Alan D Johnstone 1939–1999
Fellow of the RAS, instrumentalist and space plasma scientist.

Prof. Alan Johnstone, a talented, energetic and highly respected space plasma scientist, died on 28 May 1999, aged 59. He was Professor of Space Science, Associate Director of University College London’s Mullard Space Science Laboratory and head of the Space Plasma Group there. His expertise was in designing space plasma instrumentation and in the science of the aurora, the Earth’s magnetosphere and solar wind interactions with other planets and comets.

Alan summed up the thrill of space research and scientific discovery: “What we are doing is exploring. We are going somewhere that no machine has gone before. We do not know what we are going to find when we get there.”

Alan’s research career began in 1961 when he joined the Radio and Space Research Station, now the Rutherford Appleton Laboratory. While there he collaborated in auroral research and took an MSc (1967) at Chelsea College, University of London. He then moved to the University of Alaska Geophysical Institute to study for his PhD (1970). While at Fairbanks he helped to build the Poker Flat Research Range and worked on payloads for auroral sounding rockets. The next two years were spent as a Resident Research Associate at NASA’s Goddard Spaceflight Center.

Auroral rockets
In 1972 he returned to the UK, as a researcher at UCL’s Mullard Space Science Laboratory, eventually becoming lecturer (1985), reader (1988) and professor of space science (1993). He became an Associate Director in 1991. His first projects were on auroral rockets including the Anglo–US Norwegian Rocket Campaign and the SERC High Latitude Campaign. During this time he developed electrostatic analyser techniques and saw the opportunity of using microchannel plates as particle detectors that would have the advantage of measuring energy and angle of particle arrival simultaneously. He proposed such an instrument for ESA’s Giotto mission to Halley’s comet, and was selected as Principal Investigator for the five-nation Johnstone Plasma Analyser experiment.

At about the same time the opportunity arose to propose for the AMPTE UK sub-satellite, and Alan’s design was used for both the ion and electron detectors. AMPTE, a three-satellite mission, was launched in 1984 and the particle data are still the best so far from these regions of the magnetosphere.

The Giotto mission to Halley was probably the most important of Alan’s career. It was also one of the first missions with the requirement for instant media-oriented science. Later he wrote: “While we were carefully tending to the needs of the instrument, princesses, bureaucrats, journalists, government ministers from several nations and the elder statesmen of space science streamed past seeking instant explanations. After the climax of closest approach, we were enveloped by champagne-assisted euphoria and relief of knowing that our baby had successfully made it to the heart of the comet and returned the quality of scientific data that every scientist dreams about.”

The success of the instrument at Halley took Alan to 10 Downing Street to explain the significance to Margaret Thatcher. The results helped provide the impetus for Giotto’s second encounter, with the smaller comet Grigg–Skjellerup, in 1992.

Analysis of the Giotto results from both encounters, and the development of an elegant theoretical framework to explain them, has been a major part of Alan’s and the group’s work since the encounters. The theoretical ideas were successful and inspired others to try similar approaches in other contexts where pickup ions are important, including Mars, Venus, Earth’s magnetosphere and interstellar ion pickup.

The next success was the CRRES mission where Alan led the Low Energy Plasma Analyser team. These data from 1990–91 are still being analysed, giving improved understanding of Earth’s radiation belt region.

Alan led a team to propose for the Cluster mission, and the PEACE (Plasma Electron and Current Experiment) was selected. He saw the importance of accuracy of the plasma measurements on four spacecraft and set a goal of 1% relative accuracy in order to determine gradients between spacecraft to 10%. This led to extremely tight tolerances in the instrument design. Alan played a key role in getting Cluster II approved following the Ariane-5 failure in 1996, and PEACE should provide excellent data particularly on low-energy electrons.

Following contacts established during Giotto days, Alan also proposed for the Russian Mars mission which finally became Mars-96. The scientific drive for this instrument was to measure the ion distribution rapidly at speeds approaching the ion gyration period. The innovation this time was to image mass and energy simultaneously, using parallel electric and magnetic fields as used by Thomson in 1911, combined with a modern fast imaging anode in a compact instrument. Had the launcher worked as it was planned, the advances with this instrument on water loss at Mars could have been significant. A similar imaging anode was used on NASA’s Polar mission and is still returning data on ions far above the auroral oval surrounding Earth’s North Pole.

Practical contributions
Alan’s work also had strong practical benefits. The environment in space can lead to electrical charging of surfaces and deeper charging in on-board cables, as well as problems with communications and power systems on the ground.

The radiation belts are particular hazards to weather, communications and navigation satellites. Alan’s contributions were in characterizing these hazards in a methodical way. He was one of the earliest pioneers in these “space weather” studies, providing instruments for two of ESA’s Meteosat craft and an STRV. More recently he led statistical studies of the radiation belts, and was involved in producing new models of their behaviour.

Alan was an inspirational teacher of undergraduate and graduate students, and was a generous, kind and friendly person. His legacy to MSSL’s Space Plasma Group is incredible. High-quality data from the Earth and beyond are still to be analysed, Cassini is on its way to Saturn, Cluster-II will be launched next year and Alan has prepared the groundwork for further successes with both missions and science. He is sorely missed by colleagues both within the UK and abroad.

Alan is survived by his wife Svetlana and their daughter, and by another daughter and two sons from his earlier marriage.

Andrew Coates.