Presidential Addresses on the Society’s Awards

(Delivered by Professor D.E. Blackwell on 1974 February 8)

THE GOLD MEDAL
PROFESSOR LUDWIG BIERMANN

The Gold Medal of the Society has been awarded to Professor Ludwig Biermann for his distinguished contributions to theoretical astronomy.

Professor Biermann has spent most of his working life as a Professor at the Max Planck Institute for Physics and Astronomy, where he has built up a strong group interested in astrophysical plasmas, cosmic radiation and cosmic magnetic fields. He is an outstanding theoretician who has worked on a wide range of topics, but always keeping a firm link between theory and observation. His work over the last two decades on the interaction between the solar wind and the tails of comets provides a fair example of this. Before Biermann began his work it had been supposed that the structure of a comet tail of type I (that is, a gaseous tail) is determined by solar radiation pressure. Biermann showed that the intensity of solar radiation is quite insufficient to account for the accelerations that are observed in tails and he suggested instead that these are due to interaction between the tail and particle emission from the Sun. Later, he further argued that the observed lag of a few degrees between the direction of a comet tail and the radius vector joining the Sun and the comet should be attributed to an aberration effect resulting from the combination of velocities of comet and particle stream: he deduced from this that the particle velocity is not greatly in excess of the orbital velocity of the comet. Unfortunately, this first theory required an unreasonably high particle density of about $10^8$ protons cm$^{-3}$, but the interaction process is complex and little understood, and the addition of a magnetic field brings the required density down to measured solar wind densities.

Biermann’s prediction of a steady solar particle emission, now identified with the solar wind, was a remarkable achievement. In 1964 he took this proposal further and suggested that a comet might be surrounded by a greatly extended cloud of neutral hydrogen. Observations of $\lambda$ emission from such a cloud surrounding comet Bennett were made in 1969, and since then $\lambda$ emission has been observed