



A Scientific Dream in Action

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I was born on August 14, 1938, to a Bahá'í family of Zoroasterian background in the city of Yazd in Iran. My father, for the motive of pioneering moved to Natanz, then a small town where he established its first electric power plant. I can never forget the scene of the inauguration night when a crowd of people gathered at the power plant and saw for the first time in their life a single 1000 watts light bulb becoming illuminated. The excitement and astonishment on the faces of the crowd were such that I can not imagine what phenomenon would be its equivalent today. In such a town the opportunity for a good education was obviously very limited. In order to receive an adequate education, my parents sent me away from home from the age of 12 for academic study.

After completing my high school I went to the USA in 1957 to study for my B.S. degree in West Virginia University and M.S. degree at the North Carolina State University. Afterwards I went to the Imperial College of Science and Technology of the University of London for my Ph.D degree which received in 1967.

For my Ph.D thesis, I developed a neutron scattering model for polyphenyls which was then considered a promising nuclear reactor moderator and coolant. I demonstrated the model's validity by measuring the diffusion parameters of Dowtherm-A at the University of London's research reactor in Ascot. The success of this work resulted in an invitation to work in the field of cold neutron scattering at the Reactor Laboratory of the Atomic Energy Commission of Finland in Otaniemi. In 1970 I went to Tehran, Iran to work in the newly established Arya Mehr University of Technology, today known as the Sharif University of Technology. I became involved with the nuclear energy program of Iran in its formative age. I spent my sabbatical year in Kraftwerk Union in Germany and half a year at Framatome in France on leave of absence. In 1979 I accepted a position in the Federal University of Rio Grande do Sul in Brazil.

My incentive and love for science came mainly from the words of Baha'u'lláh, *“In truth, knowledge is a veritable treasure for man, and a source of glory, of bounty, of joy, of exaltation, of cheer and gladness unto him.”*

Going to the International Centre for Theoretical Physics (ICTP) almost regularly in the decade of 70's participating in the courses on nuclear and reactor physics, gave me the opportunity to discuss problems with qualified people in a scientific atmosphere which did not exist at home, where I was almost scientifically isolated and alone. For me, the most important role of the ICTP was bringing together young scientists in a scientific surrounding where one could discuss our ideas with peers and get inspiration. There was no e-mail, international telephone calls were very expensive, and communication through letters with a slow postal system was very inefficient. The difficulty of communication and having limited scientific discussions with one's peers were the main problems of scientists in developing countries. In this respect ICTP made an invaluable contribution to my development and I believe to most others. I am eternally thankful to Dr. Abdus Salam who provided me the opportunity for my regular visits to the ICTP. I remember with nostalgia our various meetings where he was a source of inspiration for my efforts concerning the development of science and technology in developing countries.

My experiences in industry occurred in between my academic life, and led me to the belief that there is no such a thing as “transfer of technology”, which was then a common motto in the international arena. I used to say that “science may be transferred, but technology is not transferable, it is developed”. I became a promoter of the idea that developing countries wishing to use nuclear energy can and should develop new innovative nuclear reactors that do not have the limitations of the present day ones. To show the feasibility of the idea, I came up with an innovative concept, namely the fluidized bed nuclear reactor, which I first published in 1977. The project of the fixed bed nuclear reactor (FBNR) as a simplified version of the fluidized bed is being developed with the support of the International Atomic Energy Agency (IAEA) and detailed information about it can be found at the site www.rcgg.ufrgs.br/fbnr.htm .

The basic motivations and arguments for such type of nuclear reactor were those that today are common knowledge and are generally accepted by the nuclear community, however 30 years ago they were the subject of heated discussions. For example, the concept of modularity of nuclear reactors did not exist before. The concept of inherent safety for nuclear reactors was frowned upon and even opposed by the nuclear industry. One of my publications was delayed for more than six months because a reviewer from the industry would not accept the term “inherent safety” in the paper, and finally we had to compromise and invent a phrase acceptable to the journal. The nuclear industry was afraid that if the public knew about the possibility of designing an innovative nuclear reactor which had the characteristics such as simplicity, inherent safety, passive cooling, environmental friendliness, proliferation resistant, small and economic at the same time, the present reactors would be considered obsolete causing great damage to the nuclear industry. The events during the last decade have brought us to the present stage of development where such ideas are being reasonably well supported, leading to projects such as the fourth generation nuclear reactors and the INPRO program of the IAEA.

In a spirit of service to humanity based on the words uttered by Baha'u'lláh "*All men have been created to carry forward an ever-advancing civilization.*" and "*Work done in the spirit of service is worship.*", I did not attempt to patent the FBNR reactor concept which is available to all humanity for exploitation. Presently, various countries have shown interest in the FBNR reactor concept and are collaborating in its development. My dream is to see again the emotions of a crowd like that of 60 years ago watching an electric bulb light up, not by the power of a diesel engine, but with the power from the FBNR nuclear reactor.