

Many in medicine and surgery do much, grow tall and achieve a lot but there are few who let others working under them, grow and achieve (I am one of the many beneficiaries of his largesse)—SPK was one of such rare breeds. Not only on his students, SPK has left an indelible mark of his personality and style on his young faculty colleagues at SGPGIMS (including S.S. Sikora, Ashok Kumar I, Anu Behari and myself).

On the fateful morning of 3 August 2021, both Robin and T.D. Yadav informed me that he has passed away; ‘You are wrong,’ I said, ‘he has NOT passed away, he has passed on his legacy to all of us to carry it forward and carry it we will.’ His associates (including myself) and his students, the alumni of DoSGE at SGPGIMS have decided to celebrate his life and achievements.

Record-keeping, data and audit were his obsession. All numbers had to tally; all i’s were to be dotted and all t’s must be crossed; if not, he will become impatient. After his demise, many people wished for his soul to rest in peace (RIP) but I am sure even ‘there’ he must be instructing Chitragupta to correct his records and conduct a proper audit of Covid deaths in India.

Indira Nath

(14 January 1938–24 October 2021)



On 25 October 2021, the Leprosy Mission Trust India Research Committee was scheduled for a zoom meeting, with Professor Indira Nath as chairperson. Regretfully, the meeting was never to be. Professor Indira Nath had passed away peacefully the previous night. The irreparable loss, a feeling of despair descended on all who were privileged to know her. With the passing away of Professor Indira Nath, we have

lost a distinguished biomedical scientist. A champion researcher who chose to pursue research in leprosy, a stigmatized neglected human disease. Professor Nath’s research contributions in deciphering human cellular immune responses in leprosy are recognized internationally. Looking back on a career spanning over five decades, Professor Indira Nath had been a leading global voice on issues related to public health, international scientific cooperation and research ethics. A visionary endowed with characteristic zeal and dynamism to seed change, to usher in new disciplines into the medical curriculum. For example, she advocated using science to investigate clinical problems; to establish a tradition of linking the clinic and the laboratory to address clinical issues in real-time. During her lifetime, she dedicated her energies to taking up issues of national relevance related to health, women’s participation in science and ethics in science. She extended her experience of being at the forefront of efforts to end discrimination and prejudice toward patients and healthcare providers that prevailed initially with the ongoing Covid-19 pandemic. Being an executive member of the International Human Rights Network of Academies and Scholarly Societies (IHRN), she spoke on disease, stigma and

A teacher, a mentor, a true guru, a pioneer, a leader, SPK was indeed a ‘tall figure in a small frame’.

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With inputs from a condolence meeting organized by Rebala Pradeep on behalf of the Indian Association of Surgical Gastroenterology (IASG) on 8 August 2021 in which R.A. Sastry, G.R. Verma (SPK’s students at PGIMER) and S.S. Sikora, Rebala Pradeep, K.R. Prasad, Ashok Kumar I (SPK’s students at SGPGIMS) remembered him and paid their tributes.

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discrimination. In an interview with CNN (18 February 2021), she pointed out that besides the role of science in discovering solutions, it is crucial to communicate with the community to establish trust and transparency, to help implementation of healthcare and the rights of patients and care providers. In this regard, she saw the need to develop expertise in behavioural sciences so that the advice given is acceptable to society.

We owe a great deal to Professor Nath for her role in establishing one of the first Biotechnology departments (in 1986 at the All India Institute of Medical Sciences, New Delhi) in the country. She was the Professor and Head of the department, for about 12 years, till superannuation in 1998. Despite her responsibilities as head, she persisted in her research and took on additional national and international assignments. This trend she retained notwithstanding retirement and served on several national and international advisory committees. She was involved in the formulation of science policy, ethics in science, Indo-US dialogue on biosecurity, health security; implications of genome editing, and preparation of the health document submitted to the G20 meeting in 2017. She made an impact as a member of the Scientific Advisory Committee of the Union Cabinet, Government of India (SAC-C, 2003–2007, 1997); council member (1992–1994 and 1998–2006) and vice president (2001–2003) of the Indian Academy of Sciences, Bengaluru; Raja Rammohan Fellow; Emeritus Professor, National Institute of Pathology, Indian Council of Medical Research; Director, LEPRO Blue Peter Research Centre, Hyderabad and Dean of Medical School of AIMST, Malaysia.

Professor Nath was a multifaceted personality. Besides being involved in biomedical research, she took up issues related to women scientists as chairperson, Women Scientists Program, Department of Science and Technology, India 2003. She projected women’s issues in science internationally as a member of the Indian delegation and speaker at the Women’s Economic Forum, Deavoux, France, 2008; and as the Indian representative for the Women Scientists Symposium, Barcelona

and Madrid, 2008. Speaking at the MDIS School of Health and Life Sciences, Singapore, in 2017, Professor Nath said, 'The human population is healthier than ever before, but to achieve this, we have exploited the planet at an unprecedented rate. The ill-effects of unplanned urbanization have led to increased carbon dioxide emissions, ocean acidification, energy use and tropical forest loss. More than half (53%) of the world's population live in the Asia Pacific region, with 48% living in urban areas. What this implies is a "Triple Burden for Health"—(i) existing and emerging infectious diseases; (ii) emerging lifestyle diseases; and (iii) injuries due to accidents. Human health is inextricably linked to urban health. This inter-relationship plays out in long chains of causation, wherein one factor influences another to eventually affect the health of individuals and communities. Presently, we are seeing a worrying cumulative load on our health system;' emphasizing the need for a 'Systems thinking' to address issues related to human health. She recommended as a plenary speaker at the UN-STI Forum in 2017: '(i) One health approach in policies and implementation for infectious diseases; (ii) systems approach for tackling urban health and climate change; (iii) STI Forum to be a fulcrum with/within developing countries for innovative low-cost technologies, vaccines, and better use of manpower and use of existing satellites for monitoring and communicating health issues.'

Born in Guntur, Andhra Pradesh on 14 January 1938, the eldest daughter of Smt Nagalaxmi and Shri N.V. Rao (a CPWD engineer), she had her early schooling in La Martiniere, Kolkata. She was clear about her chosen path as asserted in an interview to the *The Hindu* when she was awarded the L'Oreal-UNESCO Women in Science award (2002): 'Unlike most people, I have never had a dilemma about what to do in life. When I was ten, I decided that I wanted to become a doctor. By the second-year medical college, I was sure I wanted to specialize in pathology, and later I was clear I wanted to do research.' She did her pre-medical course (Hindu College) and was selected for the Bachelor of Medicine and Surgery (MBBS) in 1957 at AIIMS (2nd Batch). On completing the MBBS course in 1961 (Gold Medallist), she specialized in Pathology (MD, 1969). During the Nuffield Post-doctoral Fellowship (1971), she acquired expertise in the *in vitro* cultivation and maintenance of murine macrophages.

Additionally, her long association with Professor John Turk at the Royal College of Surgeons and Dr R.J.W. Rees at the National Institute for Medical Research, London, UK enriched her research experience. On her return, she was appointed Lecturer in the Department of Biochemistry at AIIMS in 1972. Motivated by her initial exposure as an undergraduate to leprosy patients at the Shahdara colony, she chose to work in leprosy. Now a faculty member with a defined interest, with the introduction of immunology as a new discipline in AIIMS, it became her focus to investigate the immunological aspects of human leprosy. *Mycobacterium leprae* is an intracellular pathogen, hence it is essential to explore cell-mediated immunity (CMI) to the pathogen. Cellular immunology requires a tissue culture facility to maintain *in vitro* peripheral blood mononuclear cells for 5–6 days. Laboratories versatile in CMI techniques were uncommon or absent at that time. Investigating humoral immunity was an easier option. However, she chose the unfamiliar to establish a cellular immunology laboratory devoted to leprosy research. After 8 years in the Biochemistry department, Dr Nath returned to Pathology Department as Assistant Professor (1980), and was promoted to Associate Professor in 1986.

Besides establishing the stringent conditions necessary for the tissue culture, it was essential to transport clinical samples within hours of collection from the field to the laboratory for the *in vitro* radiometric assessment of viable bacilli in dermal biopsies and the functional immunological evaluation of peripheral blood mononuclear cells. Here too, Professor Nath took on a formidable challenge concerning transporting patient samples by air, recalling one such incidence. I joined the Department of Biochemistry as a Junior Research Fellow (JRF). Other laboratory colleagues and I accompanied her to Baroda (Vadodara). Samples were collected in the forenoon and placed in appropriate containers/boxes. At the airport, officers raised objections to the carrying of medical samples on board. Dr Nath explained that they were patient samples to be taken to the laboratory for analysis at AIIMS. The high decibel exchanges forced higher-ups to arrive on the scene, several tense moments lapsed.

Finally, due respect and priority for patient samples prevailed, followed by submission of written statements that the patient samples were not infectious, had been appropriately sealed and cushioned to prevent breakage during transit. On arrival at the laboratory, all blood samples were processed overnight for isolation of peripheral blood mononuclear cells (PBMC). Human/murine macrophages were infected with bacilli extracted from biopsies. The stacks of microplates were placed in the incubator, hoping all was well, and there was no power breakdown! That was the pace and magnitude of work done during her tenure in the departments of Biochemistry and Pathology.

Professor Nath made pioneering contributions concerning cellular immunity in human leprosy and the discovery of LSR2 gene in the leprosy bacillus. She had demonstrated the overt presence in circulation CD4+FOXP3+T regulatory cells producing TGF- α could explain the specific antigen anergy associated with stable lepromatous leprosy. However, her focus was to investigate the cellular basis of 'reactions' among patients (immunologically unstable) resulting in severe morbidity, requiring immediate clinical attention. In a series of publications, she and Dr Chaman described those patients undergoing leprosy reactions show an imbalance in Th17 and Treg populations, a new paradigm beyond the conventional Th1 and Th2 T cell subsets. Alteration in cytokine(s) expression (suppression of TGF- α and increased IL-6, IL-21) led to an imbalance. Increased expression of chemokines (CCL20 and CCL22) facilitated the migration of Th17 to inflammatory sites. The enhanced presence of hyperactive Th17 cells at the lesional sites could potentially contribute to the inflammation and immunopathology observed in leprosy reactions.

In recognition of her contributions, she was conferred with numerous awards. The award she cherished was the Shanti Swarup Bhatnagar award (1983). The citation reads as follows: 'Dr Nath has studied the immunological mechanisms involved in various types of leprosy and contributed to the basic understanding of the cellular mechanisms regulating natural immunity in the human form of the disease. Development of a new *in vitro* radiometric assay using macrophages has provided a rapid method for screening anti-leprosy drugs, drug resistance and immunologically-mediated microbiocidal activity.' Professor Indira Nath is the only Indian to date to receive the L'Oreal-UNESCO Laureate award for 'Women in Science—Asia/Pacific region', in 2002, in recognition of her contribution in medical science related to deciphering mechanisms underlying immune unresponsiveness, reactions, nerve damage in leprosy

patients and search for markers for the viability of the leprosy bacillus. Again in 2002, she was awarded the Silver Banner, Tuscany, Italy, for her research in leprosy as part of the Tuscany Day celebrations whose theme was 'Women of the World, Women in the World'. She was one of the six influential women of the world who were honoured for their role in Science, Culture and Politics. Additionally, she has been conferred the Padma Shri (1999); Chevalier Ordre National du Merite, France (2003); DSc (Honouris Causa) by the Pierre and Marie Curie University, Paris (2002); the Basanti Devi Amir Chand award by ICMR, (1994) and the Lifetime Achievement award, AIIMS (2018) from the President of India, Shri Ram Nath Kovind. She was an elected Fellow of all three National Science Academies (1988, 1990, 1991); the National Academy of Medical Sciences (India, 1992); the Royal College of Pathology (London, 1992) and the Third World Academy, Trieste, Italy (1995).

To those fortunate to know her and work with her, Professor Nath took care of all of us. Dr Gupta was always available to take

care of our children, vaccination or when they were ill, as a paediatrician. Delightful events one recalls—Farmhouse new year get together, Deepa's wedding, etc. Perhaps one of the few women who indeed have broken the glass ceiling by sheer perseverance and toughness. Professor Indira Nath's lifetime achievements will ignite minds and inspire coming generations—she hoped they would not have to take as long as it did in her case.

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Obituaries

Many doctors in India practise medicine in difficult areas under trying circumstances and resist the attraction of better prospects in western countries and elsewhere. They die without their contributions to our country being acknowledged.

The National Medical Journal of India wishes to recognize the efforts of these doctors. We invite short accounts of the life and work of a recently deceased colleague by a friend, student or relative. The account in about 500 to 1000 words should describe his or her education and training and highlight the achievements as well as disappointments. A photograph should accompany the obituary.

—Editor