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Albert R. Boggess III (1929–2020)

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**Albert Boggess died on Friday,
December 25, 2020 at age 91.**

Introduction

Albert (“Al”) R. Boggess III was among the few remaining early pioneers of experimental ultraviolet stellar astronomy. He practiced the new field of space astronomy over four decades, from the pioneering days of early ultraviolet rocketry through his pivotal roles in the development and operation of two historic, high impact orbiting observatories, the International Ultraviolet Explorer and Hubble Space Telescope.

Al was born in Dallas, TX; [a family history is available online \[1\]](#). He majored in Physics and Mathematics at the University of Texas at Austin, where a course in Astronomy taught by E. J. Prouse inspired Al’s interest in the subject and led to an undergraduate assistantship tending to a telescope and a transit instrument in a campus observatory. Prouse also suggested that Al apply to the University of Michigan for graduate work, according to [a tribute to the professor by Boggess \[2\]](#).

At Ann Arbor, Al made isophotometer scans of photographic plates taken with the H. D. Curtis Schmidt telescope in nebular emission lines and continuum for his doctoral thesis on “Photometry of Gaseous Emission Nebulae,” supervised by L.H. Aller [3]. More importantly, he met and married a fellow astronomy graduate student, Nancy E. Weber (subsequently, Nancy W. Boggess) who also later had important roles in space astronomy at NASA. Their marriage lasted 67 years until her death in 2019.

His Ph.D. was awarded in 1955 but by then the Boggess’s had moved East.

Al Boggess, sporting a bolo tie as usual, socializing with fellow astronomers at an IUE gathering. Edited from a photo provided by D.S. Leckrone.

Early Career

By 1954, Al was at The Johns Hopkins University Applied Physics Laboratory in Maryland, studying solar granulation. As he wrote in his family history [1], “That led me to the program in ultraviolet solar spectroscopy,” — rocket research at the Naval Research Laboratory in Washington, DC. Soon, his solar research gave way to stellar astronomy. A 1955 NRL rocket experiment had revealed that there were detectable non-solar sources in the 1225–1350 Ångstrom band. Then Al joined J. E. Kupperian and J. E. Milligan in a March 28, 1957 Aerobee rocket experiment intended to survey a larger region of sky than was observed in the 1955 flight and at higher spatial resolution. The objective was to measure the intensity of sources in the same wavelength band as in 1955 and to determine what the objects were. It revealed many bright extended regions tending to occur near O and B stars [4]. The 1957 rocket payload also included three wide-band photometers operating in the 2700-Å band. Forty-nine stars of spectral types from about O to F were measured and analyzed by Boggess and Lawrence Dunkleman [5]. Soon Al and his above three co-experimenters left NRL to establish a space astronomy program at the recently formed (May 1959) Goddard Space Flight Center (GSFC).

Telescopes in Orbit

OA0-B

OA0-B was intended to be the second Orbiting Astronomical Observatory. Al was the Principal Investigator of its science payload, the Goddard Experiment Package (GEP), consisting of a 97-cm telescope and a 7-channel ultraviolet spectrometer. The mission failed on launch on 30 November 1970 when an explosive bolt failed to fire, the shroud failed to detach and the spacecraft on board an Atlas Centaur rocket fell back to Earth [6]. Typical of Al’s characteristic concern for colleagues and coworkers, he then negotiated with the science team of the Wisconsin Experiment Package (WEP) on OA0-2 to arrange science opportunities with WEP for young astronomers from his GEP team [7]. As a result, D. S. Leckrone learned to program and schedule WEP for other observers and was able to carry out research on ultraviolet photometry of chemically peculiar stars and S. R. Heap investigated a heavily reddened O star and an eclipsing binary system with WEP. Both these astronomers then pursued long careers in ultraviolet astronomy.

IUE

Al had a principal role in the creation and operation of the International Ultraviolet Explorer (IUE) Observatory, a satellite facility that helped open space research to a much wider population of scientists. Prior to IUE (launched 26 January 1978), it was often necessary and almost always desirable for a researcher to be associated with the spacecraft experiment science team or to accept a team member as a coworker and coauthor to correctly use the instrument or even just the data. In contrast, IUE did not have a science team with preferred instrument and data access. It had an observatory staff to assist all users, who obtained telescope time by a competitive proposal process. Roughly 100 astronomers used OAO-3 (Copernicus) data in the first three years after its 1972 launch, as opposed to over 500 users of IUE data in the latter's first two years: ultraviolet astronomy was no longer “the province of instrumentalists” [8].

Typical of Al Boggess as the NASA IUE Project Scientist, he ignored the prevailing caste system of Civil Service vs. contractor-employed astronomers — he encouraged the contractors (called “Resident Astronomers”) who worked in the IUE observing facility at GSFC to propose their own research, and if selected by peer review, to use the funds granted with their observing time to in effect pay their own salary, enabling them to spend time on science and advance their professional development [7].

IUE was a joint project of NASA, the European Space Agency, and the UK Science and Engineering Council. Al's principal collaborator in IUE leadership was Robert Wilson (University College London). Together, they were honored with the Royal Astronomical Society's Herschel Medal for investigations of outstanding merit in observational Astrophysics. The 1986 award was “in recognition of their fundamental contributions to ultraviolet astronomy through the success of the International Ultraviolet Explorer (IUE).” The President of the RAS noted that “In recognizing Boggess and Wilson one would pay tribute to the fundamental contributions they made to the project from its earliest conception, through to its successful commissioning and subsequent operation” [9].

By the 10th anniversary of IUE's launch, observers with the spacecraft constituted “significant fractions of the astronomers active in research in North America and Europe” [10]. IUE was still working fine (it eventually operated for 18 years, three times the design lifetime), but by then Al had turned most of his attention to the future Hubble Space Telescope and had joined GSFC's Space Telescope Project Office.

HST

Al had major roles in the Hubble Space Telescope (HST) program, as both an experimenter and a project scientist. He was responsible with S. R. Heap for conceiving the optical design of the Goddard High Resolution Spectrograph (GHRS, [\[11\]](#)) and contributed likewise to the Space Telescope Imaging Spectrograph (STIS, [\[12\]](#)). He was a Co-Investigator on the science team for each of these workhorse Hubble instruments and co-authored many papers on their results. GHRS was launched in the original Hubble payload on April 24, 1990. STIS was added on-orbit, during the second HST Servicing Mission (SM2) in February 1997, when the GHRS and the Faint Object Spectrograph were removed from the observatory.

Al was particularly adept at laying out spectrograph designs that were compact enough to fit within the volume limitations of a spacecraft while still achieving very high resolving power, photometric precision, and functional versatility. The GHRS and STIS were among the most heavily subscribed instruments over the years on Hubble. Their records of scientific achievement are remarkable. The GHRS enabled studies of the ultraviolet spectra of planets and comets, stellar atmospheres and envelopes, and the interstellar and intergalactic media at resolving powers up to $\sim 100,000$ and with an extremely wide dynamic range [\[13\]](#). STIS, with its two-dimensional detectors, was a true imaging spectrograph. Perhaps its major claim to fame is the discovery that most galaxy nuclei contain supermassive black holes proportional in magnitude to the mass of the vast systems of stars in which they are embedded [\[14\]](#).

Under NASA's management approach for Hubble, the Marshall Spaceflight Center was responsible for the development of the orbiting systems — spacecraft and telescope. Goddard was responsible for spacecraft operations, science operations (via the Space Telescope Science Institute), the development of new science instruments (in collaboration with the Instrument Science Teams) and the development of other spacecraft systems to be inserted into Hubble during regular servicing missions carried out aboard the Space Shuttle. Goddard also played a major role in the organization and implementation of those servicing missions in collaboration with the Johnson Space Center and the Kennedy Space Center. Overall management responsibility for Hubble was supposed to be transferred from Marshall to Goddard within a few months after Hubble was launched, nominally in late 1986. However, the tragic loss of Shuttle Challenger in January 1986 put the plans for the Hubble mission (and everything else related to the Space Shuttle) on indefinite hold.

Under these circumstances, and considering that Marshall's development responsibilities were essentially complete, NASA decided to begin phasing in the transfer of observatory management from Marshall to Goddard even though a new launch date had not yet been set. In this scheme Al was assigned responsibility as the Lead Scientist for Hubble's operational phase. Al moved from his office in the Laboratory for Astronomy and Solar Physics, the U.S. scientific home of IUE operations, to the Space Telescope Project Office in GSFC. By the April 1990 launch he was the Hubble Project's Senior Project Scientist.

In June 1990, NASA announced the unfortunate discovery that the Hubble primary mirror was incorrectly ground and consequently afflicted with spherical aberration. Al coordinated with experts in NASA Centers, academic institutions, contractors, and the Space Telescope Science Institute in the development of plans to correct for the spherical aberration and also to improve the performance of the ESA solar arrays, which tended to cause the observatory to jitter, as well as the gyroscope packages, which tended to fail [\[15\]\[16\]](#).

By late 1990 planning for a contingency servicing mission, SM1, to repair Hubble had begun in earnest. Goddard brought on board the respected engineering manager, Joe Rothenberg, to lead the effort. Al became Joe's right-hand man for scientific advice and to represent the interests of the scientific community. He was the Hubble Project's "scientific conscience." Al and Joe developed a strong rapport. Early on they negotiated a strategic plan in which Joe committed to three major points:

1. The Project would find out in detail what's wrong with Hubble;
2. The Project would fix the problems;
3. The Project would not "eat its own young," meaning that the funding already allocated for future servicing of Hubble, including the development of the future instruments STIS and NICMOS (Near Infrared Camera and Multi-Object Spectrometer), would not be cut in order to solve Hubble's immediate problems.

Al's deep experience dealing both with NASA projects and the scientific community made him a very effective defender of community interests, as in this strategic plan.

Retirement

Al retired from NASA in late 1991, roughly two years before SM1 would fly and famously restore Hubble's performance. However, he had set the stage for SM1, one of NASA's most vital accomplishments.

The Boggess's then moved to Boulder, Colorado, the new home base for their long-standing hobby, birdwatching. Travelling the globe, they ultimately documented sightings of over 8000 species, a fittingly astronomical number for what began as a part-time avocation [17]. He is survived by three children, Albert R. Boggess IV, Edward Deeds Boggess, and Amenda Boggess Stanley, grandchildren and great-grandchildren.

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The authors were long-time colleagues of Al Boggess at the Goddard Space Flight Center. We are grateful for the privilege of having known and worked with Al and having benefitted from his advice and friendship.

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