

Speech Notes

“Engineers: Wealth Creators and Leaders”

By Richard G. Weingardt, PE

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Congratulations to those of you who received scholarships tonight...you're certainly on the right road to success.

As a matter of fact, congratulations to all of you who have chosen engineering for your life's work – or who are already engineers. You're in for some real exciting times.

Because when we look into the crystal ball, it's pretty clear that science, engineering and technology will advance more over the next few decades than it has in all of recorded history.

And the skills of America's engineers – and (indeed) the scientific and technological literacy of our general populace – will most assuredly be put to the test. As will the ability of tomorrow's engineers to meaningfully participate in the debates on issues like our country's future productivity... and environment concerns and sustainable development.

As we move deeper and deeper into the 21st century and the world gets more and more technologically dependent and sophisticated, the overall need for people with strong engineering backgrounds is going to multiply greatly ... as will the promise for engineering to become a very powerful force in society in the coming years.

Currently (as we speak) there's a high demand for engineers of all types ... and starting salaries for graduating engineers are again on the rise.

How long will this continue?

What better time than now though – surrounded by you gifted scholars – to reflect on this ... and other things like ...

What significance will engineering (and engineers) really have on the world of the future ... and ... even more importantly ...

Will engineers be pacesetters and leaders in it or not?

As we discuss the current trends and opportunities ... and talk about the many forks in the road our profession faces ...

Let's keep in mind what that wise, ole baseball “philosopher” Yogi Berra told us: “when you come to a fork in the road, take it!” Or put another way – Carpe diem ... seize the day!!!

You know, just the word ENGINEERING ... to engineer something ... has a special ring to it – an excitement!!!

Engineering breakthroughs are so uplifting to the human spirit.

Have you noticed how when some star quarterback brings his football team from sure defeat to a victory in the last seconds of an important game – the sports writers like to say he engineered a miracle? He did something special.

Sunday's Super Bowl was a little too ho hum for such platitudes. But the Fiesta Bowl (a month ago) wasn't – Remember how when the upstart Boise State Broncos came back (with just seconds remaining) to defeat the mighty Oklahoma Sooners ... sports reporters went crazy! Called it one of the greatest football games ever – and suggested that what Boise State's quarterback accomplished was one of the best engineered happenings ever – even though no actual engineering work was actually done!!!

Well, in real life, real engineers (people actually doing actual engineering) are producing and getting outstanding things done in most skillful ways – day in and day out ... And with a lot less fan fare and commotion than happens in the sports world.

So, we engineers should be taking great pride in what we accomplish ... should be popping our buttons with satisfaction at being engineers ... because everyone else sure thinks that to engineer something is pretty brilliant!!!

Throughout the ages, engineering has always been a noble and creative profession – the reason we have all the modern technological marvels and systems we do ... cutting-edge facilities and soaring bridges, towering skyscrapers and space-age looking sports arenas.

Virtually all of the historic “Seven Wonders of the World” – from ancient times thru the middle ages to modern days, from the pyramids to the Golden Gate Bridge and Sears Tower, and beyond – were (and are) engineering feats.

Without the expertise – and talents – of engineers, the performance of these structures (and buildings) would never have reached their maximum potential.

As a matter of a fact, the history of engineering is (in essence) the very history of civilization.

In my latest book “Engineering Legends,” it is clearly illuminated ... How U.S. engineers were so crucial to this nation's progress and development (from the 1700's to present times)... How America's engineers (for instance) produced such history – and progress-altering infrastructure projects as the Erie Canal and the Transcontinental Railroad ... both enormous sensations and world news-getters of their time.

“Nothing like it in the world!” is how the great American historian Stephen Ambrose described the Transcontinental. (N.L.I.I.T.W.)

Without engineering know-how, most of our significant modern-day private and public-works projects would never get past the dream stage, let alone built or manufactured.

Projects like:

- Our Interstate Highway System – the envy of the world
- Europe’s CHUNNEL – The massive tunnel under the English Channel, physically linking England with the rest of Europe for the first time in history
- Billion-dollar Airports ... like LAX and the all new DIA
- The landing of a man on the moon

You know, the media likes to refer to the moon landing as one of the greatest scientific feats ever. In reality, it was an engineering achievement! The true story is – we got to the moon because of superior engineering, plain and simple.

The famous space scientist/engineer Theodore von Karman put it in perspective this way: “A Scientist discovers that which exists. An Engineer creates that which never was!”

Visionaries and futurists call engineers – the “Wealth Creators” ... and tell us that the future of any nation (in economic stability, progress and well-being) depends on the strength of its engineering base.

Engineers are the single most indispensable group needed for developing a country’s infrastructure – and maintaining its standard of living.

Engineers take ideas and turn them into reality – a computer chip into a product or a machine that does something.

Without engineers, most of the discoveries of modern science would remain laboratory curiosities. The laser for instance – Einstein and his buddies knew about it for years, but it took an engineer to develop the first usable laser beam. He did it utilizing a simple bar of ruby, a revolutionary concept at the time.

And look at all the advances we’ve made with lasers since – and all the uses it’s been put to!

And how because of them we have all the clever guidance systems we do. It’s virtually impossible to get lost anymore ... no matter where we go (or how hard we try) .. which saves we men – when we’re driving in unfamiliar locations – from the embarrassment of having to stop and ask for directions!!!

We engineers are constantly coming up with practical and useful solutions like that – lasers and other inventions.

How to build sophisticated mechanical and electrical systems.

Or design smart highways or bridges ... or products like robotic machines, cars, boats, airplanes, and spacecraft. Plus, we engineers are the ones behind purifying our nation's air and water ... and maximizing its energy choices.

And when it comes to sending satellites and rockets into space, the engineering community not only provides the expertise ... but it also provides the doers. You know, don't you, that most of our astronauts were (and are) engineers ... and that the first man to walk on the moon – Neil Armstrong – was an aerospace engineer.

In public surveys, in poll after poll, it's always confirmed that engineers are held in high esteem – a profession well known for its ethics and honesty.

Most people, I'm told, don't even mind it if their daughter (or son) is married to one of us!!! It's just that they don't know exactly what it is that we engineers actually do! But they do have the perception that we're smart, hardworking and trustworthy ... and necessary for progress. And that engineering is a truly fascinating and wondrous calling – one that adds value. And few other professions can honestly say that!!!

Because of this (in the coming years), we engineers will increasingly be sought after to get more involved in public affairs ... and even in politics.

So just being a technically competent engineer (only able to do engineering) will not be enough in the future for many of us. With the world's growing dependence on technology, many of you will be called upon to become industry – and societal leaders. Being a technically skilled engineer (a wealth creator and the protector of everyone's standard of life), in and of itself, will continue to be most rewarding. But for those of you who also get active as public pacesetters – and societal “movers and shakers” – it will be even more exhilarating. To do so, however, will require that you be conversant in a wide-range of subjects.

As we progress through our careers we all face two fundamental forks in the road .. two distinct paths to choose between.

1. Specialization (becoming a narrowly-focused, technical expert)... or ...
2. A management or leadership track (what some call being a Generalist)

You know the tongue-in-cheek explanation of the difference between a specialist and a generalist, don't you?

Specialists (they say) focus so narrowly that their range of knowledge becomes so tiny that they eventually know everything about nothing!

Generalists, on the other hand, broaden their horizons so much they ultimately know nothing about everything!

Well, there's a bit of truth in both of those observations, which would caution us to do things in moderation.

However, whichever direction you take – as a specialist or generalist – to be the most effective you can be, you'll want to remember that technical competence by itself doesn't translate into having sound judgment – Nor does it make for the most well rounded person...

Nor will it prepare you for all the dilemmas you'll face as an engineer (or a leader) ... especially, in the expanding global workplace we're now in.

Even as honorable and rewarding as engineering is (and will continue to be), our profession is not without its frustrating irritants and problems. Many of which can't be solved – or properly addressed – merely by discussing them within the narrow confines of the engineering industry ... which (I'm sorry to say) we engineers have a tendency to want to do – solve things all by ourselves without any input from outsiders.

For as long as I can remember – for at least the last 40 years anyhow – I can't recall a time (at engineering meetings and seminars ... and other gatherings) where consulting engineers didn't ultimately get around to hotly debating the following three irritants or dilemmas:

1. Why is engineering often treated like a commodity ... rather than a service – and engineers frequently hired by low price rather than by qualifications?
2. What can we do to control frivolous lawsuits ... which are stifling innovation and burdening all of us with enormously high liability insurance costs?
3. How do we improve our image of value and importance – and deal with the public's (and the media's) lack of awareness (and understanding and appreciation) of what we engineers do?

In recent times, the American engineering community has added a fourth (4th) concern to the list.

4. Because of the internet (ole Al Gore's invention!) we now have instantaneous (and ready) access to low-cost labor pools from every corner of the globe – a never-ending supply of eager foreign engineers who will work at salaries much lower than Americans will (on projects both here and abroad). This trend, incidentally, is wide spread and engineers aren't the only ones affected by it. Every worker in the U.S. is ... or will be!

For we engineers to adequately confront (and resolve) these four dilemmas and trends as they relate to us, we're going to have to get away from just talking among ourselves ... behind closed doors.

In the future, more and more U.S. engineers will need to engage in big picture thinking .. and ... Get involved in meaningful leadership roles beyond engineering ... So they can effectively participate in the public debate on both the direction the country is taking ...

and the best ways to strengthen our much needed engineering base ... so it remains a leader in the world.

To do that, tomorrow's engineers (you guys!) will really need to hone your natural (God-given) leadership and communication skills to the fullest ... and ... Move out of the backrooms .. and up the "food chain" to where the controlling decisions are made. Which if you do well, will better allow you (and your generation) to control your own destiny and deal with the complex trends now on the horizon.

Planet-impacting issues like the exploration of space and the oceans ... terrorism and national security ... managing sustainable development ... and spiraling infrastructure burdens now being fueled by our exploding world population.

The population of the U.S. alone will double in this century, which means we'll need to build a whole new America – double the size of our country's public and private facilities ... and replace or renovate our existing ones.

A tremendous task!

But great news for we engineers since we're the ones who know how to design and build these kinds of things – we're the master builders! But will we do the work as technicians or leaders? The choice is entirely ours!!!

For any engineer in today's (and tomorrow's) world to say he or she doesn't want to get involved in public or civic affairs (or politics) – because he or she is an introvert (or not good at communicating ... or just plain not interested) is a cop out.

And it accomplishes nothing. It's like putting our heads in the sand ... and hoping someone else benevolent to our profession will prevail on our behalf and make things right. Nothing like that ever happens in real life!!!

Engineering is a learned profession (like medicine and law and science) ... and it behooves all of us to participate in and contribute to our communities ... and give back to our profession and society.

I've been on the engineering advisory boards for a half-a-dozen universities, for a couple of decades now.

And, what I've found, is that whenever we question engineering graduates – those in top positions in their companies – about what courses helped them most in their careers, we always get similar answers. It doesn't matter if they're from MIT, California or the University of Colorado; the answers are always virtually the same.

For the first few years (after graduation) – they say their technical engineering classes were the most useful ... and most needed. So those of you still in college ... learn them well!!!

Ten years or so after graduation – engineers report: courses dealing with management, planning, economics (product costing and systems design) and team building helped them the most.

Then 15-20 years or so after graduation most say something else – something completely different. They say ... “Shakespeare!” In other words, the humanities, literature, art, history, geography, political science ... and public speaking and communications. Those subjects that help them cultivate their inter-personal skills ... and their understanding of what’s important in life.

These, they submit, were – and are – the most important to them in the second-half of their careers, as they rise to the top.

Over the years, I’ve observed (and written about) a lot of engineering super-stars. And (to the person) they’re all well-rounded individuals ... and they possess a certain number of common traits.

For one, most are highly educated, well beyond a four-year Bachelor’s degree ... and they’re knowledgeable about a broad range of topics .. and ... they’re usually involved as leaders in their communities ... and on policy-making public boards and commissions.

Plus, they’re active in engineering societies – serving as officers and as chairs of committees ...

And many of them are prolific writers – regularly contributing to both technical and non-technical publications ... and sometimes even writing books that non-engineers read.

As with any learned profession having enlightened and well-rounded, citizens-of-the-world in its ranks, engineering needs to encourage its members to develop a good appreciation of the visual and performing arts (painting and sculpture, poetry, opera and ballet).

The great Fuz Khan, structural designer of Sears Tower (still one of the world’s most magnificent skyscrapers), stated: “The technical man must not be lost in his own technology; he (or she) must be able to appreciate life, and life is art, drama, music, and most importantly, people.”

Most top engineers, likewise, are highly knowledgeable about the history of engineering – they know all about the engineers who precede us ... and made the profession what it is today.

Plus, according to the celebrated Duke University engineering professor Henry Petroski – author of a dozen or so bestselling books and known as America’s poet laureate of technology – “What makes history interesting (and relevant) is it not only teaches us about the way things used to be done; it also gives us perspective on how things are done today – and how they (most likely) will be done in the future.”

Nearly all great engineers (it seems) are also big world travelers ... both for pleasure and work. The remarkable Bucky Fuller – inventor of the geodesic dome, for instance, completely circled the globe more than 50 times during his illustrious career – and he claimed that ... “Only by travel can people experience and bring together man’s complex ideas ... and propel civilization forward in quantum leaps.”

Travel not only broadens, it gives you a chance to go out there and see other parts of the country and the world – and seeing some of them might even change how you think about life.

How many of the Seven Wonders of the World (which we previously mentioned), have you visited ... or studied?

If the answer is none or few, have you asked yourself why not, why not? And do you plan to do so in the future?

Walking along the Great Wall of China ... or looking out from the top of the Eiffel Tower or the Coliseum in Rome are enlightening moments. And you can’t help but be introspective for the moment, wanting to understand why and how ... and did the people (of the time) have any clue how much these engineering monuments would impact future civilizations ... and progress? Kind of makes you wonder (doesn’t it) – how future generations will view our accomplishments!!!

So what’s a plan of attack? A plan for getting prepared (and geared-up) for the different forks in the road you’ll encounter .. and ... for involvement in consequential activities ... and for becoming someone who can take charge and make a difference?

There are any number of ways to do it.

The following is as good as any – and probably better than most. It’s the one I’ve followed for years ... and because it has six items in it, I call it the “Six Pack Plan.”

One of the best things about the ‘Six Pack Plan’ is you don’t have to do the six items all at once. You can do them at your own pace, in moderation – one at a time or several together (at any time in your career) ... preferably sooner rather than later though. However, don’t go overboard and get so involved in accomplishing the plan you neglect your family or other personal activities that can be so enriching to your life!

1. (First) Continue your education well after graduation. (Something you probably didn’t want to hear tonight, right?) When you take these post graduation courses,

- though, don't just pursue technical subjects ... also take non-engineering classes – history, literature, political science – broaden your thinking!!!
2. Maximize your communication skills (writing and speech making – and presentation style). It's such a waste when great ideas don't get accepted because they're presented so poorly.
 3. Become an expert at something outside of engineering (even if it's just fly fishing ... become the best fly-fisherman (or woman) west of the Mississippi). It's amazing what some of our fellow engineers have gotten into (and become world-class authorities on) – mountain climbing, sail-boat building, sculpting and painting, even cheese-cake making. One of the wealthiest self-made friends I have today is an electrical engineer – whose cheese-cake hobby became so successful, he eventually sold it to Wal-Mart for well over \$10 million. Now, when he's not doing engineering or developing lucrative projects, he's sailing around the Caribbean on his 95-foot-long yacht. My main hobby isn't a moneymaker like that at all (not by any stretch of the imagination). I'm into early Colorado and Plains Indians history ... and I've written a handful of books and papers about it – and I'm considered somewhat of an expert on the subject. So whenever a big-time blockbuster Indian-cowboy movie comes out (like, say, Kevin Costner's "Dances With Wolves"), I'm a hot ticket on the lecture circuit. People want to know if the facts in the movie are accurate ... and if Hollywood got the story right. Much of the time they're only about half right, even for movies that are allegedly based on true stories. But, (you know) it really doesn't matter what you become an expert at (outside of engineering) – or if you become rich and famous at it. What matters, is that it's a way for you to broaden your perspective ... and get out of the mold of always only doing technical things ... and only thinking engineering thoughts.
 4. (Item four) Become active in community affairs. (Chambers of commerce – service clubs, like the Kiwanis and the Rotary – community groups, like your local school or church board ... or boy scouts or girl scouts .. or even a fine arts council. Push the envelope a little.) But don't just be a member of the group – become its leader ... the chairman of the board. Then, you'll really make a difference!!!
 5. Get familiar with our political process. (Serve on public boards and commissions ... ones that make decisions and set policy – or be advisors to elected officials.) As Plato reminds us, "If intelligent people don't get involved in politics, they'll soon find they're being ruled by the less intelligent." Sound familiar?
 6. Find mentors and/or role models who are leaders. (Study why they succeed).

Now, if I were to rank these Six Items, I'd probably make the last one – finding (and studying) role models and mentors – as number one.

You've all probably had some very important role models in your life already – people close to you (like your parents, or a favorite relative or neighbor ... or professor or colleague).

In my case, (early on) it was my father (a general contractor) who inspired me to (not only) become an engineer but also to start my own business. His code was: “Always do more than is expected of you ... and never compromise your values. Your reputation is the most sacred thing you have ... never lose it.”

In recent years, several prominent engineers have impressed me with their insightful “Words of Wisdom” about how to be both a successful engineer and a human-being.

Lou Graef (past-president of the American Society of Civil Engineers and a respected leader in Wisconsin ... and founder of the engineering firm that designed the award-winning, space-age-looking Milwaukee Fine Arts Museum that’s been on the cover of so many magazines over the years)... He urges all young engineers to do five things:

- Obtain a master’s degree
- Get your PE registration as soon as possible
- Know ethical standards and act accordingly
- Support your Alma Mater ... and ...
- Constantly seek leadership opportunities

General Hank Hatch (former head of the Army Corps of Engineers, who was in charge of 40,000 employees and 250,000 contract designers and constructors) said, “People will more willingly follow a leader who has purpose and vision ... someone who walks his talk – in other words, shows the why rather than just tells the way.”

Former U.S. Senator and three (3) term governor of the state of Washington, Dan Evans – the only practicing and registered P.E. ever to hold such a lofty positions, says, “Society is too dependent on technology not to have engineers in public leadership. It’s a waste of talent not to have those with strong engineering backgrounds making vital decisions involving growth, infrastructure and the environment.” All we engineers need to do is show up.

William Parsons, mastermind and designer of the NYC subway system and founder of Parsons Brinkerhoff – one of the largest engineering firms in the world, said, “Remember you’re entering a noble profession. Seek to develop its spiritual side, to understand its ideals, and to maintain its standards of ethics and conduct. The engineer has a higher mission to perform than that of a mere technologist. He occupies a position of trust and great responsibility. He (or she) must develop bold vision ... and have the courage and imagination to be an innovator.”

While serving as national president of the American Council of Engineering Companies (ACEC) a number of years ago, I represented the interests of over 5,000 U.S. firms worldwide. And on many occasions (in speeches to national and international audiences), I used the phrase – “The World is Run by Those Who Show Up” ... if we engineers are to truly make a difference on the world’s stage, we must boldly step forward and be heard.

Since then, many engineers from all around the globe have come up and told me (or written me) that those words greatly helped them advance as leaders (not only in their own companies) but also in the profession ... and in business ... and in helping influence public development.

As your professors – or other mentors – will tell you (or probably have already told you) – no richer satisfaction exists than hearing that your words, actions or engineering skills or designs inspired someone else to greatness! So, strive for that.

Let me close by (again) reminding you – the world around us is (indeed) changing faster and faster every year ... and society will increasingly be needing your engineering talents (and problem-solving skills).

Make sure you're ready to seize the moment –as a leader not just as a follower ... and as a well-rounded professional, not just a narrowly focused technician.

If you are to truly make a difference (over the full range of your career) both in the engineering profession ... and in your community, be a trailblazer, as skilled at running things as at making things run.

Then you'll easily be able to handle any forks in the road you encounter (no matter how difficult). And you'll make ole Yogi Berra one proud man of wisdom!!!

The future for tomorrow's engineer (each of you) is going to be incredibly exciting and challenging ... and there will be many amazing things to accomplish.

I only wish my career were just beginning!

Good luck to all of you ... at reaching your highest level ... and making the world a better place!!!