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Professor Daniela Rhodes describes her entry into science in 1969 as a stroke of luck, but now lives and breathes molecular biology, working almost every day, including weekends, in Singapore.

Nanyang Technological University (NTU) president Bertil Andersson has never been shy about the fact that he knows a Nobel Prize winner or two. At a recent dinner, Professor Daniela Rhodes – who is with the NTU's School of Biological Sciences and Lee Kong Chian School of Medicine – decided to playfully upstage him.

"I told him that there were five Nobel Prize winners working along the same corridor in my old lab," says the 67-year-old Italian-born scientist. Before joining NTU two years ago, she worked at the world renowned Medical Research Council Laboratory of Molecular Biology (MRC-LMB) in Britain for 42 years.

But she was no mousy scientist in a lab coat, she had him know. "I told him I used to party with David Gilmour," she says, referring to the guitarist and vocalist of legendary rock band Pink Floyd. Another Pink Floyd vocalist and guitarist Syd Barrett lived 50m from her in Cambridge.

Upon hearing this, Prof Andersson – the former chief executive of the Strasbourg-headquartered European Science Foundation – dramatically dropped to his knees in mock obeisance.

As she recounts the tale, Prof Rhodes' girlish laughter echoes in her spartan office at the end of a lab-filled corridor at Biopolis. In the world of science, she is a rock star. Internationally recognised for contributions to the area of chromosome biology, she is a fellow of The Royal Society of Britain, considered the most prestigious accolade after the Nobel Prize.

In Singapore, she heads an inter-disciplinary network of eight teams which has just clinched the Ministry of Education's Tier 3 grant – worth \$23.8 million – to research telomeres. Telomeres are important structures that cap the ends of human chromosomes. Knowing how they work could lead to breakthroughs in our understanding of the molecular mechanisms of cancer propagation and human ageing.

The mild-mannered professor did not come from a family of scientists or intellectuals. In fact, the elder of two children was born in a small mountain village of 200 people in Tuscany, outside Florence in Italy.

Her mother was a housewife with little schooling; her father was a low-level engineer and also taught at a technical school.

"My father was a freedom fighter during World War II and I think that made him realise the importance of education. He read a lot and was self-educated," she says.

"He taught me maths and geometry when I was very young and he was very strict. He challenged me all the time and expected me to understand things quickly," adds Prof Rhodes who excelled in her studies.

The family reared their own poultry and cultivated their own vegetables. Her grandparents had a farm further up the mountain.

"I remember collecting chicken eggs with my grandmother and she would make two holes in an egg with her hairpin and make me suck it," she recalls.

This bucolic lifestyle ended when she was 10 when her father uprooted his family to Eskilstuna,

an industrial town west of Stockholm in Sweden. The city is famous for its steel industry, producing cutlery, keys, machine tools and precision instruments.

"My father wanted us to grow up in a socialist country and believed we would have a better education," says the scientist who remembers arriving in the city in January when it was bitterly cold.

Asked if she was resentful that she had to leave her friends behind, she laughs and says: "If you knew my father, you wouldn't dare."

Adjusting to her new life was not easy. She had to suddenly grapple with two new languages, Swedish as well as English, a compulsory subject.

"I remember going to school and not understanding anything. It was really embarrassing," she says. "I struggled a bit but suddenly one day, I could understand what they were saying."

Within two years of moving to Sweden, she did well enough to get into Eskilstuna Flickskolan, a prestigious girls' school.

"It had Scandinavia's best girls' choir and a fantastic music and art department. I was very fortunate to be in that environment," she says.

She thrived in the school and won the maths prize every year.

"The key to maths is to understand it. Once you've understood it, you build on the foundation. It's one of the few subjects you don't have to revise during exams because once you've understood it, you've understood it."

At 19 she had a gap year. Together with a friend, she went to the university town of Cambridge in England to work as domestics in a hospital and brush up on their English.

At a dance, she met the man who became her husband. Mr Richard Harvey Rhodes, who died 10 years ago, was a quantity surveyor for Cambridge University and oversaw the construction of many of the institution's newer buildings and extensions.

"Cambridge was a hotbed for pop music in those days and I used to go to parties at David Gilmour's house. He went to school with my husband and we knew a lot of the people in that world who were trying to break into music," says Prof Rhodes, who is extremely conversant with Pink Floyd's history.

After nine months, she returned to Sweden where she applied to enter the Orebro Technical College, now Orebro University.

"I wanted to do architecture, thinking I might marry both art and science. But I applied too late and the course was full. The head of the university offered me a place in the chemical engineering department instead. I said 'okay,'" she says.

For the next three years, she and Mr Rhodes kept their relationship alive by writing letters.

Rock star of the scientific world

Prof partied with Pink Floyd guitarist, had Nobel laureates as colleagues



"He was a prolific writer, writing three or four letters a week, I was less so," she says with a laugh.

Each summer, she would intern at the architect's office in Cambridge University where her future father-in-law was a senior architect.

Two days after she graduated, she and Mr Rhodes tied the knot in Gothenburg, Sweden, with no family members present.

"We decided that if his family couldn't be there, mine shouldn't be either. I told my folks and my dad said, 'It's about time. I've supported you for 22 years.'"

The couple left for Cambridge immediately. Topmost on her mind was getting a job. She had to support her husband who was then still studying building management in Cambridge.

She describes her entry into science in 1969 as a stroke of luck. She

had landed a job with the university's metallurgy department and was waiting for an official letter of offer when she saw a newspaper advertisement for a research assistant at the MRC. She applied and got an interview.

"Molecular biology was a new word 45 years ago. I was interviewed by a man called Aaron Klug. I found his name in a textbook and had no idea who he was. We talked and he gave me a job."

Professor Klug, who became a great mentor and boss, is a Lithuanian-born British chemist and biophysicist, and winner of the 1982 Nobel Prize in chemistry. The LMB, she says, is a unique place.

"There's no hierarchy. From cleaning lady to director, we use first names. It's a very flat structure. People there don't tell you to work, they inspire you to."

The men in her life

"The three most important persons in my life were all men: my father, my husband and my boss Aaron Klug. My father challenged me when I was young; he expected me to think, to know and to do things. My husband was a very open person and very educated; he expected me to go as far in my career as I could. Aaron was a great mentor; he was also extremely challenging and was always pushing me to give my best."

PROF RHODES on her father, husband and former boss, Nobel Prize winner Aaron Klug

Marrying work and family

"I never felt I had to choose between science and a family. If I had wanted three kids, then maybe but I only have one. That's probably the price I paid. Practically, it's really hard to have a family and work."

PROF RHODES on work and family

Many ground-breaking techniques were pioneered at the laboratory, including DNA sequencing and methods for determining the three-dimensional structure of proteins. Since it was set up, it has nabbed nine Nobel prizes.

"I worked in this corridor which had 10 labs and five Nobel Prize winners," she says.

Besides her boss, Prof Klug, they include Dr Max Perutz (1962 for chemistry) and Dr Fred Sanger (1958 and 1980 for chemistry).

Prof Rhodes was quite outstanding herself, publishing 13 papers during her time as a research assistant.

In 1976 after the birth of her son, now 38, she decided to do her PhD.

Because of her outstanding track record, the institute sponsored her course fees for her doctorate and paid her salary as well.

She finished it in two years.

"Having a child makes you incredibly focused. I used to cycle to work in the morning and the moment I got on my bicycle, I would start thinking about my work and my experiments," says Prof Rhodes, whose in-laws also helped to mind her son.

With a rueful laugh, she says her son still gripes about how she was often too busy to play with him.

"But I think to do science well, you need to think about it all the time, whether at work or home. I think I do better thinking when ironing or gardening," she says.

She became an independent tenured researcher at the same institute after that.

The LMB shaped her approach to scientific research.

"It was a very protected environment because we were centrally funded by the Medical Research Council and so did not need to apply for grants. We had a lot of freedom; the all-important thing was to carry forward the science."

"I don't think I could do science in an environment which was very defined like in a company where you have goals and targets which you have to meet within a certain time frame."

She has made some very important contributions to fundamental science: how DNA is packaged into chromosomes, the first nucleic acid structure with Prof Klug and her own work on telomeres.

Her resume is eye-poppingly impressive. Among other things, she was visiting professor at the Rockefeller University in New York, delivered a Women in Science Lecture at Brookhaven National Laboratory in the US, and chaired the European Molecular Biology Organisation (EMBO), a scientific organisation which Singapore joined last year.

She laughs when asked if she encountered sexism and the glass ceiling in her years in science.

"It never occurred to me or may-

be I was just too naive to notice but when I think about it, probably yes. My husband said, 'It never occurred to you that you're not a man.'"

She turns serious: "I always believed that you'll be judged by your work. But when I got older and started getting invited onto committees, I kept on walking into rooms full of men and started thinking, 'Something is wrong here.'"

Prof Rhodes remembers a discussion on men versus women scientists when she was chairing EMBO between 2010 and last year.

"We gave out lots of fellowships and we asked, 'Why are women less successful than men?' The difference, I think, is that women don't have this gene called the ego."

"I know many men in science who are successful because they want to be important and earn lots of money; they just happen to be scientists. I know more women who are successful because they love what they are doing."

She acknowledges there are hungry and ambitious women scientists too, but says that is because of the yardsticks used to measure success.

"I've met many women scientists, especially those from the US, who had all the traits of men: the way they dress, their aggressive behaviour. I told myself, 'Good God, if I have to behave like that, I don't want to be in science.'"

After 42 years in LMB, she took up an offer from Prof Andersson – whom she knew from the European Science Foundation – to join NTU.

There were a couple of pull factors. Her son is working in Singapore, and she gets to continue her research in an exciting way, especially with the Tier 3 grant.

"We have eight teams in Singapore, ranging from physicists to people who work on cells. I've got a lot of resources and a lot of talent. This multi-pronged approach to ask really important biological questions is exciting; it's a fantastic initiative that does not exist anywhere else."

LMB scientist Venki Ramakrishnan – who won the Chemistry Nobel Prize in 2009 – has known Prof Rhodes for more than 20 years.

He says: "Daniela is someone who cares about people in her lab and treats them as intelligent collaborators rather than as people who are simply there to do what she tells them. In her later years at the LMB she was away quite a bit because she served on several international committees. I think she saw this as part of the duties of a senior scientist to the larger scientific community and as being a role model for women."

In Singapore, she works almost every day, including weekends.

"I don't think I have a life," she says. "But I believe the only way to stay in science is to be interested. What should drive you is the curiosity."

Her face breaks into a mischievous grin when asked how her life would have turned out if her late father had not moved his family to Sweden.

"I wouldn't have been a scientist. Probably the biggest career achievement would have been to marry the village butcher because he was making the most money."

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