A Noble Profession

by Richard B. Priory, West Virginia Beta '69

I'D LIKE TO BEGIN my remarks by recounting a remarkable story whose climax occurred just 300 miles from here on the sand dunes of Kitty Hawk, North Carolina. It's the story of first flight, of inspired engineering and of aeronautical perseverance. It's a story of creativity, design and dreams taking wing. As you've guessed by now, it's the story of Orville and Wilbur Wright.

The Wright brothers aren't native Carolinians, though we're proud to claim them as our own. Their hometown was actually in the heartland in Dayton, Ohio, where they operated a bicycle business. And while the bicycle shop paid the bills, the brothers dreamed of machines that could leave the ground. And so they built wings as well as wheels in their shop.

Their fascination with flight began with a cork and bamboo flying toy powered by rubber bands, which their father had given them as children. That fascination continued into the late 1890s, when Wilbur and Orville crafted and tested kites and gliders, with the goal always being of an aircraft "capable of sustaining a man." Their quest to defy gravity was strong and unyielding. Wilbur described himself as "afflicted with the belief that flight is possible." Their obsession led them to invent each of the technologies they needed to pursue their dream.

They devised their own wind tunnel to test airfoils. They figured out how to move the vehicle freely, not just across land, but up and down on a cushion of air. They built an elevator to control the pitch of their aircraft as it nosed up and down. They designed their own propellers and built their own lightweight (152 pounds!) gas-fired engine. They methodically, some at the time would have said madly, focused their energy and creativity on the many iterative inventions needed to reach their ultimate, breakthrough goal.

That happened on December 17, 1903, when Orville piloted a shaky 12-second flight. The distance of the flight — 120 feet — was about half the wingspan of a Boeing 747. Nonetheless, the flight changed the world forever. The airplane revolutionized our world, in war and in peace. It made our world smaller, changing the way we communicate, commute, conduct commerce and govern our countries. It was the first step in "globalization," a term that those of us in business are batting about quite a bit lately.

I share the story of the Wright brothers because, for me, it articulates the essence of the engineering learning process. I use "engineering learning" rather than education because the Wrights were self-taught. They didn't benefit from the fine curriculum and instruction that so many of you provide. They learned through trial and error, by literally testing their wings, and by falling — hard and often. There are many lessons we can take from Orville and Wilbur that bear out today as we face a new century.

The first is about passion. Now I know that "passion" and "engineers" are two words that don't often turn up together in the same sentence, but bear with me. And if passion makes you blush, substitute fanaticism, unbridled enthusiasm, fervor, or zeal. It all comes down to the almost mathematical alignment of drive *and desire* that results in world-changing feats of engineering. It's the ability to apply yourself to a chosen task, dream, or vision with such focus and resoluteness that you achieve breathtaking feats. Ten years following his pioneering 12-second journey, Orville Wright conceded that "I look with amazement upon our audacity in attempting flights with a new and untried machine."

The second lesson I propose to you is *perseverance*. The stick-to-it attitude that transports us from the hypothetical to the pragmatic is a trait we desperately need in our business and in our world. Your students must understand that good ideas, and especially great ideas, require unending care and feeding. We need to allow ourselves time to stare into a blue sky, surrendering to great thought and contemplation. But we also need to do the calculations, the experiments, the tests, and the trials — many times over — that move those ideas to fruition.

When you look at our scientific and technical leaders, you quickly recognize that dogged persistence, often in the face of doubt and adversity, is a common thread. Consider Robert Goddard, the physicist who launched the space age with a 10-foot rocket in a New England cabbage field. His belief in rocketry as a viable technology was met with great cynicism and dismissal. In the January 13, 1920, issue of *The New York Times*, a thesis by Goddard entitled "A Method of Reaching Extreme Altitudes" was soundly panned. Professor Goddard, the *Times* wrote, clearly lacked "the knowledge ladled out daily in high schools." He persevered, and later proved an essential theory — that rocket engines can create thrust in a vacuum — to the science of space exploration.

The third lesson I bring to you today is *practice*, and by that I mean the experiential learning that I hope is taking place at your universities and in our workplace. Theory is well and good, but we need engineers with a depth of knowledge and a capability that comes only from in-the-field experience. Enrico Fermi's laboratory was a Chicago squash field. The Wright brothers did their learning in a back room of a bicycle shop and on the dunes of the Carolina coast. They kept learning, well beyond that first flight. Our engineers today need to continue that learning path as well, long after they've received their degree and P.E. certification.

There's an apt saying that "Experience is a hard teacher because she gives the test first, the lesson afterward." Let your students have experience as a teacher, tough as she may be. It's a pass or fail course, but it's a prerequisite to the working world.

Keeping pace is another timely theme I'd like to bring to the table. When I describe our company and our industry today, I find myself using such phrases as global competition, industry restructuring, intellectual management, speed to marketplace, and intellectual capital.

Education must keep pace with the changes that are shaping our business environment. As a resource supplier to business, education must focus on the needs of its "customers" or "end users." We shouldn't assume that the preparation we used to enable engineers for professions in the 20th century will suffice for the 21st century. The fundamental principles may be sound, but the way we work is profoundly changed. Technical innovation, the explosion of information technology, a sharp decline in defense work — once considered a National Academy of Engineering innovation — are shifts that should signal educational realignments.

We should take a critical look at both the *quality* and *quantity* of engineering education. I'm sure I don't need to defend my argument for quality, but I am compelled to share my thoughts on quantity. Consider this: an attorney's professional preparation is seven years. A physician undergoes eight years of training. An engineer completes his or her course work in just four years. Building schools, bridges, power plants, roads, and aircraft certainly carries with it enormous societal responsibility. Are we giving it its due?

I would argue that engineering preparation shouldn't end at four, 10, or even 20 years. It's a lifelong process. At Duke Energy, we have made a conscious effort to encourage engineers to take responsibility for their own careers. They need to identify, seek out, and master the skills and information they need to keep pace. Their continuing education shouldn't be limited to the minimal courses required by P.E. re-certification. It should be ongoing, substantive, and self-directed.

When I graduated, a grounding in engineering fundamentals was ample ticket. Today, the price of admission is a little higher. At our firm, we're seeing a growing need for engineers whose range exceeds traditional engineering boundaries. Engineers in our company need to be as comfortable with a balance sheet, in the boardroom, and at international deal making as they were at yesterday's drafting table. Engineering degrees paired with M.B.A.s is a combination that is serving us well. We're also looking for engineers with backgrounds in economics, environmental science, and international business. We need well-rounded engineers who can follow dual tracks and bring valuable perspective to their work.

Finally, I propose that we all work together to make engineering *accessible*. Engineering and all of the sciences need to move beyond very specialized domains to very fundamental, familiar common ground. There are two quotes I'd like to share on this theme. The first is from Rachel Carson, the author of *Silent Spring*.

"We live in a scientific age, yet we assume that knowledge of science is the prerogative of only a small number of human beings, isolated and priest-like in their laboratories. This is not true. The materials of science are the materials of life itself. Science is part of the reality of living; it is the what, the how, and the why for everything in our experience."

The second lesson I propose to you is perseverance. The stick-to-it attitude that transports us from the hypothetical to the pragmatic is a trait we desperately need in our business and in our world.

The second quote, a little more dramatic, but worth sharing, is from Carl Sagan:

"We've arranged a civilization in which most crucial elements profoundly depend on science and technology. We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces."

The task of making the sciences accessible cannot begin at the secondary level. It must begin in elementary school. Duke Energy has a very self-serving interest in mathematical and scientific education, which is a cornerstone of our philanthropic approach. We support math and science education at many levels, from college scholarship programs and summer workshops for teachers to dedicated employee tutors and energy-related materials that support grade-specific curriculum needs.

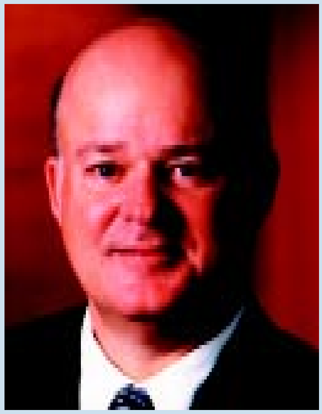
Accessibility touches on another issue that our company and many others face: diversity. We need women and minorities to enroll in your engineering schools and to join our ranks. We need to tap the rich source of talent, perspective, and experience that, quite frankly, as a profession, we are missing today. If we are to make the life-changing, world-changing engineering advances that will shape society in the 21st century, we need a workforce that is reflective of that society.

We've made some progress, but we have much more to do. I have no answers, only one suggestion from a friend. The mother of a young daughter, she has labeled the disparity between boys' and girls' propensity for math and science "the Erector-set phenomenon." She never had an Erector set as a child, but has vowed that her daughter won't miss out the experience to build and explore. I'm not aware of any empirical evidence to support her theory, but if it works, I've got a job in the wings for her three-year-old!

Engineering is a noble profession. As we hurdle toward the new millennium, we are besieged with countdown lists of the top 100 events of the 20th century. When I read those lists and consider the years 1900-2000, I am struck by the fact that a majority of those events and achievements are engineering and scientific in nature:

- The first radio signal broadcast in 1901
- The inaugural flight at Kitty Hawk in 1903
- Introduction of the Model T Ford in 1908
- The Theory of Relativity in 1916
- The first electronic computer in 1941
- The first nuclear chain reaction in 1942
- Unraveling of the double helix in 1953
- Creation of the first working laser in 1960
- Creation of the Internet in 1969
- Birth of the world's first test tube baby in 1978
- Cloning of the first mammal, Dolly the sheep, in 1997

Put in a century's context, engineering ranks right up there, alongside world wars, the civil rights movement, and Elvis Presley as a defining force in our world's history. It will define the future as well. Many new Orvilles, Wilburs, and Enricos will race through the open door of the 21st century, ushering in new, unimaginable innovation. Those future engineers are in your classrooms today or will be tomorrow. They're the interns in our company and the children at home, tinkering with Erector sets. Let's wish them safe and successful passage as they pilot their own amazing flying machines.



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