Fr: Continuation of Life on the Planet
To: The Grand Challenges for Engineering

C. D. Mote, Jr.

President, National Academy of Engineering
Regents Professor, University of Maryland

University of California, Irvine
Washington, D.C.

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Today’s Takeaways

1. National Academy of Engineering
   - what is it?
   - what does it do?

2. Grand Challenges for Engineering
   - where did they come from and why?

3. Grand Challenges Scholars Program
   - Educational platform to prepare students for global problems like the grand challenges
A CENTURY OF INNOVATION

Twenty Engineering Achievements That Transformed Our Lives

Foreword by
NEIL ARMSTRONG
Afterword by
ARTHUR C. CLARKE
20th Century Greatest Engineering Achievements

1. Electrification
2. Automobile
3. Airplane
4. Water supply and distribution
5. Electronics
6. Radio and television
7. Agricultural mechanization
8. Computers
9. Telephone
10. Air conditioning/refrigeration
11. Interstate highways
12. Space flight
13. Internet
14. Imaging
15. Household appliances
16. Health technologies
17. Petrochemical technology
18. Laser and fiber optics
19. Nuclear technologies
20. High-performance materials
What will be the engineering achievements in the 21st century?

Hmmm . . . not possible to predict, but a different question

What is a vision for what engineering needs to achieve in the 21st century?

A vision may have promise . . . but to do what?
Vision: Continuation of life on the planet, making our world more sustainable, safe, healthy and joyful.
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Goals: Grand Challenges for Engineering

Satisfying the goals (GC) will deliver the Vision
1. Make solar energy economical
2. Provide energy from fusion
3. Develop carbon sequestration methods
4. Manage the nitrogen cycle
5. Provide access to clean water
6. Restore and improve urban infrastructure
7. Advance health informatics
8. Engineer better medicines
9. Reverse-engineer the brain
10. Prevent nuclear terror
11. Secure cyberspace
12. Enhance virtual reality
13. Advance personalized learning
14. Engineer the tools of scientific discovery
Vision: Continuation of life on the planet, making our world more sustainable, safe, healthy and joyful

Goals: 14 Grand Challenges for Engineering

Objectives: Solutions that deliver each Goal

(the hard part)
Vision: Continuation of life on the planet, making our world more sustainable, safe, healthy and joyful.

Goals: 14 Grand Challenges for Engineering

Grand Challenges Scholars Program: Prepare students for problems like GC.
• Program and *experiences* that prepare students (and others) for problems like the Grand Challenges

• Students earn a certificate in the GCSP while earning their degrees

• 5 “competencies” of GCSP program:
  – *Research/creative* project experience on GC like topic
  – *Multidisciplinarity* – through hands-on experience
  – *Business/entrepreneurship* – viable business model for implementation
  – *Multicultural* understanding from global experience
  – *Social consciousness* through service learning
In 2015 120+ Deans of Engineering (~ 1/3 U.S. deans) committed to graduating more than 20,000 Grand Challenge Scholars over next decade.

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Global Grand Challenge Activity

- Australia
- Botswana
- China
- Egypt
- Hong Kong
- India
- Kuwait
- Malaysia
- Singapore
- U.K.
- U.S.
Global Grand Challenges Summits

- Beijing, September 14-16, 2015
- Washington D.C., July 18-20, 2017

GGCS 2015 – Beijing – U.S. Speakers
- Robert Socolow
- Dean Kamen
- Molly Coye
- Roderic Pettigrew
- Wayne Clough
- Will.i.am
- Doris Sung
- Arun Majumdar
- Richard Miller
- Marcia McNutt

BEIJING SUMMIT THEMES:
- Sustainability
- Restore and Improve Urban Infrastructure
- Health
- Energy
- Education
- Joy of Living
- Security and Resilience
i. This is the 1st Engineering Vision for the planet in history

ii. The Grand Challenges are the best description of Engineering for the public.

Illustrates the answers to two important questions:

- What is Engineering?
- How does Engineering serve people and society?
iii. Global Vision **mandating global solutions** to reach the Goals

- Solutions depend on locale
- “We” are all in these Challenges together

iv. Students are inspired by the Challenges

- Preparing talent for global challenges is essential
  - National Academy of Engineering priority
  - Grand Challenge Scholars Program focus
- Over 50% GCSP students are **females** and **minorities**
"Grand Challenges of Engineering"
adapted from
National Academy of Engineering

Make Solar Energy Affordable
Energy from Fusion
Carbon Sequestration Clean Air
Manage Nitrogen Cycle
Restore and Improve Infrastructure
Access to Clean Water
Advance Health Information Systems
Create Better Medicines

Prevent Nuclear Terror
Understand How the Brain Works
Secure Cyberspace
Enhance Virtual Reality
Develop Tools of Scientific Discovery
Advance Personalized Learning
Closing Point:

• Come join with the NAE to inspire the preparation of young engineers and others for global problems of our time, problems like the Grand Challenges for Engineering and the Vision that inspired them.

• Together “we” can lead this *movement* for the betterment of the world.

• What could be better?
NATIONAL ACADEMY OF ENGINEERING