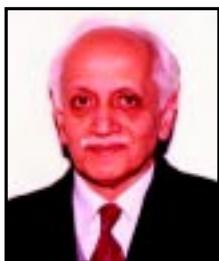


OBITUARY

Autar Singh Paintal (1925–2004)



What can I say that can change your lives? Perhaps I should ask you to do something that is very difficult. And so I am going to ask you to try to achieve perfection in your chosen areas of activity.

(A.S. Paintal at the Institute Convocation of Delhi University of Technology, 1993)

Professor Autar S. Paintal - an internationally acclaimed scientist in the area of cardio-respiratory physiology - died on December 21, 2004. He was born on September 24, 1925 in Mogok, Myanmar, where his father Dr. Man Singh was a physician in the service of the British Medical Service and possessed a strong socialist outlook, while Autar's mother Rajwans Kaur was a deeply religious lady. Autar's own life thus came to be moulded by both these systems of belief.

At the age of 14, he was sent to Lahore to finish his matriculation, ahead of the evacuation of the family from Burma. Here, besides studying hard and starting on his inexhaustible fund of limericks that he subsequently became famous for, he learnt to row the large country boats that plied on the river Raavi. He stayed on at the Forman Christian College to write the Intermediate Examination of the Panjab University and after that he joined his family in Lucknow where his father chose to settle down.

Admission into Medical College in 1943 was an easy matter for him but he needed financial support. Fortunately for him, he still held the status of a 'Burma Evacuee' and the Burmese Government came to his support.

His student life at the King George's Medical College (1943-1948) was marked by distinctions and awards, finishing off with winning the coveted Hewitt Gold Medal for obtaining the highest marks in the final MBBS examination. That he was a serious student and committed to do well can be concluded from his having to seek the quiet of the grounds of the 'Lucknow Residency' and studying under its bright lamps. But A.S. Paintal was no bookworm; he and his friends spent their leisure time rowing on the river Gomti and won awards in the annually held Regattas of the Lucknow University.

Due to his keen interest in research, Autar decided to give up a lucrative career in clinical medicine. His Medical Superintendent, while reluctantly agreeing to recommend him for an M.D. Degree in Physiology, wrote that he was confident that he would make a valuable and useful contribution to science in course of time. His teachers too were taken aback with this decision. S.N. Mathur, his Professor of Physiology, recorded that, "In my life-long experience as a teacher, I have not come across another young man who, through sheer love and liking for research, has deliberately given up his clinical training for the sake of a research job".

Dr. Paintal's subject for research was *Electrical resistance of the skin in normals and psychotics*. For this he built an apparatus himself and handling it with great dexterity collected some extraordinary data from which he obtained the 'Paintal Index'. Till more advanced methods were available, psychiatrists used this index to identify psychotics.

After being appointed as a lecturer in the Physiology Department of the King George's Medical College, he proceeded to work for his Ph.D. degree with Professor David Whitteridge in the Physiology Department of the Medical School in Edinburgh on a Rockefeller Fellowship in 1950. This was unprecedented as this fellowship is primarily given for conducting research in USA.

Although the J receptors were discovered by him in 1954 at the Vallabhbhai Patel Chest Institute of Delhi University, their discovery was made possible by his having devised two new techniques in electrophysiology while at Edinburgh. The first one almost cost him his Fellowship, but it revolutionized sensory physiology. It involved the use of liquid paraffin for immersing nerves while dissecting and recording from them. The second was the injection of chemicals to unmask 'silent' sensory visceral receptors.

Elected to the Physiological Society in 1953, he returned to India to work as a Technical Officer of the Defence Laboratories in Kanpur. There he set up laboratories for the bioassay of drugs and devised ergonomically efficient equipment for soldiers while assessing the physiological efficiency of summer clothing for soldiers in the desert environment. This experience and his concern for giving the best physiological advice to the Indian soldier remained constantly uppermost in his mind and led him several years later to set up the Department of High Altitude Physiology at the Vallabhbhai Patel Chest Institute.

During the years 1952–1960, he discovered several sensory receptors in the viscera and made notable advances in sensory physiology. For example, he discovered the volume receptors of the atria and the ventricular pressure receptors, the gastric stretch and the mucosal mechanoreceptors of the intestines, the pressure pain receptors of muscles, and with C.C. Hunt coined the term 'fusimotor' for the nerve fibres that supply intrafusal muscle fibres of muscle spindles.

Foremost amongst his discoveries is the juxtapulmonary capillary (J) receptors which are stimulated by a rise in interstitial fluid volume and increase in pulmonary blood flow as in left heart failure, coronary artery disease, and chronic obstructive pulmonary disease. Their stimulation gives rise to breathlessness and termination of exercise. He described the reflex termination of exercise as one of their most important functions - providing a protective reflex to humans and animals against excessive pulmonary pressures. With Ashima Anand he showed that these receptors are also stimulated by increased blood flow, as in exercise. Along with his other collaborators, he also showed that stimulation of J receptors produced respiratory sensations leading to dry cough. This discovery has assumed clinical significance in patients experiencing dry cough.

His work on the conduction and block in mammalian nerves provided a tool to the electrophysiologists enabling them to distinguish between myelinated and non-myelinated nerve fibres. He was also able to demonstrate that the Head's Paradoxical reflex was an artefact. At only 39 years of age, A.S. Paintal was invited to contribute to the Pharmacological Reviews.

One of the most insightful scientists of the world, his contributions came to be described as having opened a new era in physiology with Cornellie Heymans and Eric Neil coining the terms Pre-Paintal versus Post-Paintal while referring to the impact of his discoveries.

Although bench research was his first priority, he had a stint with teaching when he joined the All India Institute of Medical Sciences as a Professor of Physiology (1958-1964). While he enjoyed this assignment, his students observed "an enigma - a brilliant, fascinating, witty, explosive character with more than a trace of resemblance to the action potentials..."

In 1964, he was appointed the Director of the Vallabhbhai Patel Chest Institute, where he gathered a galaxy of scientists from several institutions in the country and also from other parts of the world. His total commitment to his scientific pursuits led him to establish his laboratory in his office from where he not only administered the Institute, with the students, the faculty and the staff having the full run of his presence, he also entertained from the edge of his laboratory all his visitors from various parts of India and overseas. His hospitality was legendary - whether he brewed cups of Darjeeling tea in the laboratory for his visitors or took them out bird watching and rowing on the river Yamuna in the winters or for a swim in his country club in the summer.

He was elected to the Fellowship of the Royal Society of Edinburgh in 1966, followed by an election to the National Academy of Medical Sciences and the Indian National Science Academy. In 1981 he was elected to the Royal Society (U.K.) and had the distinction of being the first Indian medical scientist to be so honoured. An honorary membership of the Physiological Society U.K. and the American Physiological Society followed soon after as did an Honorary Fellowship of the Royal College of Physicians. His outstanding scientific contributions won him several National Awards and Honours, with the President of India bestowing on him the coveted Honour of the Padma Vibhushan in 1986. In the same year, he was appointed the Director General of the Indian Council of Medical Research (ICMR), and he served this office till 1991. He was elected a member of the International Council of Physiological Sciences in 1997 and was re-elected for another term up to 2005 - which was an honour not only for him but also for India.

In his own view, his greatest contribution to Science in India, apart from his discoveries was the creation of the Society of Scientific Values, which he helped to establish and served as its first President. This Society, the first of its kind in the world, has among its main objectives promotion of integrity, objectivity and ethical values in the pursuit of science. Indeed while serving as its President he himself pursued several cases of scientific

dishonesty in India. Throughout the last two decades of his life, Professor Paintal stressed upon the urgent need of introducing methods of adjudicating accountability in biomedical research. His opinion in this regard was fair and above board. He opined, "Since self-imposed accountability does not exist in India, as it does in certain western countries, India should develop a system for holding scientists accountable for the suffering of others. However, it would be much more desirable if medical scientists adopted self-imposed accountability".

Additionally, he strived for intellectual independence and solicited ceaselessly the young scientists to think for themselves and dream their own dreams. While actively promoting collaboration with scientists from India and abroad, he knew well where to draw the line.

Professor Paintal was generally very critical about the method of science education in India. He mentioned, "I have always felt that practical work in schools and colleges must be greatly increased, and methods suitable for Indian conditions must be developed for evaluating practical work in high schools and colleges...Perfection must be encouraged and rewarded. Schools and colleges where the best practical work is done should be encouraged appropriately to provide leadership to others."

Based on his recent discoveries, the Department of Science & Technology set up a Centre for Visceral Mechanisms in the Vallabhbhai Patel Chest Institute in order to intensify and extend the work on dyspnoea (breathlessness) and exercise limitation that arise reflexly by stimulation of J receptors.

The entire fraternity in biomedicine shall remember the seminal contributions of Autar Singh Paintal with gratitude and reverence.