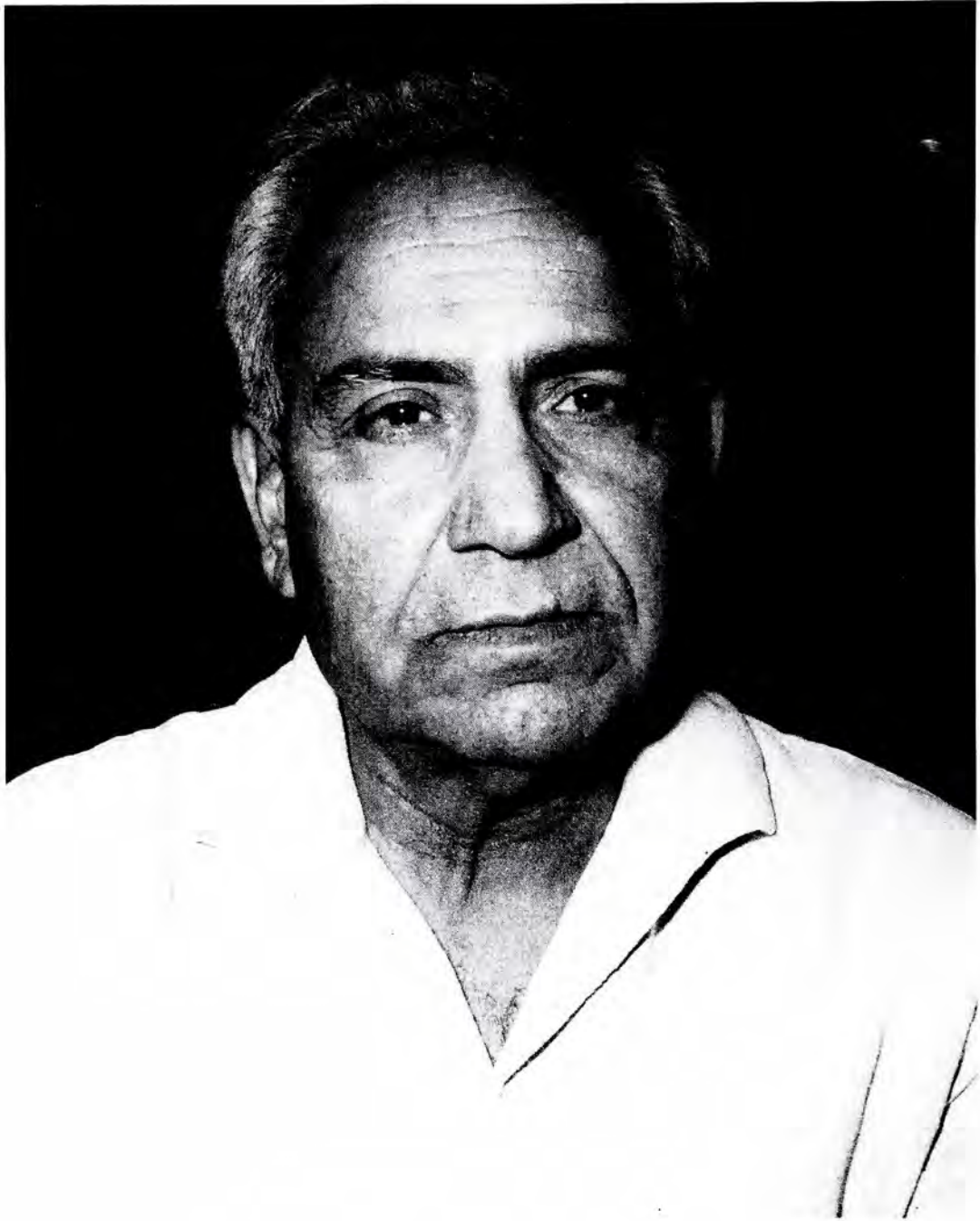


PIARA SINGH GILL

(28 October 1911 - 23 March 2002)

Biog. Mems. Fell. INSA, N. Delhi, 25, 139-149, (2004)





P. M. J.



PIARA SINGH GILL

(1911-2002)

Elected Fellow 1945

Life history of **PIARA SINGH GILL** represents an epic story of a man, who by sheer force of qualities of head and heart and resolute work, rose from a backward Punjab village life to the status of an internationally known physicist and a science administrator of outstanding merit. His personal struggle and courage in the face of odds, is the best exhortation to any aspiring youngman and serves as a beacon light to everyone, especially those from a lower middle class.

FAMILY BACKGROUND AND EARLY EDUCATION

Born on 28 October, 1911 in village *Chela*, in district Hoshiarpur, Panjab in a farmer's family, Piara Singh had to go through all the phases of life that a typical village-lad had to experience in India of those days and even more. His native village had no elementary school even and he had to walk a few miles to and fro his school everyday, rain or shine. Facing the hardships of daily life in those days of rural Panjab, Piara Singh imbibed the proper spirit of self-reliance and independent judgment and an unswerving capacity to achieve high goals, irrespective of the odds involved in future life. His parents had a firm resolve to see their son become a school teacher, unaware of all that destiny had in store for him; that he will far exceed their expectations in achieving fame and reputation, far beyond the national boundaries. He matriculated from Khalsa High School, Mahilpur (Hoshiarpur) in 1928.

The political trials and tribulations of his elder brother, who was arrested by the British government for his participation in the National Movement, left an indelible mark on the young mind of Piara. He resolved that he should get out of the "enslaved country and study abroad in an atmosphere of freedom." In the backdrop of survival-level existence financially at home and his family's involvement in National Movement, it was a difficult task to acquire a passport for travel abroad. Finally Piara Singh left in the summer of 1929 for Panama as a deck passenger on an Italian cargo ship "SS Carlo" on his way to U.S.A. via Europe. For raising some funds, he worked in Panama for a period of eight months and left for U.S.A. in 1930. In those days of economic depression, it was impossible to land with any job, which was an immediate need for survival. By dint of sheer will power and tenacity of purpose, while doing odd jobs of picking fruit, scrubbing floors and washing dishes for his livelihood; he secured his B S and an M A (Physics and Mathematics) degrees in 1935 and 1936 respectively at the University of Southern California, where he earned a tuition scholarship (merit) for his studies.



In keeping with his high objectives of working in a world-renowned school; in spite of the fact that he received an offer of a fellowship to study at the University of California at Los Angeles, he joined the University of Chicago in Oct 1936 and worked with the famous American physicist, Nobel Laureate Professor Arthur Holy Compton. He began his research career in 1937 and did extremely good work on: *Time Variation of Cosmic Rays*. His doctoral dissertation, *Further Studies of Cosmic Rays on the Pacific Ocean* comprised data collected by means of an ionization chamber shielded by 12 cm. of lead placed on board 'SS Aorangi', which navigated the Pacific Ocean from Vancouver, BC to Hobart, Tasmania. The results established the latitude effect of cosmic rays at sea level after accounting for the temperature effect. *The New York Times* reported his work and that of his associate Marcel Schein in its 30 June, 1939 issue under the heading, *Cosmic Bullets Make Dust of Atom*. In March 1940, he received his doctorate degree in Physics at the 199th Convocation of the University of Chicago.

In June 1939, an international symposium on Cosmic Rays was held at the University of Chicago, where half a dozen Nobel Laureates from all over the world, were present. Gill was one of the younger members, who in collaboration with Dr Marcel Schein presented a paper on, *Size Frequency Distribution of Cosmic-Ray Bursts*. This paper created great interest among physicists, as it was the first experiment, which gave clue to the spin of the meson. This work put him in contact with many eminent cosmic-ray workers in the world like Professor MS Vallarta and Professor SE Forbush. The American government placed a World War II plane B-29 at their disposal to carry out extensive measurements of cosmic rays on the Pacific Ocean, upto heights of 33,000 ft, by slow stages and confirmed the results obtained by him in his earlier Himalayan expedition. By the time of Dr Gill's departure from America to his native India, he was recognized as the most congenial graduate student at the University of Chicago, earning the nickname of "Pi", a pun on the mathematical symbol⁴ (he also relished apple pie a la mode).

At Bombay, the venue of the Congress Working Committee meeting, Dr Gill was introduced to Mrs. Sarojini Naidu among others. Mrs. Naidu asked him to see Miss Mrinalini Chattopadhyaya, who was the Principal of the Ganga Ram Training College for woman at Lahore. Mrs. Chattopadhyaya was such an amiable and cordial person, that Dr. Gill became an almost daily visitor to her residence. It is at her residence that Dr Gill met Chambeli for the first time. She had been a student of Miss Chattopadhyaya and had recently returned from Cambridge University, England. The casual acquaintance blossomed into their marriage on 17 February, 1942. Mrs Gill was an elegant lady with sophisticated family background. She proved a great asset and a source of strength for Dr Gill in his future life.

Their first daughter, Nishtha was born on 14 February, 1944 and the younger daughter Surishtha was born on Oct. 13, 1946. They were a source of great joy to the parents and augmented the family happiness. Both of them are well settled in United States with their respective families. On describing the passing away of his wife in 1978, in his autobiography¹ entitled, *Up Against Odds*, Dr. Gill refers to his wife's passing by saying, for many years, I suffered loneliness that I had never before known.

PROFESSIONAL CAREER AND SCIENTIFIC CONTRIBUTIONS

On his return to India on a traveling fellowship (1940-41); Dr Gill carried out experiments on the Azimuthal Variation of Cosmic- rays, which could best be carried out at the latitudes and altitudes



available in India. He was a Lecturer in Physics at F.C. College, Lahore (1940-47). Such studies at that point of time, though a lone furrow in a barren field, did inspire a number of young students to take physics research as a career. In 1947, he joined Tata Institute of Fundamental Research, Bombay as Professor of Experimental Physics, where a renowned compatriot in the field of Cosmic-rays, Professor HJ Bhabha, was the Director. Along with Dr VH Vaze, he carried out the studies of Azimuthal Variation of Cosmic-rays at Bombay.

Dr Gill's international recognition as an eminent scholar allowed him to perform research at Carnegie Institution, Washington D.C. in the Department of Terrestrial Magnetism in 1948. At the National Bureau of Standards, Washington, D.C. as a Consultant in Nuclear Physics, he set a Nuclear Standardization Laboratory.

On the persuasion of Pandit Jawahar Lal Nehru, then Prime Minister of India and on the invitation of Dr Zakir Hussain, the then Vice-Chancellor of Aligarh University, Dr Gill took the charge of the Physics Department, Aligarh University, on 1 September, 1949 on his return from U.S.A. In April 1950, Dr Gill was also appointed Dean, Faculty of Science; so that the university could derive maximum benefit from his rich experience in the development of other science departments.

At the very outset, the syllabi of postgraduate studies were revised and brought up-to-date so that teaching of physics could improve. On two other fronts, he directed his energies to give a face-lift to the Department. Firstly, he created first-rate facilities for work in the field of Cosmic Rays, so that he could pursue personal research vigorously.

The development of G-M counters, Neutron counters, Nuclear Emulsion technique and sophisticated electronic circuitry for various experiments were some of the activities completed successfully under guidance of Dr Gill. In addition, Prof. Gill revamped other sections of theoretical physics and experimental physics such as nuclear physics, conventional spectroscopy of optical and vacuum regions, and created state of the art facilities in radio-frequency spectroscopy like Nuclear Quadrupole Resonance (NQR), Nuclear Magnetic Resonance (NMR), Electron Paramagnetic Resonance (EPR) and Microwave spectroscopy. Furthermore, in electronics, some studies were made in the switching mechanism of timing circuits like mono- and bi-stable multivibrators. A Cockroft-Walton accelerator was built for studying thermal neutron cross-sections and for producing isomers. As a result, new life was infused in an otherwise dormant department.

In collaboration with late Professor WFG Swann, Director of the Bartol Research Foundation of the Franklin Institute at Swarthmore, PA; on a grant from the American Philosophical Society, Dr Gill built Cosmic-ray telescopes for the study of Lead Absorption of Cosmic Rays at different altitudes. This experiment was conducted simultaneously at Swarthmore, Aligarh and Gulmarg.

Dr LF Curtiss, from the National Bureau of Standards, Washington came as a guest scientist and jointly with Dr Gill, conducted a project on the variation of intensity of Fast Cosmic Ray Neutrons as a function of altitude and latitude. Dr Gill built up the pitch of the research activity to a crescendo and raised the status of the department to an international level.

Geiger Muller counters are basic detectors for the study of Cosmic-rays and so Dr Gill first directed his attention to their in-house production. A temperature independent counter, which operates satisfactorily from minus 20° C upto 85° C was developed by M Yasin and Ajit Singh under the



guidance of Dr Gill. Later SP Puri, a student of Dr Gill carried out extensive studies on the discharge spread mechanism of GM counters, for which work he was awarded a Ph.D. degree. Subsequently, he developed halogen-filled counter and studied its firing characteristics. RN Mathur, another student developed Neutron counter and made use of it in measuring the mean free path of Cosmic-rays in different absorbers. He was awarded the Ph.D. degree on the basis of this work.

Employing the banks of these counters, the directional studies of Cosmic rays were carried out by TH Naqvi and later by MK Khera for their Ph.D. degrees. These studies were conducted at Gulmarg and were aimed at throwing light on the nature, composition and energy spectrum of primary cosmic rays. Analysis of absorption of Cosmic rays in lead were thoroughly investigated at Aligarh and Gulmarg. HS Hans, another student of Dr. Gill constructed and successfully tested, with the help of SP Agarwal, a sophisticated set-up for studying the decay of mu-mesons.

VB Bhanot, another student of Professor Gill, undertook study of nuclear events through Nuclear Emulsion technique. Using this technique, several problems including studies of star-producing radiation at mountain altitudes and east-west asymmetry of cosmic ray particles were conducted. Three students of Professor Gill, namely Yog Prakash, IS Mittra and AP Sharma got their Ph.D. degrees on the basis of this work.

Nuclear studies comprised radioactivity, neutron scattering and neutron cross-section measurements. HS Hans along with CS Khurana, was primarily responsible for construction of a Cockcroft-Walton type of accelerator. This was used for producing 3 or 14 Mev neutrons. Various problems in this field were undertaken. Professors ML Sehgal, BP Singh, CS Khurana and SK Mangal got their Ph.D.'s under the supervision of Professor Gill.

On the joining of Professor P Venkateswarlu, the spectroscopy lab started developing fast and extended the measurements to radio frequency and microwave regions. The section on theoretical physics was built by Professor S Gupta and later on by a brilliant young physicist Professor AN Mitra. As ill luck would have it, Professor Gill met with a severe car accident on 2 January, 1959 and he had to be hospitalized at Chandigarh. S Partap Singh Kairon, Chief Minister of Panjab and a friend of Dr Gill, took personal interest in his well-being and arranged the best possible medical advice and help for his recovery.

On the invitation from the Berlin Academy of Sciences, Professor Gill visited Research Institutes throughout East Germany. The Soviet Academy of Sciences also extended invitation to him to visit the Soviet Union, which he did. Professor Gill spent the academic year of 1961-62 as a Visiting Professor at the Washington State University, Pullman, Washington. He was so highly respected for his scholarship and erudition, that the university offered him a tenure appointment of Professor of Physics. Being dedicated to the service of the country, he declined the offer. However, he went to the Atmospheric Research Center Boulder, Colorado for three months each year in 1963 and 1964.

During 1962-63, Professor Gill, on invitation from the American Institute of Physics and the American Physics Teachers' Association, delivered lectures at various universities and colleges throughout U.S. It was on 2 September, 1963 that he joined the Central Scientific Instruments Organization, Chandigarh as its Director. Thus after a stay of fourteen years, he returned to his home State Panjab. His stay at Aligarh helped in creating a strong tradition of research in Cosmic Rays, Nuclear Physics, Atomic and Molecular Spectroscopy and Theoretical Physics. He created an active



School of Physics at Aligarh. About a dozen of students got their Ph. D.'s under his inspiring leadership and most of them occupied positions of distinction in the research and teaching fabric of the country.

Gulmarg Research Observatory, Gulmarg (Jammu & Kashmir)

Another feather in Dr Gill's cap, was the establishment of Gulmarg Research Observatory, jointly by the Universities of Aligarh and Jammu & Kashmir in 1951. It constituted the base for much of the high altitude work done by his group. On 4 April, 1954, the Late Professor AH Compton visited the observatory and formally inaugurated it. He, in general, found the location ideal for research in the field of cosmic rays, solar radiation and physiology.

A symposium on High Altitude Research was held in May 1955, under the auspices of the National Institute of Sciences of India. Initially, Dr Gill's students carried out their research at the Observatory every year from April to September or October, bringing along side the required equipment. On the basis of work done carried out on Time Variation of Cosmic Rays and Extensive Air Showers under Dr Gill's guidance, LV Sud, Ch. V Shastri and A Bhaskar Rao, received their PhD degrees.

Central Scientific Instruments Organization, Chandigarh

From 1963 till 1971, he headed the Central Scientific Instruments Laboratory, Chandigarh as its Director. This institution was built up due to his dedicated work and emerged as a place known for precision instruments of high quality. His pioneering initiative led to the creation of a large number of sub-divisions in the disciplines of Fiber Optics, Medical Instrumentation, Process Control Instruments, Digital Electronics, Industrial Instruments, Repair and Maintenance Division, Precision Mechanical Workshop and Agriculture Instrumentation. This was possible due to the foresight and unstinted support of his friend S Partap Singh Kairon, the then Chief Minister of Punjab, in his zeal to build a modern Punjab.

On one hand, Professor Gill got started the construction of the workshops and laboratories of the Organization in Sector 30, the present location of C. S. I. O. complex; on the other, he along with a band of devoted young scientists, started the planning work of the Organization for rendering technical assistance to industry in the form of design and development of new instruments. He made optimum use of U. N. special Fund Scheme (U. N. E. S.C.O.), both by equipping the laboratories and its Science Centers with sophisticated instruments and secondly by selecting the right kind of experts. Furthermore, he sent the young staff for technical training abroad.

The Organization shifted to its own workshop building in 1965. Research, design and development showed a rapid progress under his inspiring leadership. Professor PMS Blackett, Academician Professor VA Fock and Academician Professor A Aberiksov visited the Organization in Jan. 1966 and Dr Gill had the advantage of constructive criticism and discussion of his plans with these luminaries.

A seminar was held at C. S. I. O. during Nov. 13-21, 1967 and delegates from South-east Asia got together to study Instrumental problems. The recommendations were submitted to the Director-General of UNESCO in December 1967 by Dr Gill, who was a member of the Panel of Consultants. The inauguration ceremony of the laboratories and workshops of C. S. I. O. was performed by Dr Zakir Hussain, the President of India on 28 December 1967. The four-story building was christened, "Zakir Technological Laboratories."



A number of electronic, medical and optical instruments and components had been developed and released to the industry for commercial exploitation. He introduced the concept of, "OPEN DAYS", for throwing open the Organization for the public and the industrialists for seeing at first hand, the development activities. This idea has become an yearly feature. As a result of collective efforts of the scientists at C. S.I. O., "Directory of Scientific Instruments and Components Manufactured in India", was released in May, 1969. The Service and Maintenance Centers, were set up at Delhi, Madras, Calcutta and Chandigarh and have rendered yeoman service in putting into operation the costly equipment, which had been out of order.

The students, associates and admirers of Professor Gill brought out a volume² entitled, *Professor Piara Singh 60th Birthday Presentation Volume*, as a cherished token of love and gratitude for the pioneering role that he played in developing the traditions of research in the country. The glowing tributes, expressing appreciation for his scientific contribution and administrative competence, were paid to him by scientists all the world over. To give a sampling, a few are reproduced below.

AWARDS AND HONOURS

Dr Piara Singh Gill held different distinguished positions in various universities and scientific bodies. such as Research Fellow, University of Chicago, 1940-41; Lecturer in Physics, F.C.College, Lahore, 1940-47; Professor of Experimental Physics, Tata Institute of Fundamental Research, 1947-49; Officer-on Special Duty, Atomic Energy Commission, 1948-49; Professor and Head, Department of physics, Aligarh Muslim University, Aligarh, 1949-63; Dean, Faculty of Science, Aligarh Muslim University, Aligarh, 1950-53 and 1956-58; Director Gulmarg Research Observatory, Gulmarg, 1951-71; Honorary Professor of Physics: (i) Jammu & Kashmir University (ii) Panjab University; Honorary Scientific Adviser to the Government of Panjab; Director, Central Scientific Instruments Organisation, Chandigarh, 1963-71; Emeritus Professor of Physics, Punjab Agricultural University, Ludhiana, 1971-81.

He was also Member and Fellow of various learned societies namely: Fellow of the American Physical society; Fellow of the Indian Physical Society; Fellow of the National Academy of Sciences of India; Fellow of the Indian National Science Academy; President of the Physics Section of the Indian Science Congress, 1954; President of the National Academy of Sciences of India, 1956-58; President of the Indian Physical Society; Secretary(outstation), Indian Science Congress Association, 1960-63; Foreign Secretary, Indian National Science Academy, 1961-64; Vice-President, Northern India Science Association; President, Optical Society of India, 1970.

Membership of Learned Bodies

Member of the U.P. Scientific Research Committee; Member of the U.P. University Grants Committee; Member of the Council of the Indian National Science Academy; Member of the Council of Indian Physical Society; Member of the Council of the National Academy of Sciences of India; Member of the Board of Editors of the Indian Journal of Physics; Member of the Faculties of the University of Lucknow, Banaras and Allahabad; Member of the National Scientific Advisory Council of the Institute for Comprehensive Medicine and also the Editorial Board of the Int. Journal for Comprehensive Medicine, California, USA; Member, Panel of Consultants in Technological Sciences



and Applied Research to the Director-General of UNESCO, 1967; Chairman, Development Council for Instruments Industry set by Govt. of India, Ministry of Internal Trade & Company Affairs (Department of Industrial Development); Member, Senate, Panjab University, Chandigarh; Member, Senate and Syndicate, Punjabi University, Patiala

TRIBUTES...

“He joined the Muslim University, Aligarh as a Professor of Physics and transformed the inconspicuous physical laboratory into an active center of research. Subsequently, he was inducted into the new fangled Central Scientific Instruments Organization as its Director. He has been eminently successful in building up a modern, up-to-date institution, newest in promise and full of potentialities.”

Prof. SN Bose

“He has a wide acquaintance in American scientific circles, where he is highly respected. He has a great enthusiasm for and dedication to the development of the scientific service in India.”

Prof. EU Condon

“The accounts of his bold moves as a youth in coming to the U.S. and making his way successfully, indeed brilliantly, into a university career and substantial research have delighted and inspired those, who are aware of them; and they provide a perspective against which his subsequent moves into positions of responsibility and confident leadership can be viewed and appreciated.”

Prof. Burton J Moyer

“The most productive part of his career was as professor of Physics in the Aligarh Muslim University from 1949 to 1963. He built from the scratch up-to-date laboratories with most modern equipment. He was an inspiring teacher, a friend and a true guide of students. Apart from his researches in cosmic rays, the efforts which he put in, in building the careers of a galaxy of talented students, is an important contribution to science in India.”

Dr. MS Randhawa

As a humble token of our respect a volume³ entitled, “*Collected Scientific Papers of Prof. PS Gill*”, compiled by his student Professor SP Puri, was published in 1971 by Punjab Agricultural University, Ludhiana. It is presented in three main sections: *Cosmic Rays, Nuclear Physics and Instrumentation*, the major fields which engaged his attention for a period of well over three decades and to which he made notable contributions.

It is indeed difficult to do justice to his glorious career in its multifarious aspects of scientific worker, able supervisor and science administrator. Prof. Gill, a doyen of Indian physics and a bright star on the firmament of scientific sky, pioneered the cause of experimental physics in India.

LAST DAYS

It was in 1989, that Dr Gill moved to United States to be near his two daughters and grand children. On the eve of his departure to United States, I went to pay my regards and take possession of the books and journals of his personal library; which he donated so graciously to the departmental library of the Department of Physics, Panjab University; for the use of staff and students. He reiterated that left to him, he would continue to stay here but for the fact that he finds it difficult to manage things on his own any more.



He lived at Atlanta with his younger daughter, Dr Surishtha G Sehgal, Faculty and Director of the Carter Award Program at Georgia State University and his son-in-law, RK Sehgal, Commissioner, Industry, Trade and Tourism for the State of Georgia. In Atlanta, he became an Adjunct Professor of Physics at Georgia Institute of Technology.

It was in January 2000 that I travelled to Atlanta to spend some time in his presence. He had suffered a stroke a couple of years back, which left him in a wheel-chair and at that time, he was living in Assisted Living where he was provided all possible help and care for routine functions of daily life. He had happy reminiscences of his associations and activities at Aligarh University as well as C.S.I.O. Chandigarh and talked at length of Indian Physics, in general. A paramount desire at that time was to go back to India and resume academic life of teaching and research once again. His physical handicap prevented Surishtha from undertaking this trip, which according to medical advice may prove too arduous at this stage of his health. In his lofty and affectionate presence, I felt that I have come on a pilgrimage to acquire again the contagion of inspiration for academic excellence.

He breathed his last on 23 March 2002 in the presence of his daughter and son-in-law. His death left a great void and marked an end of era in Physics in India, as Professor Gill, a bright star on the firmament of scientific sky, will no longer be there to inspire and guide us. Ambassador Andrew Young⁴ offered a more apt classification of Dr Gill on learning of Dr Gill's passing away. Ambassador Young noted, "I felt enriched in his presence. He was an Indian Einstein. He knew something, I did not understand. He was easy to talk to, wise, loving and it was a blessing to be in his presence."

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