

*Harnessing Fusion:
The Ultimate Green Energy*

AMIYA SEN

Professor of Electrical Engineering
and of Applied Physics and Applied
Mathematics

World demand for more efficient energy production is colliding with the need for environmental responsibility. Finding and harnessing a sustainable energy source is a paramount universal goal. If the nuclear fusion which occurs naturally in the sun can be replicated by science here on Earth, it will be possible to turn the heavy hydrogen that is available in abundance in seawater into a powerful, nearly inexhaustible source of energy.

However, while thermonuclear fusion has great potential as an efficient and environmentally friendly energy source, harnessing that power is hampered by fusion plasma's instabilities, fluctuations, and turbulence. The large variety of instabilities and fluctuations drain energy out of their core and vitiate the success of fusion devices.

An important tool in identifying and studying these instabilities is the Columbia Linear Machine. It was developed, repeatedly redesigned, and appropriately tailored with striking ingenuity for the physics requirements of each instability by Amiya Sen. His efforts, extending over many years, led to the very first production, identification and detailed parametric studies of trapped particle, ion, and electron gradient instabilities and their transport consequences.

With his sustained pioneering theoretical and experimental efforts in the relatively new field of feedback control of plasma instabilities, Sen has established himself as a leader in this critically important area. These efforts include the Lyapunov stability of plasmas, the observability, controllability, and feedback suppression of most plasma instabilities.

Recently, Sen has pioneered a new paradigm for plasma transport, which challenges the 50-year-old gold standard of Bohm/gyro-Bohm scaling. This finding promises to have a great impact on the quest for fusion.

By far the most prestigious archival journal in physics and applied physics is *Physical Review Letters*. Sen and his students have published 17 papers in this, and in numerous other publications.

Sen has been a consultant and advisor to the Lawrence Livermore National Laboratory, the Princeton Plasma Physics Laboratory, the United States Department of Energy, and the National Science Foundation. He is a fellow of the American Physical Society and the Institute of Electrical and Electronics Engineers, and is a member of Sigma Xi and the American Geophysical Union.

Dipl., Indian Institute of Science, 1952; M.S., Massachusetts Institute of Technology, 1958; Ph.D., Columbia, 1963

