

Penelope Jeggo

Penny Jeggo was born in Cambridge, England. She obtained a BSc Honours degree in Microbiology at Queen Elizabeth College, University of London in 1970. She then did a PhD in the Genetics Division at the National Institute for Medical Research (NIMR), London, in Robin Holliday's laboratory. Her first postdoctoral position was with John Cairns at the ICRF Mill Hill Laboratory. She then obtained a postdoctoral fellowship with Miroslav Radman at the Université Libre de Bruxelles, Belgium. From there, she returned to the Genetics Division at NIMR as a scientific research officer. In 1989, she moved to the Medical Research Council's Cell Mutation Unit (CMU) at the University of Sussex. In 2001, following closure of the CMU on the retirement of the director, Penny became a founding member of the Genome Damage and Stability Centre (GDSC), a new collaborative research centre established by the University of Sussex and the Medical Research Council.

Penny's research has focused on DNA damage responses and particularly on the repair of DNA double strand breaks (DSBs). She applied the techniques learnt during her early years working with lower organisms to isolate mammalian cell lines sensitive to ionising radiation. Using these cell lines, she characterised the major DSB repair pathway in higher organisms and, in collaborative work, showed that the DSB repair pathway also functions during V(D)J recombination, a critical process during immune development. The cell lines were also pivotal in allowing her to identify the first mammalian genes that significantly contribute to the response to radiation exposure and to V(D)J recombination. The GDSC houses the UK's largest collection of cell lines from patients with damage response disorders. Penny has exploited and extended this resource to identify patients deficient in DSB repair, as well as additional damage response genes. Such studies have provided insights into the role of the damage response pathways in human development and cancer avoidance.

She has recently discovered an important connection between the signalling response to DNA damage and the DNA repair machinery, which makes a significant contribution to the response of human cells to ionising radiation. She continues to focus on understanding the basis of human radiosensitivity.

In the interview below, Fiona Watt, Editor-in-Chief of JCS, asks Penny about her experiences as a woman in science.

FMW: *How has your research career impacted on your personal life and vice versa?*

PJ: I consider myself just plain lucky to have chosen a career that continues to excite and motivate me. It is this aspect of a career in science that has impacted upon my personal life in a positive way and provided the *raison d'être* to endure the hard work and the more difficult challenges. I remember the thrill of doing an undergraduate laboratory project; although my results contributed only the tiniest smidgeon to scientific knowledge, I gained immense satisfaction from it. I was lucky in having two wonderful mentors in my early days of research: Robin Holliday, in whose laboratory I studied for my PhD; and John Cairns, with whom I undertook my first postdoctoral position. In addition to being excellent scientists, they enhanced my ability to enjoy and be excited by science. I believe this is a defining criterion of a great career – if the highs are high enough, the lows can be endured.

As a young postdoc, I was lucky in having a partner who understood the joy I gained from laboratory life. Though not a research scientist, and certainly not motivated in the same way as me, he supported my needs and achievements, and encouraged my independence. Finally, he found his own job satisfaction, which resulted in us commuting between Germany and England for a couple of years.

Enjoying science as I did, and taking the opportunity to do a postdoctoral fellowship outside the UK with Miroslav Radman, I didn't worry too much about starting a family. But as my thirties progressed, the motherhood desire set in and new excitement entered my life. Tragically, my partner, who had endured



Penny Jeggo with her son, Matthew, taken in the Grange Gardens at Lewes, East Sussex around 1990.

sympathy pains during the course of my pregnancy, was diagnosed with colon cancer not long after our baby was born and died within a year. I felt let down by cancer research as a career and I might well have quit, had it not been for the support of wonderful colleagues and friends. But I recovered the fire, and before long the thrill of a good result was sustaining me through the difficult times of being a single parent in a demanding career.

A wonderful aspect of science is the ability to form friendships around the world. A few years after the death of my husband, I had the opportunity to re-establish myself and make new friends by undertaking a sabbatical in the USA. This was of huge personal benefit. Although it becomes increasingly tiring, I still love to travel and meet with my international friends and colleagues.

Since the start of my PhD, I have been fascinated by DNA recombination and repair. At that time, the importance of genomic stability was not well appreciated, and at ICRF (now Cancer Research UK) viruses and viral oncogenes were considered to be all important. The work in Cairns's laboratory on DNA repair was only tolerated as a concession that some basic research had to be undertaken. Those of us in the field were convinced, however, that the maintenance of genomic stability was central to cancer avoidance. I still feel thrilled by the recent conversion of many scientists to appreciate the importance of my field!

I rarely felt guilty about the limitations that a research career places on

motherhood. This was perhaps because as a single parent I had to work, or perhaps because I knew my own needs. One time, however, that I was filled with guilt was when my son, aged 2, greeted me on my return from a meeting with the words “Hello, are you my Mummy? I’m Matthew”. When he was older and had heard this story, it became a running joke to repeat the question if I came home late from the laboratory. Another time that I felt guilty was when I missed his star performance in a school play – I didn’t know whether or not to admit that I hadn’t been there. But I know that staying at home and making him the focus of my attention would not have made me a better mother. Now, he seeks a path in life that will provide him with the same joy as research has given me – though he is hoping for more money and a little less hard work.

FMW: *What changes for women in science have you observed during the course of your career?*

PJ: I believe that a career in science is now more demanding and competitive than it was when I was starting out. The pressure to obtain publications in good quality journals seems to commence at the postgraduate level. Maybe I was lucky, but I don’t remember feeling such pressure until much later in my career – this made for a more relaxed atmosphere, which contributed to making science fun. The pressure to gain independent funding, to establish a laboratory and to gain a reputation is stronger and felt earlier than previously. For many, it takes time to appreciate the ‘bigger picture’, to place one’s own work in perspective, and to gain a gut feeling of how biology works and which bizarre results should be pursued or dismissed. Today there is little opportunity to learn by trial and error or for Friday afternoon experiments performed just for fun.

Of course, the pressures I describe have to be endured equally by today’s young male and female scientists. The impact, however, is particularly hard on a woman wanting to pursue science at a slower pace whilst starting a family. For many women the pressures associated with establishing a laboratory coincide with an age when the call of motherhood is mounting. Although maternity leave is an established practice today, few grant application forms provide any space to record leave of absence

(or reduced time availability). The competitive nature of funding and the dependence upon publications provide little allowance for combining motherhood and a research career. Although fathers today share much of the burden of child rearing, the onus of child bearing falls uniquely on the mother. Women should strive to ensure that time taken out for child bearing is taken into account when they are being considered for tenure or promotion.

Young women scientists today have more confidence and take themselves more seriously than my generation. Nonetheless, although there are at least equal numbers of men and women undertaking PhDs and carrying out postdoctoral training, there are many fewer women laboratory and departmental heads. I have observed that a higher percentage of male PhD students embark on their studies with the notion that they will progress up the career ladder and run their own laboratory, compared with female PhD students of equivalent ability. Is this owing to a lack of role models, lack of ambition or simply less aggressive personalities? I am also aware of many able young women scientists who decide against following the group leader route, simply because they do not want to maintain the long hours, the commitment, and the perceived limitations to their maternal duties.

FMW: *Do you feel that being a woman is an inherent advantage/disadvantage for a career in science? Why?*

PJ: I do not believe that I have encountered any direct prejudice as a female scientist and I believe that today, and in the past, there are, and have been, equal opportunities for men and women in science. However, I do believe that the imbalance in the ratio of men to women in higher scientific positions is a disadvantage for women – not because of prejudice but because of behavioural differences. I suspect that many (though not all) men behave differently in a committee made up only of men, compared to a committee with equal numbers of men and women. Such differences have been discussed extensively in relation to women in politics and, I believe, they extend to many additional careers.

Women have to learn to adapt to certain

intrinsic behaviour patterns in men. While this can be difficult, it is not necessarily to the disadvantage of women. I have come out of meetings dominated by male behaviour with a full appreciation of what the book title “Men are from Mars, Women are from Venus” means in practice. A consequence of the competitive nature of funding is that today more aggression is required for success in science. Although women today are perhaps more trained to handle this than I was, many women find the aggressive aspect of science more stressful than men. My first authorship conflict cost me many hours of lost sleep, but I am certain that my male counterpart viewed it simply as part of a great game.

I hope in time we can achieve equal numbers of men and women throughout all layers of science. Since there are as many outstanding young female as male postdoctoral scientists, there is clearly an enormous loss of talent at present.

FMW: *What are your remaining career ambitions?*

PJ: I am not sure that I ever had career ambitions – perhaps this is an underlying consequence of being a female of my generation! A focus of my career has been to understand the molecular basis of human radiosensitivity, exemplified by the human disorder *ataxia telangiectasia*, which is probably the most radiosensitive human condition described. Amazingly, few scientists in the field have appreciated that our existing knowledge fails to explain this marked radiosensitivity. Recently, my lab has made a huge step in understanding this, but many questions remain that I would like to solve.

I would also like to feel that I have inspired just a few young people to embark on a research career. Maybe in my last few years, when the pressure of achieving for the sake of future funding is removed, I can have the joy of science without its demands, and thereby contribute to enthusing young people, as I believe my mentors did for me.

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Feedback on our series of Women in Cell Science articles is always welcome and should be emailed to wics@biologists.com