

No Longer Outside the Mainstream

The first time I presented the model that the extracellular matrix interacts with the nucleus and chromatin dynamically and reciprocally one scientist said publicly, “You better go pray!” Another had earlier told me, “You better stick with ballet; you will never make a decent scientist!” Many people thought I was doing weird and “messy” stuff just to be difficult.

Some scientists, especially in first tier universities, can be quite arrogant and snooty for no good reason at all. But having studied in these kinds of places myself and having had the upbringing I did, I kept going despite the criticism. I grew up in Iran, before the current regime. I was the younger of only two daughters in an academic family. My mother was very ambitious for us and told us that women need “a room of their own and 500 £.” I had many successful women as role models.

I trained as a chemist and then studied bacterial genetics for my Ph.D. at Harvard University Medical School. Even then, I was intrigued by how the outside and the inside of a cell were delineated. When I started my postdoc, I worried about things like changes in pH and temperature and how they affected cells in culture. These were important questions to me, but not the kind of things people were thinking about at the time. It’s how my mind works. I look at a biological problem from all different angles.

Once I had my own lab, I pursued the concept that the microenvironment outside a cell shapes its function and behavior. But my own understanding was both gradual and intuitive. In 1981, I wrote a single author review of which I am very proud. Through our work and the published literature, I realized that the pattern of metabolic activity is just as tissue-specific as gene expression. I reasoned we should not study “generic” cells, but rather cells in their physiological contexts.

I was also lucky to have some excellent postdocs who taught me different techniques and concepts. Joan Emerman taught me how to culture mouse breast cell. Rick Schwarz and Glenn Hall introduced me to the extracellular matrix. Together we were able to show that breast cells will behave like breast cells only if they are grown in the presence of an appropriate extracellular matrix.

Another original postdoc, David Daldberg, injected a chicken cancer virus, Rous sarcoma virus, in chicken embryos. We found

that at very early stage of development, the virus became integrated in the chick’s DNA and was expressed, but malignant tumors did not develop in the embryos. When we pulled the cells apart and put them in a culture dish, they all became transformed. We published the finding in *Nature* in 1984. But despite the fact that the idea that an oncogene would do different things in different environments was new, few paid much attention to that paper.

You have to be stubborn and have confidence not to be mainstream. I am drawn to people who are really inquisitive and who will run with an idea without worrying too much where it will take them. This means that some of the people I accept to work with me are not all that easy to deal with. They are often contrary and may even be combative, but most are very bright and original and end up doing extremely well.

I was barely 18 when I left Iran. I had received a fellowship for being the top student in the country and decided to attend Bryn Mawr College near Philadelphia, one of the best colleges in the U.S. A couple of years later, I transferred to Harvard to get married and be with my husband. Our daughter was born when I was a first-year graduate student, and our son was born when I was a second-year postdoc. I had no idea of what it took to raise children without family close by and no household help.

I now also have three lovely grandchildren. I try to see them and their parents as often as possible, sometimes combining my visits with travel to meetings and seminars. I do work a lot. It is not unusual for me to stay up working until 2 in the morning, but I also have a lot of other interests. My husband, a great scientist and physician at UCSF, is very athletic, so we go cycling and hiking together. We both love art and the theater; we would fly to London or New York to see a play. We also like good literature and enjoy cooking.

When people ask me, “How do you do all these things?” my answer is, “Badly!” I am forgetful. I leave clutter everywhere. I procrastinate. But I have had wonderful people help me, and I love my work and my life.



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*As told to Laura Bonetta,
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