Bulletin of the AAS • Vol. 54, Issue 1 (Obituaries, News & Commentaries, Community Reports)

Paul D. Feldman (1939–2022)

Rachel Wallach¹

¹Johns Hopkins University

Published on: Mar 01, 2022

License: [Creative Commons Attribution 4.0 International License \(CC-BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

Astronomer Paul Feldman, a worldwide leading authority on comets who pioneered the field of ultraviolet spectroscopy of comets, died at home on January 26, 2022. He was 82.

In addition to pioneering contributions to cometary science, Feldman — professor emeritus in the Johns Hopkins University Department of Physics and Astronomy and Academy Professor — made similar contributions to the fields of planetary and satellite atmospheres and astronomical instrumentation. He was principal investigator of a NASA-supported sounding rocket program and was responsible for more than 50 sounding rocket launches to study the Earth's upper atmosphere, the aurora and the airglow, the atmospheres of comets and planets, the spectra of hot stars, and cosmic background radiation. He is largely responsible for Johns Hopkins' reputation as a leader in solar system ultraviolet astrophysics and spectroscopy.

Photo credit: Johns Hopkins University.

“Paul has been a major presence in the department for many decades and served with great effectiveness and distinction as department chair during a critical period of departmental growth and reinvigoration. He was really one of a kind, and his leadership, wit, and wisdom will be sorely missed,” said Timothy Heckman, professor and chair of the Johns Hopkins department.

Feldman’s program also developed the UVX experiment that flew on the Space Shuttle Columbia in January 1986. He was principal investigator for a program of comet studies, including Comet Halley in 1985–1986, using the International Ultraviolet Explorer satellite observatory. He was a co-investigator on the team that developed the Hopkins Ultraviolet Telescope for FUV astronomy as part of the Astro payload that

flew on the space shuttle in December 1990 and again in March 1995, and was a general observer with the Hubble Space Telescope and served on the Space Telescope Users Committee from 1992 to 1995. He was also a member of the FUSE science team and a co-investigator on the HST Advanced Camera for Surveys, and a member of the NASA science teams for the Rosetta and LRO ultraviolet spectrometers team and the Europa Clipper UVS team.

“Paul was on the ground floor of developing the instruments and analytic techniques used to understand the chemical and dynamical makeup of comets, planets, and moons in our solar system, which he eagerly shared with anyone who walked into his office,” said Stephan McCandliss, a research professor in the JHU department whom Feldman hired in 1988 to work on the sounding rocket program. “His expertise and enthusiasm for spectroscopy made him a key developer and informed user on dozens of U.S. and international space astronomy missions, where he could always be counted on for sage mentorship, wry witticisms, and a readiness for fine dining. But perhaps most importantly, working for him was easy and always interesting.”

“Feldman's work was notable for its great breadth and depth,” said Harold (Hal) Weaver, research professor in the department, principal professional staff at Hopkins' Applied Physics Laboratory, and a former student of Feldman's. Feldman first ventured into the field of cometary science with an ultraviolet sounding rocket experiment to observe the Comet Kohoutek in 1974, and made an inventory of the hydrogen, oxygen, and carbon abundances in the comet's coma. For the rest of his career, he was what Weaver describes as a “planetary archaeologist,” investigating the origin and evolution of our solar system.

In 1976, during a sounding rocket experiment to observe Comet West, Feldman made the first detection of the carbon monoxide molecule in a comet, recording what is still one of the finest examples of a cometary ultraviolet spectrum ever obtained, Weaver said. The amount of CO in cometary nuclei is key to understanding their formation, conditions, and evolutionary history. Since then, Feldman remained at the forefront of attempts to study cometary CO, using sounding rockets, the International Ultraviolet Explorer satellite observatory, the Hubble Space Telescope, FUSE, and the Rosetta spacecraft.

In the field of planetary and satellite atmospheres, Feldman was one of early leaders in the remote sensing of the Earth's upper atmosphere by rocket borne spectrometers, and his fundamental research on the radiation from the Earth's upper atmosphere ultimately led to the emergence of the field known as “space weather,” said Darrell

Strobel, Academy Professor and research professor in the departments of Earth and Planetary Science and Physics and Astronomy, and one of Feldman's close collaborators for 50 years.

Feldman also spent time researching the Galilean satellites, serving on the team that discovered molecular oxygen atmospheres on Europa and Ganymede, polar aurora on Ganymede, and equatorial aurora on Io. Most recently, he was on the team that discovered fountains of gaseous water emanating from the surface of Europa, which suggests there might be life below that moon's thick ice shell. His work with the Hopkins Ultraviolet Telescope delivered spectacular spectra of Jupiter's dayglow that are the definitive data for unraveling the fundamental processes that create Jupiter's ultraviolet luminosity, and he led that telescope's investigations of Mars and Venus, with similarly significant results.

Warren H. Moos, professor emeritus in the Hopkins department, worked with Feldman on many projects both formally and informally. "I came to really value him as a colleague for his fantastic scientific insight and his ability to sum things up and say them correctly," Moos said.

Meanwhile, he supervised dozens of Ph.D. theses, significantly shaping the next generation of researchers. "It takes this kind of commitment from professors like Paul for scientific research to flourish," Weaver said.

Former student Kevin France, now associate professor in the Department of Astrophysical and Planetary Sciences at the University of Colorado, says that the fundamentals he learned from Feldman and McCandliss have allowed him to follow whatever research questions arise in his current role. "I believe the single most important lesson I learned from Paul was that if you take the time to learn the physics underlying astronomical spectra, you can basically teach yourself how to make a contribution to any astronomical field," France said.

France described a legendary milestone for Feldman's students. Known as "the Talk" or "the Ride," it typically happened during a trip to White Sands Missile Range to launch the student's thesis rocket. When the student least expected it, Feldman would suggest they ride back to Las Cruces together. "Forty-five minutes, no NPR, just you and Paul. Then Paul would review your graduate career to that point, and politely but firmly tell you that it was soon time to wrap up your thesis and move on with your life," France said. "I ended up finishing Hopkins' typically 6.5-year graduate program in 5.25 years because I knew, after the Talk, it was time to leave the nest!"

As a child, Feldman — a native of Brooklyn — made hand-drawn sky maps and was a member of the junior astronomy club at the Hayden Planetarium in New York. He graduated from Brooklyn Technical High School, and earned a bachelor's degree and Ph.D. (1964), both in physics, from Columbia University. He served as instructor at Columbia (1964–1965) and as an E. O. Hulburt Fellow at the Naval Research Laboratory (1965–1967), and arrived at Hopkins in 1967, where he chaired the department from 1996 to 2002. He retired in 2010.

Feldman was an Alfred P. Sloan Foundation fellow (1969–1974) and a Fellow of the American Physical Society, and was a member of the American Astronomical Society, American Geophysical Union, and International Astronomical Union. He served as associate editor of *Journal of Geophysical Research: Space Physics*, and was a member of the editorial board of *Icarus* and of the Committee on Planetary and Lunar Exploration of the National Academy of Sciences' Space Science Board from 1985 to 1988.

Many years ago, the department had a chamber music group where Feldman was the cellist. "I vividly remember Paul liked the Beethoven Archduke Trio, and did not like the Mozart piano quartets. We all enjoyed the Schumann's Piano Quintet. Those were the good old days," remembered Chia-Ling Chien, a professor in the department and one of two pianists in the group.

In addition to his scientific prowess and lasting impact on his fields, Feldman is remembered as a dedicated colleague and mentor whose enthusiasm and humor built many bonds of friendship. Weaver recalled an anecdote illustrating that wit: "During one of his trips from Denver to BWI, the airline attendant asked Paul if he enjoyed his meal, to which he responded: 'This is the second worst meal I've ever eaten in my life. The worst was on the flight out here from Baltimore.'"

"The people who supported Paul when he was chair were not only his staff; we became his friends," said Pam Carmen, senior administrative coordinator in the department. "He was the type of guy who brought you into his family. In that time, we also became friends with his wife, Joan, knew all about his daughters, Marian and Kathy, and got to experience the thrill he felt at the births of his grandchildren, which we all waited in anticipation. And I was honored to see Paul and Joan at my 50th birthday party. It was a very busy Friday and I said goodbye to him at 5 p.m. only to see them at my house when I got home. It was a surprise that I'm shocked he was able to keep. This close relationship lives on until the present day. I felt so blessed to be able to visit Paul and

Joan shortly before he passed. I have a photo of that visit and will remember the day always with a smile on my face.”

Feldman’s daughter Marian holds joint appointments in the Johns Hopkins departments of History of Art and Near Eastern Studies.

Feldman’s family has established The Paul D. Feldman Fellowship in Far Ultraviolet Spectroscopy from Space. Gifts in his memory can be made to the fellowship fund at <https://secure.jhu.edu/form/krieger>.

Adapted and reproduced with permission from [The Hub](#), a publication of The Johns Hopkins University.