

GRAND CHALLENGES SCHOLARS PROGRAM

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WORKSHOP

Alvaro T. Prata

**Department of Mechanical Engineering
Federal University of Santa Catarina**

**POLO – Research Laboratories for Emerging Technologies in
Cooling and Thermophysics**

***“Fostering Modern Global Engineer Competences
Including Entrepreneurships*”**

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Aspirational Vision

(National Academy of Engineering)

□

**Engineering needs to deliver to all people
on the planet in the 21st century:**

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

Grand Challenges for Engineering in the 21st Century

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 **Clear 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**

Sustainability / Health / Security / Joy of Living

Grand Challenges Scholars Program

The Five Student Competencies

- ✓ **Talent Competency:** mentored **research/creative experience** on a Grand Challenge-like topic;
- ✓ **Multidisciplinary Competency:** understanding **multidisciplinarity of engineering systems** solutions developed through personal engagement;
- ✓ **Viable Business/Entrepreneurship Competency:** understanding, preferably developed through experience, of the necessity of a **viable business model** for solution implementation;
- ✓ **Multicultural Competency:** understanding different cultures, preferably through multicultural experiences, to ensure **cultural acceptance** of proposed engineering solutions;
- ✓ **Social Consciousness Competency:** understanding that the engineering solutions should primarily serve **people and society** reflecting social consciousness.

Grand Challenges Scholars Program

Fostering Global Engineering Competencies

(Brazilian Perspective)

- ✓ **University:** Relationship with the industrial sector and strong engagement with national and global challenges;
- ✓ **Department:** Broad list of companies assisted and projects carried out;
- ✓ **Course:** Strong emphasis on laboratories and project oriented activities;
- ✓ **Faculty:** Commitment with technology and innovation;
- ✓ **Student:** Strong engagement with companies and industrial projects.

Basic Sanitation

(Brazilian scenario)

Of the country's 5,570 municipalities, only 85 provide a decent sanitation system for the population:

- ✓ **Water supply;**
- ✓ **Sewage collection;**
- ✓ **Sewage treatment;**
- ✓ **Solid waste collection;**
- ✓ **Proper disposal of solid waste.**

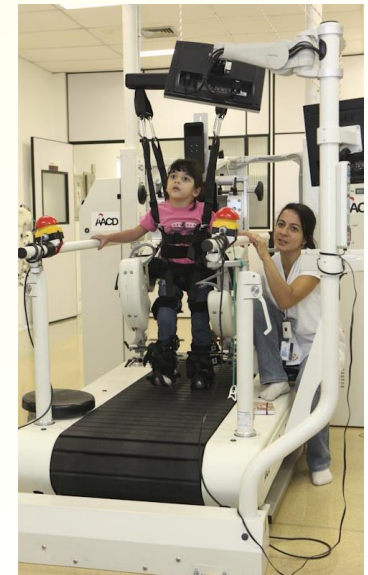
Basic Sanitation

Brazil is the eighth largest economy in the world with the following basic sanitation data:

- ✓ **106th position in basic sanitation;**
- ✓ **35 million with no access to clean water;**
- ✓ **100 million using pits and no sewage collection;**
- ✓ **For every 100 liters of sewage released into the environment 48 liters are not treated.**

Inequalities

- ✓ **Social;**
- ✓ **Economical;**
- ✓ **Gender;**
- ✓ **Regional;**
- ✓ **Racial e Ethnic;**
- ✓ **Opportunity;**
- ✓ **Environmental;**
- ✓ **Etc.**



Technological Challenges

(Brazilian Perspective)

- ✓ Solve or minimize emergencial **structural problems**;
- ✓ Identify and work on major **national projects** for wealth generation and global competitiveness.

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