



Stanford Report, June 16, 1999

## Memorial Resolution: Joseph Ballam

(1917-1997)

Joseph Ballam, Emeritus Professor at the Stanford Linear Accelerator Center (SLAC) and the founding Associate Director of SLAC's Research Division, a position he held for 19 years, died December 14, 1997 of emphysema related complications at the age of 80. He served Stanford University for 26 years until his retirement in 1987.

Ballam was born in Boston on January 2, 1917. He entered the University of Michigan in 1935 and received his BS in Physics four years later. The stimulating atmosphere at Ann Arbor, and its large community of prominent physicists from the U.S. and abroad, kindled his enduring interest in basic physics. After one semester at MIT, Ballam commenced war work by joining the Navy's Bureau of Ships, working on underwater mine sweeping and on infrared signaling devices and other naval problems. After the war Ballam returned to graduate studies at the University of California at Berkeley and did his Ph.D. work in cosmic rays. His thesis was on the proton component of cosmic rays at sea level. At Berkeley Ballam worked initially with the on-campus cloud chamber group of Professors Brode and Fretter; after two years he joined the UC Radiation Laboratory. After receiving his Ph.D. in Berkeley, Ballam became an Assistant Professor at Princeton University where he did cloud chamber work in cosmic rays at high altitude and at the Brookhaven National Laboratory's Cosmotron, principally on strange particles. Ballam then joined the senior faculty at Michigan State University. From there he continued work at the Cosmotron, using a propane bubble chamber for pion scattering experiments.

When SLAC was authorized in 1961, Ballam was persuaded to join its senior technical staff as an associate professor and he participated in the early planning of the experimental program. The promise demonstrated at Berkeley by Ballam's organizational ability and deep knowledge of physics was of immediate value to the early evolution of SLAC. Theoretical calculations predicted that high-energy photon interactions would produce very large yields of secondary beams that could compete successfully with the hadron beams produced by then existing and planned proton machines. Moreover, because of the high pulse repetition rate in the Stanford Linear Accelerator, the use of such beams might offer singular advantages. Ballam initiated work to develop an experimental program utilizing such beams at SLAC. He extended and confirmed these predictions through measurements at the then operating Cambridge Electron Accelerator and subsequently converted these ideas into practice, thereby opening an exciting new area beyond what was originally planned for SLAC's experimental program.

Ballam became Associate Director of the Research Division in 1963. He assumed and executed brilliantly the multiple roles of directing the construction of a wide variety of advanced particle detectors, making decisions on competing proposals for instruments and experimental work, and as an active leader of one of the research groups at the laboratory. In the latter role Ballam initiated a vigorous double-headed hydrogen bubble chamber program. Under his direction a rapid-cycling 40 inch hydrogen bubble chamber was designed and built. In a hybrid configuration the chamber could operate in a mode in which picture taking

was triggered by appropriate electronic detectors. He also, in cooperation with Professor Luis Alvarez at Berkeley, arranged for the conversion of Alvarez's 72 inch bubble chamber into a modified 82 inch chamber operating at a higher expansion rate, followed by a move of that chamber across the Bay to SLAC.

The 82 inch chamber was installed in hadron beams of many varieties and the 40 inch chamber was operated in photon beams of highly original design pioneered by Ballam. In particular, the conventional Bremsstrahlung beams were replaced by monochromatic gamma rays resulting from electron-positron annihilation, followed by an arrangement in which high intensity laser photons were Compton back-scattered from a high energy electron beam. The 82 inch chamber served a wide variety of university bubble chamber analysis groups and, in fact, developed such a high productivity that for some time it saturated the worldwide data analysis capacity producing as many as six million photographs per year. The program of the 40 inch chamber in which Ballam was most personally involved comprised studies of the photoproduction of Vector mesons, the first measurements of photoproduction of charmed particles at high energies, and numerous other photoproduction studies and research.

With the advent of colliding beam physics at SLAC, Ballam joined the MARK II detector group when it was in process of being upgraded from its original version used at the first storage ring SPEAR at SLAC. He also participated with the upgraded MARK II, when it was moved to serve as the first detector at the SLAC Linear Collider (SLC), including studies of the parameters at the  $Z_0$  resonance, measurements of the strong coupling constant and various particle searches.

Even after retirement, Ballam participated personally in some of SLAC's research. Until his death he remained an active collaborator in the second generation gamma-ray detector in space, called GLAST, now under active design.

In parallel with his personal research, Ballam was an extraordinarily effective director of the research activities at SLAC. He established a first-rate computation department and his counsel on computation in high energy physics was widely sought on national committees. He assumed chairmanship of a sub-committee of the High Energy Physics Advisory Panel (HEPAP) for the DOE, charged with projecting the computing needs for High Energy Physics. He counseled on an upgrade of computational facilities at Fermilab and on the computation needs of the SSC. Even after his retirement Ballam continued to serve as advisor to the director of SLAC, principally on computational matters.

Ballam greatly advanced high energy physics through first-rate personal contributions through his own research, largely using pictorial techniques. He combined this work with a major administrative role at SLAC, wise counsel to many institutions and a gift for creative presentation covering designated areas of the science.

Joe Ballam had the rare and wonderful gift of gaining the respect, the admiration, and the warm affection of his colleagues even as he made the necessary tough decisions as SLAC's founding Associate Director for Research. He did this by acting decisively, retaining his kindness, his patience and his understanding under the greatest pressures, and never sacrificing his sense of justice and fairness. Both winners and losers in the competition for SLAC's limited resources remained his friends. His contributions will be long remembered and his many friends and associates deeply miss him.

MEMORIAL RESOLUTION COMMITTEE:

Wolfgang K. H. Panofsky, Chair

Sidney Drell

David W. G. S. Leith

[Stanford News](#) | [Stanford Homepage](#)

© Stanford University. All Rights Reserved. Stanford, CA 94305. (650) 723-2300.