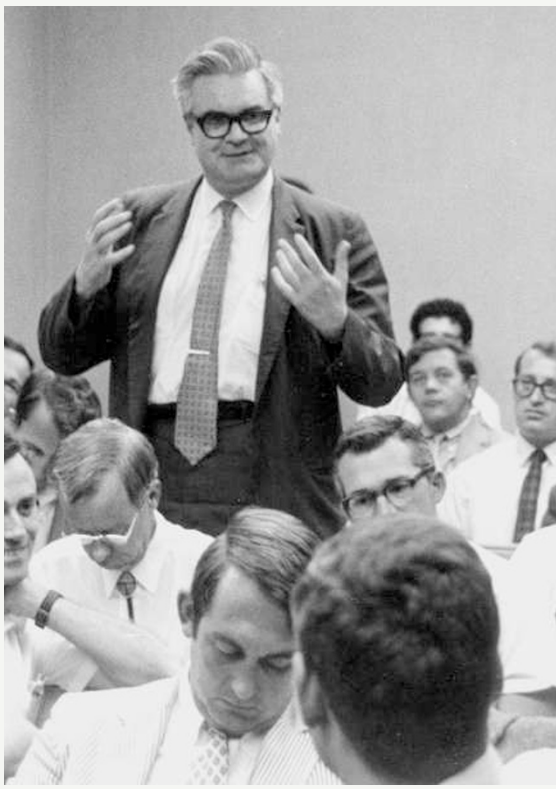
NATURE|Vol 438|8 December 2005

OBITUARY

Alastair Cameron (1925-2005)

Astrophysicist and planetary scientist.



NASA

Almost all our theories of the origin of the stars, the planets and the chemical elements have been developed in the past half-century. These were the diverse arenas in which Alastair G. W. Cameron worked, and where his ideas — he was a well-spring of ideas — inspired and guided two generations of colleagues.

Cameron, who died on 3 October in Tucson, Arizona, was born in Winnipeg, Canada. He received his PhD in nuclear physics from the University of Saskatchewan in 1952, and took a faculty post at Iowa State College in Ames. While there, he read of the discovery of the highly unstable element technetium in the atmospheres of a certain class of red-giant star. He was inspired by this to wonder about the source of the flood of neutrons that would be required to maintain a spectroscopically observable concentration of the element. Ignorant of astrophysics, Cameron acquired a shelf of textbooks and set about educating himself. Without regret, he thus turned his back on experimental physics, embarking on a lifetime career as a theorist. While at Iowa, Cameron also met Elizabeth MacMillan at a science-fiction convention; she would become his wife.

In 1954, Cameron joined the Canadian atomic-energy project at Chalk River, Ontario. There he worked on calculating the reaction rates that control nucleosynthesis inside stars. (Nucleosynthesis is the creation of chemical elements through nuclear processes such as fission, fusion and neutron capture.) After a brief stay at the California Institute of Technology in Pasadena, he moved in 1961 to the NASA Goddard Institute for Space Studies in New York City's Upper West Side. Given Cameron's increasing interest in the creation of the Solar System, the fact that the institute's home was called the Interchurch Building was a source of mild amusement for his colleagues.

Cameron's approach to understanding the formation of chemical elements was guided by their present-day abundances in the Solar System, which had been reviewed in 1956 by Hans E. Suess and Harold C. Urey. In working to update and improve their table, Cameron came to appreciate the importance of data from meteorites. Seeing the need to improve communication between the meteoritic and astrophysical communities, he instituted a series of interdisciplinary meetings in New England under the aegis of the Gordon Research Conferences, first during the 1960s and again in the 1990s. In the 1960s, Cameron also wrote his first semi-quantitative papers modelling the solar nebula, the disk of matter from which the meteorites and planets of the Solar System formed. These papers came to be taken very seriously by the meteoritics community — perhaps more seriously than Cameron, who saw them rather as steps towards the right answer, intended them to be taken.

In 1966, Cameron (now a US citizen) moved to the Belfer Graduate School of Science at Yeshiva University in Manhattan, and in 1973 became a professor at Harvard University and associate director of the Harvard-Smithsonian Center for Astrophysics. He remained at Harvard until his 'retirement' in 1999 — when he shifted his activities, undiminished, to the Lunar and Planetary Laboratory at the University of Arizona.

Any account of Cameron's career would be incomplete without noting his love affair with digital computers. The complex, interlocking nonlinear equations that describe the reaction networks in stellar nucleosynthesis and the behaviour of protostellar disks require numerical integration, which in turn needs computing power. Cameron had been an eager consumer of that commodity ever since his first encounter with a card-fed IBM 650 in his Chalk River days. As soon as he could, he acquired his own minicomputers, preferring these to the shared mainframes at his various institutions. Cost-effectiveness was his justification; in truth, it just pleased him to be the master of his own computing. And no one was more knowledgeable on the subject: for about a decade, computers dominated his social conversation. Visitors to his office frequently complained that the whine of massed cooling fans made conversation difficult.

But Cameron was a man of uncommonly broad interests, and his activities and enthusiasm routinely overflowed the boundaries that confine most workers. From discussions of the solar nebula it was a short step to questions of planetary formation, and so to the origin of the Moon (which had not been explained by the results of the Apollo Moon missions of the 1960s and '70s). Cameron and others suspected that a gigantic collision between sub-planets during Earth's accretion must have blasted off debris, creating an orbiting circumterrestrial disk from which the Moon formed.

The proposition was difficult to test quantitatively: the trajectories of a huge number of debris fragments needed to be followed, in a complex gravitational field and under the effects of an expanding vapour cloud. The problem posed a fine challenge to Cameron's computational prowess, and he rose to it royally, making clear in a series of co-authored papers dating from 1976 that the Moon could have been created in a collision. In the light of the severe problems attached to other models, it became generally accepted that this was indeed the case.

This was arguably the closest Cameron came to reaching closure on a major problem. His many papers on nuclear astrophysics (his first and continuing love), star formation, and protostellar-disk theory contributed profoundly to those fields; but Cameron knew his interpretive papers were successive approximations to the truth, not final answers, and right to the end he continued rethinking his vision of the cosmos. Appropriately, at the end of his life, Cameron was awarded the Hans A. Bethe Prize of the American Physical Society for his work in astrophysics and nuclear physics. He lived long enough to learn of this honour, but not to attend the prize ceremony, which was scheduled for the society's April 2006 meeting. Bethe, who wrote the classic 1939 paper on hydrogen burning in stars, had been the first to put his foot on the path that Cameron trod for so many years. ■

John Wood

John Wood is recently retired from the Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, Massachusetts 02138, USA.
e-mail: jawood@alum.mit.edu