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## Way to science

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**T**he town is Shahjahanpur, in the year 1950, in an old reputed parda-observing family, a girl of 6 years of age observes her mother being treated at home by a lady doctor. She is very impressed by the physician. She decides to become a doctor. Time passed by and, one day when she was in class IX at Abdullah School, Aligarh, she went to her mother and told her that she wanted to become a doctor. Her mother did not approve the idea; as in her opinion lady doctors discuss certain things with their male patients, which are not very decent. When she was in B.Sc., she got married. Unfortunately, she had problems in her married life and decided that this was not the life she wanted. To live with someone who was so different and did not even respect her, was something she did not and could not accept.

She moved to her parent's house with her daughter who was a few months old. She joined M.Sc. in Physical Chemistry at Saint John's College at Agra where her father was posted as Commissioner. It was quite difficult to study with a child, but her mother helped her a lot with the young baby and she continued her education. After completing her M.Sc. she came back with her parents to Shahjahanpur again.

One day she went to visit her sister in Lucknow and met the Principal of Karamat Husain Muslim Girls College, Ms. Wasim.

Ms. Wasim was looking for a Chemistry lecturer, for intermediate classes.

She joined the college and this was a great experience of her life. Teaching science to young girls, talking about scientists like Perking Senior and Junior, discussing dreams of Kekulé and Fischer's; she used to feel proud. But still she had to do so much more. One day she went to the Department of Biochemistry, at the Lucknow University and met Prof. P.S. Krishnan, a well-known Biochemist, a legend in his field. She requested him to take her for Ph.D under his supervision. First he did not agree but seeing her determination he allowed her to join the department. Soon (1970) Industrial Toxicology Research Center advertised (One of the leading National Laboratory of the Council of Scientific and Industrial Research) a post of Junior Scientific Research Assistant (JSA). She applied for it and got the position. Dr. A.S. Paintal was the chairperson of the selection committee; he said, "You will make a name for yourself in the field."

In her scientific journey she went through various experiences. She realized that at every stage a woman must work harder than a man. It is very difficult for a woman to achieve and make a name in the male-dominated society. But she never accepted defeat and kept herself going in spite of many hurdles. Today, she feels proud of her personal as well as academic achievements. Her daughter is a well-known medical doctor (which was her dream). Her two grandsons inspire her and see the dream to become a scientist.

She has a profound experience in toxicology, a field in which she is working on a wide scale. Her main field of research is the toxicity of fibers, particles and nanoparticles. Based on her work she has published 130 papers in the journals of International repute.

She has worked with the toxicity of silica, asbestos, asbestos substitutes, slate dust, carpet dust, soot and other ultra fine particles, the known environmental and occupational air pollutants which have attracted attention over decades. She has also conducted epidemiological surveys to monitor the impact of these pollutants on the exposed population using biomarkers at molecular level for risk assessment analysis.

Her studies showed that asbestos induce reactive oxygen and reactive nitrogen species. These free radicals activate signaling cascades and cause DNA damage that result in altered gene expression and cellular toxicity important in the pathogenesis of asbestos associated pulmonary diseases. Nanoparticles were evaluated for their toxic potentials. The studies revealed that some of the engineered nanoparticles are toxic and need toxicological evaluation. Pioneered studies on the toxicological effects of slate dust were conducted at Mandsaur and helped in developing diagnostic tests, therapeutic and preventive measures.

She has conducted in depth studies in asbestos based industries both at organized and unorganized sectors and highlighted the predisposing factors existing in Indian industries accelerating the disease processes. The study established that a combination of cigarette smoke and kerosene soot accelerates the disease process in the exposed population. These in-depth studies in asbestos based industries in India highlighted occupationally venerable population (domestically exposed to cooking fuels and occupationally to asbestos). These findings are of great national importance to advise asbestos exposed workers to abstain from smoking, avoid exposure to unprocessed cooking fuel.

Surveys were also conducted in a few organized and unorganized carpet units and the factors influencing the health of the exposed workers were determined. She has conducted intensive studies on Indoor Air Pollution due to the exposure of biomass fuels (cooking fuel) in Indian homes. She showed high levels of particulate air pollution due to biomass exposure causing respiratory morbidity and mortality.

She has conducted in depth studies in asbestos mining areas, which includes, monitoring identification of asbestos varieties and complete medical examination along with specific biomarkers for risk assessment. An extensive research on women and their occupational hazards was conducted, highlighting specific problems in different organized and unorganized sectors where women workers are exposed to toxic chemicals (A film on the above subject made by her was selected as the best video film from Govt. of India).

On the basis of the research work on particulate air pollutants and women problems, international and national collaborative projects of great values funded from the United States, Commonwealth Science Council, London, Germany and Government of India, were initiated.

Her scientific achievements were internationally recognized as is visible from invitations she received to pay research visits abroad, to write review articles, to organize international meetings. She has been invited as guest scientist under collaborative programs by internationally known institutions such as the National Center for Toxicological Research Nov. 1981, Cretiel University, Paris, France, 1987 US Environmental Protection Agency, and Duke University, North Carolina, EPA, 94, the US National Institute of Environmental Health Sciences, 1996, German Forschungszentrum Karlsruhe, 1994 and 1996, Institute for Cell Biology and Biosystem Technology University of Rostock, 1998, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007 and 2008. She has been invited to give talks and keynote addresses in the national and international conferences. She always took active part in different capacities for the progress of the country in science as well as for the social cause, and for the progress of young scientists.

Now at the age of 63, she dreams of establishing a centre for occupationally venerable population.