mathematicians, eighteen of whom were considered to be creative, a designation based solely on the evaluation of (male) mathematicians at distinguished research universities. The remaining twenty-seven women mathematicians served as a comparison group. This method of identifying creative women in mathematics is in itself problematic, as it clearly reflects the judgment of the male majority, as well as the preeminence of mathematical research over other forms of scholarship and professional activity.

Helson's study nevertheless provides valuable insight into the psychological development of those women who met the highest standards of the American mathematical community in the 1950s. The profile that emerges is that of a girl growing up in a family with relatively few brothers and a dominant but emotionally distant father, whose intellectual and educational attainments differ sharply from those of his wife. As the girl grows older, she comes to identify strongly with the father, particularly with regard to intellectual pursuits; somewhat introverted and socially isolated, her approach to life is flexible and nonconformist. The characteristic that describes her best is "rebellious independence" (1971: 214–218).

While this profile may describe a significant minority of the women mathematics Ph.D.'s of the forties and fifties, it offers just one model of how girls of this generation grew to become active participants in the American mathematical community. In fact, they came from a variety of backgrounds and family circumstances, and each followed her own unique path to mathematics. What they all have in common is one central act of "rebellious independence": the crucial decision to set out on that path.

In his recent, provocative study, *Born to Rebel*, Frank Sulloway (1996) offers the concept of the *family niche* as a means of explaining why and how individuals emerge from their families of origin to lead lives of originality and nonconformity. As children, each of the women interviewees carved out a unique family niche within which her interest in mathematics began to grow and develop. Some of these girls came from warm families where their emotional and material needs were met and their intellectual interests were actively encouraged. Others came from more adverse circumstances in which their interests developed in spite of disparagement, or as a defense against emotional or material difficulty, or as a crucial means of self-expression. What the stories bear out, in their similarities and in their differences, is that mathematical ambition arises from a complex interplay of factors: some genetic, some familial, still others external to the family. Because the family of origin is so crucial to personality formation, it is there that I begin.

Mothers and Fathers

Thirty-one of the thirty-six women interviewed grew up in a traditional family structure in which the mother and father were married and present in the home. Of the remaining five, three (Maharam Stone, Schafer, Bates) experienced the early death of one or both parents. Domina Spencer's father was a traveling salesman, and as such saw his wife and children only at irregular intervals during Domina's childhood. Domina, her sister Vivian (twelve years older), and their mother moved from place to place as Vivian, who also became a professional mathematician, attended college at Oberlin and graduate school at the University of Pittsburgh and the University of Pennsylvania.¹ Mr. Spencer would join the family in these various locations when work and finances permitted. Evelyn Granville was the only woman interviewed to experience the marital separation of her parents; she and her older sister were raised by her mother, but her father remained a vital presence in their lives as they grew up.

Nearly all of the women interviewed came from family backgrounds in which education was valued very highly. As has already been noted, many of the women were immigrants, or children of immigrants, from central and eastern Europe. These immigrant families brought with them to America the respect for learning and culture that was the hallmark of many European societies and, in particular, a central feature of the Jewish tradition. In many of these families, the myth of a better life in a land of opportunity became an extremely powerful motivating force for both parents and children, spurring them to achievements in work and at school.

Twenty of the thirty-six interviewees had at least one parent who had attended some college. In two cases, both parents had earned doctoral degrees: both of Rebekka Struik's parents had Ph.D.'s in mathematics; Joan Raup Rosenblatt's mother had a Ph.D. in economics, while her father (a student of John Dewey) had his Ph.D. in educational philosophy and psychology.² Four of the women had one parent who held a doctorate (or equivalent degree awarded in Europe): Maria Steinberg's mother held a Ph.D. in history; Vera Pless's mother earned a dentistry degree in Russia and, on her arrival in America, went back to school for a D.D.S.; Cathleen

Morawetz's father was the Ph.D. mathematician J.L. Synge; Anneli Lax's father had a medical degree and worked as a surgeon and a urologist.

For the women whose *mothers* had doctorates, their mother's educational and professional experiences made a profound and lasting impression. Joan Raup Rosenblatt's mother worked as a professor of economics at Barnard College; while she was pregnant with Joan, she was "the first woman on the faculty of Barnard College to get a maternity leave—unpaid, but with the promise of getting her job back" (Rosenblatt: 2). Vera Pless, an only child, could not help but be aware of her mother's dental practice: "She had an office in the house when I was a child, so that she could watch after me" (Pless: 2). Rosenblatt and Pless grew up in environments where the combination of motherhood and professional work, while decidedly unusual, nevertheless seemed natural and even desirable.

By contrast, Rebekka Struik's mother never really had satisfactory employment as a mathematician, and Rebekka was always acutely aware of her mother's conflicted feelings: "While I was growing up, she didn't do any mathematics, and I saw her as very unhappy . . . being primarily a housewife" (Struik: 3). Similarly, Maria Steinberg's mother was never employed as an historian but seemed to have far fewer regrets. Her intellectual attainments made an enduring positive impression on Maria, who recalls with some fondness, "She always was interested in things of the mind" (Steinberg: 2).

For exactly one-third of the women interviewed, a fairly dramatic educational disparity existed among the parents. In seven of these families, the mother was more highly educated than the father (Spencer, Martin, Asprey, Steinberg, Larney, Barrett, and Pless); in the remaining five families, the father was more highly educated than the mother (Maharam Stone, Walton, Morawetz, Lax, and Weinstein). Curiously, in the majority of these families, the *mother* was the parent who was most adamant that her daughter be educated. If the mother was the parent with the superior educational attainment, she usually wanted her daughter(s) to have the same educational opportunities that she'd had. But if the mother was less highly educated than the father, she had nevertheless had the opportunity to observe firsthand the advantages of education. In some cases, she deeply regretted not having had more education of her own

and thus sought for her daughter what she had been unable to secure for herself.

Winifred Asprey and Lida Barrett provide illustrative examples. Asprey's mother was a graduate of Vassar College, devoted to her alma mater; Barrett's mother was a 1912 graduate of the University of Texas and a firm believer in college education. Both fathers dropped out of school—Asprey's in the tenth grade, Barrett's in the eighth—for financial reasons to help support their families. Yet both fathers went on to become reasonably successful businessmen; each is aptly characterized as a self-made man.

Winifred Asprey's father was an ambitious man with intense intellectual and political interests. After dropping out of school, he worked first as a jeweler and then as a candy jobber, staying in business during the Depression by accepting barter as well as cash. Ultimately, he left business altogether and entered city politics in their home town of Sioux City, Iowa. Asprey recalls:

I never saw Dad read anything that was trash. It always was history and biography: he loved it. . . . He knew more about current events, he knew more about history and business matters, than I think I would ever know. And I don't think that we ever differentiated at all in our minds that, you know, Mother was "college" and Dad was not—except that we knew that it was true. He was a very intelligent man, and a very kind man. He supported loads of families in the city, and some that he'd known since childhood. And everybody knew him. Everybody liked him. (Asprey: 2, 4–5)

Lida Barrett's father was ingenious and inventive, with a great deal of practical intelligence. The signal event that shaped his adult life occurred while he was still a teenager: he lost a leg in a work-related railway accident. He was fitted with an artificial leg, and some years later went on to purchase the company that supplied his prostheses, the Texas Artificial Limb Company. Barrett remembers him as someone who was "very good at numbers, really enjoyed numbers and games and things, and was very intelligent," although she adds, "I don't have a sense of how well-read he was" (Barrett: 3).

In the twenties, thirties, and forties, it was still possible—if by no means easy—for a man to make a living without having had a lot of formal education. But in those days it was far more difficult for a woman to do so. Thus it comes as no surprise that the *mothers* of Winifred Asprey

and Lida Barrett proved to be the most consistent and vocal advocates for the college education of their daughters. Asprey—the eldest of three children, with two younger brothers—recalls that her mother took an extraordinarily active interest in her education, regaling her with stories of Vassar College from a very early age. Barrett, who grew up in Houston with an older brother and a younger sister, asserts unequivocally, “My mother was the one that was determined we were all going to have college educations” (Barrett: 3). Indeed, both Barrett and her sister attended Rice Institute (now Rice University), where tuition was free in the 1940s.

Neither of Domina Spencer’s parents completed high school, but her mother had considerably more education than her father did. Her father “had a third grade education and thought that was plenty!” At the same time, he maintained a lively intellectual life. “He read continuously—history, politics—and wrote poetry continuously,” Spencer recalls. Whenever he wrote to his family, his mailings included a one-page letter and a one-page poem. She likens his work to “Edgar Guest poetry” and believes that “he would have made a very good writer” (Spencer: 4).

For Mrs. Spencer, however, the situation was very different:

Mother wanted to be an artist, and she was very much interested in music also. But what she wanted most when she was a girl was to go to Europe to study art and go to college here. Her family wouldn’t let her. She went to a business college. That was it. I don’t believe she’d even completed high school because [of] an incident over an epidemic. Mother was going to public school, [and] when she was probably around twelve, something around that, the state confiscated all her books and burned them because there was an epidemic. And my grandfather was a stubborn German, and he thought it was wrong to take those books that he had bought and burn them. [The school] wouldn’t replace them, so he wouldn’t let Mother go back to school! She was at the top of her class all the time she went to public school. She was the brightest student in the class, and suddenly, she wasn’t allowed to go to school at all. (Spencer: 4)

The unfairness of having been deprived of an education of her own—particularly in view of the fact that her older brothers *had* been allowed to finish school—led Domina Spencer’s mother to a passionate insistence on the education of her daughters. At the same time, however, she had serious reservations about the quality of the public schools, and so she undertook the education of her daughters at home.³

The experience of Tilla Weinstein illustrates how a mother who has appreciably *less* education than her husband can play a crucial—if inadvertent—role in her daughter's education. Weinstein's father emigrated from Russia to New York City at the age of thirteen. He graduated from City College and Harvard Law School and established a law practice in New York City. Her mother—whom she describes as having “almost graduated from high school; her typing teacher refused to let her graduate”—worked as a legal secretary prior to marriage and assisted her father in his law practice afterward. “I came as close to killing my mother in the process of innocently being born as one can,” Weinstein recalls, “and she was literally unable to have children after. But also, they couldn't have afforded it. They could barely afford having me” (Weinstein: 2).

Weinstein's parents' marriage was stormy, and her father was seldom at home. “For me,” Weinstein says, “growing up was very much being with my mother, and my father wasn't much of an influence at all. . . . It was a happy house when he wasn't there.” As an only child, Weinstein was her mother's pride and joy, the center of her universe: “She spoke to me at great length about absolutely everything. . . . I loved listening to her and she loved listening to me. And I imagine that just being taken as seriously as I was by my mother was very important” (Weinstein: 2).

Weinstein's mother did not encourage her daughter to pursue advanced education but, rather, encouraged her to be whatever she wanted to be. This encouragement gave Weinstein the sense of freedom, security, and self-confidence that enabled her to continue her education as far as she could go. Her mother seems to have been surprised at the outcome:

I think she never understood the implications of what she admired and encouraged in me. She would have wanted me to excel at everything and marry someone who could give me a very comfortable life financially, so I could stay home and raise her grandchildren. . . . She never quite understood how things turned out the way they did! She didn't see the connection between encouraging me in every way and my not stopping. (Weinstein: 3)

There were, of course, numerous ways in which *fathers* exerted their influence to ensure the education of their daughters. In families of daughters, younger daughters were often treated as if they were sons—either covertly, as in the case of Jean Walton, or overtly, as in the case of Barbara Beechler.

Jean Walton was the fourth of five daughters born to George Walton—headmaster of the Quaker-affiliated George School outside Philadelphia—and his wife. Again, there was an educational disparity between her parents. Her mother had been educated through two years of normal school and was a teacher before she married; then, as was customary at the time, she left teaching to devote her full-time energies to home and family. Her father had a master's degree from the University of Pennsylvania, and though he aspired to earn more advanced degrees, he never did so. She characterizes her childhood relationship to her parents in the following way:

I was very much more emotionally tied to what my father was thinking and what I might do to please my father, than I was with my mother. [But] I did not have an especially warm relationship with my father. He was a very loving—in words, and in manner, in a way—but he was not a warmly affectionate, person. He was busy, he was remote, he didn't talk very much. [Yet] somehow or other I had this strong need to please him—which I didn't recognize particularly at that point as being anything special. That came later. . . . I've in recent years checked this with my other sisters, and none of them had it this strongly. (Walton: 3)

Walton points out that she was “the last planned child” in a family of daughters. “Mother did confess to us that, indeed, the fifth one was an accident,” she recalls. “There's no doubt that Dad would have liked a son” (Walton: 4). Perhaps her father, desirous of a son, communicated his disappointment to her; she responded with a tremendous urge to please him and perhaps to fulfill his educational ambitions as well. As it turned out, Walton was the only one among her sisters to continue her education to the doctorate.

Barbara Beechler was the younger of two sisters. Her sister Virginia, six years her senior, “was a homecoming queen; she was a very beautiful girl. So there was all this nonsense about how ‘Virginia has the beauty and Barbara has the brains.’ And we were very, very different” (Beechler: 3). Barbara's interests, and indeed her entire approach to the world, contrasted sharply with her sister's:

I was very mechanically inclined—the typical little tomboy—and my father thought of me as his son, and I stayed with him all the time. But my mother and sister were constantly unhappy with whatever it was I was doing. That was bad news, you know; this insistence on baseball and running around and no dolls and so forth, was really bad news. . . . I was not my sister, and that was mentioned frequently. (Beechler: 2–3)

Beechler's father was a career employee of the Illinois Bell Telephone Company. Frustrated by the limits of his own education and by the difficulty of supporting his family during the Depression, his worries were compounded by ill health; he had been gassed during World War I and spent most of World War II in a tuberculosis sanatorium. It is clear that he sought a better life for his daughters and in particular firmly believed that both of them should have a college education. "My father was thought to be a fool by all of his colleagues at the office," Beechler recalls, "because he was educating his daughters" (Beechler: 2).

While both Beechler daughters did, indeed, complete college, it was Barbara whom he saw as the child who could fulfill his own dreams and aspirations. Her father's idealistic goals for her were consonant with her own interests and desires but manifestly at odds with her mother's practical and pragmatic view of how her daughters' lives should unfold:

My father was *inordinately* proud of me and insisted that I was going to be a scientist. And so, you know, from a very early age, I really *did* think I was going to be a professor of physics, long before I could pronounce the word *physicist*! Daddy thought that was really very important. My mother, on the other hand, I now realize, thought that was a terrible idea. I mean, I'm sure she worried terribly about this whole thing. She thought I would never finish going to school. She thought [I should] go out and earn an honest living, for heavens' sakes! (Beechler: 2)

As Barbara Beechler grew older, she ultimately developed much closer relationships with both her mother and her sister. What is more, she came to realize that her mother's decision to go to work during World War II, while her father was ill, was what made it possible for her to attend college at all. According to Beechler, it was her mother—despite all her misgivings—who "essentially put me through school" (Beechler: 10).

While it was often true that one parent took a more active interest in a daughter's education, the support of both parents—and occasionally the whole family—was usually what made a daughter's education possible. The upbringing of Edith Luchins provides an illustrative example of this. Luchins emigrated with her family from Poland to New York City when she was just six-and-a-half years old. Neither of her parents had had very much schooling in Poland, and her father felt the lack of formal education especially keenly: as a Jew in Poland, a college education had been all but closed off to him. Like the fathers of

Winifred Asprey, Lida Barrett, and many of the other women interviewed, Luchins's father was largely self-educated and had a lively intellectual life of his own making. Edith—as the oldest child and the one most inclined toward academic work—became the academic standard-bearer for the next generation:

I had a brother, but he was younger; and as a child he was not well, so he had trouble doing the regular schoolwork. Then he went early into the Army, so he wasn't going to be the one to carry out the educational aspirations of the family. . . . The whole family supported me and wanted me to succeed. Everybody agreed: "Edith's the scholar!" So that was taken for granted. (Luchins: 6, 37)

Thus Luchins's entire family—her parents, her two younger sisters, and her younger brother—came to salute and to support her academic goals as they would the achievements of an eldest son.

Many of the women with whom I spoke had the good fortune to be raised in families where *both* parents communicated to *all* of their children an infectious enthusiasm for learning and culture. Herta Freitag describes just such an environment in her vivid recollections of family life in Vienna in the 1920s. Her father was a managing editor of *Neue Freie Presse*, which she describes as "Vienna's foremost newspaper"; her mother was an artist; and her brother Walter—who has had a long career as a conductor with New York's Metropolitan Opera—was a musical prodigy whose "talent was discovered when he was five years old." She recalls her family life as one of shared intellectual and artistic passions:

What we specifically liked was to sit together—specifically, say, weekends—together, but everybody doing his thing. Father would almost invariably read the newspaper, Mother would do her embroidery, Walter would compose, and I would do mathematics. We even coined a German name for that—it was very, very important for us: *Eine wonnige Gruppierung*. *Wonnig* is a rarely used word—a delightful *Gruppierung*—group togetherness. (Freitag-1: 2)

Similarly, Joan Rosenblatt, both of whose parents had Ph.D.'s, describes the environment of her childhood as "supportive, and stimulating" (Rosenblatt: 2). Like Edith Luchins, she was the eldest of four children, with two sisters and a brother. Remarkably, she adds, "all of my siblings went to graduate school, [although] I'm the only one who got a Ph.D." (Rosenblatt: 3).

While most of the women interviewed had at least one supportive parent who valued education and achievement, two of them report that they

generally lacked this kind of support in their families growing up. Dorothy Maharam Stone was the fifth of six children in her family (three girls and three boys). Her father was a rabbi and her mother died when Maharam Stone was about five years old. Her family valued "the education of boys in rabbinical studies," but "the education of girls didn't matter" (Maharam Stone: 2). While her father did nothing to prevent her from going on in her education, she had to look outside the family for support and encouragement.

Similarly, Margaret Willerding recalls that her parents—neither of whom had graduated from high school—were not particularly interested in her education. But from a very early age, she resolved that she "was the kind of person that was going to go [to college] come hell or high water. . . . I was very ambitious" (Willerding: 2–3). Her parents, for the most part, adopted a *laissez-faire* attitude toward her ambitions. But when Willerding began work toward the Ph.D., her parents spoke up at last:

And that's when my mother said, when I said I was going to get my Ph.D., she thought that was rather silly. . . . I think my mother wanted me to get married, you see. And I wasn't the kind of girl my mother wanted. She wanted a social butterfly and she got a bookworm. But at least my father said, "If you want to do it, go ahead and do it." So I did. (Willerding: 3)

Sisters, Brothers, and Others

While parents have an important part to play in developing the talents and interests of their children, the environment of the family is a complex web of relationships that may also involve sisters, brothers, and significant others. In families with two or more children, interactions between siblings play a decisive role in forming the personality of each individual child. In families with only one child, however, the larger community often plays a key part in shaping her interests, values, and ambitions.

Ten of the interviewees were only children. Vera Pless is a good example of an only child whose early life was clearly shaped by the intellectual and cultural vitality of the community in which she grew up. "I lived on the west side of Chicago, in the Lawndale district, which was a large area for Jewish immigrants at that time," she recalls. "It was a very intellectual atmosphere. . . . It was not unusual for kids to teach other kids in that

neighborhood" (Pless: 1). In particular, when Pless was about thirteen years old, her Sunday school teacher, Samuel Karlin—at that time an undergraduate at Illinois Institute of Technology—was impressed by her intelligence and took her under his wing, tutoring her in Hebrew and calculus. He would later go on to a distinguished career of his own in pure and applied mathematics.⁴

Tilla Weinstein feels that being an only child—and specifically, being *brotherless*—gave her the freedom to escape some of the conventions of femininity. "I was less aware of what it meant to cater my aspirations to the female role," Weinstein says, "than I would have if there had been a brother in the house who was treated differently" (Weinstein: 2). During the crucial years of early adolescence, when the social imperative to be pleasing toward boys can easily derail a young girl's intellectual development, she benefitted from the almost exclusive company of other girls like herself:

My close friends in high school didn't have brothers either. We were at a special girls' junior high. And I think that helped us to plan our lives in ways that weren't as restricted as they otherwise would have been. Also, we were the best hope of our families, whereas if there had been a son, the son would have been the best hope for the family. (Weinstein: 2–3)

Twelve of the women interviewed had just one sibling. It is curious to note that none of the women who had a younger brother has very much to say about him; older brothers, on the other hand, are recalled with warmth and affection. Grace Bates and her older brother were bound together by the experience of losing their mother at an early age and remained extremely close. Her brother completed high school on the eve of the Depression and went directly to work; as soon as he was able, he sent her a little bit of his salary every week to help out with her expenses during high school and college. Similarly, Herta Freitag and her brother, Walter Taussig, separated by less than a year in age, were extremely close as children and have remained devoted lifelong friends. Even Anneli Lax, who characterizes her childhood as having been extremely unhappy, remembers her half-brother, five years older, with fondness. What these three women have in common is that each was drawn closer to her brother through the experience of shared adversity: for Bates, a mother's death; for Freitag and Lax, escape from Nazi persecution.

Five of the women grew up with one older sister. Such two-sister dyads are frequently studied in contrast, particularly if the sisters are close in age, as the relationship between Barbara Beechler and her older sister Virginia clearly illustrates. Margaret Marchand and her older sister show a similar sort of split. While her sister "was not interested" in college, Marchand became increasingly passionate about education as she grew older (Marchand: 2).

Marchand's parents had emigrated from the Ukraine to Canada as adults. "Their education . . . since they were from the peasant class, amounted to approximately three or four grades, with no English," she recalls. Her father was extremely ambitious, studying English in night school and then using his night school textbooks to teach his children. "By the time we went to school" says Marchand, "we were bilingual" in English and Ukrainian. Her father firmly believed "that it was obvious you couldn't get out of poverty without an education" and encouraged his daughters to succeed in school. Marchand embraced her father's attitudes and aspirations. Her sister, by contrast, adopted attitudes much closer to those of her mother, who "was of the school that said women stayed home and got married and had babies" (Marchand: 1-2).

Other two-sister dyads show less tension and less conflict in values. Domina Spencer's older sister Vivian played a key role in her home schooling and introduced her to the wonders of mathematics. The lack of conflict between the two sisters may be attributable in part to the difference in their ages: Vivian, twelve years older, may have been more like an aunt than a sibling in the sense that her presence in the family did not engender heated competition for parental attention. Indeed, for much of Domina Spencer's childhood, she had the best of both worlds: the companionship of a sister, the attentions of an only child. But even when two sisters are close in age, each can carve out a distinctive niche for herself that allows her to express her individuality without conflict in the family unit. Both Evelyn Granville and Joyce Williams had one sister about a year and a half older than herself. In each case, the two sisters each pursued their own interests and goals without engendering opposition within the family.

The remaining fourteen of the women interviewed came from families of three or more children; of these, five were eldest children. It has been

argued that eldest children often exhibit greater conformity, while younger children are more rebellious, imaginative, and nonconforming; but everything depends on the values of the family in which one was raised in the first place (Helson 1968; Sulloway 1996).

The experiences of Rebekka Struik, the eldest of three daughters, illustrate this quite clearly. By comparison to the larger society, her own outlook is decidedly original, iconoclastic, and nonconforming. But in a manner of speaking, Struik has indeed been a conformist to the unconventional intellectual and political values of her family. Both of her parents held Ph.D.'s in mathematics and were active throughout their adult lives in left-wing political causes. In religious outlook, she says, "both of them were atheists, but my father comes from a Dutch Calvinist background, and my mother comes from a Jewish background" (Struik: 2). It was assumed in the family that the children would pursue careers in science; and in fact, both Rebekka and the younger of her two sisters, an ecologist, have done so. It is the middle sibling "who rebelled against the overall intellectual atmosphere in our family," devoting herself to marriage and children and becoming actively involved in the Catholic Church (Struik: 2).

Winifred Asprey, Joan Rosenblatt, and Edith Luchins are also eldest children; they, too, can arguably be called conformists to the values of their families. But those families were rich intellectual environments, in which curiosity and creativity were valued. The divergent backgrounds and the intellectual passions of Winifred Asprey's parents, for example, created an intellectually exciting home life. "We were allowed to read anything under the sun," she recalls, "[with] no restrictions whatsoever in the house" (Asprey: 2). Asprey's two younger brothers likewise embraced the predominant values of the family; as adults, one became a chemist, the other, an historian.

"Laterborn" children seem to face a mixed bag of advantages and disadvantages growing up (Sulloway 1996). In large families, younger children often benefit from a great deal of attention, not only from the parents but from the older children, who help to raise them. This situation is best illustrated by the childhood experiences of Mary Dean Clement, who grew up in and around Nashville, Tennessee. Her father was a Methodist minister, while her mother—a graduate of George Peabody Normal

School (now part of Vanderbilt University)—had been a schoolteacher prior to marriage. Clement was the youngest of five children and recalls that “our whole family was always studying. My father always had a book in his hand. . . . And we read voraciously. . . . I was just *extremely* lucky to be born into a family that considered intellectualism fun” (Clement: 4). While the whole family was steeped in education, reading, and learning, her mother and her next older sister had the biggest impact on her early life. She attributes much of her affinity for mathematics to their influence:

[F]rom the way I was brought up, I was quite ignorant of what is common knowledge, to wit: that girls can’t do math. Therefore, being ignorant, I liked math and I did it without knowing I wasn’t supposed to. Tied in with that is the fact that both my mother and my next older sister majored in math in college, and both of them got me started when I was curious as a child, not by working the problems for me but by showing me how to do them. (Clement: 1)

Clement, like Domina Spencer, received much of her formal education prior to high school at home; her education was a project in which the whole family participated. The Clement household was a vibrant place, the center of life and learning. Prior to high school, Clement reports, “I did not have any friends, real friends,” but her family seemed to provide for her all the social life she needed. In those days, she recalls, “I was miserable if I was out of the cocoon of my family” (Clement: 4–5).

But many of the other women who were laterborns did not receive the same quality or degree of attention from their siblings and parents that Clement did. I have already mentioned Jean Walton, who was the fourth of five daughters, and Dorothy Maharam Stone, who was the fifth of six children. Their recollections of childhood do not include memories of being doted on by older siblings, nor do they include stories about intellectual excitement at home. As children, they were both loners, intensely focused on the importance of doing well in school. While both had fathers who valued learning, family life did not have the same quality of intellectual adventure that it had for Mary Dean Clement, Winifred Asprey, or Herta Freitag. In their jobs as rabbi and headmaster, respectively, the fathers of Maharam Stone and Walton created and nurtured intellectual communities in the world outside—but seemed disinclined to do so at home.

For some laterborn children, older siblings helped to mediate and resolve difficult conflicts with parents. Vivienne Morley's childhood experiences provide a case in point. She was the youngest of four daughters, widely spaced apart in age. Her parents, Polish emigrants from impoverished backgrounds, were diametrically opposite in education and outlook. Her father had very little education and a rather poor command of the English language; her mother, by contrast, excelled at languages, including English, Polish, and Yiddish. Her mother was the dominant parent, valuing education for her daughters, not for its own sake but "as a social asset": her chief concern was "in marrying her daughters off, marrying her daughters off *well*" (Morley: 2). Thus she greeted the academic and professional success of her first three daughters (the oldest became a history teacher, the next an accountant, the third a physician) with considerable dismay.

When Morley began to manifest scholarly, bookish inclinations as an adolescent, her mother sought to undermine her intellectual aspirations, hoping instead to see her youngest daughter attain the kind of conventional married life she had wanted so badly for herself. Morley's next older sister—nine years older than she—intervened twice to help relieve the tension, inviting Vivienne to leave her parents' home in Philadelphia to live with her in Oregon. For several years—first in high school and later in college—Vivienne Morley lived thousands of miles away from her mother's interference, enjoying the freedom to explore her academic interests with the support of a sister who nurtured and shared them.

Larger families, by virtue of their sheer size and diversity, can sometimes provide emotional and material resources that smaller families cannot. Likewise, the extended family and the larger community can play a role in shaping the future direction of a young girl's life that is almost as significant—in some cases, *more* significant—than that of the nuclear family. The experiences of Alice Schafer provide a case in point.

Unlike the other women in this study, Alice Schafer never knew her parents and never experienced the environment of a nuclear family while growing up. While still an infant, she was placed in the care of two aunts, Pearl and Beulah Dickerson. For the first few years of her life, Pearl Dickerson, who lived in Richmond, engaged a nurse to care for Schafer. Ultimately, she went to live in rural Scottsburg, Virginia, with her "maiden aunt" Beulah (Schafer: 2).

The Dickerson sisters provided a model of female self-sufficiency that Alice Schafer might not have seen had she grown up in a traditional family. In particular, Pearl Dickerson was able to keep her job during the Depression, despite being married to a man who also worked:

She worked for the federal government and, fortunately, did not lose her job during the Depression, although she was married. She had no children. She was greatly criticized for not giving up her position, since her husband had not lost his. And [to keep her job,] she had to point out how many people she was caring for. What amused me was that she included her maid as one of the persons she was supporting because she did have help seven days a week. (Schafer: 3)

Back in Scottsburg, Beulah lived on a farm and was able to support herself partially by renting the land out to others who worked it; she was also one of the many people who received support from Pearl in Richmond.

While the Dickerson sisters and their family provided Alice Schafer with substantial emotional and material support growing up, she was also raised, in a manner of speaking, by the larger community of Scottsburg. She recalls, for example, that while she was on the high school debating team, some of her best coaching came from the town postmistress. When the time came to consider application to college, a prominent man in Scottsburg offered to help her get a scholarship.

Evelyn Granville is the only African American woman among the interviewees. More than any of the other women interviewed, her childhood was shaped by interactions both within her nuclear family and within the extended family and the larger community of which she was a part. Granville grew up in the African American community of Washington, D.C., where women—even, and perhaps especially, women with children—had always worked for a living. Her mother had graduated from high school and worked as a secretary until she married; when she separated from her husband, she returned to the workforce as a maid. Her mother's sister, who was always very close to the family, "had more of an academic bent" and prepared for a job in teaching. "But the first year she was out," Granville says, "she didn't get an appointment." Ultimately, "both she and my mother ended up working at the Bureau of Engraving and Printing in Washington" (Granville: 1-2).

As a very young child, Granville was keenly aware of what was possible for African American men and women in Washington, D.C.; the

experiences of her mother, her father, her aunt, and their extended family and friends illustrated the range of possibilities. She noted, first of all, that the opportunities open to women and to men, limited as they were, were also quite different. Her father worked at “a variety of jobs,” selling vegetables from a truck during the Depression and occasionally working as a janitor; but the only work he was able to find in the federal government was as a messenger. Black women, on the other hand, seemed to have somewhat greater employment opportunities at the federal level, working not only at the Bureau of Engraving and Printing but also in the Government Printing Office (Granville: 3).

Beyond any doubt, Granville knew that education was the key to expanded opportunities and a better life:

Black people valued education. Black people—we weren’t *black* then, you understand; we were *Negroes* or *colored* then—colored people knew that in order to progress, you needed a college education. And, of course, our greatest, our most evident role models then were black, colored, Negro teachers. And of course, the teachers represented success; they represented stability in the community. They lived better than anybody else, and so naturally, you wanted to be like they were. And in order to be like they were, you needed an education. . . . So it was never a question of whether you were *going* to go to college. (Granville: 3)

In terms of their impact on her early life, Granville’s teachers assumed an importance comparable to that of her family. “I saw black women—attractive, well-dressed women—teaching school, and I wanted to be a teacher because that’s all I saw. I was not *aware* of any other profession” (Granville: 3).

Thus for Granville—and, indeed, for all of the interviewees—the early development of personality, intellectual interests, and academic ambitions was founded on crucial interactions within the family and in the wider community as well. In the next section, I consider how these childhood experiences helped to create key images of adulthood on which lives and careers are built.

Images of Adulthood and the Formation of Ambition

How does a young woman form the desire to become a mathematician? More generally, how does she form her aspirations? How does she form an image of adult life in general, and how does she conceive of what her

own adult life will be like? At what point in the process does the pursuit of mathematics become a part of the plan?

The images of adult womanhood that girls form as they grow up are constructed in part from their observations of the behavior of the adults around them. They observe their mothers and fathers, male and female relatives, men and women in the community and at school. They observe how men and women interact in society and in the larger culture. They often tailor their aspirations so as to conform to the positive aspects of the models of adult womanhood they see around them. But when the images of adult womanhood to which they are exposed seem too oppressive, too rigid or constraining, they can form ambitions that are openly defiant of the cultural norms for women. Indeed, for many young girls, the formation of ambition combines elements of conformity and defiance.

One of the central features of the myth of the mathematical life course is the idea that mathematical talent is innate, emerges early in childhood, and must be nurtured from an early age. For the women in this study, however, mathematics was just one among many interests they had as children. In only comparatively few cases does mathematics appear to have been a chief interest from early childhood on. Mary Dean Clement is the only one of the women interviewed to suggest that her mathematical interests and abilities were already manifest in infancy. She recalls that her three earliest memories, dating back to "before I was three years old," were very clearly of a mathematical nature. "Two of these definitely had to do with geometry, and the third had to do with my disturbance that something was not symmetric. I think these memories and understandings occurred before my family had much opportunity of training me" (Clement: 1). Grace Bates also recalls that she had an interest in mathematical games as a toddler, but for most of the women, an interest in mathematics did not emerge until after they had started school.

Like Evelyn Granville, many of the women in this study decided early on that they wanted to become teachers. Because Granville grew up in a community where adult women were *expected* to work, she came to idolize her teachers because they were her only model for what a successful, productive, well-respected woman of color was like. For many of the other interviewees, teachers were frequently the *only* adult women

they had ever met who worked outside the home and maintained an ongoing, vital connection to the world of knowledge and ideas. Thus it was natural for them to decide at an early age in favor of a teaching career; only later did mathematics emerge as the subject they would go on to teach.

For some, a desire to teach grew naturally out of the love of learning. Tilla Weinstein reports, for example, that “no matter which grade I was in—first, second, third—among the things I wanted very much to do was to teach at that level” (Weinstein: 3). For Margaret Marchand, becoming a teacher meant a new life beyond the confines of the rural Manitoba community in which she grew up:

The only thing that I remember is, even as far back as third grade, since the schoolteacher was the only other role model that I saw, outside of the farmers and their families, I was determined that I wasn’t going to stay in that area. I was at least going to be a schoolteacher. (Marchand: 2)

But in a few cases, the interest in mathematics and the aspiration to teach emerged nearly simultaneously. Herta Freitag provides the best example of this:

[A]t that time I kept a diary, which I still have. It is, of course, in German. And I was twelve years old, and what the diary says is, “School is sort of all right, but it seems to be the case that getting an education is equated with memorization, which I find simple but boring. But I have finally found a subject where I don’t have to memorize: mathematics. I can just think it out.” And then comes the next entry: “I like mathematics more and more from day to day, and I now know that I want to become a mathematics teacher.” And then, the last entry, still at twelve, I rather like: “I have changed my mind. I do not want to become a mathematics teacher. I want to become a *good* mathematics teacher.” (Freitag-1: 1)

“It was my mother, really,” says Margaret Martin, “who made the decision that I was going to have a career where I could earn a living, rather than being married and then dependent upon my husband completely” (Martin: 3). Martin’s mother had been a teacher but had quit her job before she married. Disappointed by a marriage that was neither particularly happy nor particularly satisfying, her mother was determined that Martin would not make the same mistakes she had. “From the time I was fairly young, it was assumed in the family that I would be a teacher,” Martin recalls. “In those days, there were not many careers for

women, and my mother regarded teaching as the most desirable" (Martin: 1). Martin accepted her mother's decision without question.

By contrast, Tilla Weinstein *observed* her mother's unhappiness and resolved for herself that she would have an independent life and not allow herself to feel trapped in a marriage:

I might be a lawyer; I might be a clothing designer; I might be a buyer for a department store. I don't think I ever thought in terms of owning a business. Entrepreneurial adventures were not for me! I thought at different times after high school of being a writer. But probably the most persistent sense was that I wanted to teach. Behind all of this—which is important—was the knowledge that I was not going to put myself in the situation which I saw my mother in. I expected to work in order to not be dependent. I didn't see myself as working in order to attain some great status or to excel particularly. I wanted control of my existence. And even though I expected to get married and I expected to have children, I never wanted to have to stay in a bad marriage. (Weinstein: 3)

What Margaret Martin and Tilla Weinstein have in common is that each began to form her vision for the future in reaction to the adverse circumstances of her mother's life.

Martin and Weinstein were certainly not the only women who formed such reactive ambitions. Alice Schafer's earliest aspirations arose in defiant rejection of the limitations she saw placed on girls and women everywhere she turned. In particular, she began to have an *emotional* investment in mathematics when, as an elementary school student, it was first suggested to her that she might not be *able* to do mathematics. When Schafer and one of her female classmates were skipped from the third to the fourth grade in their Scottsburg, Virginia, school, the teacher told Schafer's Aunt Beulah, "Well, I think the girls will do all right in fifth grade, but I don't know whether they will really be able to do long division." Schafer responded indignantly to the teacher's concern: "That was a challenge I couldn't take! I was determined to learn to do long division in the fourth grade. So I think that was my first *feeling* about mathematics" (Schafer: 1).

From an early age, Alice Schafer was keenly aware of the many kinds of discrimination a woman could suffer. She had seen, in particular, how a woman teacher could lose her job for reasons unrelated to her performance: "One of my favorite teachers, Glenna Snead, lost her job when she got married. . . . Glenna was an excellent teacher, and I thought,

how horrible that she could not teach because she had gotten married" (Schafer: 7). Schafer's Aunt Pearl—undoubtedly among her most powerful, positive female role models growing up—was a woman who worked and who did *not* lose her job when she married. Outraged by the example of Glenna Snead and emboldened by the example of her Aunt Pearl, Alice decided early on that she, too, would be a working woman: "I was just going to have a career, period" (Schafer: 7). Moreover, she resolved that her life would be *different* from the average working woman's: she would have a career, but it would *not* be in teaching.

In the twenties, thirties, and forties, most young women—no matter how unconventional their career aspirations—nevertheless anticipated that they would marry and have a family when they grew up. Even as children, however, many of the women in this study seemed intuitively aware of the difficulty of combining marriage and motherhood with meaningful work in the world. For Alice Schafer, the best plan was to get her intellectual and professional life underway and worry about marriage later. In fact, as a young girl she had more or less decided on the best age for marriage: "I didn't know to whom, but I was going to get married when I was twenty-seven" (Schafer: 7).

But Dorothy Maharam Stone, who saw marriage as yet another among many obstacles standing in the way of her goals and dreams, simply resolved *never* to marry:

What I thought I would like to do, was to learn. But I didn't see any way I could get a job. In those days, many jobs were closed to Jews. They couldn't get jobs. For instance, there were many Jews among my classmates, and no Jewish teachers at all, any more than there were Jews working for banks or anything like that. So I thought, "I'm not going to get married. I'm going to have a house all by myself, rooms all by myself. Then I can do what I want in the evenings, educate myself." Meanwhile, I suppose I knew I didn't have the sort of personality to sell fancy clothes in the department store. I thought I might get a job in the domestics department. That was probably the easiest way for a Jewish girl without any specific training to get a job. (Maharam Stone: 3)

Vera Pless, by contrast, recalls having no such misgivings about marriage as a child. While she had no clear sense of how far she would pursue her education, she seemed to know with certainty that she would marry and have children. "I was going to be a wife and mother," says Pless. "Even though my mother was professional and everything, she had a big

family here, her sisters. And it was quite clear that all the kids, the women, the girls, were supposed to be wives and mothers" (Pless: 3). Whatever tensions Pless's mother may have experienced between her work as a dentist and her family life may have been lessened—or at least obscured from view—by the fact that her dental office was right at home.

But Rebekka Struik observed firsthand the intense and often painful conflict her mother experienced between her responsibilities as a wife and mother and her desire to do mathematics. Unable to resolve the conflict in her own life, Struik's mother transmitted confusing messages about work and family to her children:

She filled me with conflicting pictures of my possibilities as an adult. . . . It was clear she loved math; she talked about how wonderful it was. [But] there was this whole conflicting message: that you've got to marry and have kids but if you're going to be a scientist, no man you'd want to marry would marry you! And so this was all very disturbing. And I was determined I would not be stuck with just kids and diapers for a sizeable part of my adult life. (Struik: 3–4)

Augusta Schurrer, like many of the women interviewed, developed a dual set of ambitions in childhood. Growing up in poverty in New York City, she was imbued from a very early age with a sense of the importance of work and self-sufficiency, although she wasn't quite sure what she would do to make a living. At the same time, she believed that at some point in the future she would be married and no longer working outside the home: "Somebody would take care of me, after a while" (Schurrer: 4). Clearly envisioning both work and marriage as separate phases of her future life, Schurrer expended little energy worrying about what might happen if these disparate visions ever came into conflict. Like many of the other women interviewed, she skipped grades in school, was sharply focused on her studies, and remained content to live her life day to day.

Indeed, for most of the interviewees, childhood was a time to learn, to observe the world around them, to wonder and to dream. With the approach of college, however, each woman was called on for the first time to make plans—however tentative—for her future. And in the act of making these plans and following them through, she began to experience the excitement and the conflict of life as a woman in mathematics. In resolving the inevitable problems that followed, each woman drew on her own resources—her family, her community, her intelligence, her ingenuity, and the images of adult life she had seen or created in childhood.