We live in unprecedented times. In the words of NAE President Chuck Vest: “We live in the most exciting era for science and technology in human history.”

Indeed, the spectacular advances driven by Moore’s law have spawned and continue spawning great innovation, with deeply technological roots, that empowers society in unprecedented ways.

This is a theme to which I have returned to time and again- and which drives today’s world: the notion of “engineering empowering society.” As we talk about engineering or technology it is worth attempting to define it. Among a number of definitions, the one I like most is from Brian Arthur’s book “The Nature of Technology”:

**Technology is the exploitation of a phenomenon for useful purposes.** I would characterize “exploiting” as “controlling, adapting, transforming, manipulating”, or other such actions.

Now, traditionally, the “phenomenon” we studied or exploited as engineers was physical or chemical, e.g. photoelectric effect, semiconductors, combustion, with the resulting technology being what is traditionally associated with engineering (sensors, actuators, computers, airplanes, etc.).

During the last few decades, however, the rapid (exponential) advances in biology brought us “biotechnology” and “bioengineering” - now exploiting biological phenomena, with unprecedented consequences for health and medicine, as well as for biomimicry in designing new materials and processes. This has brought ever closer, biology, engineering and medicine (the convergence we witness today).

I will go one step further, now, and argue also that we are also witnessing and at an unprecedented fast pace, technologies based on the exploitation of social (rather than physical, chemical or biological) phenomena. Social media technologies (from Facebook to Twitter, etc.) are characteristic of these. They are bringing a convergence of the general social sciences and
engineering. I must say that I tend to see these in exactly the same way in the definition of technology (and by extension engineering). They serve useful purposes- (or we hope that they do!), and they empower society, e.g. with social media, in an unprecedented way (from crowd sourcing to the Arab Spring).

This enabling power of engineering as a discipline we have characterized as Engineering+. It reflects its extraordinary interdisciplinary potential, its convergence with the sciences, medicine, the arts, and yes, even the social sciences. Our recent expansion in informatics and big data, in fact, underlies this rapidly moving revolution.

Engineering + helps to elevate the engineering profession. It helps “Change the Conversation”, an NAE-led movement, which is based on the following:

- No profession unleashes the spirit of innovation like engineering
- Few professions turn so many ideas into so many realities
- Few have such a direct and positive effect on people’s everyday lives
- We are counting on engineers and their imaginations to help us meet the needs of the 21st century

Here at USC, we are very strong supporters of this effort. In fact, a step in the changing of the conversation was taken in 2009 at the first national summit on the NAE Grand Challenges, put together by Duke University, Olin College and USC. The first summit in March 2009 resulted in the creation of the GC scholars program, which spread to more than 25 schools in the US- and it is now growing globally. The second national Summit was held here on our campus, in October 2010. At the end of the first Summit I expressed our aspiration for the event to become the “Davos of Engineering”. Through NAE’s efforts, this indeed happened last March 2013, in a global summit in London, hosted by the RAE, and co-sponsored by the NAE and the CAE. Our students attended this event and came back with great inspiration.
And, following a similar notion, the school hosted last June here in Los Angeles, the second event of the National Engineering Forum, sponsored by Lockheed Martin and the Council for Competitiveness- which focused in the “three Cs”: Capacity, Capability, Competitiveness, where engineering is the main and dominant focus.

In his book “The Beginning of Infinity”, Oxford quantum physicist David Deutsch states,

1) Problems (I prefer to say, challenges) are inevitable.
2) But all problems are soluble.

In the 108-year-old history of the School of Engineering, we have shaped the twentieth century here, in Southern California, and in this nation, by solving always new problems, developing technologies to take advantage of phenomena and serving “useful” purposes: In areas like communications, energy, infrastructure, health, information sciences, digital media. The school has set the mark for excellence at USC. And in the last 10 years, it has grown into a school with tremendous global reach, a powerhouse of education and innovation and with an empowering presence across the disciplines and across the globe. Not coincidentally, this year we will be celebrating 10 years with the Viterbi name. By embracing and promoting the empowering nature of Engineering across the disciplines, we position ourselves at the leading edge of the profession and of engineering education. (A leader in the nation!) With this background, I would like today to provide you with a glimpse of the state of our school as we begin another academic year.

When I consider our mission, I marvel at how comprehensive and all-encompassing USC Viterbi is. I tend to see our activities in the following components:

Students- at all three levels (UG, MS, PhD)
Faculty
Academic Programs- at all three levels (UG, MS, PhD)
Research and Scholarship
Innovation and Entrepreneurship (MEPC, VSI2)
Programs Outside the Curriculum (Student Groups, KIUEL)
K-12 Outreach (VAST)
Global Outreach (China, India, other)

I would argue that no other school at USC is as comprehensive, all-encompassing or as complete! (First at USC!).

I would also like to pause for a moment to summarize some recent reputational rankings (I know I should not been paying attention, but some constituencies do, so I will take a quick read, and I also want to get them out of the way)

USC Viterbi was ranked #10 in USNWR 2014
Computer Science ranked #10 in SJTU 2014 (Shanghai Jiao Tong Global Rankings), #9 in Microsoft rankings
Games Program (with Cinematic Arts) ranked #1 in the US (Princeton Review 2014)
DEN@Viterbi Ranked #1 in USNWR 2014 (both engineering and computer science)
And since 2009, USC Viterbi had the largest number of MIT TR35 winners than any school worldwide (OK, this is my own stat…)

Those of you who follow me on Twitter, of course, know about all these already! Those who don’t, it’s never too late: Follow me @DeanYortsos!

When I think about all the activities in which the School is engaged I believe that they can be summarized into four distinct objectives. I call them the four pillars: Look, think of a 2-D Parthenon with four pillars- you get the picture…

1. Be the attractor of top talent, whether students, faculty or staff, from anywhere in the world; and create the environment for them to flourish.
2. Continuously add value in the curriculum and programs, and our infrastructure.

3. Lead globally to advance solutions to world challenges, from sustainability, to health, to security to the elevation of the world’s standard of living.

4. Use engineering+ to be the catalyst for the innovations that will fuel the economic growth of Los Angeles, Southern California, the United States, and the world.

So, as I review briefly the State of the School, I will make my remarks around these four pillars:

In attracting and nourishing top talent I have much good news to report:

The freshman class exceeded, yet again, enrollments, and quality, by 10 SAT points. Indeed, the average SAT has increased 54 points since the new test was introduced in 2006. This continuing trend, year-after-year, reflects real advances in quality, which we treasure. THIRTY-FIVE PERCENT of the entering freshmen were named university scholars and 61 OF OUR STUDENTS ARE NATIONAL MERIT SCHOLARS.

The diversity of the class is also very strong: 38% percent of the freshman class are women- a great statistic, when you consider that the national average in engineering is 18%; with students represented from 21 different countries; 39 different states; having incredibly diverse backgrounds and interests, which enhances our student’s co-curricular experiences tremendously.

It is our obligation to see that these talented students receive the education they deserve, and the opportunity to shine at USC and after they graduate. (This would be the subject of the second pillar, of course.)
Recently, a mother of one of our graduates wrote to me. She said her daughter, who earned a degree in mechanical engineering, just landed a great job in a company in Chicago. Let me quote from her letter:

“I just wanted to write and tell you how happy I am as a parent of a 2011 graduate of Viterbi. My daughter majored in mechanical engineering and I could not be a happier parent. I loved her four and a half years there, almost as much as she did. Her major was difficult for her, at times I wondered if she should change majors, but she loved her field and kept at it. Not only does USC provide its students with a fabulous education and an incredible all around experience, but your graduates get good jobs in their field. Kristin just finished her second week at xxx in Chicago. This job couldn't be a better match since her senior project was on the aerodynamics of trucks, a field for which she has a passion.

“I had heard about the USC network and job placement success and it is all true. I only wish I had another daughter to send to USC and Viterbi.”

We had record enrollments in our MS class, with new programs in Cyber Security and Big Data coming along. Applications remained at an all-time high of 10,300, but our yield rate increased to 37 percent from 33 percent. Likewise, the PhD class has been exceptional.

The success of our students is also seen in multiple ways: A CS student team, ably led by David Kempe and Sven Koenig, won the “Pac-12 South” of the ACM in 2014 and finished 3rd among US teams in the World Finals. Just last weekend, the Rocket Lab undergraduate team attempted to place a rocket into space. As you might want to know, they had to secure FAA permission for take-off and BLM for landing. Alas, the rocket exploded on the way to its destination after a great launch! They will try again.

Moving next to faculty recruitment: We had another stellar recruiting year, by adding eight tenure-track faculty this fall, including three women, two in the Spring (both women) and two who will start in Fall 2014. Our Fall 2013 new faculty include:
Jong-Shi Pang, professor of industrial systems engineering and the new Epstein Family Chair in ISE. He joins us after serving six years as department chair of Industrial and Enterprise Systems Engineering at University of Illinois at Urbana-Champaign. Jong-Shi is one of only eight people ever, who have won both the Dantzig and the Lanchester prizes. Hao Li, assistant professor in CS and our newest MIT TR-35 recipient. Let me pause for a moment on The MIT Technology Review TR35 list. This is an annual list of the top 35 young technology innovators in the world under the age of 35- includes universities, research labs and corporations. Hao is our latest recipient. I am very proud that in the last five years, seven Viterbi junior faculty members (of which four women) have earned this distinction, more than any other university in the world (including M.I.T., Caltech, Berkeley, Stanford and Harvard). Stacey Finley, joins us as assistant professor in biomedical engineering. Amy Childress, professor in CEE and Director of our Environmental Engineering Program. Computer Science Assistant Professor Nora Ayanian joins us after a postdoc at MIT. Her research focuses on autonomous systems, an area of strategic importance to the school. Joining her in that initiative is Nestor Perez-Arancibia, assistant professor in AME- after a postdoc at Harvard. George Ban-Weiss, assistant professor in CEE, focuses on air quality. Panos Georgiou, formerly a research assistant professor in Electrical Engineering – Systems, now a tenure-track assistant professor.

In addition, we celebrated the arrival of neuroscientists Arthur Toga and Paul Thompson, both with joint appointments in the Keck School of Medicine. They will help our strong team in neural engineering- and engage in the NAE Grand Challenge (probably the most ambitious and important one) of reverse engineering the brain.

I wanted to take a moment and reflect on the growth of women faculty in the school. In 2000, we had three women faculty. A bit more than a decade later, the number has increased by a factor of 7, and we are not done yet.

Three members of our junior faculty, Ben Reichardt of EE, Malancha Gupta of Mork and Yan Liu of CS won NSF Career Awards.
Andrea Armani was selected by *Popular Science* as a “Brilliant 10” scientist of 2013 (in addition to other honors - which I religiously tweet about). Ted Berger was selected by the *MIT Technology Review* to be included in its 10 Breakthrough Technologies list. Ted also received an Academic Career Achievement Award from the IEEE Engineering, Medicine and Biology Society. Maja Mataric received the Anita Borg Institute’s 2013 Women of Vision Award in Innovation. Alan Willner received the IEEE Eric E. Sumner Award. Barry Boehm won the American Institute of Aeronautics and Astronautics Aerospace Software Engineering Award. Patrick Lynett won the 2013 Walter L. Huber Civil Engineering Research Prize. Jerry Hobs won the Lifetime Achievement Award of ACL. And Francisco Valero-Cuevas will receive later next week the Technical Achievement Award from HENAAC, the Hispanic Engineering Society.

After a national search Dr. Prem Natarajan, Vice President at BBN Technologies research center in Boston, joined ISI as its new Executive Director. Prem’s term stared July 1, 2013. We are very excited having Perm as part of the leadership team of the school and look forward to his continuing Herb Schorr’s remarkable legacy.

Consider next, pillar two: *Continuously add value and innovate in our curriculum, our programs, and our infrastructure.*

As you know, we live in unprecedented times in higher education. Technological developments are promising unique opportunities to enhance the effectiveness of instruction in engineering education and create truly personalized learning (yet another NAE GC). It is almost inescapable that the currently practiced methods of instruction will cease being competitive, efficient, or truly serving our students. It is imperative, therefore, that we take a close and careful look on the pedagogy we offer, both at the undergraduate and at the professional MS levels- including DEN. As in many other fields, our challenge, and opportunity, is to re-imagine engineering education in today’s exponentially changing world. I believe
that now is the time to proceed with a disruptive restructuring of our instruction-to this effect I announced last week an initiative to do just that: engaged learning. Over the next year, USC Viterbi will launch several pilot programs to seize the opportunity to reshape engineering education for the benefit of our students and for that of higher education. This is the only way, and of great urgency, I might add, to address the increasing importance of technology in education and help lead a potential disruption.

As part of the technology evolution, we are also re-imagining the classroom itself through our “global classroom” iPodia: As you know, this brings together student groups, spanning multiple countries and multiple elite engineering schools, joined through the Internet. The current members of the iPodia Alliance are the schools of engineering at USC, Peking University, National Taiwan University, Technion, the Korean Institute for Advanced Studies (KAIST), Aachen Technical University in Germany, and University of Sao Paolo in Brazil. This alliance expands the definition of a university to global dimensions. Last May, almost 100 students from USC, PKU, KAIST, Aachen and Technion, all assembled in Seoul, Korea, to present a phenomenal class to all attending the USC Global Conference. I urge all faculty to consider converting and/or offering their class through the iPodia platform. The dean’s office will help facilitate this effort.

DEN@Viterbi has also helped in other ways as well. Ryan William, a Roanoke, Va., native, excelled in his Ph.D. program at USC Viterbi. Then, everything changed. On Jan. 27, 2008, Ryan went to Santa Monica with friends to catch some waves. As he paddled toward the breakers, he dove under an oncoming swell. In a freak accident, he landed headfirst in a hidden sandbar and snapped his neck. He lost all feeling in his legs and arms. If not for the two surfers who pulled him from the water, Ryan would have surely drowned. After his accident, Ryan returned to his family’s Virginia home nearly 2,500 miles away. But DEN@Viterbi made it possible for him to pursue his academic dreams. Today, Ryan is pursuing his PhD research on the development of algorithms for multi-agent systems to interact intelligently and autonomously. Along the way, Ryan has received support from several Viterbi professors, especially his Ph.D. advisor Gaurav
Sukhatme. Ryan plans to graduate next year from USC Viterbi and hopes to have his own research lab at a top university within the next decade.

As I mentioned before, we now have new MS programs in Cybersecurity and in Computer Science (Data Science). The Cybersecurity program will prepare students for one of the grand engineering challenges of coming decades. According to The National Institutes of Standards and Technology, the United States will need 700,000 new cybersecurity professionals by 2015.

While at the UG level, a new class, Planning Your Engineering Career, team taught by former Chevron Vice President and Chief Technology Officer Donald Paul; USC Viterbi alumnus Neil Siegel, vice president and chief engineer of Northrop Grumman’s Information Systems sector; and Research Assistant Professor Julie Albright, helps students understand their employment options and succeed in successfully pursuing them.

Consider, now, Pillar Three – Solve global challenges from sustainability, to health, to security to the elevation of the world’s standard of living.

Earlier this summer, the NSF’s Office of Emerging Frontiers in Research and Innovation (EFRI) awarded a team of three USC Viterbi professors a grant for a project on a wireless, multi-sensor system for the early detection of shunt malfunctions in people with excessive brain fluid. Principal investigator Ellis Meng, and co-principal investigators Malancha Gupta and James Weiland will devise a way to embed or integrate sensors into shunts for people with hypocephalus, a chronic, incurable condition characterized by excess fluid in the brain that affects an estimated one in 1,000 newborns and includes symptoms such as headaches, nausea and dizziness. At present, about 75 percent of the shunts fail within 10 years.

In an unprecedented, and probably world record, BMSR, the Biomedical Simulation Resources Center, funded for the first time by NIH in 9/1985, received another 5-year renewal through 8/2018! This will mark the continuous funding by NIH for 33 years for a cumulative funding of
$33.7M! Its Current Core Research Focus is to develop and advance systems modeling as a framework for translational and clinical research. Throughout its history, it has spanned 78 Collaborative Projects, representing 83 institutions and 95 investigators in: Neurovascular & Neurodegenerative Diseases; Oncology; Infectious Diseases and other; has distributed over 10,000 software packages worldwide and held 64 workshops/courses that have trained over 4,500 investigators! Congratulations to PIs Marmarelis, D’Argenio and Michael Khoo. When the grant was first awarded, the US President was Ronal Reagan, and more importantly, the Lakers beat the Celtics in the NBA final! When the grant finally ends in 2018, we hope for a repeat performance led by the 40-year old phenom Kobe Bryant!

To help protect us against terrorist attacks, Milind Tambe and his team designed the ARMOR-PROTECT system, which aims to greatly increase port security. After successful rollouts in Boston and New York, earlier this year their system was introduced at the ports of Los Angeles and Long Beach, which together rank No. 8 in the world by container traffic. It has subsequently been introduced elsewhere. The system uses algorithms to randomize Coast Guard patrols to confuse would-be terrorists and make it impossible to identify exploitable patterns. Federal Air Marshalls, LAX police and the L.A. Metro have also used system, while it is now moving to the protection of endangered species and other environmental applications. And finally, this brings us to the Fourth Pillar: Be the catalyst for the innovations that will fuel the economic growth of Los Angeles, Southern California, the United States, and the world.

Realizing that at the end of the day, it is technology that drives innovation (exploiting a phenomenon for useful purposes) we created last year VSI2, the Viterbi Student Innovation Institute. This will help spawn a slew of local engineering-led, high-tech startups that will create jobs, a vibrant entrepreneurial ecosystem and paradigm-shifting products and services.

Our extremely successful MEPC held last year its third business plan competition. The winners were a start-up company led by Computer Scientists Rajiv Maheswaran and Yu-Han Chang, who are building
essentially Big Data basketball analytics. These will unlock the mysteries of what constitutes good offense and defense in basketball- I hope it can also be installed to benefit our football-team offense (particularly in the second half…)

Complementing MEPC, we offered this summer for the first time ever, the USC Viterbi Startup Garage, a unique collaboration among USC, venture capital giant Kleiner Perkins Caufield & Byers, and United Talent Agency (UTA), a Hollywood talent agency. The Garage provides financial support, mentoring and other strategic resources to a select group of USC student and alumni entrepreneurs. Over 90 teams competed for 10 spots in the VSG. Each team, cofounded or led by a current USC Viterbi student or recent alumnus, received $20,000 in exchange for four percent equity.

AIO Robotics Inc., a new student-led startup launched by the Garage, recently unveiled the world’s first 3D copier, an all-in-one 3D printing device that combines printing, scanning, copying and faxing. The Zeus 3D copier will facilitate prototyping and replicating and digitizing models, artifacts, parts and sculptures. You can 3-D copy and fax everything- or almost everything: I am not sure that it copies humans yet… The company shows such promise that it surpassed its one-month $100,000 fundraising goal after only one day on Kickstarter, attracting favorable press from Forbes and CNNMoney, among other national publications.

Cyrus Shahabi, director of USC’s Integrated Media Systems Center and professor of computer science and electrical engineering, helped create a new smartphone traffic app that uses sophisticated algorithms to crunch massive amounts of data, including historical traffic patterns, to suggest the fastest possible local routes.

And Jerry Loeb’s start-up SynTouch received a ton of distinctions: These include the World Economic Forum - Technology Pioneers award. While it will also be featured in Nov. in the Science Channel - "This Changes Everything".
So, as you can see from this short review, the State of the School is strong. Our budget this year is also strong, thanks in part to the innovation in our programs, the quality of our faculty and the strength of our brand.

At this juncture in time, USC Viterbi is entering one of the most exciting chapters in our history. Building on over a century of innovation in research and education – and energized by the limitless potential of engineering to make the world a better place – we are sharpening our upward trajectory. In our quest to open new horizons for humanity’s benefit and shape the next innovation, we have embarked on one of the most ambitious fundraising campaigns ever undertaken by an engineering school. Legendary aerospace engineer and mathematician Theodore von Kármán said, several decades ago: “Scientists discover the world that exists; engineers create the world that never was.” Creating the world that never was is the theme of our campaign.

We aim to raise $500 million to elevate USC Viterbi to greater heights. That’s a half a billion dollars for those who are counting. In the broadest sense, we will invest our donors’ gifts to support the four pillars by attracting world-class professors and students; endowing chairs; creating new programs; and building best-in-class facilities to advance research. Among our highest priorities is to raise funding for the Convergence of Molecular Science Engineering building. As envisioned, CMSE will bring together faculty scholars from USC Viterbi and the Dornsife College Natural Sciences area to collaborate where engineering and molecular science intersect – the very essence of Engineering +.

We also want to deepen our already strong commitment to innovation and entrepreneurship. We want nothing less than for USC Viterbi to help launch the next major technology startup here in Los Angeles. We fully expect USC Viterbi students, in conjunction with their talented faculty advisors, to create next Amazon or LinkedIn right here in Southern California. Our ambition is to establish the Viterbi School at the core of a booming and growing Silicon Beach ecosystem of entrepreneurship.
How are we doing in this campaign? To-date, we have raised almost $150M. The last fiscal year was the second strongest in our fundraising history by bringing in $62 million. We hope to complete or even exceed our goal on time and will do so with your continued support.

So, the State of the School is strong and getting stronger. When I started as a Dean I articulated the following vision: To be

- **First at USC**
- **A leader in the nation**
- **Constantly rising quality**
- **Excellence in all our endeavors**

I also reminded us that we should always keep a sense of service:

**Serving Our Constituencies – which are**
Faculty and Staff; Students; Parents; University Administration and Trustees; Alumni; Donors; Advisory Boards; Industry and Corporations; Academia at large; and Society at large

The Dean’s office is here to serve our faculty, staff and students, and all our constituencies. We should never forget that this is our mission- as a powerful tower of engineering education and research.

So that we can all say: I am fortunate to be part of the Viterbi School. This vision remains as strong as then.

As I close, I am reminded of the book “The Beginning of Infinity”, by Oxford quantum physicist David Deutsch. He states,

1) Problems (I prefer to say, challenges) are inevitable.
2) But all problems are soluble.

Indeed, there will always be problems, because they represent collisions of ideas and because as you move ahead, the challenges become greater. But I
absolutely share in the belief that all problems are soluble. I invite you to share this mindset.

Thank you and fight on!