

Office of Scientific Research and Development.

In 1948, he moved to Orinda, California from Cambridge, Massachusetts and became a research associate of Lick Observatory for two years. He returned to Harvard in 1950. He had spent thousands of hours doing ray trace calculations on a Marchant calculator to produce his first aerial cameras. To replace the tedious calculations by hand, Dr. Baker introduced the use of numerical computers into the field of optics. His ray-trace program was one of the first applications run on the Harvard Mark II (1947) computer. Later on, he developed his own methodology to optimize the performance of his optical designs. These optical design computer programs were a family affair, developed under his direction by his own children to support his highly sophisticated designs of the 1960s and 1970s.

For most of his career, Dr. Baker was involved with large system concepts covering not only the camera, but the camera delivery systems as well. As the chairman of U.S. Air Force Scientific Advisory Board, he recognized that national security requirements would require optical designs of even greater resolving power using aircraft at extreme altitudes. The need for such a plane resulted in the creation of the U-2 system consisting of a plane and camera functioning as a unit to create panoramic high-resolution aerial photographs. He formed Spica Incorporated in 1955 to perform the necessary optical design work for the US Government. The final design was a 36-inch f/10 system. Dr. Baker also designed the aircraft's periscope to allow the pilot to see his flight path. By 1958, he was almost solely responsible for all the cameras used in photoreconnaissance aircraft. He continued to serve on the President's Foreign Intelligence Advisory Board and on the Land Panel.

Before the launch of Sputnik, he designed the Baker-Nunn satellite-tracking camera to support the Air Force's early satellite tracking and space surveillance networks. Because of his foresight, cameras were in place to track the Sputnik Satellite in October 1957. These cameras allowed the precise orbital determination of all orbiting spacecraft for over three decades until the tracking cameras were retired from service.

He continued to advise top Government officials in the evolution of reconnaissance systems during the 1960s and 1970s. He received a Space Pioneer Award from the US Air Force. He received the Pioneers of National Reconnaissance Medal (2000) with the citation, "As a young Harvard astronomer, Dr. James G. Baker designed most of the lenses and many of the cameras used in aerial over flights of 'denied territory' enabling the success of the U.S. peacetime strategic reconnaissance policy."

Around 1968, he undertook a consulting contract with Polaroid Corporation after Dr. Edwin Land persuaded him that only he could design the optical system for his new SX-70 Land Camera<sup>TM</sup>. He was also responsible for the design of the Quintic<sup>TM</sup> focusing system for the Polaroid Spectra Camera system that employed a revolutionary combination of non-rotational aspherics to achieve focusing function.

In 1958 he became a Fellow of the Optical Society of America (OSA). In 1960 he was elected President of the

Society for one year and helped establish the *Applied Optics Journal*. He was the recipient of numerous OSA awards, spanning the breadth of the field, and has been honored with the Adolf Lomb Award, Ives Medal, Fraunhofer Award, and Richardson Award. He was made an honorary member of OSA in 1993. He also was the recipient of the 1978 Gold Medal, the highest award of the International Society of Optical Engineers (SPIE). Furthermore, he was the Recipient of the Elliott Cresson Medal of the Franklin Institute for his many innovations in astronomical tools.

Dr. Baker was elected a Member of the National Academy of Sciences (1965), the American Philosophical Society (1970), the American Academy of Arts and Sciences (1946), and the National Academy of Engineering (1979). He was a member of the American Astronomical Society, the International Astronomical Union, and the Astronomical Society of the Pacific. He authored numerous professional papers and has over fifty US patents. He maintained his affiliation with the Harvard College Observatory and the Smithsonian Astrophysical Observatory until he retired in 2003. Even after his retirement in 2003, he continued work at his home on a new telescope design that he told his family he should have discovered in 1940.

Light was always his tool to the understanding of the Universe. An entry from his personal observation log, 7 January 1933, made after an evening of star gazing reveals the pure inspiration of his efforts: "After all, it is the satisfaction obtained which benefits humanity, more than any other thing. It is in the satisfaction of greater human knowledge about the cosmos that the scientist is spurred on to greater efforts." James Baker fulfilled the destiny he had foreseen in 1933, living to see professional and amateur astronomers use his instruments and designs to further the understanding of the cosmos. Whereas, he had not predicted that his cameras would protect this nation for over many years.

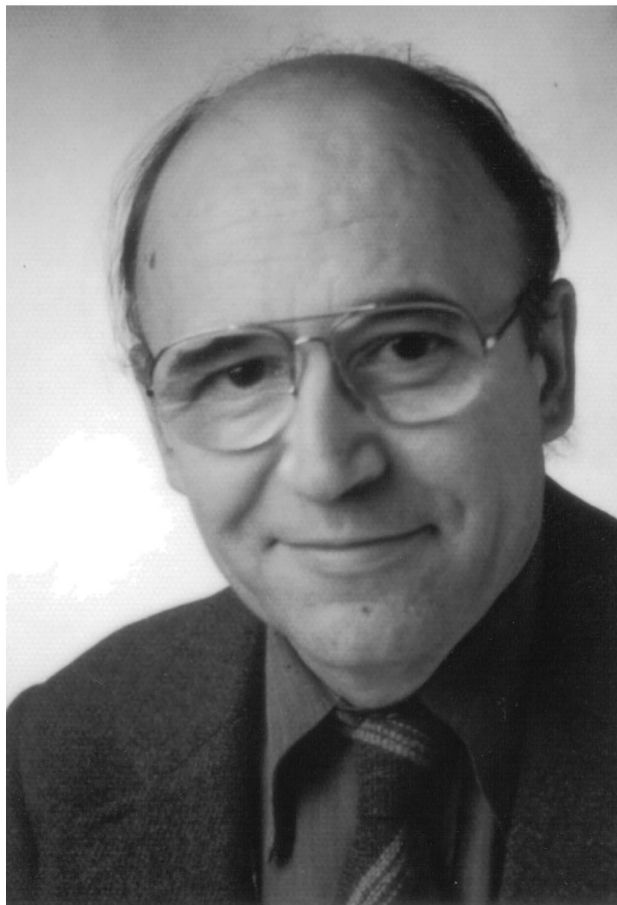
He is survived by his wife, his four children and five grandchildren.

Neal K. Baker

National Oceanic and Atmospheric Administration

#### **NORMAN HODGSON BAKER, JR., 1931-2005**

Norman H. Baker, a key contributor to the foundation of modern stellar pulsation theory and former editor of the *Astronomical Journal*, died on 11 October 2005 in Watertown, New York near his beloved summer home in Natural Bridge. He succumbed to complications of Waldenström's macroglobulinemia, a bone marrow lymphoma that he had successfully surmounted for twenty-two years. Norm, as he was known to all, was born 23 October 1931 in Fergus Falls, Minnesota to Norman Hodgson and Jeannette (née Lieber) Baker. He attended the University of Minnesota where he met the first of many lifelong astronomical friends, Bill Erickson. He received his BA in 1952. He went on to do his PhD, "Radiation from Particle Interactions which Create Current," at Cornell University under Phil Morrison. He then moved to a postdoctoral position at the Max Planck Institut für Physik und Astrophysik in München with the intent of pursuing his work in plasma physics with Ludwig Biermann



Norman Hodgson Baker, Jr.

and Arnulf Schlüter. However, Rudolf (Rudi) Kippenhan snatched him away to pursue what became his lifelong interest, stellar physics. This was the dawn of the era in which electronic computers were becoming practical for scientific calculations, and Norm immediately adopted this new tool. Indeed, he remained at the forefront of computing technology throughout his life: He was certainly the first member of the Astronomy Department at Columbia to buy a Mac, and was undoubtedly one of the few emeritus professors in the world known by all the administrative staff as the first person to turn to when stumped by a computer problem.

Following his first paper with Kippenhan on stellar rotation, Norm turned his attention to stellar pulsations, a topic he would pursue throughout his career. His 1962 paper in *Zeitschrift für Astrophysik* on pulsational models of Cepheids (Baker and Kippenhan 1962, **54**, 155) is a classic in the field. The first figure displays the three dimensional model of the atmospheric absorption coefficient as a function of  $\log P$  and  $\log T$ . Sophisticated three-dimensional computer images being many years in the future, it was constructed from a folded and bent sheet of grid paper which was subsequently photographed. Using extensive numerical analysis, the paper showed that stars in the  $\delta$  Cephei region of the H-R diagram were “pulsationally unstable due to the destabilizing effect of the  $\text{He}^+$  region.” This paper, along with those of Zhevakin, Cox, and Christy, established our modern understanding of pulsational instability in horizontal branch stars. His sec-

ond paper with Kippenhan the following year brought convection into the problem; this topic became another lifelong theme of Norm’s research that he subsequently pursued with Douglas Gough. His most cited work, carried out a decade later with van Albada, was an attempt to understand the properties of horizontal branch stars. It synthesized for the first time stellar evolution theory and the insights gained from studies of stellar pulsations. Between 1961 and 1965, Norm held no fewer than five positions. After a year on the west coast at the Convair Science Research Lab in San Diego, he landed in the New York area to pursue pulsations, oscillating among the Goddard Institute for Space Studies, the Institute for Advanced Study in Princeton, Yale, and New York University. In 1965, he was hired as an Assistant Professor in the Department of Astronomy at Columbia University by Lo Woltjer, and remained at Columbia until he retired in 2003. As a teacher, he was deeply appreciated by undergraduate and graduate students alike for lectures that were models of clarity, for his out-of-class assistance which was generous and unstinting, and for incorporating into his courses modern numerical techniques which served the students well throughout their careers. In 1975 when Woltjer returned to Europe, Norm took over the editorship of the *Astronomical Journal*, a position he held (shared in the last few years with Leon Lucy) for a decade. His scrupulous integrity and forthright honesty served him, and the Society, well. Despite his scathing intolerance for administrative stupidity, he also managed to complete successfully a term as Chair of the Department of Astronomy. (This author, who currently holds the Chair and shares the intolerance, has yet to fathom the gracious equanimity Norm displayed.) His early interest in brewing beer during graduate school at Cornell (where he co-founded the Old Undershirt Brewing Company) was transformed in later life into an expertise in German wines. The precision that marked his research extended to every aspect of his private life. I had the distinct pleasure of subletting his apartment during my first year on the faculty at Columbia while he was on leave in Europe. We spent most of the year trying to imagine how we could ever restore it to the state of perfect organization in which we found it. Norm is survived by his wife and constant companion of thirty years, psychiatrist Doris Blum Nagel, by his sister Dr. Jean Trousdale, and brother Dr. Richard C. Baker, two nieces, three nephews, and by several generations of undergraduates, graduate students, postdocs, and colleagues who hold fond memories of his patience, kindness, humor, and quiet *joie de vivre*.

David J. Helfand  
Columbia University

#### ALASTAIR GRAHAM WALKER CAMERON, 1925-2005

Alastair Graham Walker Cameron, one of the most creative and influential astrophysicists of his generation, passed away on 3 October 2005, at the age of 80, at his home in Tucson. Subsequent to his retirement from Harvard University, where he had been a member of the faculty from 1973 through 1999, Cameron remained active as a Senior Re-