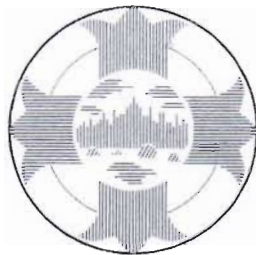


# COMMENCEMENT ADDRESS

Carlo J. De Luca  
Dean *ad interim*



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BOSTON UNIVERSITY  
SESQUICENTENNIAL

BOSTON UNIVERSITY  
COLLEGE OF ENGINEERING

THIRTY-SIXTH COMMENCEMENT

MAY 21, 1989

# When I Think of Engineering

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Boston University College of Engineering

Thirty-Sixth Commencement

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**T**oday you become an engineer. Along with 70,000 colleagues graduating from colleges throughout the country, you join a fraternity of millions who are shaping the future of our society. Many of you have participated in the Order of the Engineer ritual and are now wearing on your little finger an iron ring in token of your obligations as a member of the engineering profession. Throughout your career, that ring must remind you that in choosing to become an engineer you have become obligated to a stringent code of ethics on which rest not only your professional integrity but the well-being of modern society.

And yet, as you may have already noted, engineers are not ordinarily accorded the respect granted to other professionals.

That's particularly true in English-speaking countries, perhaps because the English language itself doesn't treat engineering with much respect. The word *engineer* suggests one who operates, or at most builds, *engines*. In Romance languages, linguistic association implies a fuller meaning. In Spanish, for instance, *ingeniero*, engineer, is clearly related to *ingenuidad*, ingenuity.

The happenstance of pronunciation to the contrary, *ingenuity*, *genius*, and perhaps even *genie* share linguistic ancestry with engineering in English as they do in Romance languages. Yet in Italy (with which I have some familiarity) and other Latin countries, engineer is an honorific title, while in the United States — perhaps because of the connota-

tions of sound – meanings attached to engineer are pragmatic and incomplete.

Children may be excused for thinking an engineer is a man who drives a train. Men and women whose daily lives give them only indirect exposure to our discipline may be excused for knowing little about the breadth and depth of what we do, particularly since they receive no guidance from the dictionary, which has not evolved to overcome historical linguistic anomalies.

But even those in academia frequently display only casual knowledge of engineering. Although their disciplines are taught side-by-side with ours, many view engineering as apart from academic pursuits. From the lofty height of their erudition, our academic colleagues – even mathematicians and scientists, who should know better – all too often look down on engineers as mere mechanics, and the study of engineering as occupational training.

Yes, the nature and demands of engineering are distinct from those of other academic disciplines.

Engineers cannot be satisfied with amassing knowledge; they must also be able to put their knowledge to practical use.

Engineers must not stop at understanding the past and commenting intelligently on the creations of others; they must be themselves creators.

Engineers cannot call a piece complete that exists only on their desks or in their laboratories; they must master the complex physical, mechanical, organizational, social, and economic processes required to bring their works to independent and useful life.

Your educational program at the College of Engineering was carefully planned to prepare you to meet these obligations.

Technical/scientific education has been integrated with wider-ranging education in analysis and problem solving. In the classroom and the laboratory, we have addressed issues

that develop theory into practice. We have taught you to look at the practicality as well as the aesthetics of solutions.

This is an added dimension to your education, a layer that augments the rigor of your training and increases the worthiness of your studies. The decision-making process you have learned to use in the development of structures and devices is governed by logic as well-defined, formal, and demanding as that of any other profession.

Your curriculum was constructed of courses in signal processing and logic design; electronics and circuit theory; thermodynamics and applied mechanics; mathematics, physics, chemistry, and biology; various areas of the social sciences and humanities; manufacturing processes, material sciences, and laboratory techniques; software engineering and system analysis . . . to name a few.

What other field of study offers — no, demands — such a remarkable range of coursework? Who but engineering students can boast such a Renaissance education? You, the 1989 graduates of the nation's colleges of engineering, have acquired the knowledge, skills, and intellectual discipline to solve problems that are among the most complex that life holds.

Consider for a moment the complex sequence of logical decisions required to create the simplest computer. Consider the ingenuity in the design of the transmitter housed in the Voyager space craft. In the hostile environment of outer space, that twelve-watt transmitter serves as our eyes in the neighborhood of the planets, illuminating worlds beyond our own solar system. Twelve watts — approximately one-third the power emitted by a single candle — used with such logical creativity that we are now privy to what once was seen only by the mind's eye.

Consider the great dams. To tame the mighty Nile, engineers literally moved a mountain. Indeed, engineering has changed that metaphor for impossibility into a process

description, and in doing so has taken a force once worshipped as a god and transformed it into our willing slave.

Yes, engineering has transformed the world around us. It has transformed life itself. To walk into a hospital's intensive care unit is to be awed by technology's power to protect and enhance human lives. In hospitals around the world, respirators, magnetic resonance imaging machines, ultrasound machines, heart-lung machines, dialysis units, and numerous other technological tools save lives beyond numbering. In homes and schools and offices, plastic valves and pacemakers, artificial limbs and implanted lenses are inobtrusive enablers of daily existence.

Try to imagine your life without your telephone, television, or car. Try to picture society without superhighways, supertankers, satellites.

Who can gaze on a jumbo jet — a six-story-high structure transporting hundreds of people through the sky — and not marvel at the prowess of the engineer? Who can ponder rocket boosters as they propel man beyond our atmosphere and not be moved by their power and authority? Who did not share the thrill and the triumph when man first set foot on the moon?

These creations began, as do all creations, with a dream. But the men and women who made these feats possible moved beyond dreams and concepts. Combining inspiration and craftsmanship, they brought their concepts to reality. And then, before the world, they submitted their creations to the test of function.

It is perhaps the drama of this step from speculative truth to working truth that veils the intellectual toil that has matured our discipline. So tangible and functional is the bridge, the rocket, the pacemaker, the computer that some thinkers — accustomed as they are to the self-indulgent atmosphere of the study — may see such marvels as somehow less significant than a difficult philosophical concept. Some

scholars — perhaps made shortsighted by years pouring over their own notes — are more moved by a poem than they are by the technology that now routinely saves premature infants.

A philosophical theory must be plausible; a poem must be both plausible and apparently well constructed. But the engineer's creation is put to the ultimate test: it must function, and it must suit the needs and the abilities of the society for which it was conceived.

We engineers may not spend much time searching our souls to explain the human condition; we are far too busy improving that condition. From the tools that etched decorations on cave walls, to the savages' huts, to the cathedrals of the middle ages; from the machines that brought about the industrial revolution, to the vehicles and communication devices that have shrunk the world, to the computers that make this a technological age — the creations of engineering have changed life more profoundly than have all the prose and poems and pronouncements since time began.

What's more, engineers have directly assisted poets and philosophers, and I'm not speaking of the progression from chisel and stone to word processors. Engineers have freed us from the elemental activities that consumed the hours of early man. They have given us time to relax, to ponder the most profound human and spiritual questions, to refine the human character. Freed from basic needs and fears, we can look beyond, to the advancement of life and spirit.

And as our view of ourselves broadens, so too does our vision for technology. Reflection and technological progress are related monotonically, progressing simultaneously.

Thus technology is at once an expression of our intellect and a nourisher of intellectual activity. It is the objective expression of our humanism.

Technology is, as well, a continuing stream, moving forward through history. Our lives are enriched beyond mea-

sure by art, but great musicians and painters and actors do not build on the work of those who came before. Can we trace a literary continuum from Dante to Shakespeare to Dickens to Maupassant? From Lincoln's speeches to Churchill's to Martin Luther King's? Who would say that there will be creations greater than those of Keats or Michelangelo or Bach? To understand today's theatre, we look back to Aristotle, for the structure of life's drama has not changed.

But in science, the words of Aristotle have become historical curiosities, although that evolution was a long time coming. The ancients knew the world through logic, and logic was long unable to move past belief. So persuasive were Aristotelian and Christian perceptions that in the seventeenth century man still looked up and believed the sun to be moving around the earth. And today some natural and social scientists continue to argue by extension of logic, being seduced by the exotic possibilities that lie beyond known fact.

Engineers understand the limits of such reasoning. We understand both the necessity of internally consistent reasoning constructed on a base of knowledge, and the danger of freely extending logical deduction beyond the realm of the known. For the engineer, creative imagination and logic are tools whose products must withstand the most rigorous test — the test of daily life.

Technology touches every aspect of our life and every facet of our vision of civilization and ourselves. By becoming an engineer, you have taken upon yourself responsibility for society, because you have acquired the power to influence it more surely than can the greatest abstract thinker, the most inspired painter or musician, the best-trained social scientist or natural scientist, the most skilled statesman.

Some people think of engineering and visualize engines, devices, and structures. I think of engineering and see man's

ingenuity and creativity, and contemplate the enhancement of life since human life began. I think of engineering and see the pyramids of Egypt, the arches of Rome, and I know that when ancient man looked on those magnificent structures he understood that he was master of his environment. I see spacecraft, and realize that they fulfill the wistful dreams of the first person who looked to the heavens and dreamed of setting foot on other celestial bodies. Now millions of stargazers see in the heavens worlds within their reach.

Engineers are the artists who turn dreams to reality. By interrogating and applying the laws of nature, engineers turn flights of fancy to concepts, and concepts to objects and processes.

To solve a problem, to design a machine, to create an instrument that will enhance the well-being of humankind: these acts reflect the nobility of the human spirit. To construct a device that will prolong life, ease existence, or reveal the wonders in our world and worlds beyond: these are actions that will change life forever.

Engineers: Move forward boldly in your careers. Step aside for no other professional, work in no one's shadow, for engineering has earned its place in the sun.