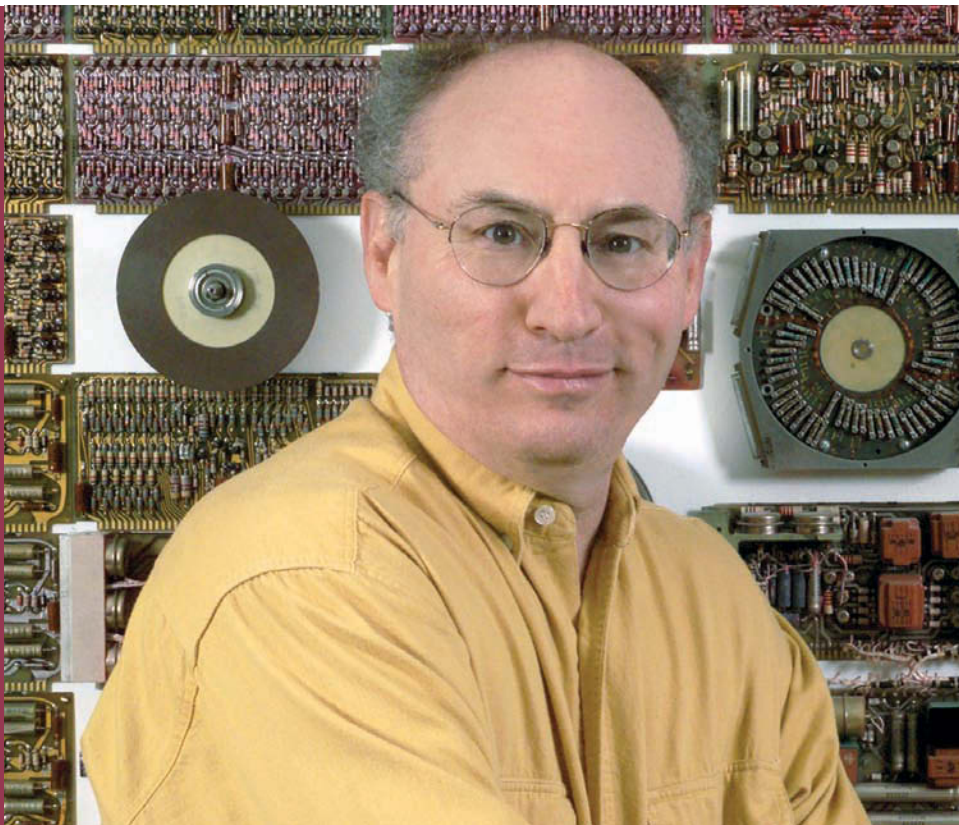


Art and design: Jim stands in front of a creative spread he did of the innards of a Minuteman missile, which hangs in his living room (courtesy Linear Technology)

GONE BUT NOT FORGOTTEN



ANALOG GURU JIM WILLIAMS

EDN'S PAUL RAKO, INDUSTRY EEs, AND OTHER CO-WORKERS AND FRIENDS REFLECT ON THE LIFE AND WORK OF JIM WILLIAMS, AN ENGINEER'S ENGINEER AND ANALOG EXPERT, WHO DIED UNEXPECTEDLY ON JUNE 12, 2011, AFTER A STROKE.

BY PAUL RAKO • TECHNICAL EDITOR

World-famous analog guru Jim Williams, who helped found and expand Linear Technology Corp, passed away peacefully at Stanford Hospital, Stanford, CA, in the company of family and friends at 10:15 p.m. on June 12, two days after suffering a massive stroke. Along with his wife, Siu, and son, Michael, he leaves behind an analog community—and electronics industry at large—enriched by his many contributions, both personal and technical, that will continue to ripple for decades to come.

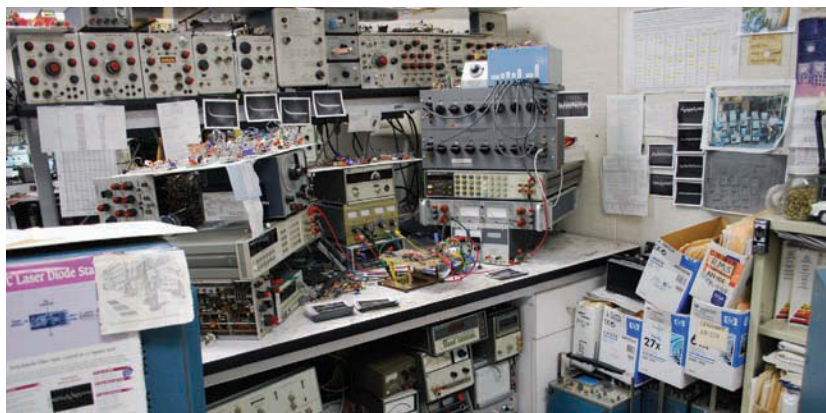
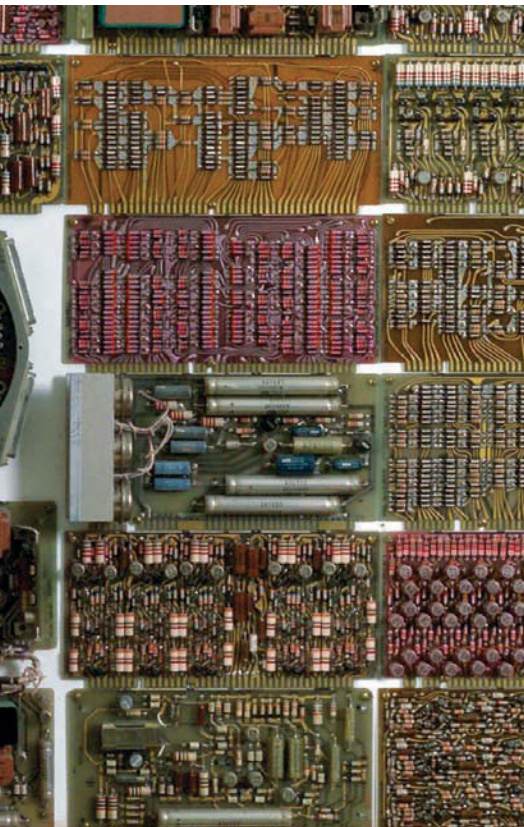
Jim had just returned to work from a well-deserved vacation and was excited about his next two articles for *EDN*. One, concerning sine-wave oscillators, is currently slated for the Aug 11, 2011, issue; the other will be his last article for *EDN*: a brilliant description of developing a 100A electronic load, currently scheduled for the Sept 22, 2011, issue. No one imagined at the time the article was submitted that it would be his last for a publication whose relationship

with Jim goes back more than 35 years.

Jim was pleased with that article. He often told me that it was one of the few technical projects in which “everything just worked perfectly.” He said it was rare to have all the parts of a complex design go so well. When he confided this feeling, I couldn’t help but think how his awesome talent had to play a part in the ease of the design.

Jim’s background was as interesting as the circuits he designed. You might say

that he “lacked credentials.” He took one semester of psychology at Wayne State University in Detroit. When Jim was growing up, however, a neighbor shared with him his garage full of big, beautiful Tektronix oscilloscopes. As a result, Jim developed a passion for electronics, and especially for test equipment. His passion led him to the Massachusetts Institute of Technology—not as a student but as a lab technician who built hardware for the scientists and kept a slew of sophis-



**This page
(top to bottom):**

Jim and his wife, Siu;
young Jim at Linear
Technology; Jim at work
at his lab bench; one of
Jim's four lab benches
at work; one of Jim's
many electronic sculp-
tures (courtesy Fran
Hoffart)

licated test equipment working. The department head once told Jim that a certain piece of equipment was beyond repair. That's all Jim needed to hear. Always up for a challenge, Jim fixed it in three weeks.

Test equipment must be more advanced than the circuits it tests, so learning the design of test equipment turned Jim into one of the best analog engineers in the world. He never confused description with understanding. When he gave seminars on how to design piezoelectric-transformer lamp drivers, he pointed out that professors who fill the blackboard with math don't know how a circuit works. He believed that, although math can describe how a circuit works, *understanding* how it works is a more fundamentally intuitive and poetic endeavor.

In 1975, while still working for MIT, Jim wrote his first article for *EDN*, "Heavy-duty power supply regulates either voltage, current, or power" (available online on the Jim Williams archive page at www.edn.com/jimwilliams). The article, like those that followed, stressed the need for a deep understanding of underlying concepts. Jim neither talked down to his readers nor tried to show off. A brilliant teacher, he simplified things

until you understood them, and he made things look simple. Anyone can learn jargon and a few tricks and secrets to try to look smarter than they are. Jim was the exact opposite. He painstakingly described the basic principles of operation of the topic he was discussing—be it how application engineers should serve the customer (June 25, 2009), measuring settling time (March 4, 2010), or designing an acoustic thermometer (April 21, 2011). He then showed you how to achieve your goals for your designs.

Jim loved to get his hands dirty, hacking on copper-clad boards and brandishing a soldering iron rather than instructing a technician about how to perform these tasks—a great example for generations of analog engineers. He taught us all that doing the work yourself gives you a far deeper understanding of the design than if you just toss a schematic to a hapless technician.

“Jim lived electronics,” says Bob Dobkin, founder of Linear Technology and the victim of many of Jim’s pranks. “Electronics—along with humor—was his art.” Jim’s belief in building your own prototypes and testing them taught tens of thousands of engineers the right way to get a working design from scribbles on a paper napkin to production.

For one so brilliant, Jim was modest, quiet, and articulate. His joining Linear

EETimes editor Bill Schweber also published a touching tribute to Jim: www.edn.com/110714df2a.

View additional photographs of Jim in the *EETimes* photo gallery at www.edn.com/110714df2b.

Technology in the earliest days also made him wealthy, but it was hard to tell from his manner. He was never condescending, despite his wealth and talent. Jim loved to talk to fellow engineers, and he meant *talk*. He had no use for e-mail, a cell phone, or voice mail. It was OK for engineers, readers, or editors to call him while he was at work, though. He especially welcomed hearing from fellow engineers, saying that he learned as much from them as they could learn from him.

Jim had a window office with a door, but calls to his office phone almost always landed at the lab bench where he spent most of his time. He respected the best in people. He didn’t care what country you came from, what car you drove, or what breakfast cereal you liked. All Jim needed to know was that you loved analog. He was approachable and friendly, no matter what the situation.

In the late 1970s, Jim worked in the Boston area—for Teledyne Philbrick,

Arthur D Little, Consultek, and Analog Devices. By the late 1970s, however, the action in electronics was in Silicon Valley, so Jim went to work at National Semiconductor. “We tried to get him to stay in Boston, but the call of the West and all that action was too much to beat,” says Dave Kress, a former co-worker at Analog Devices.

While Jim was at National Semiconductor, several engineers left to form Linear Technology, but Jim didn’t go with them. “They didn’t have any chips yet,” he said. “What did they need an application engineer for?” That situation soon changed, however, and Jim joined Linear as the company’s first applications person.

“Jim and I were good friends, even at a distance and working for competitors,” says Kress. “But we never personally felt competitive. He was extremely creative and productive.”

Dobkin encouraged Jim to write for the trade press, to demonstrate the capabilities of Linear Tech’s parts. Beyond achieving that goal, though, Jim’s articles also demonstrated his brilliant command of analog design. He wrote 60 articles for *EDN* during the 1980s alone. His natural emphasis on analog gave *EDN* an analog tilt that continues to this day. Loyal readers knew they could learn the best principles of analog design by just reading his articles. Despite suffering from Parkinson’s disease, Jim never let it slow him down or affect his prodigious output of work.

Jim’s effect was profound. Alan Martin, himself a brilliant engineer, read Williams’ articles, which instilled in him a love of analog. As a result, Alan moved from Colorado to Silicon Valley and took a job at Linear Tech—just so that he could work with Jim on a daily basis.

Jim had that effect on every engineer around him. He made you want to do the best work you could. He made you want to solve the intractable problems. He made you want to not just get it working but to get it working in an elegant way. Jim helped set the standard for analog engineers the world over. That world will miss his technical brilliance and his warm personality. I know I will. **EDN**

Jim leaves his wife, Siu, and son, Michael. You can make donations in his memory to The Parkinson’s Institute, 675 Almanor Ave, Sunnyvale, CA 94085.

Jim’s first article for *EDN*, “Heavy-duty power supply regulates either voltage, current, or power,” was published on May 5, 1975. Read the article online at www.edn.com/jimwilliams. During Jim’s decades-long association with *EDN*, he wrote numerous additional articles, many of which also can be found on the Jim Williams archive page at www.edn.com/jimwilliams. Below is a sampling of some favorites:

■ “Something from nothing,” Sept 15, 2005

■ “JFET-based dc/dc converter operates from 300-mV supply,” May 25, 2006

■ “1-Hz to 100-MHz VFC features 160-dB dynamic range,” Sept 1, 2005

■ “20-bit DAC demonstrates the art of digitizing 1 ppm, part 1: exploring design options,” April 12, 2001

■ “The taming of the slew,” Sept 25, 2003

■ “A clock for all reasons, part 1: monolithic oscillator invigorates instrumentation applications,” June 26, 2003

■ “Thank you, Bill Hewlett,” Feb 1, 2001

■ “Precisely measure settling time to 1 ppm,” March 4, 2010

■ “An introduction to acoustic thermometry,” April 21, 2011

■ “Layout and probing techniques ensure low-noise performance,” Feb 2, 1998

FAMILY, FRIENDS, CO-WORKERS, AND EDN READERS HONOR JIM

Numerous people who had the pleasure of knowing Jim both personally and professionally responded to the news of his death with an outpouring of stories and favorite memories of Jim. These comments are a true testament to Jim's life and work. Below is just a sample. Read more online at www.edn.com/110714df2c:

"As Jim Williams' son, nothing has been more touching and comforting than being able to read about how much he will be missed by all those that knew of him or were fortunate enough to work with him. ... My father was a brilliant and ingenious man, but what most people do not know is that he was also an excellent father. ... He expected me to stick to my word, treat people with respect, and, most important, to be loyal and honest to myself and to those around me. ... His loyalty, generosity, and moral discipline were only outranked by his ability to make me feel like the proudest son in the world. ... I will never forget our times together, whether we were driving around in his Jaguar XKE with the top down or discussing our love for vintage electronic equipment over hamburgers. You could find us on weekends at the De Anza electronics flea market or watching the Niners take a pounding on TV. Whether he was giving me advice on my love life or teaching me how to find the fuel cap on a '56 Chevy, I always listened, eager to learn everything I could from him. I love you and miss you, Dad."—*Michael Williams*

"Original. Generous. Mentor. Friend.

For the past 23 years, Jim showed me how it should be done:

Saturday mornings at Foothill.

How to be a student of the past and use it as a guide to the future.

Why giant slide rules are cool.

The joy of a home lab and the beauty of growing up with a hobby and a job that are one and the same.

Funky electronic art.

How to pay attention to details and question every measurement.

How to write and speak with style and humor so that whether your audience is one or 1000, you are just being yourself.

How to mentor junior engineers with patience and grace, while helping them discover the same enthusiasm that you feel.

How to maintain scientific integrity and ignore politics.

How to give credit and praise when it is earned.

How to be ever mindful of the needs of other people.

How to live your life to the fullest by sharing what you love to do best with those around you.

Thank you, Jim."—*Bob Reay, vice president, mixed-signal products, Linear Technology Corp*

"Many years ago ... I needed an oscilloscope, and the obvious source for advice on anything lab-related was Jim Williams. I explained what I was looking for, and Jim said I was in luck: He had just bought a broken Tektronix 453 scope at the Foothill flea market. As I stood at Jim's bench, pondering exactly why I was 'in luck,' he reassured me that this scope

would suit my needs and that he would have it fixed in no time. He offered to sell it to me for the \$65 it cost him at the flea market; however, there were conditions attached.

A few days later, Jim brought the scope in to work and spent about five minutes explaining the features. He spent 10 minutes explaining how these features differed from those of comparable scopes, and then another 15 minutes explaining how to care for the scope. He showed me how to keep the tube in good condition and how to ensure that the filter for the cooling fan had adequate airflow. He explained how the past owners had taken good care of this instrument, and his first condition was that the new owner do the same.

Anybody who worked with Jim knew that he devoted as much care to the upkeep of his lab equipment as he did to the performance of his circuits. Few people will ever approach Jim's knowledge of electronic instrumentation. Even fewer will treat such instruments with the same level of care and respect. His final condition for parting with the scope was that it be used for something productive and profitable! Jim's devotion to his work and to the tools of his trade will be missed by all of us."—*Sam Nork, director, Boston Design Center, Linear Technology Corp*

"I have known Jim Williams for 30 years. I have known him as the consummate engineer, scientist, writer, humorist, and family man. In all areas that Jim ventured, he excelled. His combination of personal integrity, drive, and humble interaction with other people drew many friends.

Jim's intuitive understanding of electronics enabled him to design complicated circuits in his head, which he tested with real parts to prove the circuits. The ability to design circuits also requires analysis of the results of the testing. His strong analytical ability ensured test results were correct and circuits were well-understood.

Jim took his developments and turned them into words for publication. He helped engineers of all ages understand circuits intuitively like he did. There are few sources for advanced circuit understanding and design—especially the way it was taught by Jim. ... In all the time I've known Jim, I have never known him to refuse to help someone with a circuit.

While Jim's vocation, avocation, and hobby were electronics, he had a great sense of ... art. His electronic sculptures are unique, beautiful, and functional. He built these structures (with much cursing) and careful selection of aesthetically pleasing functional parts. He [also] had a great sense of humor, which was often foisted on his friends, myself included.

[Jim] was a dedicated father to his son, Michael, and husband to his wife, Siu. Both of these people were very much a part of his life. A successful poet is the rarest of all vocations. Jim Williams was unique: a poet who wrote in electronics."—*Bob Dobkin, co-founder; vice president, engineering; and chief technical officer, Linear Technology Corp*