

## DS Kothari and Delhi University

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“Professor Daulat Singh Kothari may be shouldering responsibilities anywhere in the world but he will always belong to the University of Delhi. He is the conscience of Delhi University”. So said the then Vice-Chancellor of Delhi University a few years ago. For the teachers in the Delhi University and the students who have passed through this university in the last 50 years, especially in the physics department, he was not only conscience but much more a living presence in their formative years.

Professor Kothari joined University of Delhi in 1934 as a Reader and Head of the Department of Physics. At that time there were no post-graduate courses. Such courses, that is MSc courses, were started at the university in 1942 when for the first time four professors in different subjects were appointed. Dr Kothari became Professor of Physics while Dr VKRV Rao became Professor of Economics. Both these eminent persons influenced—in fact dominated—the university in their earlier days and were important figures on the national (and to some extent on the international) scene in their later years. Under Professor Rao’s guidance the Department of Economics became Delhi School of Economics, a justly famous school. Later, Professor Rao settled in Bangalore where he started another institute.

Under Professor Kothari’s guidance the physics department soon acquired a name and became a leading centre of learning not only in India but also at the international level. He had the help of Professor RC Majumdar and Professor FC Auluck among others in nurturing the department at Delhi. Dr BN Singh, Professor PK Kichlu, Dr RN Rai, Professor NK Saha, Sardar Thakur Singh were some of the others. Many other well known physicists were either students or

those taught for a short or long while at Delhi before moving elsewhere. RP Bambha, AR Verma, BS Chandrasekhar, KS Singwi are some of the names that come to mind. Those days were the aftermath of the quantum mechanics revolution which had changed the face of physics (in fact all sciences) during 1926-32; Professors Kothari and Majumdar had felt the impact of this revolution when they were abroad. Delhi was the first and, for several years, the only university to teach the methods of quantum mechanics and quantum field theory at the MSc level.

In 1948, Professor Kothari was offered the post of Defence Scientific Adviser to the Government of India. He accepted it but after laying down some rather unusual conditions. One of them was that he would continue to draw the same salary as that of a university professor and not the enhanced one he was entitled to as Adviser. The other was that he would continue his teaching assignment. He continued his teaching till the late sixties even though he was involved in other assignments. After that, though it was not possible for him to take regular classes, he kept in touch with students by meeting them once a week.

During his term as Defence Scientific Adviser, he was on leave from the University for the period 1949 to 1951. After his return to the University in 1951, he continued at the University till he became Chairman of the University Grants Commission in 1961. This change took him to the national level in the fields of both science and education. So from 1934 to 1961, he had full time association with the University out of which for about 20 years he was involved in post-graduate teaching and research. (Part of this period also overlaps with his tenure as Scientific Adviser.) Though he was not involved in full-time teaching after 1961, his influence

and guidance to the department continued in varying degrees till his death in February 1993.

In understanding the achievements of Professor Kothari at Delhi University, one has to recall two important factors. One is the way Delhi University was changing under the vice-chancellorship of Sir Maurice Gwyer. The other is the role of the School of Science set-up by Professor Meghnad Saha at Allahabad which largely supplied the personnel for the physics department at Delhi University. Sir Maurice wanted to develop Delhi University along the lines of Cambridge and Oxford, with a central University closely knit with colleges around it. The students and faculty were largely in colleges but came to the university for lectures at the honours and post-graduate levels. The colleges, in their working, were governed by the advice and guidance of the departmental heads as well as professors from the university, specially attached to the colleges. This gave the university professors a lot of influence in the University. The head of a department in the University was very powerful in the entire set-up. Professor Kothari was attached to St Stephen's College, Delhi, as university representative besides being head of the physics department. This structure enabled the professors to play a vital role in the overall development of colleges and the University.

In the middle of this century from 1920s to 1960s there were two different schools of physics set up in the country; one by Meghnad Saha, first at Allahabad and later at Calcutta, and another by CV Raman in Calcutta and later at Bangalore. While Saha's school laid more emphasis on theory, that of Raman probably emphasized more on experiment. The nucleus of people that helped Professor Kothari at Delhi were largely from Saha's school at Allahabad; RC Majumdar, NK Saha, PK Kichlu, BN Singh, RN Rai, KS Singwi, AR Verma were all from Allahabad.

Professor Kothari came under the influence of Professor Meghnad Saha when he joined Allahabad University for his MSc degree. Saha encouraged him to go to Cambridge, England. At Cambridge, he got to know Professor Subrahmanyan Chandrasekhar the famous astrophysicist and Nobel laureate. RC Majumdar was then studying at Jena in Germany and used to visit Cambridge. Influenced by the work being done at Cambridge by R H Fowler (Professor Kothari's supervisor) and others, both Kothari and Majumdar worked in quantum statistical mechanics and its

application to degenerate stars and planets. In particular, Professor Kothari calculated the effects of pressure ionization in cold compact objects. He showed that bodies having masses greater than that of Jupiter would be unstable against collapse. Later, he went on to apply quantum statistical mechanics to a wide class of systems. In this, he was helped among others by Professor Auluck at Delhi. They were among the first to use in this context Ramanujan's famous theory of partitions to high polymers. In his capacity as Scientific Adviser, he also studied the behaviour of metals under intense pressure of explosive loads. Later with Professor Saha he also studied the magnetic monopole which had been proposed by the famous physicist Professor PAM Dirac.

Among the many traditions established by Professor Kothari at Delhi, two may be mentioned. Every faculty member, be he trained in theoretical physics or experimental physics, had to participate in the laboratory supervision of students at BSc or MSc level. This was based on the advice of the famous scientist Lord Rutherford to Professor Kothari when he was returning from Cambridge, UK, to India. Lord Rutherford urged Kothari to keep using his hands (in the laboratory) even if he was doing theoretical work.

The second tradition was partially due to the advice that the famous physicist Niels Bohr gave to Prof Kothari. He stressed the importance of an atmosphere where even the younger members could express their opinion freely. A very large degree of freedom and autonomy characterised the functioning of the physics department at Delhi in contrast to the functioning of some other science departments at Delhi and other places. In following Bohr's advice, Professor Kothari must have been helped by his own humility and innate confidence.

Professor Kothari was a natural and highly gifted teacher; in fact he should be described as a superb teacher-learner. He often stressed and strongly believed in the necessity for 'a teacher to be always a student and keep learning'. He was highly sensitive to the atmosphere among listeners. His switch-over from English to Hindi, to drive home a point, was very noticeable and effective in communication.

He was deeply conscious of the necessity for young students to be exposed to good teaching and liked to take courses for the first (entering) year honours

students. Often these courses were unconventional and included experiments (like blowing into Duffel bags to measure the capacity of lungs) influenced by his experience as Defence Scientific Adviser. He enjoyed teaching quantum mechanics. He and Professor Majumdar taught this subject in alternate years to MSc Previous classes. In the next year, the same teacher continued teaching them in the final year. While Professor Majumdar went into detailed mathematics and followed Schrodinger's differential equation approach (as described, for example, in Pauling & Wilson's book), Professor Kothari preferred to follow less of details but teach the more elegant formulation of Dirac given in his famous book 'Principles of quantum mechanics'. Students of successive years naturally compared notes and realised how each approach had its own advantages and disadvantages. Professor Kothari loved to go into the philosophy of uncertainty principle of quantum mechanics and stress the necessity to reconcile opposites (principle of complementarity) quoting Niels Bohr and others also in the process. He liked deriving order of magnitude relations from simple principles and would show that many results followed very simply from the uncertainty principle. He also liked to teach latest developments. To our class of 1953 he taught Bethe's derivation of Lamb Shift which had been given just four years earlier.

The importance given by him to teaching is illustrated by an oft retold incident. Once when he was interrupted during a class with the message that the 'Defence Minister wishes to speak to him on phone', he told the messenger politely to inform the caller that he (Professor Kothari) was busy in a class and would call the Minister after the class was over.

Physics cannot progress without experiments. Realising this, Professor Kothari started with two strong groups, one in optics headed by Professor Kichlu (who was later Director of National Physical Laboratory) and the other in experimental nuclear physics headed by Dr NK Saha who had worked with Professor Bothe in Germany. Later Dr KD Chaudhury went to Oxford for training in low temperature physics. On his return, he helped in the setting up of the liquid helium facility donated by Professor Kapitza of USSR. Dr VP Duggal and Dr JS Verma also joined the department from TIFR, Bombay. But Dr Duggal died prematurely while Dr Verma moved to Udaipur. Professor Kothari was wary of glamorous attractions and used to point to the

example of USSR which was doing first rate work in really important but non-glamorous areas like semi-conductors and material science (this was in the 1950s). On the theoretical side, the Department was strengthened significantly, in the mid-sixties, by the elevation of AN Mitra and LS Kothari to professorships and the induction of SN Biswas as professor. All the three were under forty in age at that time.

Professor Kothari's appointment as Chairman of the University Grants Commission in 1961 brought him into wider educational scene. It led to his appointment as Chairman of the Education Commission in 1964. Kothari Commission, as it has come to be known, had educationists of all hues from India and other countries. Professor Kothari was successful in welding them into a homogeneous team which produced a remarkable report. Among the recommendations which were implemented was the 10+2+3 system as we know it to-day and probably more importantly the introduction of science and mathematics as compulsory courses for every student up to 10th class. Universal primary education still eludes us while the suggested use of mother tongue and Hindi in higher education is still being debated in the country. The report elevated him to the position of a leading expert on education and he was an adviser on educational issues and problems till the end. He was a member of the Central Advisory Board on Education at the time of his death.

His ascetic attitude (refusing high salaries and perks) led to remarks, in a lighter vein, that he wanted research to be done on the banks of the Yamuna, after giving up all possessions, in sack clothes and ashes! This however was not true of his attitude. He would often plead and obtain reasonably generous working conditions for teachers and research workers.

His presence in the university campus, even in later years, enabled various members of the University to go to him for advice and encouragement. The presence of the Defence Science Laboratory and the Solid State Physics Laboratory close to the university campus brought many of the scientists from these laboratories to him for consultation. The decrease in the importance of the universities in relation to research institutes was a later development. In the last few years he had started a discussion group with some members of the department, on philosophy and physics. His interest in the

relationship between *Vedas*, *Upanishads*, *Gita*, *Syādvād* of Jain texts and the ideas of modern science merits a full discussion elsewhere. He was one of those

who believed in a holistic approach to the study of Individual, Science and Society. His first and enduring love was for learning and teaching.