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Harlan J. Smith (1924–1991)

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Harlan J. Smith died on 17 October 1991 of complications related to cancer, two weeks after reluctantly postponing a trip to Hawaii. The optimistic enthusiasm and determination which characterized his entire life did not desert him at the end.

Harlan Smith was born in Wheeling, West Virginia, on 25 August 1924, and lived for the first eighteen years of his life in the same house on Wheeling Island — the only inhabited island on the Ohio River. "It was the only flat land for fifty miles around," Harlan recently recalled, "and when it's not in flood it was a lovely place to live". His father was in the building supply business, which was not good during the depression, but Harlan retained no sense of privation: "There was no significant money for toys, but there was the public library with an infinite number of books to read, and things to do ... I had a very peaceful childhood right through the middle of the depression."

Harlan attended Wheeling public schools, enhancing the moderate intellectual challenges presented by playing a game of doing everything as nearly perfectly as possible. He did this to such good effect that he won the prize for highest grades right through high school. His older brother Kenneth was determined to become a chemist (and did so), and Harlan was always convinced that he too would be some kind of scientist. Astronomy was singled out by the Buck Rogers radio serial, by the Boy Scout astronomy merit badge, and by using a 6-inch reflector which had been built by a local Catholic priest and donated to the city.

He never had any doubt that he was going to college — both of his parents had gone to Ohio Wesleyan, and he prepared to follow them on graduation from Wheeling High School in 1942. In the summer of 1942, Harlan unexpectedly found himself on a larger stage — he had been selected as one of 40 national finalists in the first Westinghouse National Science Talent Search. This entailed a trip to Washington for further competition, in which he emerged as the national runner-up. More important than the flood of scholarship offers that this achievement produced was the fact that one of the three judges was Harlow Shapley, who was then at the height of his fame. Harlan got to know Shapley pretty well, and this was to have a decisive influence on his future.

Following a semester at Ohio Wesleyan, Harlan joined the U.S. Army Air Corps in February of 1943. He was assigned to meteorology, and was sent to Dennison University in Ohio for a concentrated one-year course in math and physics, followed by a three-month course at Harvard in electronics. While at Harvard in the spring of 1944 he renewed his acquaintance with Shapley, discussed a career in astronomy, and planned to attend Harvard after the war. For the next two years, Harlan served at various bases in the United States, and completed his war service with a stint as a weather observer on Guadalcanal.

Harlan entered Harvard in the summer of 1946, and after completing his first year took a job with Fred Whipple, who planned to set up a field station for the Harvard Meteor Project in the clear skies of the southwest. Harlan and another Harvard undergraduate and army friend, Richard E. McCrosky, took on substantial responsibilities, choosing the New Mexico site of the field station from inspection of weather records and setting it up. Smith, McCrosky and other Harvard students were also involved in operating this successful project, and the enthusiasm of that group has echoed down through the years — and has been repeated in the many other projects in which Smith has been involved.

Completing his BA in 1949, slightly delayed by the year in New Mexico, Harlan entered Harvard graduate school in astronomy. He proposed to do optical observing, which in Massachusetts was a challenge, and devoted considerable effort to refurbishing the 24- and 61-inch reflectors at Harvard's Agassiz station, near Cambridge. His interest in variable stars had been sparked by Cecelia Payne-Gaposcbkin, and for a dissertation he decided " .. to see if I could make sense of the short-period end of variable stars. I chose that for another reason, too — because one clear night would give me several cycles of variation. And I may not have another clear night for two months ... "

It turned out to be an interesting piece of work — he discovered that the short-period variables were more like Cepheids than like RR Lyrae stars, with which they had previously been associated. He showed that they formed a distinct new group, which he designated the "dwarf cepheids," but which today are more frequently referred to as Delta Scuti stars.

During Harlan's first year in graduate school he met Joan Swift Greene, a Radcliffe student and a good friend of the Shapleys'. They were married 18 months later, in December 1950. Joan was the daughter of the medical missionary Dr. Theodore Greene, and had been born and raised in China. Harlan developed an interest in China which was to be with him all his life. A strong advocate of astronomical development in China, he visited there several times, and Chinese astronomers and students have been an increasing presence in Austin.

While writing his dissertation and with the encouragement of Harlow Shapley, Harlan applied for a newly vacant job on the faculty of Yale University. He moved with Joan and their infant son Nat to New Haven in the fall of 1953, where he was to remain for ten years. He was Instructor in 1953-57; Assistant Professor 1957-60 and Associate Professor 1960-63, but this academic progression gives the merest hint of the enormous personal and professional expansion that was in progress.

The Yale Astronomy Department in 1953 was small. Dirk Brouwer, who was Chairman and Director of Yale Observatory, Rupert Wildt, and Smith were the regular faculty, and there were a few research associates. Harlan as the junior faculty member taught most of the undergraduate courses, and carried out such observing as was possible from the old Observatory site not far from the center of New Haven.

Against this background of regular duties, Harlan found time to finish his dissertation (he received his Harvard Ph.D. in 1955),to write and produce two educational film strips which received national first-place awards at the New York Film Festival in 1959 and 1961, to move the Yale telescopes from their old location to a new observatory location 15 miles north of town, and to build (with the assistance of graduate students James N. Douglas and Kenelm W. Philip) a new program in planetary radio astronomy. He became active in national astronomical affairs as the co-editor of the *Astronomical Journal* (1958-63) and as the Acting Secretary of the American Astronomical Society (1961-62). He knew every astronomer of the day, and was interested in all of their work.

Three research contributions from this time at Yale may be singled out. The first was his recognition and discussion of the class of dwarf cepheids — the subject of his Harvard dissertation. Although the observations were made while still at Harvard, the data analysis, interpretation and writing all occurred during his first two years at Yale.

His second special research contribution arose from the program in planetary radio astronomy. Hoping to use the dispersion of millisecond decameter pulses from Jupiter as probes of the interplanetary electron density, Harlan and his students set up multi-frequency receivers (to measure dispersion), plus spaced receivers at 4 sites in Connecticut connected by telephone lines (to permit rejection of ionospherically-induced fluctuations). No dispersion in the Jupiter fluctuations was observed, but clear evidence of a rapidly drifting diffraction pattern emerged from the spaced receivers. Harlan suggested in a paper read to the AAS in 1962 that the fluctuations were produced by interplanetary diffraction — two years before Hewish and collaborators at Cambridge published a more famous paper announcing a similar result for the fluctuations in intensity of discrete radio sources.

Harlan Smith's most important research contribution was the discovery of the optical variability and thus small size of quasi-stellar objects. The first stellar-like object with a strange spectrum to draw attention was 3C48. "Anything as weird as that I figured ought to vary optically, and the question is, does it?" Harlan recently recalled. Harlan and Dorrit Hoffleit were teaching a small graduate class in observational astronomy techniques at the time, so they took the whole class with them for a search of the Harvard plate stacks. They found sixty or eighty images, but no convincing evidence of variation. It was a very different story with 3C273, found some time later. This was a brighter object, with many more images, going all the way back to 1886, for which they found absolutely unambiguous evidence of optical variation. By this time, its spectrum had been interpreted in terms of a large redshift, suggesting a luminosity greater than that of entire galaxies, while Smith and Hoffleit's results suggested a physical size more comparable with the solar system. Their result was announced at the April 1963 meeting of the AAS, and published in *Nature* two months later: the ultra-small size of these ultra-luminous objects was established.

Harlan moved to the University of Texas at Austin in the fall of 1963 as the first "Texas" Director of McDonald Observatory and Chairman of the small astronomy department. The University of Texas owned the Observatory, but it had been developed and operated by the University of Chicago for its fIrst thirty years. On expiration of the agreement with Chicago, Texas decided to retain control and accepted an ambitious expansion plan outlined by Smith as a condition for his acceptance of the post. Key elements of the plan included expansion of faculty, the upgrading of existing facilities, a new telescope, a radio astronomy program, and eventual expansion into space astronomy.

The times were right: astronomy was in the early stages of rapid scientific and technological development; funding from the federal government and the state was on the increase; there was a national commitment to excellence in science from the relatively recent Sputnik shock, and there was a determination in the state of Texas to make the University a first-rate internationally ranked institution. And Harlan Smith, whose dreams and enthusiasm were boundless, directed a phenomenal expansion of astronomy at Texas over the next 26 years.

When Smith arrived in 1963, he found a department with four faculty and four support staff in Austin, with a half dozen more on the mountain, and a few graduate students. Today there are 22 faculty plus many research astronomers, making a total of about 60 Ph.D. scientists on the combined department and Observatory staff, with a combined support staff of more than 125 people; 44 graduate students are now in residence.

The program has grown large, but also strong: Texas researchers in the past decade have been awarded the Herschel Medal of the Royal Astronomical Society, the Gill Medal of the Astronomical Society of Southern Africa, and from the American Astronomical Society, the Russell Lectureship, the Heineman Prize, the Warner Prize, the Pierce Prize (twice), and the Cannon Award. The faculty Includes one member of the National Academy of Science, and several current or past holders of Sloan Fellowships or Presidential Young Investigator awards. Research is carried out in virtually every area of modem astronomy, and Harlan's plan for expansion into space astronomy has been carried out — 8 staff members are involved with the Hubble Space Telescope, and Harlan himself served on the early committees that defined its mission.

During his time as Director, Harlan led a rejuvenation and expansion in Observatory facilities. The 82-inch was modernized; a large meter-wave interferometer was installed near McDonald, and a 5 meter millimeter dish was moved to the mountain; NASA, NSF and the University shared the cost of installing a 2.7-m telescope at McDonald, which was the third largest in the world when dedicated in 1969. A dormitory for visiting astronomers and fifteen new staff residences were added to the mountain, and conversion from the photographic to the electronic and computer age was carried out.

For seven years beginning in 1978 Harlan devoted much of his effort to the design and financial nurturing of plans to build a 7.6 meter telescope at McDonald. This project was very nearly realized, but collapsed with the collapse of the Texas economy in 1985 — his greatest professional disappointment. But he liked to point out that it served a role in stimulating the competition, and some of the design philosophy has survived. And he immediately turned his attention to another large project: a collaboration with Pennsylvania State University to build a large (8.5 meter) special purpose telescope at McDonald — the Spectroscopic Survey Telescope — a project which continues with every sign of success.

Throughout his career, Harlan Smith regarded communication of astronomy to the public as one of the most important, and most rewarding, jobs the astronomer has. Himself a gifted teacher, he saw to it that good teaching was expected of all. The University of Texas has as a consequence one of the largest programs of undergraduate instruction in the country. He encouraged programs of outreach to the general public: the StarDate newsletter distributes 100,000 copies annually, and the award-winning radio program StarDate is heard by ten million people per week all over the world. Visitors are welcomed, not merely tolerated, at McDonald Observatory; the visitors' center now serves 120,000 people per year — who must come there on purpose, since McDonald is not on the road to anywhere! And Harlan always insisted that the largest telescope on the mountain be open for public viewing on one evening per month — the only place in the world where a 107-inch telescope is accessible in that way.

Harlan Smith's profound impact on astronomy at Texas was matched by his work on behalf of the larger astronomical community. He served on numerous committees and panels, among which were: National Academy of Sciences ad hoc Committee on the Large Space Telescope (which eventually became the Hubble Space Telescope), 1966-70; Chairman of the Planetary Division of the AAS, 1974-75; Council member of the AAS, 1975-78; Vice President of the AAS, 1977-79; member of the Space Science Board of the National Research Council and chair of its committee on space astronomy and astrophysics, 1977-80; member of the board of directors of AURA, 1972-1983 (Chairman of the Board, 1980-83); Chairman of the Management/Operations Working Group for Planetary Astronomy (NASA), 1988-1991.

Harlan Smith received honorary doctorates from Nicolaus Copernicus University (1973) and from Denison University (1983). He was named the Edward Randall, Jr.,MD, Centennial Professor of Astronomy at the University of Texas in 1984, and received the Distinguished Public Service Medal from NASA in 1991.

Harlan retired from the Directorship of McDonald Observatory in 1989, and focused his energies on teaching and on space — two threads that ran throughout his life. His courses always edified and often inspired cumulative thousands of undergraduates, and he served as supervisor of 17 Ph.D. students

and mentor to hundreds. I was his first Ph.D. student (1961), and during Harlan's last summer Scott R. Sawyer completed his degree (1991).

Harlan's interest in space appeared in my first association with him in 1953 — I was an undergraduate in his first Yale astronomy course. During a lecture on orbits, he took a side-track into the technical problems involved in going to the moon, stated they were all soluble, and predicted a landing in ten years – i.e. by 1963. His time estimate was optimistic (which was characteristic of Harlan), but he was perfectly right (which was also characteristic), and that at a time when very few people were taking the subject seriously. His interest in space continued and broadened; my last collaborative work with him involved the design of a lunar farside radio telescope, which was for him a sideline in his larger work of drumming up scientific and public support for a return to the moon.

His bubbling spirit of optimism pervaded everything. He set high goals for himself and threw himself into things wholeheartedly. He saw the best in everyone, and assumed that they too would do their best. It wasn't that he was blind to the difficulties of projects and to the darker sides of people — it was just that his policy and his nature were to take the positive road. He had successes and he had disappointments, but his spirit was never quenched.

Harlan is survived by his wife Joan Greene Smith; his children Nathaniel, Julie, Theodore and Hannah; three grandchildren, and his brother Kenneth.