Donald O. Pederson

Professor, Visionary, and Friend

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I first met Don Pederson in the Fall of 1966 when I attended my first session of EE105 (Electronic Circuits). My first impression of Don was that he was a character. Thank goodness Don never made any attempt to hide the fact that he was a character! Not only did he have a marvelous understanding of electronic circuits, but he also knew the people who designed the circuits and the companies that were nurturing those people and fueling the innovations that were transforming Silicon Valley into a technological and economic powerhouse. When you took a class from Don, not only were you learning circuit design, you were becoming a part of a new and exciting industry.

Don had a remarkable sense of humor and was a captivating lecturer. His lectures didn't always give the students the information they needed to do the problem sets, but his stories were intriguing and provided an invaluable insight into Silicon Valley. Don wanted his students to figure out the problem sets on their own, and was reluctant to provide too many clues that would lessen the learning experience. And the exams could be terrifying, since sometimes they reflected the problem sets, and sometimes they didn't. You always had to think in Don's class.

Then there was the Yellow Peril, the official textbook of EE105. Not too many EE105 students remember the official title (it was Electronic Circuits – Preliminary Edition) but everybody recognizes the title Yellow Peril. The errata sheet was almost as long as the book, and portions of the book were downright cryptic, but other portions provided an insight into how electronic circuits work that is unique and very hard to find in other textbooks. I have two copies of the Yellow Peril, the copy that I used from EE105 onward, and a copy that Don gave to me shortly after he was awarded the IEEE Medal of Honor, with the Errata corrections scribbled in his handwriting. I still refer to the Yellow Peril first when I have a question about circuit design. It is a true classic.

Don was a great teacher but he was also a true visionary. He was quick to recognize trends in the industry that would have enormous impact, and dogged in his determination to include those trends in the Electrical Engineering curriculum. He recognized the potential of integrated circuits long before many professors, and began to build an Integrated Circuits group that would concentrate on the research topics that could best advance the Integrated Circuits industry. Don was very instrumental in incorporating Integrated Circuit design techniques into the curriculum in the mid sixties,

years before this material would included in most EE programs. The courses EE140, EE141, and EE145, and their graduate counterparts EE240, EE241, and EE245, were flagship courses in Integrated Circuit Design which prompted counterparts in all of the leading University curricula.

Don also realized that students would understand integrated circuit design better if they understood integrated circuits better. Don was the major mover in developing the first IC fabrication laboratory at an academic institution. Only Don could have done such a feat. His wide network of colleagues in the integrated circuits industry enabled him to obtain contributions of near state-of-the-art fabrication equipment and assistance in setting up the line. The laboratory, located on the fourth floor of Cory Hall before there was a fifth floor, provided students in the Integrated Circuits group the unique opportunity to actually fabricate their very own integrated circuit. I was one of the benefactors of this facility. As an undergraduate researcher under Don's tutelage, I designed and fabricated a Schmitt trigger. Granted, the circuit contained only three transistors and five resistors, but it was a real integrated circuit, it worked, and it was fabricated in 1969!

Don understood that future IC design would require the use of the computer because breadboarding was out of the question and integrated circuits were clearly becoming larger and more complex at a remarkable pace. Don had a very healthy distrust of computers, but he was always willing to employ a computer if it could make his life easier. The first example I know of was the FORTRAN program GRADER which Don used to calculate and print the grades for all of his courses. I'm not sure who first wrote GRADER. I know Ian Getreu had a hand in it, I'm pretty sure Bill McCalla had a hand

in it, and I think even Bill Howard may have been involved. GRADER isn't around anymore, but it was exemplary of Don's embrace of computer technology when the time was right.

More important than GRADER, of course, was a FORTRAN program that Bill Howard wrote to help him understand nonlinear bias networks for integrated circuits, and in particular the temperature dependence of these bias networks. The program included a fairly elementary Ebers-Moll model for bipolar transistors and well as temperature dependent models for resistors. The program got to be known as BIAS, and Don was quick to include the use of BIAS in EE141. This would be a recurring theme with Don, that new computer tools were immediately introduced into the curriculum. This both helped the development of the tools and introduced students to the use of computer-aided design as an integral part of the Engineering curriculum.

Bill McCalla took over BIAS and introduced frequency-domain analysis and an algorithm for determining the poles and zeroes of an integrated circuit. This allowed students study the behavior of the poles and zeroes of a complex circuit in much the same way that the poles and zeroes of a simple circuit were analyzed in the Yellow Peril. Bill's program became known as SLIC and was widely used both in integrated circuit design courses and in graduate research.

I graduated at about the time SLIC was introduced, and I began my graduate studies under Don Pederson. At about the same time, Ron Rohrer joined the faculty at Berkeley and, with Ernie Kuh on sabbatical, Ron took over three of Ernie's circuit synthesis courses. With Don's blessing, I enrolled in Ron's course, thinking I could use some background in circuit synthesis. Ron turned the synthesis course into a course on

circuit simulation, and the class project was to write a simulator. Don was to be the judge of the simulator. If Don approved, we passed. If Don didn't approve, we didn't pass. This was strong motivation for graduate students! After three quarters, the program that was first called CANCER was let loose on graduate students. CANCER had built-in device models, like BIAS and SLIC, and could perform DC, AC, and transient analysis of circuits. Don was quite pleased with the results, and we all passed.

CANCER became my Master's project and Ron Rohrer became my advisor, although Don still was my honorary advisor. When Ron left Berkeley shortly after I graduated with the Master's degree, I once again became Don's graduate student, and CANCER was renamed SPICE and became my Thesis project. Don introduced SPICE to the world at the Midwest Symposium on Circuit Theory in 1971. SPICE already was a part of the Berkeley IC curriculum, but with this introduction SPICE eventually became an integral part of literally every University IC curriculum. Don's guidance and support was invaluable to me in my development of SPICE2 and my dissertation, and I can attest that the success of SPICE was in no small part due to Don. When Don was awarded the IEEE Medal of Honor, the IEEE Spectrum ran a cover story which justly proclaimed Don the "Father of SPICE."

In retrospect, Don's biggest asset was his uncanny ability to identify and nurture top talent in engineering. Don's colleagues and students alike went on to assume top leadership positions both in Universities and in the IC industry, and the list of Don's students is a veritable "who's who" of IC engineering. Don's true legacy is the Integrated Circuit Group at Berkeley, which is very much alive and well, and all of the

superb students who have graduated and will graduate from that group. That is one towering legacy.