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DATABASES
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FURTHER INFORMATION
A movie of lipid droplet formation from the American Society for Cell Biology: http://www.molbiolcell.org/content/vol0/issue2003/images/data/E03-06-0368/DC1/video2.mov.MOV
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ESSAY

Women in cell biology: how personal lives shape careers

Fiona M. Watt

Abstract | For women scientists who have 'made it', there is no standard route to personal happiness and professional success, although a universal attribute is an enduring passion for science. Growing up, some scientists enjoyed parental support, whereas for others low expectations or a geographical disadvantage were a spur to achievement. Partners can be good, bad or indifferent, but having children is not a bar to success.

As Editor-in-Chief of the *Journal of Cell Science*, I have had the opportunity over the past two years to publish a series of interviews with senior women scientists, many of whom are cell biologists. I was particularly interested to find out how their careers have been affected by their sex and how being a woman scientist has changed in the past 30 years. Previously, I discussed the obstacles to achieving an equal representation of women and men in the most senior scientific positions[1]. In this article, I discuss the impact of our personal lives on our professional lives, and our aspirations for the future.

Childhood

Sometimes it seems that being a woman scientist involves a round-the-clock battle for survival and recognition[1]. But scientists, of course, have lives outside the laboratory, and the formative influences on my interviewees make for interesting reading. Danielle Dhouailly, for example, was inspired to become a scientist because of an early love of the natural environment[2]: "One of my first memories is learning to prune orange and lemon trees and to raise chickens with my grandfather in Tunisia" (FIG. 1). Sharyn Endow[3], who was born in Oregon, USA, to first-generation Japanese–American parents, was also inspired by nature and remembers growing up in an idyllic rural setting, amid rivers, streams and waterfalls.

Family is also important. Elaine Fuchs[4] was deeply influenced by her aunt, a biologist and ardent feminist. Growing up in Argentina, Julia Polak's parents were extremely supportive, helping her financially so that she could move to the UK[5]. Pritinder Kaur[6] recalled, as a young girl in India, her parents' great regard for higher education: "I vividly remember my mother introducing me to someone who had just completed a Ph.D. degree with the kind of reverence afforded to a demi-god." Mary Osborn[7], who was raised in the UK, said that an important factor in her career has been the belief, which was instilled in her by her parents and by her schooling, that she was capable of doing anything she wanted.

Sometimes parental expectations were low, but this worked as a spur to achievement. Elisabetta Dejana[8] grew up in a traditional Italian family — the birth of a boy was celebrated, whereas the birth of a girl was a disappointment. She said: "I remember that when I was asked what I wanted to do when I grew up, I used to answer 'a secretary'. Nothing could be better than this!" Danielle Dhouailly[2] was the first of her family to attain a high-school education: "I was very successful academically, but my father always said: 'If only she was a boy…'"

Finding a mate

Another important influence on women scientists is whether or not they take a partner (FIG. 2). Several interviewees paid tribute their partners[7,9], including men who had put their wives' careers first[9] or who had endured years of separation because of the difficulties of forging two careers in the same city[10] or even country[11]. Joyce Taylor-Papadimitiou[12] said of her husband: "He is probably the most important single factor in allowing me to progress as I have in science." Sometimes the partner is also a scientist[6,7,11,13,14], and the women I interviewed described this as a positive aspect of their relationship. Indeed, I could not persuade anyone to discuss the competition/rivalry that can arise in a dual-career couple, or the difficulty of achieving independent recognition in situations in which the man is older or perceived to be more eminent.

However, women scientists do have their fair share of difficulties when it comes to finding a mate. Danielle Dhouailly[2] said: "I fell in true love twice, each time with a scientist. I was rejected twice, each time for the same type of woman, who did a PhD thesis, but did not continue her career." Her experiences were echoed by Betty Hay[15]: "Early on, I dated many attractive young men, including medical students. Most were looking for home-makers. Their taste for career females was not high." Caroline Damsky[16] recounted: "When I did start to think about going for an MD or PhD, my fiancé at the time took a very dim view, which resulted in our breaking up." Zena Werb[17] explained her situation as follows: "I did not choose career over family. I never thought that I was anything but superwoman. But finding a partner who would

accept that (that is, the male equivalent of Lois Lane), proved less than successful. I found I could control my access to great science, but not to great men!"

Some of the women that I interviewed had undergone a divorce[8]. For Anna El'skaya[18] this had the positive effect of encouraging her to leave "the rather provincial town of Donetsk", Ukraine, and to head for the greater career opportunities that were afforded by the capital city Kiev. Irene Leigh[19] found that being a pioneer in her profession had a significant personal cost: "Certainly my marriage to a fellow medical professor didn't survive the 30-year mark. Perhaps it is the overpowering need of successful women of my generation to forge ahead that has caused the epidemic of midlife crises in their spouses. These men have had to cope with a rapidly changing set of values, from home-based mothers to working wives. Many have now embarked on second marriages, often with members of their team such as their secretaries, nurses or junior doctors. Hopefully younger generations will not find such personal conflicts, because there is genuinely greater gender equality."

Children

It is clear from most studies of women scientists and from my own interviews that children are a big issue. Those in my sample who remained childless commented that this has provided flexibility and that the members of your lab and your colleagues are, in effect, an extended family[4,10,11,17,20]. Having children can make moving abroad for postdoctoral training difficult[21,22], although, if you have a supportive partner[22], certainly not impossible. Nevertheless, it is obvious that having children is not, in itself, a bar to professional success. Julia Polak[5] remarked: "When I look at my research output I do not see any correlation between my publication rate and my family responsibilities." Irene Leigh[19] commented: "Being facetious, I would say that experience with a household of unruly teenagers is a great preparation for running a lab: sibling rivalry and professional rivalry have a lot in common."

It comes as a relief to learn that children who have grown up with a scientist for a mother do not consider themselves to be disadvantaged. Irene Leigh[19] (FIG. 3) and Janet Heasman[13] each have four children. Irene said: "I'm pleased to say my children are proud of me and don't blame me for a deprived infancy, although I do wish that I had had more time with them when they were small." Janet concurred: "…so far, none of our children has expressed any regrets at my abandoning them each day. The fact is that our relatively crazy lifestyle was the 'norm' for them and they have all grown up into healthy and well-adjusted adults." These comments are welcome news for women scientists with small children, because women often feel torn between their domestic and lab responsibilites[6,22]. Penny Jeggo[23] recounted: "I was filled with guilt when my son, aged 2, greeted me on my return from a meeting with the words 'Hello, are you my Mummy? I'm Matthew'." Talila Volk[22] said that she felt continuously torn between her family and her research career, but now that her children have grown up, she sees things in perspective: "I feel that being a scientist has made me a happier person and therefore overall a better mother."

No matter how committed a woman is to combining science and motherhood, she can be defeated by the practicalities. When Irene Leigh[19] had her first child, there was no maternity leave entitlement, so she worked until she went into labour, took four weeks vacation and then returned to her post as a junior doctor. Now, many European countries provide paid maternity (and paternity) leave, and British funding bodies, such as The Wellcome Trust, have schemes to allow people to re-enter science after a career break[1].

Another stumbling block can be the availability of reliable and affordable childcare[14,24]. Anna El'skaya[18] attributes her professional success to the fact that her mother took take care of her children while she was in the lab. However, this option is not open to everyone. There is considerable variation in the childcare options between different countries, although overall there is more choice than 30 years ago.

Figure 1 | **Danielle Dhouailly with her grandfather in Tunisia.** Reproduced from REF. 2.

Figure 2 | **Elisabetta Dejana as a girl in Bologna.** Reproduced from REF. 8.

Geography and politics

Although all women scientists have to deal with the issues of whether or not to take a partner or to have children, my interviews uncovered experiences that were unique to a particular culture, country or political era. Talila Volk's[22] late start in research is an example. She grew up in a kibbutz in Israel and, after she had gained her B.Sc., she had to contribute several years to the kibbutz as a biology teacher. She was also obliged to serve in the army, which is certainly not a consideration for young British Ph.D. students.

The late 1960s and early 1970s were a time of political turmoil. In the USA, Elaine Fuchs[4] was involved in Vietnam war protests, whereas Caroline Damsky[16] was concerned with improving inner-city race relations. Amaro Cano[10] was a Ph.D. student in Spain during the last years of General Franco's regime, when opposition to his dictatorship resulted in the closure of the universities, and some of her colleagues were imprisoned because of their political affiliation with the Communist Party. Joyce Taylor-Papadimitriou had to postpone setting up her lab in London, UK, because her husband was deprived of his passport from 1967–1974, the era of the Greek colonels[12]. Anna El'skaya[18], working in Kiev, emphasized

Figure 3 | **Irene Leigh as a young mother.** Reproduced from REF. 19.

that since the break up of the Soviet Union, collaborations with scientists in countries with greater resources continue to be very important.

The main challenge that Anna Wobus[25] faced in establishing her career was not her sex but politics. Her father was a protestant priest and, in Communist Germany, this prevented her from attending high school, so she had to struggle to complete her education. As she was never a member of the Communist Party, she had no chance to pursue an academic career at a university. Furthermore, this was a time when the theories of Trofim Lysenko were the order of the day and Mendelian genetics could not be discussed openly. In the end, she found a haven of scientific freedom in the Central Institute of Genetics and Crop Plant Research in Gatersleben, Germany. Although not being in the Communist Party was a significant handicap, Anna encountered no difficulties on account of her sex: "Actually, in the former GDR, young female and male students did have equal opportunities … After the fall of the Berlin wall, I realized that to be able to work as a woman in science was actually less straightforward in Western European society."

Xin Lu[9] grew up in China and moved to the UK to do her Ph.D. research. Xin, like Anna, had not realized that being a woman scientist could present any problems: "In 1982, the director of the biggest and most prestigious Cancer Institute in China (Chinese Academy of Medical Sciences), where I did my master's degree, was a woman. Almost 40% of the group leaders in that Cancer Institute were women. Therefore the low percentage of female group leaders in UK institutes and universities was one of the culture shocks I experienced when I arrived in London in 1986. I grew up in China with the mentality that 'women are half of the pillars that support the sky' (men being the other half)."

Looking to the future

When I asked my interviewees about their remaining career ambitions, almost everyone expressed a passion to continue research, to apply their discoveries to human benefit, and to nurture the careers of young scientists. Intriguingly, rather few women expressed a desire to achieve power in traditional male preserves, such as running a research institute or becoming dean of a medical school[19] (although Caroline Damsky[16] has recently become Associate Dean for Academic Affairs in the School of Dentistry at the University of California, San Francisco, USA). Anna Wobus would like to see progress in the acceptance of science by society[25], and Fran Balkwill, who has written several highly successful science books for children, urges women scientists to try to change society's stereotypical perceptions of scientists[21]. She cited a survey of school children from east London, UK, many of whom were from economically deprived Bangladeshi families: "The children's image of a scientist was a white, middle-aged man, with glasses, untidy hair, a beard and scruffy shoes … One young girl did draw us a picture of a female scientist — the written description under this drawing said that the lady was 30, wore old-fashioned clothes, glasses — and had a beard!"

As for supporting women in science, it is important not to be complacent; we must continue to fight covert discrimination[1]. Sadly, it was still necessary for women scientists to complain recently about their underrepresentation in the 125th anniversary celebrations of the journal *Science*[26]. As Irene Leigh[19] put it: "The glass ceiling has moved up a long way but it is still there, so watch out for bangs on the head."

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