

## RETROSPECTIVE

# M. G. K. Menon (1928–2016)

## A pioneer in particle physics and a great statesman for science in India

By **Badanaval Venkatasubba Sreekantan**<sup>1</sup>  
and **Ram Cowsik**<sup>2</sup>

**M**ambillikalathil Govind Kumar Menon (MGK or Goku to friends) passed away peacefully on 22 November 2016 at his residence in New Delhi, India. He was 88 years old. Menon made pioneering contributions to particle physics and successfully implemented a grand vision for the scientific and technological growth of India.

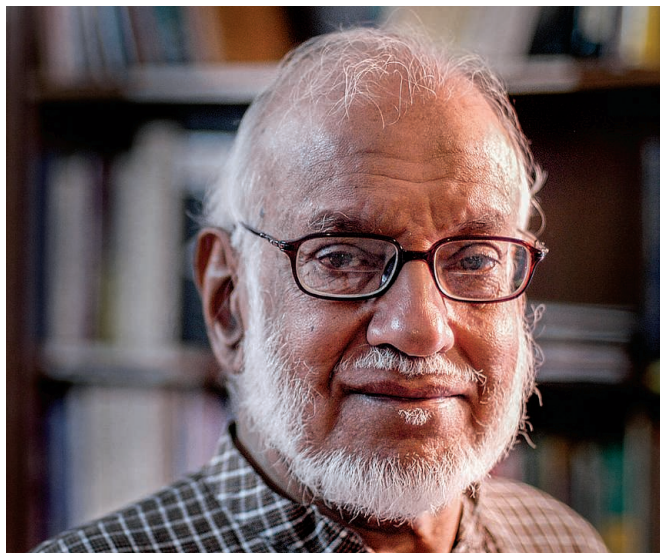
Born in Mangalore, India, Menon received a B.S. degree from Jaswant College, Jodhpur, in 1946. After being inspired by Sir Chandrasekhara Venkata Raman, an Indian physicist and Nobel laureate, Menon studied physics under the tutelage of spectroscopist Nanasaheb Ramji Tawde at the Royal Institute of Science Bombay, where he earned his M.Sc. degree. For his doctoral work, he joined the laboratory of Cecil F. Powell, soon-to-be Nobel laureate, at the University of Bristol, England, in 1949.

By the time Menon arrived in Bristol, the existence of the pion, the subatomic particle mediating nuclear forces, had been clearly established by Powell. Menon's first important contribution was to establish the bosonic character of the pion through a study of fragments emerging from pion capture by light nuclei in nuclear emulsions. The capture events he recorded also allowed a study of nuclear evaporation models that explain the emission of lighter fragments by nuclei at a high excitation energy of ~140 MeV.

Menon then focused his attention on the emerging field of K-meson physics. With his colleagues at Bristol, notably Peter Fowler, Cecil Powell, and Cormac O'Ceallaigh, he discovered that kaons decay into either two or three pions. This puzzling observation generated much discussion and debate and led to the discovery of parity nonconservation in weak interactions. Menon continued

his work and built up a sizeable collection of events showing the “associated production” of kaons and hyperons.

In 1955, Menon was invited to join the Tata Institute of Fundamental Research (TIFR) in Mumbai, India, by its founding director and nuclear physicist Homi J. Bhabha. Menon seamlessly integrated into the programs related to cosmic rays and helped to enhance the capabilities of scientific ballooning, in which large plastic balloons carry instruments to stratospheric heights to observe extraterrestrial radiation. This suborbital program not only led to rapid progress in cosmic-ray physics but also served as the pre-



cursor to the highly successful space program in India. Along with one of us (B.V.S.), Menon helped to establish collaboration with groups in the United Kingdom and Japan that energized the study of cosmic rays deep underground, measuring cosmic-ray muon fluxes up to a depth equivalent to 10,000 meters of water. This multinational group also recorded the first event generated by the cosmic-ray-induced atmospheric neutrinos in 1965. Less than a year after this discovery, Bhabha died in an airplane crash near Mont Blanc. The responsibility of the directorship of TIFR, along with the wide-ranging initiatives for national development that Bhabha had started, fell squarely on Menon's shoulders. Despite these responsibilities, Menon continued in his efforts to test fundamental questions about

subatomic particles, including violations of baryon nonconservation leading to proton decay. His pioneering contributions were recognized by awards such as the Cecil Powell and C. V. Raman medals and election to fellowships of prestigious academies.

During his Bristol years, Menon established a close friendship with William Owen Lock, who had moved to the European Organization for Nuclear Research (CERN) in 1959. They forged a collaboration between TIFR and CERN that progressively matured, often with the participation of universities in India, to studies with remarkable results, including the discovery of the Z boson, the measurement of its mass and width, and the momentous discovery of the Higgs boson.

As Menon's reputation as a scientist grew, so did his stature as a statesman of science. He encouraged partnerships between scientific bodies and other sectors of society in India and facilitated the participation of scientists in national and international policy matters. The International Council of Scientific Unions' advisory role in policy matters, especially with regard to climate change, commenced during Menon's tenure as its president. His vision and statesmanship were central to the founding of the National Brain Research Centre at Manesar, the Institute for Plasma Research at Gandhinagar, the National Centre for Biological Sciences in Bangalore, and the National Centre for Radio Astrophysics in Pune, which built and operates the Giant Metrewave Radio Telescope.

His skill in balancing the priorities of industrial growth with ecological prerogatives enabled him to protect the Silent Valley, a rainforest in Kerala, from destruction by industrial development. His concern for the developing world

prompted him to partner with Abdus Salam in founding the Third World Academy of Sciences, which has been responsible over the past three decades for the growth of science worldwide and for applying a scientific approach to societal problems and technological growth.

Amidst his incessant activities, he retained his gentle character, his love for children, and his affection and warmth toward his colleagues and friends. Menon broadcasted widely the transformative power of science to bring about societal change and harmony. The fruits of his labor are seen throughout and beyond India and stand as testimony to his remarkable life and achievements. ■

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*Science* **355** (6325), 586. [doi: 10.1126/science.aam8130]

Editor's Summary

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