

FREDRIK ZACHARIASEN
1931 – 1999


In Peter Fay's backyard in France,
 1998 (photo by Nancy
 Zachariassen).

Fredrik Zachariassen, professor of theoretical physics, emeritus, died on December 9 at the age of 68, after suffering a heart attack.

At a memorial service at the Athenaeum January 9, Zachariassen's colleagues, friends, and family celebrated his life: his work in physics, his wide-ranging interests, his love of travel, of the outdoors, of good conversation, good food and, especially, good wine, and his passion to "solve the world."

Zachariassen earned his BS from the University of Chicago in 1951, where one of his classmates was Gerald Wasserburg, now Caltech's MacArthur Professor of Geology and Geophysics. Wasserburg recalled how Zachariassen would draw cartoons and sketches in class and how, as undergraduates, they were "subjected to a string of newly made hotshot professors," including one Marvin L. Goldberger. "We were the targets of his first attempt to teach quantum mechanics." Even Murph admitted later that it was a terrible course, Wasserburg said.

David Elliott, a close friend for almost 50 years, entered graduate school with Zachariassen in 1951. "It was a

comradeship that built up almost immediately and remained strong for the rest of our years together." The Elliotts and the Zachariassens did much traveling together over those years: to France, Italy, Portugal, Spain, Greece, Egypt, to name a few. Elliott described how Fred became "a hero to our entire class of grad students" by defying W. R. Smythe on the final exam of his course on electricity—a required course of complex problems, considered a "rite of passage," that didn't touch on what was then called "modern physics." "Fred chafed more than most," said Elliott. "At the final exam, Fred wrote furiously and left after an hour." It turned out he had turned in an essay about how electromagnetism is taught in most places and why Smythe's approach was not helpful. Miraculously, Zachariassen didn't fail the course (it was eventually dropped) and earned his PhD in 1956.

It was also in 1951 that Nina Byers, now professor of physics, emeritus, at UCLA, first met Zachariassen at the University of Chicago, where they were both studying for the dreaded qualifying exam (Zachariassen passed but left for Caltech anyway). "Fred was fierce and friendly." In 1958 they both ended up as assistant professors at Stanford. "Working with him was a whirlwind of fun and a very entertaining challenge. . . . He was a fast and accurate calculator but had a depth of understanding that made working with him very interesting and very rewarding." Zachariassen's main area of research was theoretical studies of the interactions of elementary particles at high energies.

Both Marshall Baker and James Ball met Zachariassen in 1953, Baker as a first-year grad student at Caltech and Ball as a sophomore. Some-

what later they began a long and fruitful collaboration ("longer than many marriages" said Ball), even though Baker was professor of physics at the University of Washington and Ball at the University of Utah. "Fred was full of ideas," said Baker, "particularly ideas that work—and are useful and focused." "A general feeling that physics was fun permeated the whole thing," added Ball, "and that's what kept us working at this for so many years when there were probably lots of easier collaborations that didn't involve flying to Salt Lake City and Seattle."

Ball also recalled the many camping trips to Baja California, as did Peter Kaus, now professor of physics, emeritus, at UC Riverside. "Trips to Baja were always overshadowed by the possibility of impending disaster," said Kaus. "But the disasters never totally stopped us, and we always had a wonderful time, aided usually by the case of beer we had acquired in Mexicali." Kaus also noted the hiking and camping trips around Aspen, where the two were among the original participants in the Aspen Center for Physics. Zachariassen was also a member of its board of trustees from 1978 to 1982.

Sidney Drell, professor of theoretical physics, emeritus, at Stanford, worked with Zachariassen at MIT and Stanford (where, as well as at UC Berkeley, Zachariassen spent the four years between his Caltech PhD and his return as a member of the faculty). "I admired him greatly for his science, for his fundamental modesty, and his irreverence. . . . He spent a fair amount of time teaching my three-year-old son to call him God." Drell also mentioned Zachariassen's membership in Jason, an elite group of physicists formed to advise the government on defense.

“Fred, still in his twenties, was the youngest one brought into that group. Already his brilliance was widely appreciated.”

His work with Jason was the subject of his last paper, written with Walter Munk, BS '39, MS '40, on spiral eddies that could be seen in sun glitter photographed from the Space Shuttle, currently in press with the *Proceedings of the Royal Society*. Munk, professor of geophysics at Scripps Institution of Oceanography, worked with Zachariasen in a small Jason Navy group involved in acoustic problems associated with antisubmarine warfare. This research resulted in a book they wrote with others: *Sound Transmission Through a Fluctuating Ocean*. (Zachariasen's other books include *Electromagnetic Structure of Nucleons*, coauthored with Drell, and *Hadron Physics at Very High Energies*, with David Horn.) Regarding his Jason work, Munk thinks “he was motivated by a romantic attachment to the planet Earth, by the love of adventure, of learning about unexpected manifestations of natural processes, and in this pursuit he was aided by a keen sense of observation and a very good memory for diverse facts.”

Two of Zachariasen's Caltech colleagues, Steven Frautschi and Steven Koonin, both professors of theoretical physics, also spoke. Frautschi, who had written an early paper on Regge poles with Zachariasen and Murray Gell-Mann, talked about the exciting things going on in the field back in the '60s. But it wasn't all work, said Frautschi. “Fred would get us out of the smog to go hiking or camping. He loved the mountains and deserts. That's the way I like to remember Fred: a pathbreaking researcher of small particles and large oceans, a vigorous

outdoor man, an honest and forthright friend.”

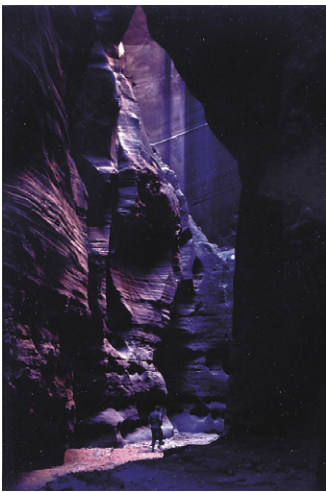
Koonin, BS '72, who was an undergraduate physics major when he came to know Zachariasen, noted that “if Fred was a hero to his contemporaries, he was a demigod to the students.” Later, as faculty colleagues, Koonin was impressed with “his perceptiveness and his frankness. Fred called ‘em like he saw ‘em, and he was usually right.” Through their common Jason connection, “the true range of his intellectual interests began to emerge to me—oceanography, global change, and of course the particle physics that he grew up with.” They had also gone “tanking” at Fort Knox with some fellow Jasons. “I think Fred could have made an alternative career as a tank commander.”

Military history was an interest he shared with Peter Fay. Fay, professor of history, emeritus, at Caltech, claims that he “never saw the inside of Fred's office. I don't know where it was. I never met any of his students; I attended none of his seminars.” Friendship between the Fays and the Zachariasens had developed accidentally out of the friendship of their children, and revolved around theater, good food and wine, visits to the Fays' house in France, a recent trip to Bhutan, and conversation. “We'd talk our heads off about things of compelling interest, and not about

what we were doing because we didn't know, either of us, what the other was doing. . . . Fred was cultured; he read things and enjoyed things that had little or nothing to do with his professional work.”

Daughters Kerry and Judy spoke of their family life and “perfect childhood”—the long dinner-table conversations, the trips to Europe (“before we could even talk”), the family camping, hiking, skiing, and rafting trips. “He gave Judy and me the most incredible lives,” said Kerry, “filled with adventures, the thrill of learning, love of the outdoors, and a powerful family bond that's still holding us together.” Judy added, “He valued education and instilled that in me to such an extent that I've hardly been able to get myself out of school my entire life. But he was sensible, too, and taught me to keep school in perspective. . . . My father taught me the difference between problem sets and science, what classes in school are good for and what they aren't.” Kerry spoke for them both when she said, “We have no mixed feelings about his passing. There's nothing we wish we had said, nothing we wish we hadn't said, no amends to make. We know he was crazy about us. He knew we were crazy about him.”

Zachariasen was an avid outdoors photographer; a show of some of his slides closed the service. □ —JD



Some of Fred Zachariasen's slides from his hiking and camping trips and from travels around the world were shown at the memorial service. Above: Paria Canyon, Utah, 1981 (Fred's wife, Nancy, carries her pack along the canyon floor), and right: the Maze, Utah, 1977.

