



Prof. Ashesh Prasad Mitra did pioneering work on the ionosphere and climate change and wore with distinction the mantle of his guru Prof. Sisir Kumar Mitra, FRS.

A. P. Mitra was born on 21 February 1927 in Calcutta where he received his early education. He learnt high standards of academics and discipline from his school teacher father. These values Mitra nurtured and actively practised throughout his life. Being a bright student he always topped his class. After an MSc in physics from the University of Calcutta he joined the laboratory of



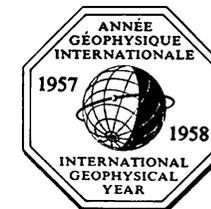
Prof. S. K. Mitra, FRS and pioneer of ionosphere research in India. This one decision propelled him into a glorious career in science.

In 1954, after finishing DPhil from Calcutta University, Mitra joined the National Physical Laboratory (NPL), New Delhi. There he founded the new division of Radio Science and was closely associated with it till his very end. The development of Radio Science was closely linked with the study of the ionosphere - a region in the upper atmosphere that

reflects short radio waves enabling transmission around the curved surface of the earth. Before the advent of rockets these far reaches of the atmosphere were difficult to access. Whatever little information we had about the ionosphere was collected indirectly through spectroscopy or other earth based instruments. Prof. S. K. Mitra laid the foundation for ionosphere research in India. His long-term associate and successor Prof. A. P. Mitra carried the programme forward.

Research on the ionosphere has always depended largely on the prevailing technology. In the sixties the upper atmosphere was probed using rocket-borne payloads. In the seventies the Satellite Instructional Television Experiment (SITE) used radio beacons to study the upper ionosphere. Balloons and rockets were used extensively in the eighties to elicit data of this far away region. In the nineties satellites in conjunction with radars, studied the atmosphere from the earth's surface to heights of 1000 km. Physical properties like density and temperature were measured at various levels along with a host of other parameters. Mitra, co-ordinated and oversaw all these successful developments.

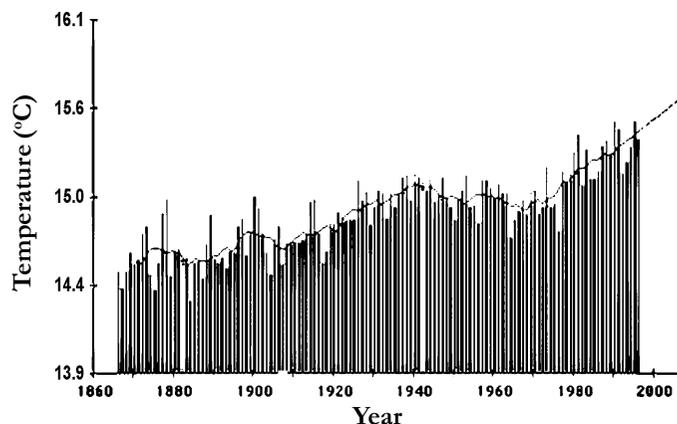
Mitra was the driving force of the Indian programme of the International Geophysical Year (IGY), 1957-58 and the International Quiet Sun Year (IQSY), 1964-65.



In the 1970s, Mitra introduced radio research in the tropo-sphere region which contributed significantly to India's radio communication capability. He established an International Radio and Geophysical Warning Centre to alert India, Middle East and South East Asia about potential earthquakes and also an extensive radio flare detection system.

Known to be assertive, Mitra combined the qualities of a good administrator and a scientist in his tenure as director of the NPL (1982-86) and director general, CSIR (1986-91). He headed India's Monsoon Asia Integrated Regional Study programme.

During the nineties Mitra concentrated his efforts on understanding the global environmental changes wrought by human activities and their consequences on the biosphere. His landmark contributions in studying the ozone layer, atmospheric chemistry and measuring greenhouse gases in India had an international impact. In the early 1990s, the US Environmental Protection Agency blamed Indian paddy fields of emitting 38.6 million tonnes of methane per year and thus adding substantially to global warming. Mitra called it a lie



Global warming is shown in this graph of global yearly temperature.

and showed that Indian rice fields emitted only four million tonnes of methane per year! The fact remains that the West contributes 9 times more per capita to global warming as compared to India. He warned about the pollution being caused by coal and the diesel burning generators used in shops, houses and agricultural pump-sets.

He wanted to counter climate science eco-politics by good home grown science. He felt that most foreign funded agencies manipulated research data to suit narrow national interests. So he was keen on setting up a South Asian Association for Regional Cooperation (SAARC) network for collecting data on pollution and climate change with India in the lead. He suggested the setting up of a series of labs in various regions for studying atmospheric data. He wanted to rope in the army too, in this data collection, especially in the rugged, remote and high altitude regions of the Eastern Himalayas which were not accessible to scientists. He believed that sound policies could only be based on good quality and authentic data. He felt that the Intergovernmental Panel on Climate Change (IPCC) was far behind in its research and stressed that India should do sustained research on emissions and get its act right on the climate issue.

Mitra along with 200-odd scientists from India, Europe, Maldives and the US conducted an intensive six-week field experiment in 1999 to study the effect of airborne tiny particles called *aerosols* on the climate. Mitra was one of the three chief scientists of the Indian Ocean Experiment (INDOEX). The venue of

the study was the Indian Ocean – where clean air from the Antarctica met the not-so-clean air from the Indian subcontinent providing a unique natural laboratory to study this phenomenon. They found a thick haze roughly seven times the size of India enveloping the north Indian Ocean. This haze could seriously affect rainfall and the onset of monsoon through its influence on cloud formation. Mitra warned that aerosols could affect agricultural yields, cause asthma and change rain patterns.

Mitra stressed the need for conserving water and did not rule out future water wars between nations. He was extremely critical of short-sighted policies which promoted water guzzling crops like sugarcane in water deficient areas.

He wrote over 200 scientific papers and edited several books and monographs. To mention a few: *Advances in Space Exploration* (1979) (ed.); *Ionospheric Effects of Solar Flares*; *Human Influences on Atmospheric Environment*. He was on the editorial board of several scientific journals including *Journal of Atmospheric and Terrestrial Physics*, *Space Science Reviews*, *Indian Journal of Radio and Space Physics* and *Mausam*.

Mitra received many awards including the Shanti Swarup Bhatnagar Award for Physical Sciences (1968) and the Padma Bhushan (1989). He was elected Fellow of Royal Society of London (1988) and was a member of many distinguished scientific academies.

Mitra who carried forward India's post-independence vision of using science for development, died in New Delhi on September 03, 2007 at the age of 81. He was survived by his wife, Sunanda Mitra, two daughters, and two granddaughters.

