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The Two Cultures: Bridging The Gap

I believe the intellectual life of the whole of western society is increasingly being split into two polar groups.
(C.P. Snow, British scientist and author)

Throughout my career, I moved back and forth between the practice world and the academic world. While in campus settings, I found that the liberal arts and the professional programs still constitute two rather distinct groups. These two cultures are alive and well and part of the stimulating diversity we find within and outside of universities. There are still at least two campus camps at most universities.

The Two Cultures

In a 1959 lecture, British scientist and author C.P. Snow[1] described the literary culture and the scientific culture. Applying Snow's two culture models to many universities, the scientific culture might very well be defined as encompassing what we call professional programs—for example, business, engineering, technology, nursing, law, and a growing number of programs in the liberal arts colleges. The literary culture might be defined as the remainder of the academic programs.

In describing the gulf between the two cultures, Snow noted that the literary culture views the scientific culture as being "brash and boastful" and as being "shallowly optimistic, unaware of man's condition". In contrast, the scientific culture views the literary culture as lacking foresight and not being really concerned with humanity.

Members of the literary culture, also according to Snow, see a social, economic, environmental, or other problem as something to dissect, discuss, and debate. In contrast, scientific culture members see problems as something to solve. Members of the scientific culture tend to share a systematic, rigorous approach to problem definition and solution. In contrast, the literary culture operates in a less disciplined mode. Snow notes that the literary culture reads more and reads widely. The scientific culture reads less and reads narrowly. And so on.

Herbert Hoover, engineer, author, humanitarian and 31st U.S. President and engineer,[2] was speaking for the scientific, or what we might now call the engineering and technical culture, when he wrote: "It is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on

paper. Then it brings jobs and homes to men. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege."

Likewise, Samuel C. Florman seems to have been calling the members of the scientific culture to recognize the value of the literary culture when he wrote the following:[3]

> *It seems to me that anyone who would call himself college educated*
> *—particularly anyone who would call himself a professional—*
> *should spend some time in close communion with the great souls,*
> *the great thinkers, the great artists, of our civilization.*
> *Most particularly, those engineers who would be leaders,*
> *those who would participate in the important communal debates,*
> *should be acquainted with the thoughts, theories, and philosophies*
> *that constitute the foundations of our culture.*

Let's recognize what we share—the bridges that join us—and use our common values as the basis for working together to make a better world. Rather than dwell on differences, balance dictates that we look for shared interests. It seems to me that there are substantive bridges crossing the gap separating the two cultures.

For example, both cultures value communication. How often we use the trite expression "It was a communication problem" and really mean it! The many and varied curricula on some college and university campuses stress the importance of writing, speaking, listening, and the use of graphics and mathematics.

We also, I believe, share the thrill of creative work. As suggested by engineering professor and author Henry Petroski,[4] the image of the writer transfixed over a blank sheet of paper next to a waste basket overflowing with false starts is equally applicable to the composer beginning a score, the artist starting a painting, the engineer initiating a design, the scientist conceiving an hypothesis, and the business manager formulating a marketing strategy.

In my own work as a civil engineer, my highest satisfactions include involvement in conceiving, planning, designing, and implementing projects and seeing and feeling them come to fruition in dirt and concrete and steel and being appreciated and valued by others for their form and function. I suspect the exhilaration of satisfying my creative compulsion via engineered works is very similar to the exhilaration felt by the writer, composer, and artist.

Our world continues to shrink. The business and professional community increasingly participates in world markets. Intellectual interests aside, the scientific culture must be increasingly prepared to understand the history, culture, and language of other nations. The literary culture offers many diverse resources to enable that understanding.

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Contrary to what today's focus on high technology might imply,
the humanities are more important than ever.
Subjects like philosophy, history and literature
teach you how to interpret information and
how to argue a point of view…
Not only the written arts but also music and the visual arts
will become increasingly important.
Music, for example, teaches valuable lessons about time and space.
Similarly, visual thinking is critical to using computers and to
manipulating images across multiple dimensions.
(L. Botstein)

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Besides getting smaller, our world is using technology to be more productive. It would seem that the literary culture must acquire basis scientific and technical literacy or risk being out of touch and outside of the sphere of influence. A scientifically and technically literate literary culture dues not bode well for the future. The scientific culture stands ready to assist.

A major responsibility of employers is to make us aware of sharp differences among individuals and between groups and to impart understanding of and encourage appreciation for those differences. This employer role includes seeing diversity as the catalyst for and means of working together to make a better world. To that end, let's strengthen the existing bridges and try to build more.

The Builders

Having argued for bridge building between what C.P. Snow called the literary and scientific cultures, and recognizing that engineering is part of the scientific culture, some thoughts on engineering's diversity and commonality are in order.

Breadth and diversity characterize the engineering profession. Consider, for example, the many and varied engineering education programs accredited by the Accreditation Board for Engineering and Technology. There are 24 groups of engineering programs and they almost run the gamut from "A" to "Z" (actually, Aerospace Engineering to Surveying Engineering).[5]

Reviewing the works of engineering is another way to demonstrate the breadth of and diversity of this profession. Regardless of where and when you are reading this essay, engineered works are probably evident. As you read, can you see or are you using any of the following: water supply and wastewater systems; highways, railroads, airports, waterways and all the vehicles that use them; dams, levees, and other flood control

structures; electric power generation and distribution systems; medical buildings and equipment; and bridges and other large structures? Engineers are known by the creativity and usefulness of their works. And the preceding list just scratches the surface.

A third way of illustrating the breadth and diversity of engineering is to reflect on the spectrum of functions carried out by engineers. Included are planning; design; construction; operations; research and development; teaching; marketing; management and leadership. Because of the range of functions, and thus the range of interests and talents needed to carry out those functions, there is "room" in engineering for a wide variety of individuals.

Engineers also differ markedly in their views, which further enriches the profession's breadth and diversity. Witness the strong feelings expressed on issues such as the engineer's image, theory versus application, the computer's role, length and content of formal education, and licensure.

Throughout engineering's long history and within its great breadth and diversity, however, there is at least one widely shared interest and function: *building*. In the final analysis, when everything else is stripped away, the engineer is at the core a builder: Building is the glue that binds engineers together. When civil engineers "build," they usually call the process *construction*. When mechanical engineers "build," they routinely refer to it as *manufacturing*. From the perspective of electrical engineers, "building" is often referred to as *fabrication*.

Call the process whatever you want, the ultimate end of the engineering process is to "build" something that never before existed that will meet human needs. Examples include the water supply system "built" by the civil engineer, the energy-efficient automobile "built" by the mechanical engineer, and the electrical power distribution system "built" by the electrical engineer. Some engineers "build" less concrete but nevertheless important things such as computer programs, better ways to perform engineering functions, and improved ways to organize engineering organizations.

I often ask student and practicing engineers, "why engineering?" Regardless of their age, building and creating are very often part of the answer. As a child I walked across the highway to the Lake Michigan shore to build. I "built" dams, levees, and channels at a point where a creek flowed into the lake. Although old enough to "build," I wasn't old enough to cross the highway, so my mother took me. Later, on learning that civil engineers build water control structures, I decided to study, practice, and earn my living in that engineering branch. I now look, with quiet pride, at water control structures and other useful things that I helped to engineer. Most engineers have similar stories with the commonality being building or some variation on it.

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We recognize that we cannot survive on meditation, poems and sunsets.
We are restless.
We have an irresistible urge to dip our hands into the stuff of the earth
and do something with it.
(Samuel C. Florman, engineer and author)

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Interestingly, when lay persons, who surveys suggest know little about engineering, want to convey the idea that something noteworthy has been built, the name of our profession is often invoked. Some politician, business executive, religious leader, etc is said to have "engineered" this or that.

As is often the case with breadth and diversity, engineering's breadth and diversity is its strength. It enables our profession to cover all the bases and build for the common good. As stated by President Herbert Hoover, "To the engineer falls the job of clothing the are bones of science with life, comfort, and hope." Building for that purpose is indeed a high calling.

Suggestions for Applying Ideas

Study one or more of the following sourced cited in this lesson:

1. Snow, C.P. 1965. *The two cultures: a second look.* Cambridge, UK: Cambridge University Press.

2. Frederich, A.J. (Editor). 1989. *Sons of Martha: civil engineering readings in modern literature.* New York: American Society of Civil Engineers.

3. Florman, S.C. 1987. *The civilized engineer.* New York: St. Martins Press.

4. Petroski, H. 1985. 1985. *To engineer is human: the role of failure in successful designs.* New York: St. Martins Press. (Stresses the design aspect of the process that ends with building. Advises the engineer that each design is a hypothesis that is not fully tested until it is constructed, manufactured, fabricated or otherwise built. Advocates the study of failures.)

5. To learn more about the Accreditation Board for Engineering and Technology (ABET), go to www.abet.org. ABET's vision is to "provide world leadership to assure quality and stimulate innovation in engineering, technology and applied science education."

Refer to one or more of the following supplemental sources:

- American Society of Civil Engineers, Task Committee on the First Professional Degree. 2001. *Engineering the future of civil engineering.* October. The report is available at www.asce.org/raisethebar. (Presents a plan for full realization of ASCE's Policy Statement 465 which states that the Society "supports the concept of the Masters degree or equivalent as a prerequisite for licensure and the practice of civil engineering at the professional level." The policy calls for a deeper and broader education for civil engineers.)

- American Society of Civil Engineers, Body of Knowledge – Curricula Committee of the Task Committee on Academic Prerequisites for Professional Practice. 2003. *Civil engineering body of knowledge for the 21st century: preparing the civil engineer for the future.* The report is available at www.asce.org/raisethebar. (Describes the broader and deeper body of knowledge (BOK), that is, knowledge, skills and attitudes that will be needed by future civil engineers. The BOK is described in terms of its three dimensions; what should be taught and learned, how it should be taught and learned, and who should teach it.)

- Cross. H. 1952. *Engineers and Ivory Towers,* New York: McGraw-Hill. (Sharply distinguishes between science and engineering while respecting the value of each. Claims that engineers are more humanists than scientists because they plan, design and build to meet human needs and, in the process, grapple with technology, law, economics and sociology. According to H. Cross, "The glory of the adoption of science to human needs is that of engineering." Young engineers, especially those in or contemplating advanced formal education, should read this old book with timeless messages.)

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Once a mind is truly stretched,
it never returns to its original dimensions.
(Anonymous)

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