Nihal Kishinchand Notani (1930–1994)

An obituary by P. C. Kesavan

Dr Nihal Kishinchand Notani ('Nihal' to relatives and close friends) was born in Hyderabad, Sindh (now in Pakistan) in January, 1930. He had his early education in Sindh and graduated in Agriculture from Agricultural University at Anand. He then obtained MS degree from University of Maryland and subsequently Ph D from Purdue University, USA. Notani joined the Atomic Energy Establishment, Trombay (now Bhabha Atomic Research Centre) on 2 June 1958, rose in ranks to assume finally the Directorship of Bio-Medical Group on 4 May 1988 and retired in the same capacity in January, 1990. Even after superannuation, he continued to be actively involved in biomedical research in one capacity or another until his sudden demise on 18 April 1994. At the time of his death, he was Emeritus-Scientist of CSIR.

Broadly stated, Notani's research endeavours were largely confined to basic and molecular genetics although his scientific interests encompassed a much wider spectrum.

His very early research work dealt with the nature and functional role of 'Controlling Elements', especially Dissociator (D_s) in cultivated maize. It may be recalled that back in the 1950s, when Barbara McClintock first encountered these elements in maize, she distinguished them from genes However, their role in regulation and development remained obscure. In the 1960s, with the proposal of 'Operon Model' by Jacob and Monod to interpret the coordinated regulation of genes in bacteria. McClintock drew parallels between controlling elements and (transposed) operators. Notani's contribution in this regard was to test McClintock's hypothesis for Ac-D_s system, based on the rationale that if D_s element was a transposed operator sitting next to a gene, then it should be possible to mutate or inactivate it. The results with known mutagenic agents were, however, negative. Based on various observations, an excision model was proposed which seems still valid.

During 1960s, Notani had the good fortune to work with R. A. Brink, who had reported the phenomenon of 'paramutation' in maize. Notani worked with Brink for a short period during which they analysed the effects of certain chromosomal translocations on the expression of *R-gene* and they arrived at the conclusion, then altogether novel, that gene loci must be larger than had been generally assumed until then.

His major area of research interest centred around genetic transformation in *Haemophilus influenzae*. Notani was baptized into this area in the laboratory of S. H. Goodgal at the University of Pennsylvania. Their significant findings were that transformation occurs by insertion of single-stranded segments of donor DNA displacing the resident homologous DNA. Further, they also demonstrated that either strand of DNA could transform. Also, they analysed the intracellular donor DNA and showed that part of the donor DNA after entry was present as fragments which sedimented slower than input DNA and had poor biological activity. These were referred to as species II molecules (Notani, N. K., *J. Mol. Biol.*, 1971, **59**, 223–226). A method of digitonin lysis developed by Notani and his associates allowed easy separation of donor DNA from resident DNA. They used this method to analyse two strains (rec 1 and rec 2) both deficient in genetic recombination. Notani *et al.* (*J. Bacteriol.*, 1972, **110**, 1171–1180) demonstrated both by the digitonin method and also by equilibrium density-gradient centrifugation that these two mutants were blocked in two different steps. The paper by Notani, Setlow and Allison in *J Molecular Biology* (1973, **75**, 581–599) elucidating that phage DNA is fragmented after entry but is reassembled by recombination to form concatenates, is of major significance.

Notani worked extensively in gene cloning during the 1980s. His studies revealed the requirement of *rec*-gene expression for chimeric plasmids. At BARC, he and his co-worker (Smt) Joshi constructed a super vector, which permitted selection of clones with great ease.

His work on DNA repair and mutagenesis initially with Jane K. Setlow at Brookhaven National Laboratory and then at BARC is widely quoted, and was indeed pioneering in its scope and content. Notani has also made significant contributions in the area of *Rhizobium* plasmids. The megaplasmids of rhizobia which are known to carry some of the *nif* and *nod* genes are well known. The interesting report, however, is of the finding of plasmids smaller than 1×10^7 Mr (D'Souza and Notani, *Curr Sci*, 1984, **53**, 186–188).

One of the most recent and also the last of his contributions is the transgenic tobacco plant. It will remain in the annals of Indian science that the first transgenic plant made in India came from BARC and from the laboratory of late N. K. Notani.

Notani was a thorough and critical researcher and made an impact in whichever area he chose to get involved in. He was an excellent research guide and he inspired his young colleagues and students. He was a born teacher and his concern and interest in students and young researchers were innate and sincere. As the Director of the Bio-Medical Group of BARC during 1988–1990, he provided dynamic leadership in basic and applied research.

Notani was a Fellow of all the three national scientific Academies of India (Indian National Science Academy, New Delhi; National Academy of Sciences,

Allahabad; and Indian Academy of Sciences, Bangalore) and Maharashtra Academy of Sciences. He delivered the B.C. Guha Memorial Lecture of Indian National Science Academy in 1990.

Notani was a connoisseur of modern, medieval and ancient arts of both Indian and European origin. He was a passionate collector of paintings, antiques, stamps, coins and old books that are rare to find. He was unhappy to discover that rare and precious books were being sold often at cheap prices in some remote and forsaken book shops! To him, their values should have been going up and not down! He was a lover of classical music.

I have been fortunate to have engaged his warm friendship and patronage until his very end. We had known each other for a little over two decades. Since my joining BARC, Bombay in November, 1993, there had hardly been a week without our having had at least a couple of meetings every week over a cup of tea. In many a discussion over men and matters of science, his disagreements in views, if any, were always gentle and subtle. He read widely, and he was often sought after for quick information. Just a week before his death, he had come to my office to urge upon me to send my daughter to Purdue University which has given her Assistantship and admission to Ph D programme in Molecular Biology. I joked whether his advice was on account of his weakness for Purdue University from where he too had obtained his Ph D. With a smile, so characteristic of him, he sat down and then slowly expounded upon some of the epoch-making papers in the field, which had recently been published by the faculty of Molecular Biology of the Purdue University! I was amazed at his keeping himself abreast of even the most recent developments in molecular and cellular biology! We were to have met around noon on Monday the 18 April 1994. I did walk up to his office on the second floor of the Modular Laboratories, only to find his door unexpectedly locked! I wondered about his absence, until a phone call from his wife roughly an hour later, announced his sudden demise. It was a shattering experience for me to realize that Notani left this world without keeping his date with me. When I went to pay the last respects, it was, however, clear that he was dressed for office. Obviously, he left this world virtually with his shoes on, and promises to keep! We shall all miss him dearly.

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