

Alfred Scharff Goldhaber

Alfred (Fred) Scharff Goldhaber was born in Urbana, Illinois in 1940. Ten years later his parents moved from the University of Illinois to the then-new Brookhaven National Laboratory on Long Island, and Fred spent his formative childhood on the south shore of Long Island. He received his bachelor's degree *Summa Cum Laude* from Harvard in 1961 and went on to graduate study in physics at Princeton, writing his dissertation on *Tests of Exchange Models Including Spin*, under the supervision of Sam Treiman. After his graduation, he joined the University of California at Berkeley as a Miller Postdoctoral Fellow. In 1967, Fred was recruited to Stony Brook as one of the first faculty members of the Institute for Theoretical Physics, now the C.N. Yang Institute (YITP). He would remain with YITP for fifty-four years, becoming full professor in 1977, and finally serving as Toll Professor from 2018 to 2021.

At Stony Brook, Fred's outstanding research output spanned an uncommonly wide range of topics across elementary particle and nuclear physics. With Wit Busza, Fred made an influential prediction about what could be learned from high energy collisions of atomic nuclei at the then-planned (and ultimately built) Relativistic Heavy Ion Collider at Brookhaven. Fred was a leader in the study of magnetic monopoles, particles that remain hypothetical, but many of whose properties can be predicted by careful quantum analysis. Another theme of his work was how seemingly-small changes to the accepted rules of the universe would disrupt familiar principles. For example, what if the mass of a photon were not zero but some small, finite value? Coulomb's law of electrostatic repulsion would fail on large length scales, and the speed of light would not be constant: light of different wavelengths would travel at slightly different speeds. In a series of papers with Michael Nieto extending over four decades, Fred assembled observations from the laboratory scale to the galactic scale to set extremely tiny limits on the mass of the photon (and also the graviton.) They established that the photon mass, if nonzero, is at least a factor of 10^{-18} smaller than that of the electron. In 2014 Fred received the SUNY Chancellor's Award for Scholarship and Creative Activities.

Fred collaborated widely, with YITP colleagues and with well-known physicists throughout the nation and beyond. Indeed, at the height of the Cold War, he and his wife Suzan spent most of a year visiting the Soviet Union on a scientific exchange, forming lifelong friendships and scientific relationships.

As a capstone to decades of undergraduate teaching, Fred developed an interdisciplinary course, co-taught with Robert Crease from Stony Brook's Department of Philosophy, which enabled undergraduates to engage with the impact of quantum concepts on our culture. This course in turn became the basis of a book, *The Quantum Moment*, co-authored with Crease, which was published by W.W. Norton in 2015 to appreciative reviews. Early in his career, Fred served the university community as the president of the faculty senate. The American Physical Society designated Fred as a Distinguished Reviewer in 2008, the first year in which they formally recognized such contributions.

Fred's colleagues remember him as enthusiastic yet gentle in his approach to science and teaching. Not seeking the limelight himself, he took many opportunities to nominate others for professional honors. His colleague George Sterman shares, "Professionally, I benefited greatly from Fred's encouragement and recognition, starting with my days as a postdoc at the Institute, through the years that I served as director. Fred's was a generous nature in all respects." Former YITP director, Peter van Nieuwenhuizen, Fred's coauthor on several papers, writes "He had two characteristics I will always remember: he was a perfect gentleman, and he was incredibly smart."

Fred and his wife, Suzan, lived near the university in Setauket for almost his entire career, and Fred walked to work on most days, over 4 miles round-trip. Faculty and student colleagues from across the university experienced their welcoming hospitality and their interest in and sympathy for the lives and experiences of others.

Fred's many scientific achievements are part of a storied family tradition, spanning the twentieth and twenty-first centuries. His parents, Gertrude (Trude) Scharff Goldhaber and Maurice Goldhaber, were both distinguished experimental nuclear physicists (Maurice the long-time director of Brookhaven, Trude one of the few prominent women physicists of her era). His uncle Gerson Goldhaber was a prominent experimental particle physicist and astrophysicist, and his aunt Sulamith Goldhaber an experimental nuclear and particle physicist who died very young. Fred's brother Michael Goldhaber trained as a particle theorist and later wrote on the sociology of technology, presciently introducing the concept of "the attention economy" during the early days of the World Wide Web. Fred's son David continues this family tradition directly, as a distinguished condensed matter experimentalist at Stanford. Fred's daughter Sara has pioneered patient safety research with operating room innovations implemented around the world, alongside her clinical care as a Clinical Professor of Anesthesiology at Stanford Medical School. Besides his two children and his brother, Fred is survived by his wife Suzan, a retired reading specialist in the Three Village School District, and five grandchildren (Zev, Shira, Eytan, Miriam, Yaara).

In his fifty-plus years on the Stony Brook faculty, Fred Goldhaber helped build the intellectual heritage of the C.N. Yang Institute for Theoretical Physics and the Department of Physics and Astronomy. His creative and incisive science, coupled with generosity and kindness to faculty and student colleagues alike, continues to act as a light to his immediate colleagues, and through them to new generations. He will be missed, but his influence will live on brightly.