



# NAE GRAND CHALLENGES SCHOLARS PROGRAM<sup>®</sup>

WORKSHOP – 5 to 8 August 2019  
Belo Horizonte

Panel: Student and Alumni Voices

Moderator: Richard M. Stephan (UFRJ)

# THE GLOBAL GOALS

## For Sustainable Development



#GLOBALGOALS

# The NAE 14 Grand Challenges for Engineering in the 21st Century

<http://www.engineeringchallenges.org/>

1. Advance Personalized Learning
2. Make Solar Energy Economical
3. Enhance Virtual Reality
4. Reverse-Engineer the Brain
5. Engineer Better Medicines
6. Advance Health Informatics
7. Restore and Improve Urban Infrastructure
8. Secure Cyberspace
9. Provide Access to Clean Water
10. Provide Energy From Fusion
11. Prevent Nuclear Terror
12. Manage the Nitrogen Cycle
13. Develop Carbon Sequestration Methods
14. Engineer the Tools of Scientific Discovery

# Boeing List of “Desired Attributes of an Engineer”

- A good understanding of engineering science fundamentals
  - Mathematics (including statistics)
  - Physical and life sciences
  - Information technology (far more than “computer literacy”)
- A good understanding of design and manufacturing processes (i.e. understands engineering)
- A multi-disciplinary, systems perspective
- A basic understanding of the **context** in which engineering is practiced
  - Economics (including business practice)
  - History
  - The environment
  - Customer and societal needs

## Good communication skills

- Written
- Oral
- Graphic
- Listening

## High ethical standards

An ability to think both critically and creatively - independently and cooperatively

Flexibility. **The ability and self-confidence to adapt to rapid or major change**

Curiosity and a desire to learn for life

A profound understanding of the importance of teamwork.

**Diversity – wanted and needed !**

**John H. McMasters, Narayanan Komerath**

**Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition**

# GCSP

## (Grand Challenges Scholars Program)

1. Talent Competency
2. Multicultural Competency
3. Multidisciplinary Competency
4. Entrepreneurship Competency
5. Social Consciousness Competency
6. Ecological Consciousness Competency

### MISSION:

“Continuation of life on the planet, making our world more sustainable, healthy, secure and joyful”

# Engineering Courses at UFRJ

- Undergraduated Courses (EP)

The place of “Know why” (#1)

The place of “Know how” is the Industry !

Student Competition Groups (#2, #3, #4, #5, #6)

- Graduated Courses (COPPE)

Place of “Why not?”

# The MagLev-Cobra project

## Graphical Abstract



Linear motor

Rails of magnets

200 meters long line – outside the laboratory  
Vehicle for 20 passengers



Superconductors refrigerated with  
LN<sub>2</sub> inside of cryostats



# The MagLev<sup>2</sup>-Cobra project

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# Introdução à **ENGENHARIA ELÉTRICA DE POTÊNCIA**



Richard M. Stephan

**UFRJ**

Agosto – 2018

# Conclusion

At UFRJ, we are active and eager to  
collaborate and share our experience  
with you!



# Thanks for your attention!!!

RICHARD M. STEPHAN







# The NAE 20 Greatest Engineering Achievements of the 20th Century

<http://www.greatachievements.org/>

- |   |   |
|---|---|
| <b>1. Electrification</b>                     | <b>11. Highways</b>                                 |
| <b>2. Automobile</b>                          | <b>12. Spacecraft</b>                               |
| <b>3. Airplane</b>                            | <b>13. Internet</b>                                 |
| <b>4. Water Supply and Distribution</b>       | <b>14. Imaging</b>                                  |
| <b>5. Electronics</b>                         | <b>15. Household Appliances</b>                     |
| <b>6. Radio and Television</b>                | <b>16. Health Technologies</b>                      |
| <b>7. Agricultural Mechanization</b>          | <b>17. Petroleum and Petrochemical Technologies</b> |
| <b>8. Computers</b>                           | <b>18. Laser and Fiber Optics</b>                   |
| <b>9. Telephone</b>                           | <b>19. Nuclear Technologies</b>                     |
| <b>10. Air Conditioning and Refrigeration</b> | <b>20. High-performance Material</b>                |