

M. K. Banerjee (1931–2006)

Manoj Kanti Banerjee, a noted nuclear physicist, died on 18 February 2006. Banerjee had obtained his B Sc degree from Patna University (1949), M Sc degree from Calcutta University (1951) and Ph D degree in 1956 after working in Saha Institute of Nuclear Physics (SINP), Kolkata. He had a distinguished career in physics. He was awarded the Weizmann Fellowship in 1962, and was elected fellow of the Indian Academy of Sciences, Bangalore and American Physical Society. Banerjee was also awarded the Humboldt Research Award in 1996 in recognition of his contributions to science. He served for nearly forty years as a Professor of Physics in the University of Maryland, USA, after a stint of about five years in SINP as a professor.

Banerjee shot to fame early in his career when he developed the direct interaction theory of inelastic scattering in collaboration with Carl Levinson. Acknowledged as 'the most complete treatment of direct interaction', this work incorporated the initial-state and final-state interactions, and allowed for direct interaction to take place anywhere inside the nuclear volume, leading to a remarkable agreement with experimental data (carbon data, to be specific) over a wide range of energy.

Among his contributions to the theory of nuclear structure, a noteworthy piece of work is the calculation of energy spectra of $(2s, 1d)$ shell nuclei, carried out in collaboration with Levinson and Meshkov. The theory used the SU(3) classification of shell-model states and was mainly focused on the ^{24}Mg nucleus. Banerjee's interest in nuclear structure continued as he mentored a string of students, including L. Satpathy and Harishchandra. Some of their studies were related to application of the Hartree–Fock–Bogoliubov method to structure calculations. He has also made

interesting observations on the shapes and symmetries of light nuclei in collaboration with Levinson and Stephenson.

Banerjee was actively interested in the physics of nuclear matter. The first ever attempt at adapting the many-body theory to the calculation of the t -matrix for finite nuclei was due to Banerjee and Binayak Datta Roy. Banerjee returned to the physics of nuclear matter much later in his career. In collaboration with Tjon, he studied the pion–nucleon parameters in nuclear matter, contributing valuable insight regarding their density dependence.



A significant result obtained by Banerjee is that the derivative-coupled one-pion exchange potential in nuclear matter, is seriously damped in relativistic calculations contrary to what would be expected in a non-relativistic treatment.

During the sixties, Banerjee's area of interest expanded to include hadron physics and from the seventies onward, he devoted himself to the study of low energy pion–nucleon physics in a vigorous manner. Research in hadron physics of that era was boosted by the success of quark model on the one hand, and the develop-

ment of quantum chromodynamics as the gauge theory of strong interaction on the other. However, direct application of QCD to low-energy hadron physics proved to be extremely difficult and the necessity for constructing QCD-inspired models as effective low-energy theory was felt. In this background, Banerjee collaborated at various stages with Birse, Broniowski, Cohen and others to develop and study such models, particularly in the case of baryons. Inspired by considerations of chiral symmetry, linear sigma model and the Skyrme model, Banerjee and co-workers investigated the colour-dielectric model, the chiral quark–meson model and the chiral soliton model of nucleon and delta, which were reasonably successful in describing the static properties of baryons. More importantly, they joined several other workers in the field to establish the importance of the role played by mesons in the effective theory of strong interaction at low energy. Banerjee's contributions in the pion–nucleon physics include study of pion–nucleus optical potential and charge dependence of the πNN coupling constant. Apart from doing some research on the role of instantons in chiral confining models, Banerjee investigated the baryon mass-splitting and photoproduction of neutral pions in chiral perturbation theory, which is considered to be the proper effective field theory of strong interaction.

Manoj Banerjee will be remembered not only as a devoted scientist, but also as a remarkable teacher and a great source of inspiration for a whole generation of physicists.

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