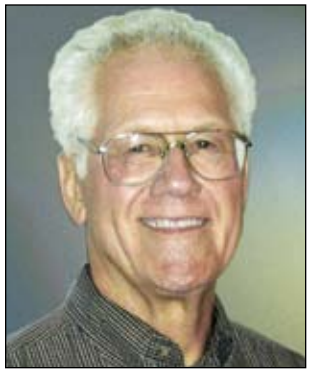
Lyle's Law of Conventionality

Engineers are proud of their patents. A patent in your name is a testimony that the technical community has examined your idea and has certified—with a red ribbon, even—that this idea is original and is deserving of the protection of the government for a period of 17 years. A patent is an intriguing document, couched in rather arcane legal phrases that are designed to be as unambiguous as possible so that the claims made are properly restrictive but do not infringe on other claims made in other patents. I wouldn't recommend patents for recreational reading, but every engineer should run through a few just to get the feel for how they look.

In the early days of my career, I was granted two patents: one for a remote-control system and one for a ferroelectric memory element. On the latter patent hangs an interesting story.

A ferroelectric may be considered the electric analog of a ferromagnet. While a ferromagnetic material can be magnetized to become a permanent magnet, a ferroelectric material can be electrified and become a permanent electret (I'm not making this up). In the 1960s, computer memories were based on little ferromagnetic toroids (doughnuts) that could be magnetized in one direction or the other to store a *one* or a *zero*. It was not too great a stretch to design a dual structure using ferroelectrics and configure it to represent a *one* when polarized in one direction and a *zero* in the other. So I did. The work was reviewed on campus, and a patent was applied for and, eventually, granted.

Now the other thing that engineers—especially assistant-professor-type engineers—like is publication, so I wrote up this marvelous invention and submitted the paper to a well-known journal. It was rejected. The reason for rejection was a statement by a reviewer that "it is well-known that fringing fields can not cause switching in ferroelectric materials," therefore—according to said reviewer—this thing could not work as I said it did. Well, I was disappointed, of course, but I was being pulled in other directions at that time, and I was advised not to get in a writing contest with the respected physicists of this respected publication, so I dropped it and went on to other things.

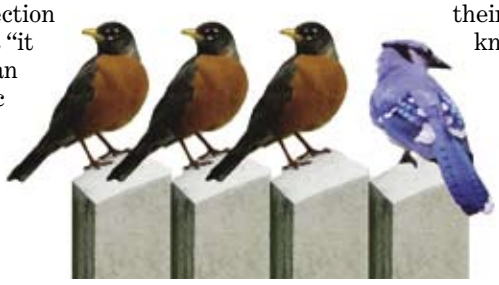


Question the conventional wisdom

Fast forward about 25 years. In the mid-nineties I ran across a paper reporting on a device that exhibited exactly the behavior that I had observed in the late sixties. Apparently fringing fields *can* cause switching, in spite of what used to be "well-known." There's a law in that story: Lyle's Law of Conventionality. *Question the conventional wisdom. What "everyone knows" might be wrong.*

I state this law not because I did follow it but because I probably would *not* have. Had I, in my literature search, learned that "everyone knows that fringing fields can not cause switching in ferroelectric materials," I doubt that I would have tried building this device. While the course of human events was little changed by my invention—although the patent is still cited from time to time—it would have been a pity if I had not had the pleasure of building and testing it and, not incidentally, receiving a patent.

So when and where should engineers use this law? Certainly in the early stages of product definition. Fifty-odd years ago, everyone knew that computers would be used only by people who were technically literate or at least involved with numbers: engineers, bankers, statisticians, actuaries, and the like. Housewives? *Ha!* Artists? *Double Ha!* My friend Flo? *Get real!* But a few people, like Steve Jobs, questioned the conventional wisdom and saw the world in a different way. They defined a product that was complex on the inside but intuitive and relatively easy to use on the outside. Today, of course, personal computers are ubiquitous throughout the developed world, and a major goal of developing countries is to obtain computers and teach their people to use them. What everyone knew was definitely wrong.



There is a similar situation with the limits of technology. I haven't heard much about this recently, but in the last half of the twentieth century there would occasionally appear an article—or even a whole special issue of a journal—devoted to determining just how far technology

would be able to take us. In that case, it wasn't "everyone" who knew, but it was "the experts," and the same principle applies because everyone tends to agree with the experts. But of course those limits kept being broken, and some expert would have to write a new article defining some new limits. I presume there are limits to technology, but I also suspect we are limited in our ability to know what those limits are. So don't let your imagination be restricted by what everyone knows. Remember, there was a time when it was believed that a heavier-than-air craft could never fly under its own power—and certainly not when it was powered by its passenger—and, later, that an airplane could never fly faster than the speed of sound.

There are non-engineering applications of the Law of Conventionality as well. For instance, stereotypes are nothing more than what everyone knows about a particular group of people. Women can't be good engineers. Right? Fortunately, we have questioned that bit of conventional wisdom and found it wanting. No stereotype can stand up to a critical analysis.

This law is also useful in dealing with *ex cathedra* statements like, "That would cost too much," or "We have to build that out of titanium." While the speaker isn't explicitly saying "Everyone knows…," the statement is made with such authority that the listener accepts it as the conventional wisdom. Question it. Diplomatically, of course. Such speakers do, indeed, often occupy "the chair" or have considerable experience. You are, however, entitled to know the reasoning behind such a statement and will serve everyone well by asking for it.

On the other hand, we have to recognize that the mythical "everyone" is often correct, and there is a lot of good conventional wisdom out there. Observing this law doesn't mean questioning everything to the point where nothing gets done. Just be alert when you hear, explicitly or by implication, "but everyone knows…."

—**Lyle D. Feisel,** Ph.D., P.E.
Iowa Alpha '61

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The Tau Beta Pi Association Scholarship Program for senior-year study during the 2008-09 academic year will close March 1, 2008, when applications must be in the hands of Director of Fellowships D. Stephen Pierre Jr., P.E., Alabama Power Company, P.O. Box 2247, Mobile, AL 36652-2247.

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