

B. R. Nag

Biswaranjan Nag, a pioneer in the field of semiconductor physics, passed away in Kolkata on 6 April 2004. This is a great loss to the scientific community as he was an inspirational figure, teacher and guide to generations of students. Born in 1932 in Comilla (now Bangladesh), he was a brilliant student of the Presidency College (B Sc, 1949–51) Kolkata and the Institute of Radiophysics and Electronics, Kolkata in its formative years. He was one of the major contributors to the eminence of the Institute as a Centre for Advanced Study in the field of electronics.

After his M Sc (Tech) in 1954, Nag was appointed Lecturer at the Institute in 1956. He was a legendary teacher with a unique and distinctive style, having excellent rapport with his students. His doctoral research was on the study of harmonic, ultra- and sub-harmonic electronic oscillators and the invention of multi-state devices, which earned him a PhD degree (Calcutta University) under the guidance of Arun K. Choudhury. He had the opportunity of studying for a year at the University of Wisconsin, obtaining his MS in 1959, after which his research interests shifted to the physics of semiconductors.

Nag and his students made pioneering contributions through experimental and theoretical investigations on microwave measurements of the properties of semiconductors. His *métier* was the study of hot-electron effects due to high electric fields in semiconductors, of great interest for the generation of microwave radiation through the Gunn effect, which was discovered in 1962. His group was also active

in the study of free carrier absorption in non-parabolic semiconductors and the study of the acousto-electric effect. Among other outstanding contributions were experiments for the study of hot-electron galvanomagnetic transport coefficients in Ge and Si, including developing the relevant theory.



The study of electron scattering processes in semiconductors was a subject of great importance to which Nag's group made significant contributions using Monte Carlo and other techniques. Besides numerous papers in reputed journals, his research activities were summed up in two authoritative monographs that he wrote on *Theory of Electron Transport in Semiconductors* (Pergamon Press, 1972) and *Electron Transport in Compound Semiconductors* (Springer Verlag, 1980). The latter has become a *Bible* for

researchers in the subject. For these comprehensive researches he was awarded the D Sc degree of Calcutta University in 1972. In 2000, he wrote another book, *The Physics of Quantum Well Devices* (Kluwer), embodying his recent work on electron scattering in superlattices and quantum wells. He developed methods for the evaluation of the density-of-states and electron effective mass in semiconductor superlattices and the theory of tunnelling in heterostructures.

Nag was recipient of numerous awards, including the J. C. Bose Memorial Prize from the Institute of Electronics and Radio Engineers, UK, the Shanti Swarup Bhatnagar Prize and the Jawaharlal Nehru Fellowship. He was elected Fellow of the Indian National Academy of Sciences, the Indian Academy of Sciences. He was a Founder Fellow of the Indian National Academy of Engineering. He was justifiably proud of the achievements of his students who have distinguished themselves in various parts of the world. After retirement, he remained active as Sisir Kumar Mitra Professor at the Institute of Radiophysics and Electronics. He will be greatly missed by his numerous students, friends and colleagues and the entire scientific community in the country.

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