

Terman Award Acceptance Speech

R. Jacob Baker, October 11, 2007

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<http://CMOSedu.com/>

It is a great honor to receive the 2007 Terman Award for my book *CMOS Circuit Design, Layout, and Simulation*. I would like to use this time to talk about Dr. Terman's lasting legacy including the ongoing support for education by the Hewlett-Packard Company. It's also a chance to thank many wonderful, and supportive, people at Boise State University, Micron Technology, the IEEE, Wiley, and the many other universities and companies that helped during the book writing and application process. Finally, it's a chance to thank my family for their support and patience while writing the circuit design books and supporting my online, and offline, educational activities that continue today.

Dr. Federick Emmons Terman was a founding member of the National Academy of Engineering, author of *Radio Engineering*, three editions, and later a fourth edition renamed *Electronic and Radio Engineering*, credited as helping to start Silicon Valley and grow Stanford University and its engineering college. He was a man with entrepreneurial vision while at the same time having a focus on quality education and its associated economic benefits.

As a well-known example of his vision, Dr. Terman encouraged two of his former students Bill Hewlett and Dave Packard, who graduated from Stanford University in 1934, to "make a run for it." The Hewlett-Packard Company, or, nowadays, more affectionately known as HP, was founded in 1939. Further, again an example of Dr. Terman's vision, he created an

industrial park adjacent to Stanford University that many call the “birthplace of Silicon Valley.” For decades now the hundreds of companies located in Silicon Valley have driven the development of technology and its associated benefit to humanity, all starting with Fred Terman’s efforts and vision.

Thank you Dr. Terman!

Thanks go to the Hewlett-Packard Company, and, in particular Wayne Johnson for supporting this award. In addition, I would like to acknowledge HP’s decades of supporting education and providing opportunities for engineering student internships. My daughter is an ECE student at Carnegie Mellon in Pittsburgh. She was an HP intern last summer at the HP-Boise site. I got to see first-hand the effort that HP puts into these internships and their altruistic efforts.

When I started teaching at Boise State in 1993 I used an electronics laboratory with brand-new, donated, HP equipment. This level of support hasn’t stopped; HP and Agilent equipment continue to be used for teaching and research activities at universities around the world. HP is regularly supporting education and efforts to get, and keep, our children interested in the sciences and engineering. It’s amazing the level and scope of educational support provided by HP on so many fronts. Thank you Wayne and thank you HP for this award and for your generous support of engineering education!

A little bit about Boise State University. A relatively young university, founded in 1932, Boise State, enrolls approximately 19,000 students and is the largest university in Idaho. It’s an academically growing university with new graduate programs coming on line each year. The College of Engineering was established in 1996 with degrees in Electrical and Computer Engineering, Mechanical Engineering, Civil Engineering, Construction Management, and Instructional and Performance Technology.

Since this time, and with support from Boise industry including HP and Micron, graduate programs were started. Masters degree programs in ECE began in 2000 and an ECE PhD degree program was started in 2006. The faculty and staff have focused on curriculum development and accreditation while ramping up research activities and the required infrastructure to support these activities. It's been a lot of hard work and it's nice to get this opportunity to publically thank a few of my colleagues at Boise State for their efforts.

Thanks go to Boise State's College of Engineering Dean Cheryl Schrader for nominating me for the Terman Award (3 times!) Her encouragement and tenacity were invaluable in the final success of the application. Appreciation and thanks go to Pat Pyke and Rex Oxford for their efforts and help during the application processes. Much of the success of a textbook comes from listening to student input. I wish I could list all of my former students with "input" but let me just say "Thank you!"

I would also like to acknowledge and thank my colleagues at Boise State, the IEEE, and elsewhere for their support of the book (reviews, publication, comments, etc.) and of my application for the Terman award including: Jeanne Audino and Cathy Faduska (IEEE Press), Edison Fong (National Semiconductor, Inc.), Paul Furth (New Mexico State University), John Gardner (Boise State University), Neil Goldsman (the University of Maryland), Mark Hadrick, Brent Keeth, Mary Miller, Tami Nord-Taylor, and Gary VanAckern (all with Micron Technology, Inc.), Bob Hay (previously with HP and now with Boise State University), Roger Lake (University of California, Riverside), Ward Parkinson (founder of Micron Technology, Inc.), Ronald A. Rohrer (Cadence Design Systems, Inc.), Lynn Watson (former CEO of In-System Design and Silicon Eagle).

Last, but certainly not least, I would like to thank my family for supporting me while I wrote the books. To do this properly requires some background. Back in 1994, right after I'd been hired to teach for the University of Idaho but in Boise, I started collaborating with Micron Technology, Inc. One of Micron's interests was a source of engineers with good circuit design skills. I set out to develop courses, technical electives, which would give student's skills needed to work in the integrated circuit design area. I knew that no single area of study would meet my goals. For example, a student couldn't just study circuit design because then they wouldn't know how to implement a product. They couldn't just study implementing a product (e.g. layout) since then they couldn't design the product. What was needed was a textbook that would provide a well-rounded plan of study in circuit design, layout, and simulation. Further, I wanted a book to cover both analog and digital design since ultimately I felt, and still do feel, that digital design becomes analog design as the operating speeds increase.

I hatched the plan to write a textbook in the fall of 1994 after a summer at Micron in the trenches working on Field Emitting Displays in 5 μm NMOS technology. The Internet wasn't as ubiquitous as it is today and research, and determining the books written in an area of study, still required a trip to the library. There were several popular integrated circuit design books on the market at the time. I knew that for my textbook incorporating analog and digital CMOS circuit design with layout and simulation to be successful I would have to have an angle. The "angle" came with little effort since I knew a book that included chip layout software for the PC would be unique and useful. I wanted to use PC-based software because all of my students had PCs. I'd been using a PC tool called LASI (LAYout System for

Individuals) written by Dave Boyce. I called him up and told him about the proposed book project. He said it sounded like a great idea. I knew that writing a large book alone with a young family and the other responsibilities that goes along with being an assistant professor attempting to get tenure would make finishing the project in a timely fashion (a year or two) challenging. I was lucky, however, to work with Harry Li whom I considered to be an excellent educator. I spoke with him about the project. He liked the idea and, after a chance meeting in February 1995 with the IEEE Press at the International Solid-State Circuits Conference in San Francisco, we put a book proposal together. The proposed book was titled *CMOS Circuit Design, Layout, and Simulation* authored by Baker, Li, and Boyce. While both Harry and I had been writing notes for our courses since the previous year, that were ultimately used in the book, we didn't formally start writing the book until the Summer of 1995 after we had interest from publishers. The book was published by the IEEE Press in August 1997.

In the spring of 1995 my daughter Kyri was 6, and in first grade, and my son Josh was 3. I spent late evenings, after the kids were in bed, and any other weekend free time writing. As an aside, one clear thing about this time that I remember was how many times I read the Berenstain Bears children's books to my kids. I think, to this day, I can tell you what happens and recite, from memory, much of the content of these books. Another thing I remember about this time was the amount of advice I got about book writing, much of it derived from Thesis or Dissertation writing. One of the more memorable was "Put your dissertation, both hard copy and floppy disk, in your freezer so that if your house burns down it's safe." I thought "Like my house is going to burn down". The Internet wasn't common then but I did do back-ups at several physical locations just to be safe.

The writing continued month after month and my children grew. Also during this time my family: Mom and Dad, Brother with family, and ultimately Sister and family moved to Boise. It was nice having many of my relatives living in the same town.

We lived in a rural portion of Idaho, outside the city of Meridian, on a couple of acres. It was quiet and great for writing. We didn't have gas heat, and electric heating is very expensive, so in the winter we would load up our wood stove, choke off the flue, and heat our house with wood. In the morning of December 8, 1996 at about 3 am my wife Julie woke me up and said she smelled smoke. During the summer of 1996 we had had a microburst of wind that blew part of our roof off striking the chimney. As we later found out our chimney suffered a crack. A cinder from our wood fireplace got into the attic of our house that morning and started a fire. We quickly got our kids and fled, safely, to our neighbor's home where we called the fire department. Our house burned down and we lost everything except the clothes we were sleeping in. No, putting a manuscript in the freezer wouldn't have kept it from burning up. Our fridge/freezer, well what we could make out, was about 8 inches tall after the fire. My computer was a melted piece of plastic.

Over the next year, while finishing the book, our house was rebuilt. The four of us lived in a 26-foot camper adjacent to our house while it was being rebuilt. I bought a laptop and wrote a significant portion of the book on a fold-down table in the camper with my family very, very close. While I could talk about the 5 gallon water heater in the camper, the twice-a-week trips to the laundry mat, the shivering in the winter, or the mosquito hunts prior to going to bed in the summer, I'll just stop here and say that it was a character-building experience.

This award has provided me with the opportunity to publically thank Kyri and Josh for their support, help, and for being such a great daughter and son. It also gives me a chance to thank my wife Julie for her patience, support, and love during our twenty-plus years of marriage.

Thank you all,

R. Jacob Baker

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