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## Creating something out of nothing

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I was privileged to be born into a family where education was highly valued and emphasized regardless of gender. Both my paternal grandparents were renowned obstetricians and gynaecologists, while my maternal grandfather was the editor of a well-known newspaper, *Deccan Herald*, for about twenty years. Born to an architect father and a literary mother, I had the fortune to grow up in an environment where both science and the arts were cherished. As a child I received the best possible education, though neither of my parents took an active interest in making me stick my nose into my textbooks. My mother used to read to me before I could speak a single sentence (or so she tells me) and spent more money than she could afford on books, which inculcated in me a love for reading. I am told that as a child I had an amazing memory, but this certainly was not reserved for school work. I was never the topper in class and was content to remain in the top twenty percent, just enough to not perturb my parents overly.

Curiously, it was during the preparation of one of my mother's several books that I met an unforgettable older friend of my parents, S. Krishnaswamy, who was then Vice Chancellor of Madurai Kamaraj University. He kindled an interest in me to do

experiments at home – small experiments, mostly repeating things I had read in my text books. How a siphon works, how one can grow small sea creatures in brine. And then later, along with my sister, I started to conduct experiments myself - making soap from oil, making invisible ink, growing sugar and salt crystals – in short, anything possible with the resources of my mother’s kitchen and father’s garden. My beloved all-seeing mother quietly encouraged this by getting me several books; later, a microscope and even a small chemical lab (in collaboration with my father) equipped with a few harmless salts that didn’t do much, but created in me a zest for experimenting. This was complemented by the chemistry practical sessions at school. I would quickly finish the designated experiment and then spend hours pottering around with solutions that were not on the specified list, much to the horror of my classmates and an indulgent lab assistant who took a shine to me and turned a blind eye.

When the time came to choose my stream after high school, despite having a penchant for creative writing and painting, I chose science, because of my love for experimenting. I wonder whether I would have chosen arts if there had been a vibrant extra-curricular programme for the arts at school. When I entered college, I remember wanting to do architecture, but ended up settling for chemistry as a compromise. It was probably the best bend-in-the-road that ever happened to me; it turned out that what seemed Hebrew to most was dazzlingly clear to me. I understood the language of molecules and reactions as if I had known it all along. Suddenly I was the best student in class.

Leaving behind the wonderfully supportive set of teachers at Women’s Christian College, after my bachelor’s I enrolled for an Integrated Ph.D. programme in Chemical Sciences at the Indian Institute of Science, Bangalore. I did my doctoral thesis in a lab, where my supervisor, Santanu Bhattacharya, offered me complete freedom to experiment. My early research was on the self-assembly of small molecules to form various kinds of supramolecular aggregates such as liposomes, liquid crystals and organogels. In collaboration with Sandhya Visweswariah at IISc, I developed a liposomal reagent that was highly effective in

bringing about DNA transfection. My association with her was brief – just six months – but her influence on my thinking still remains.

I also developed the first molecule that could selectively gelate the oil phase from a mixture of water and oil. This work received wide acclaim from peers in the field due to its potential application in oil-spill clean-ups as well as in separation technology. Throughout, the Chairman of the Department, S. Chandrasekaran, who was also the coordinator of the Integrated Ph.D. programme, gave me much advice and support, and continues still to do so. I must mention two people without whose support I would never have survived the early years of my Ph.D., when despite the drudgery there was a drought of results. These were my uncle, Ravi Menon, a well-read and patient banker-philosopher, and Arindam Ghosh, a brilliant physicist and understanding partner, whom I later went on to marry, whose unstinted support allowed me to reach my potential as a researcher.

While in India, I studied the effects of modifying small molecules that cluster in large numbers, resulting in a change in the property of the clustered structure. Towards the end of my tenure, I became fascinated by proteins and nucleic acids that were more complex, where information is hidden in a single, long string that folds up in space to form a functional entity, where the three-dimensional shape is crucial to function. Later, with Shankar Balasubramanian at the chemistry department in Cambridge, UK, I studied the assembly of an unusual form of DNA that was four-stranded, called the G-quadruplex. Shankar was an excellent mentor; he gave me freedom to experiment, and discussions with him left me thinking long after. He actively encouraged me to apply for various fellowships, which I would never have thought of doing on my own. The chairman of the department, Jeremy Sanders, whom I had encountered in many discussions, provided me with staunch support in all my subsequent academic endeavours. I was elected to various fellowships such as the 1851 Fellowship and the Fellowship of Wolfson College, both of which brought me in close proximity to several wonderful minds. When I felt the call to return to India, these senior colleagues despite their own

opinions, realized this was something I needed to do, and advised me in their own special ways; much of this advice has stayed with me to date.

Having worked all this while in chemistry-based environs, and realizing that I was slowly gravitating towards biology, I chose to jump into the deep end, and position myself in a biology-centred institute. In 2005, I set up my own lab at the National Centre for Biological Sciences, T.I.F.R. in Bangalore, in the best environment I could ask for. I was aware that my chemical language and perceptions would be quite incongruous, not dissimilar to the plight of a stranger in a foreign land. But realizing that I was by nature eager to try new things and learn from new experiences by putting my best foot forward, I took the plunge. Looking back, what I did almost qualified as foolhardy. Fortunately, a few senior colleagues took an active interest in mentoring my transition from my post-doctoral view of chemical biology, to a more full-bodied way of thinking. At the moment, my lab is looking at how one can use designed nucleic-acid assemblies to interrogate cellular processes by functioning as intelligent probes and signal transducers.

My fascination with nucleic acids has taken me from chemistry to materials to chemical biology. My driving force has always been to create, out of a set of meaningless, individual components, a collective entity with new and unusual functions. And so here I am, still experimenting, by the grace of the many people who have loved me enough to let me go.