



UNM

*School of Engineering*

# **“Act Locally, Think Globally” Networking (**Connectivity**)**

**Ramiro Jordan**

ISTEC General Assembly

INAOE

Cholula, Mexico

March 25-29, 2014



## **AGENDA**

- **About New Mexico and UNM**
- **Challenges**
- **International Collaboration**
- **Peace Engineering**
- **Innovation Plaza**
- **Why GINET?**
- **Summary-Conclusions**

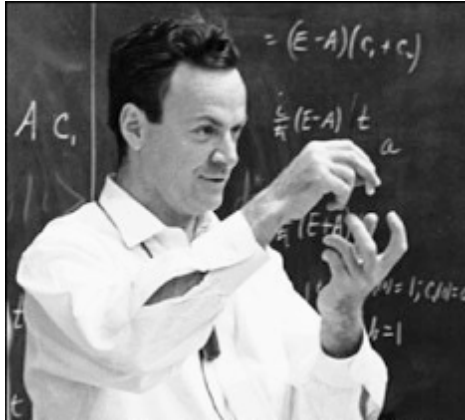
# Quiz ... what place is ...

Richard Feynman

Ed Roberts

Gates & Allen

Cleve Moler



- ... the birthplace of modern energy physics?
- ... the birthplace of the microcomputer?
- ... the birthplace of modern software?
- ... the birthplace of mathematical software?
- ... the home to the largest group of aliens on Earth?

# About New Mexico and UNM



# New Mexico History and Culture

- First European establishment in North America (1596)
- Achieved statehood in 1912
- 5<sup>th</sup> largest state in the US
- Diverse population
  - Highest proportion of speakers of Spanish, Navajo and Zuni
  - 22 pueblos, tribes and sovereign nations



# New Mexico Unique Statistics

- 5th highest concentration of tech workers in the nation
- Los Alamos has more millionaires than any other US city
- 4 military installations and Spaceport America

# New Mexico Technology Traditions

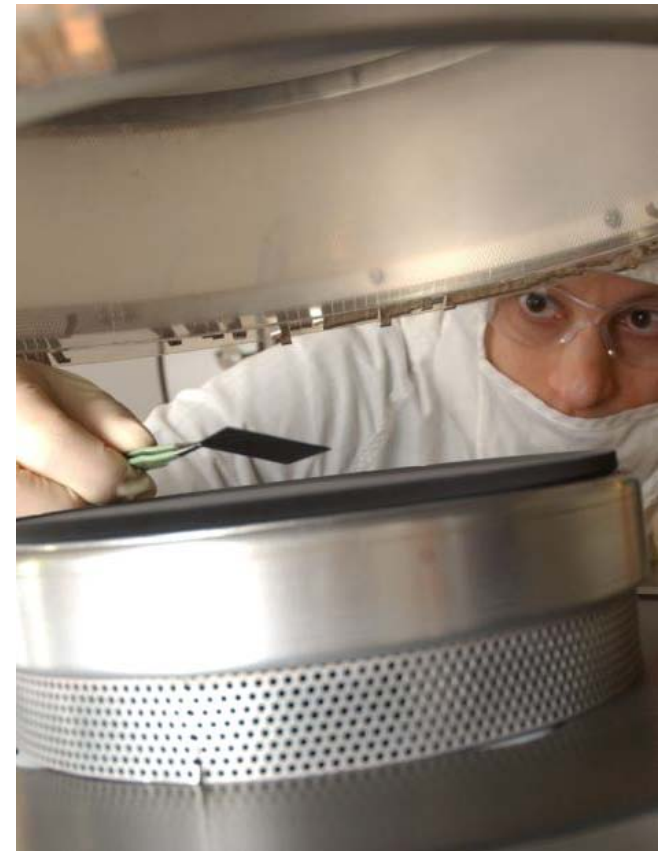
- Innovation Leaders
  - Since the Manhattan project, NM has been a center of high tech
  - Birthplace of Microsoft, Matlab, **ISTEC**, Khoros, et al
  - Home to Sandia National Laboratories, Los Alamos National Laboratory, and Kirtland Air Force Base
- Prime tech strengths focus on
  - Aerospace and Aviation
  - Bio-Technologies and Healthcare
  - Energy, Environment and Water
  - Information Technology and Software
  - Nano-Technologies and Microelectronics



# NSF Engineering Research Centers

Second nationally in the number of ERC participations

- Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies (NASCENT)
- Quantum Energy and Sustainable Solar Technologies (QESST) ERC
- Biorenewable Chemicals ERC
- Smart Lighting ERC





# Challenges



# Challenges

Engineering's Grand Challenges

X

WHAT  
DO YOU  
THINK?

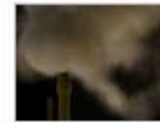
Click on the engineering challenge you think is the most important:



Make solar energy economical



Provide energy from fusion



Develop carbon sequestration methods



Manage the nitrogen cycle



Provide access to clean water



Restore and improve urban infrastructure



Advance health informatics



Engineer better medicines



Reverse-engineer the brain



Prevent nuclear terror



Secure cyberspace



Enhance virtual reality



Advance personalized learning

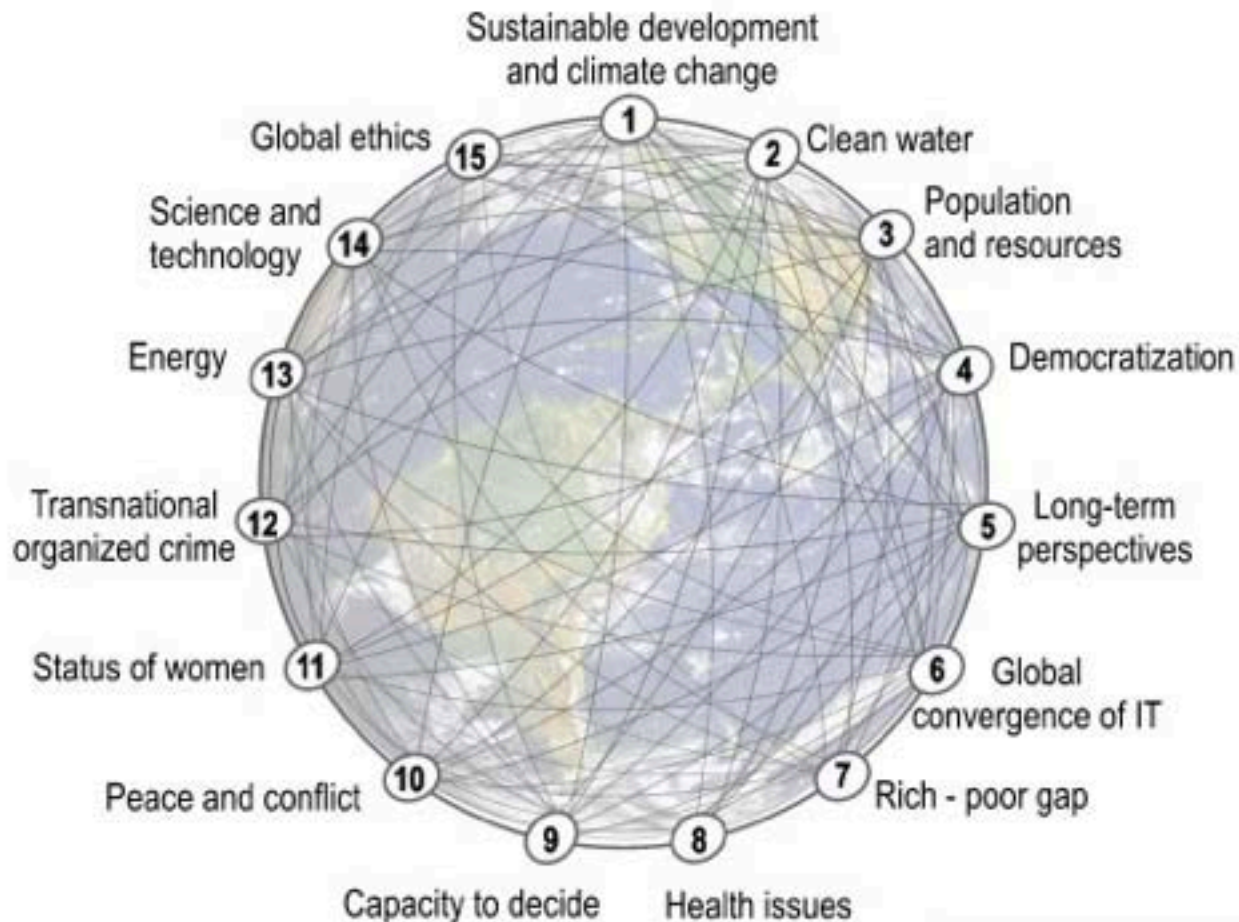


Engineer the tools of scientific discovery

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

# Challenges

## 15 Global Challenges facing humanity



by The Millennium Project  
[www.millennium-project.org](http://www.millennium-project.org)

# Challenges

- Fund Raising
  - State funded, located, **tolerated**
- Develop a joint Socio-Economic Plan with stakeholders from NM with **international** component
  - Academia, cities, state agencies, national labs, NGOs, entrepreneurs, community leaders
  - “Sister City” efforts
  - Connect UNM/STC/SNL and Innovate ABQ to **International Tech-Park Networks**

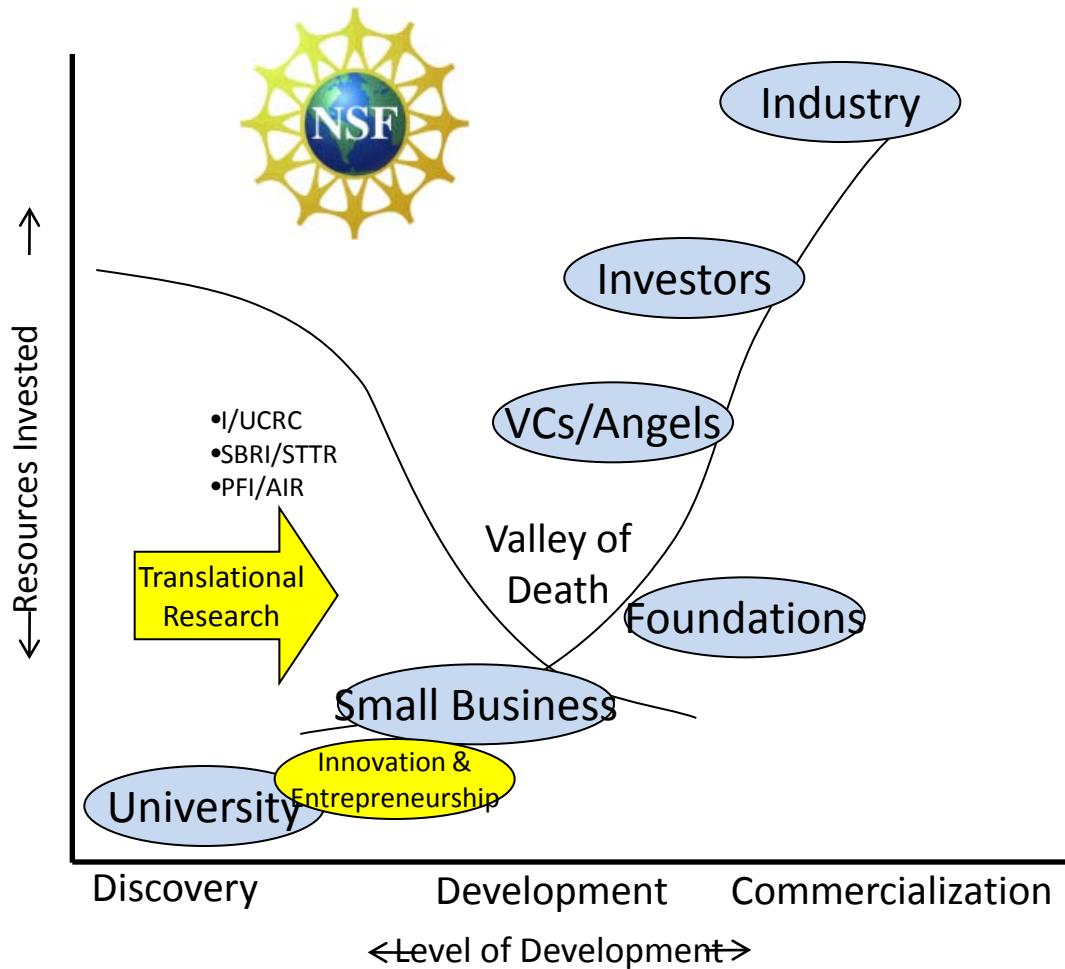
# Challenges

- A coherent **Internationalization Plan** that involves UNM North and South campuses
  - Collaboration between both campuses: HSC, SOE, Business, others
- National and **international mobility** plan and funding for our students
  - Internship programs
  - Study abroad programs
- Influence policy at local, regional, national and **international** levels
  - City, State, Federal, **Global**

# Challenges

- **International** Economic Development/Entrepreneurship activities
  - STC: HSC, SOE, Anderson, others but with **internationalization** component
  - Partner with **international** strategic academic institutions
- Need to break away from traditional learning/teaching silos
  - **International** Senior Design projects
  - Student Success: graduation rates, retention
  - Plant the seed of **international innovation, creativity and entrepreneurship** in the curricula

# Bridging Academic Research, Government and Industry Research



## Unreliable research Trouble at the lab

Scientists like to think of science as self-correcting. To an alarming degree, it is not  
Oct 19th 2013 | From the print edition

Like 15k Tweet 1,581



# Challenges

- Development of **multilingual/multicultural** on-line and in-class content (Spanish, Portuguese)
  - Multicultural 2 + 2 Program: first 2 years in home country and last 2 years at UNM
- MOOCS – **multicultural/multilingual** on-line education/learning
  - Remote labs - **MOOCHOS**
  - Degrees and certificate programs



# Challenges

- Establish **remote campuses** with strategic academic institutions
  - 4+1 undergraduate/graduate degree in a market where the undergraduate degree is 5 years
- **International Partner Universities Faculty Development** (on-site and on-line)
  - CELAC – English Training
  - SOE and ASM MS/PhD programs
- Culture of Quality (GRANA)
  - **Accreditation of Programs**


# Challenges

- Participate in **international Meta universities** efforts
- Participation in **international** forums
  - IFEES, GEDC, ASEE, ISTEAC, SPEED, other
- Strategic **international** partnerships/relationships with industry-university-government-society
- **International** members in SOE and Department advisory boards

# International Collaborations



# Collaboration


$$\text{Collaboration} \propto T \times \frac{1}{d^n}$$

T = Tropicalization, d = Distance, n = Bureaucracy

# Collaborations

## EDUCATION

- Joint curricula development and certificate programs
  - English, Spanish, Portuguese
- Undergraduate and graduate student exchanges
- Experiential and transdisciplinary learning
- Internships
- Create/Enhance Graduate Double Degree Programs (MS and PhD)
- Create/Enhance Undergraduate/Graduate Double Degree Programs (BS/MS)
  - Global Engineering Scholars Program (4+1 Programs)
  - Multicultural 2 + 2 Program: first 2 years in home country and last 2 years at UNM

# Collaborations

## CREATIVITY AND INNOVATION

- Joint R&D basic and applied
- Entrepreneurship/leadership (social, business) building and economic development
  - Create/enhance/participate in technology park networks
  - Incubation and acceleration of spinoffs
  - Access to capital
  - Business Development – Marketing, finances, administration
  - Protection, licensing of Intellectual Property
  - Internships local and international: Industry, R&D centers, Technology Parks, other

# Collaborations

## POLICY AND FUNDING

- Private Equity: Venture Capital, Investment Banking, Crowd-funding
- Presence in international forums
- Influence in policy making
- Create/enhance university-government-industry-society partnerships

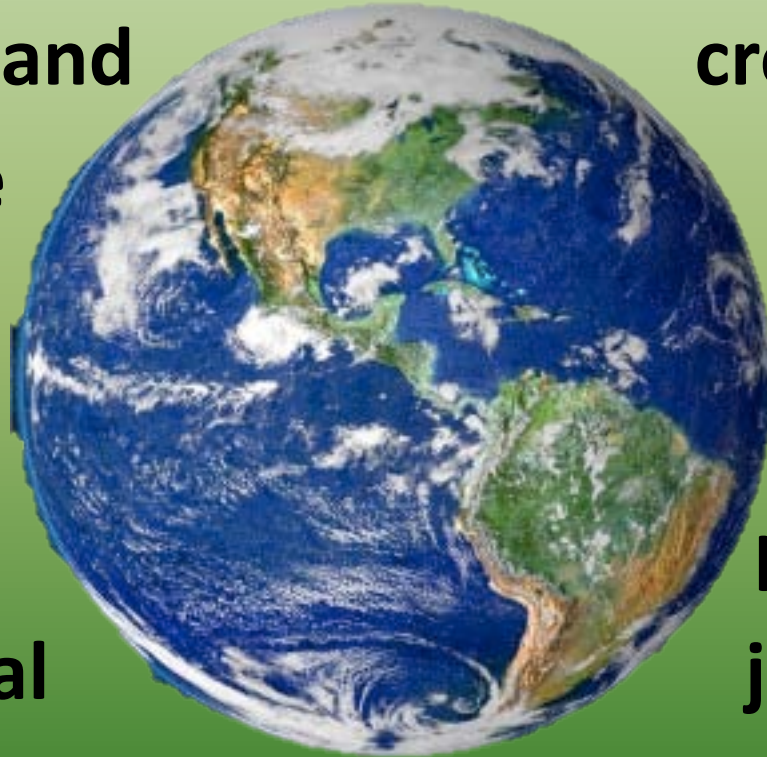
# Peace Engineering





# Peace Engineering

A trans-disciplinary program emphasizing innovation and creativity, while stressing the importance of applying engineering science and practical solutions to solve problems that advance social justice and sustainable social, economic, and environmental solutions **globally**.



# NEW INTERNATIONAL LEADERSHIP IS NEEDED!!!!

## TRUST

- Social entrepreneurs
- Business entrepreneurs
- Leadership building
- Mobility
- Teamwork, Collaboration
  - Inter/multi/transdisciplinary
- Tolerance
- Ethics
- Diversity

## TRUST

# Innovation Plaza



# Innovation Plaza

- To meet the challenges, curricula must be innovated, enhanced and strengthened.
- Addressing this need, UNM and industry developed the Innovation-Plaza, a program that integrates enhanced curricula and educational outreach with an open, **globally connected**, interdisciplinary lab for entrepreneurship, experiential learning and collaboration.



Innovation  
Plaza!



Experiential

International

Entrepreneurial

Improve  
recruitment  
+ retention

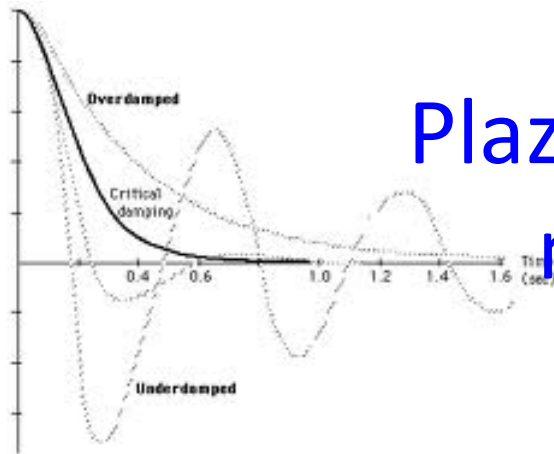
Innovative  
content

Industry  
partners

ABET

On-line

K12 outreach



One premise of the Innovation-Plaza is that the students have their noses in the textbook too much.

They are missing out on the excitement and richness of experiential learning.

They are not getting to tinker, explore and fiddle with stuff.

We want to tap their creativity and foster entrepreneurship early!!!!



# Traditional Silos of Engineering Education

High School



*Thinking  
Science &  
Engineering*

Trade School



*Supporting  
Science &  
Engineering*

University



*Learning  
Science &  
Engineering*

Research



*Expanding  
Science &  
Engineering*

Profession



*Doing  
Science &  
Engineering*

**Silos are bad! We want interdisciplinary!**



**Act**



**Locally**



**Think**



**Globally**



**Peace Engineering!!!!**

# The Innovation Plaza is a common lab shared by *all disciplines, all levels of education, all courses*

## ECE

Computing

Control, robotics

Signal + systems

Circuits

Digital design

Electromagnetism



- Multidisciplinary
- Applications
- Synthesis
- Entrepreneurship



## Others

Structures

Process control

Math, stats

Nano-tech

Capstone/Entrepreneurship

Off-campus

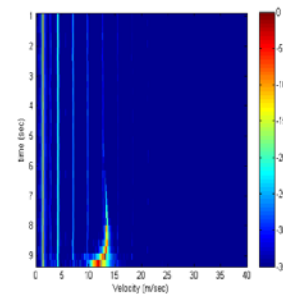
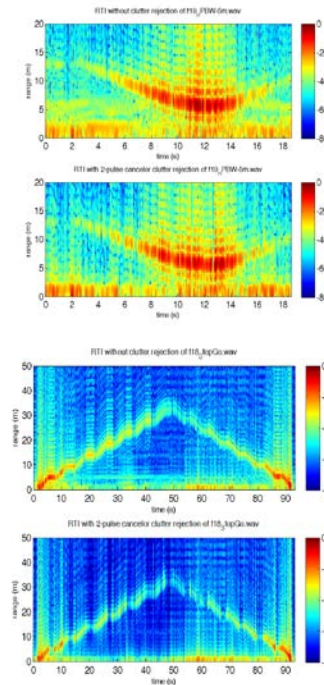
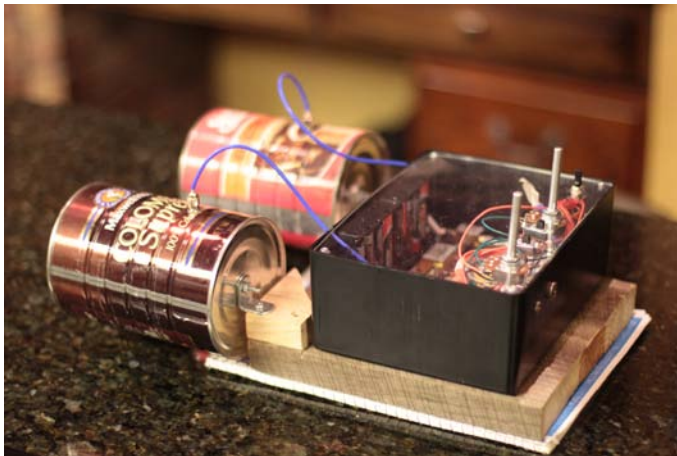


**From middle, high school to grad courses across geographical and diversity borders!**

# Creativity in Engineering

- Coffee Can Radar

- Low and high level programming (C, Java, LabView, VHDL); Circuits; Digital Systems; Signal and Systems, EM Theory; Antennas; Telecommunications

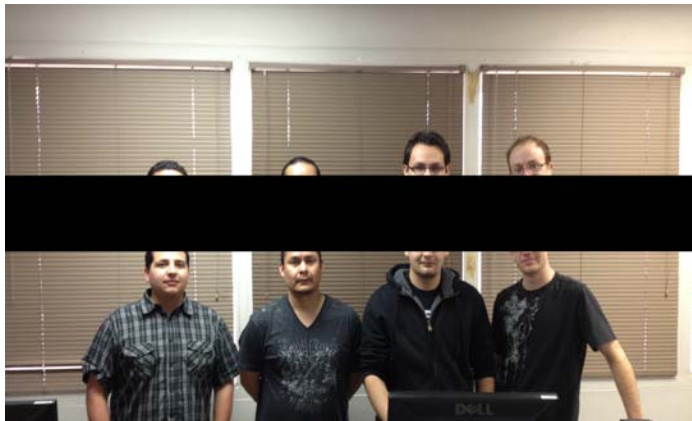
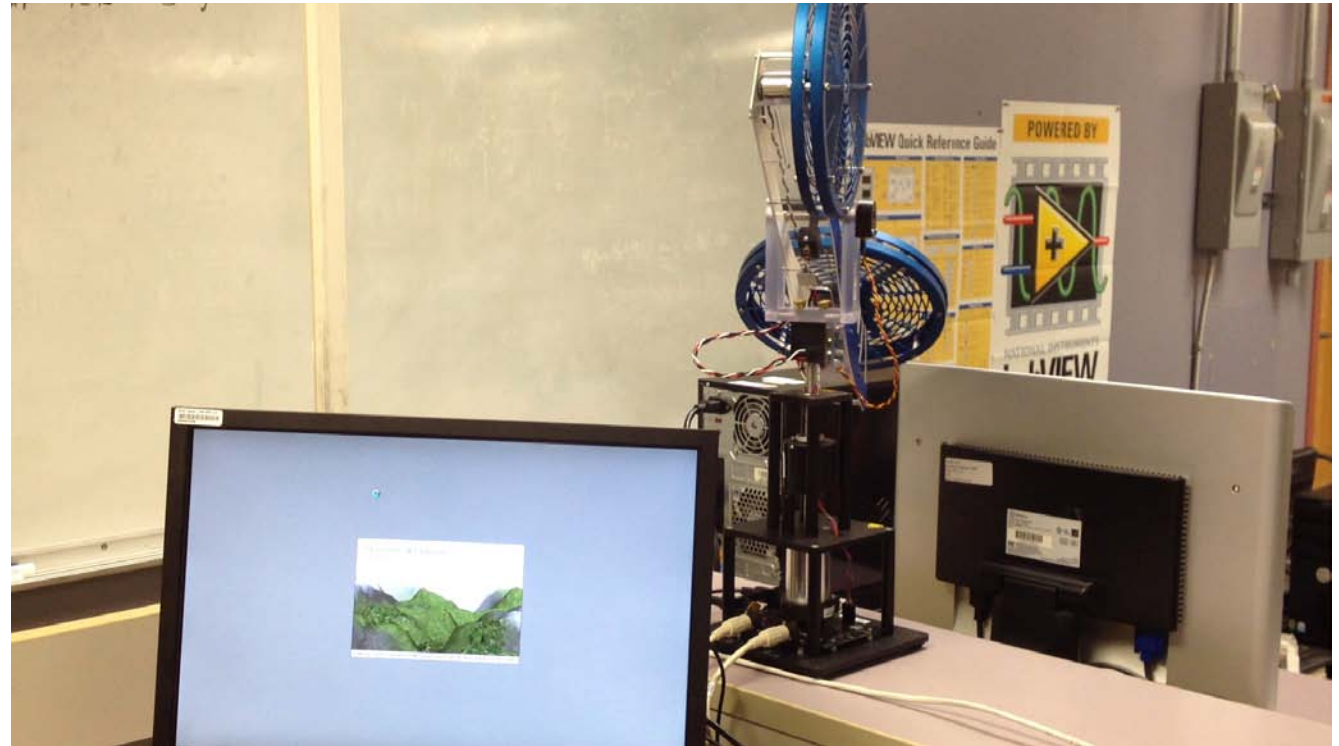


**Colombian or  
Brazilian?????**

# Senior Design Project – Quanser – NI

A local project  
turned into a  
global product!

Students, staff and  
faculty  
involvement!!!!



## Outreach and Recruitment



# Senior Design

## Entrepreneurship and Leadership

- Present undergraduate students with challenges that foster entrepreneurship and **transnational collaboration** while encompassing the values espoused by Peace Engineering.
- Students take an idea, which must be sustainable and exhibit social, cultural, and environmental responsibility, full circle from the laboratory to commercialization.
- These efforts embrace Peace Engineering and foster a new generation of conscientious, effective **global** leaders.

# Senior Design – Entrepreneurship and Leadership

- Apps development for people with learning disabilities (e.g. Autism )
- Awarded Second Place in High-Tech Business Plan Contest, UNM Anderson School of Management, Sponsored by Sandia National Laboratories
- Foster creativity and innovation



Why GINET?



# Vision

- The vision of GINET is to create a **Global Innovation Network of Entrepreneurial Programs** among Academia, Industry, Research & Development Centers, Governments, Investors/Mentors, Multilateral Organizations, and Individuals/Visionaries/Entrepreneurs (serial and first time).

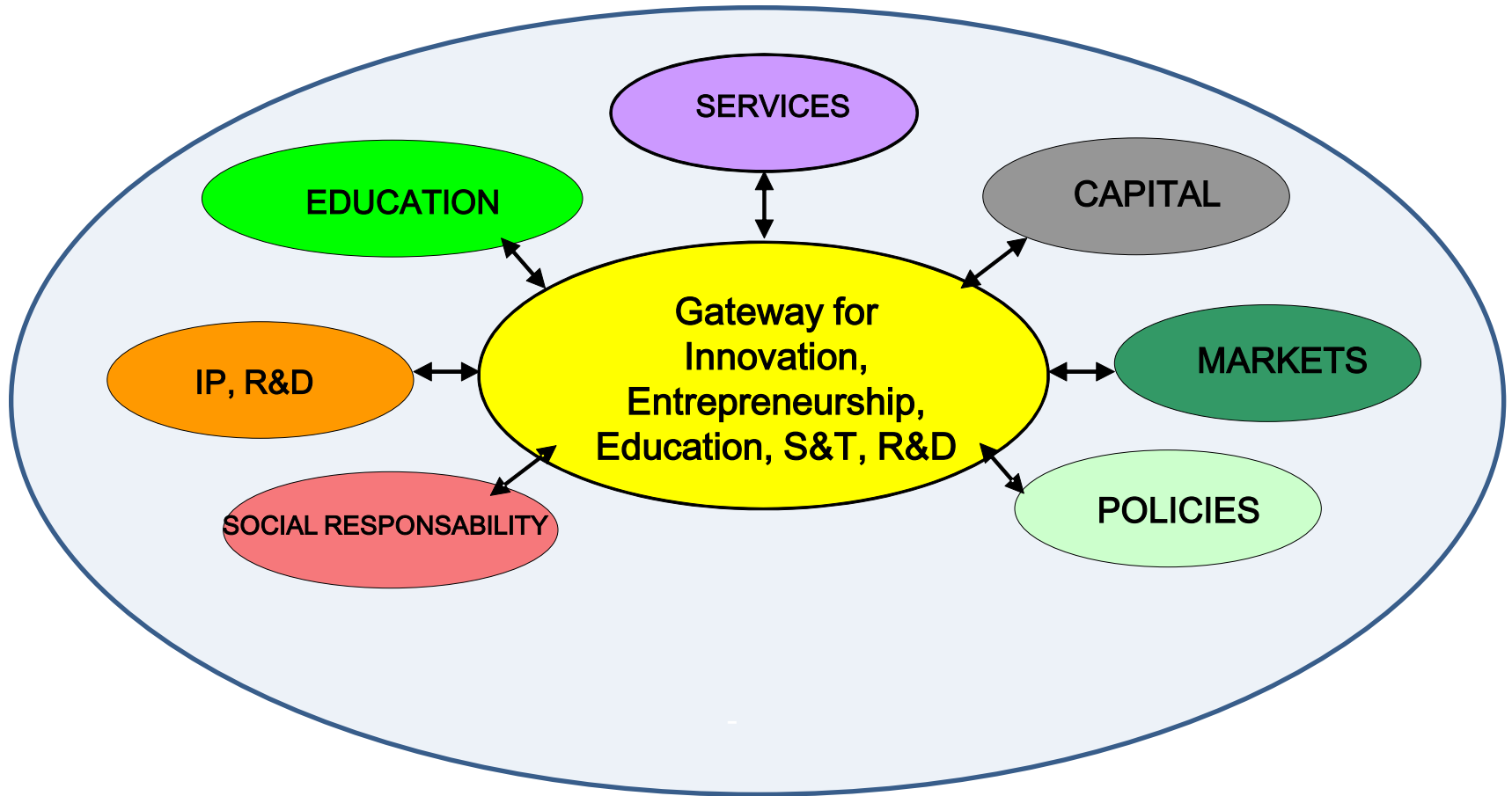




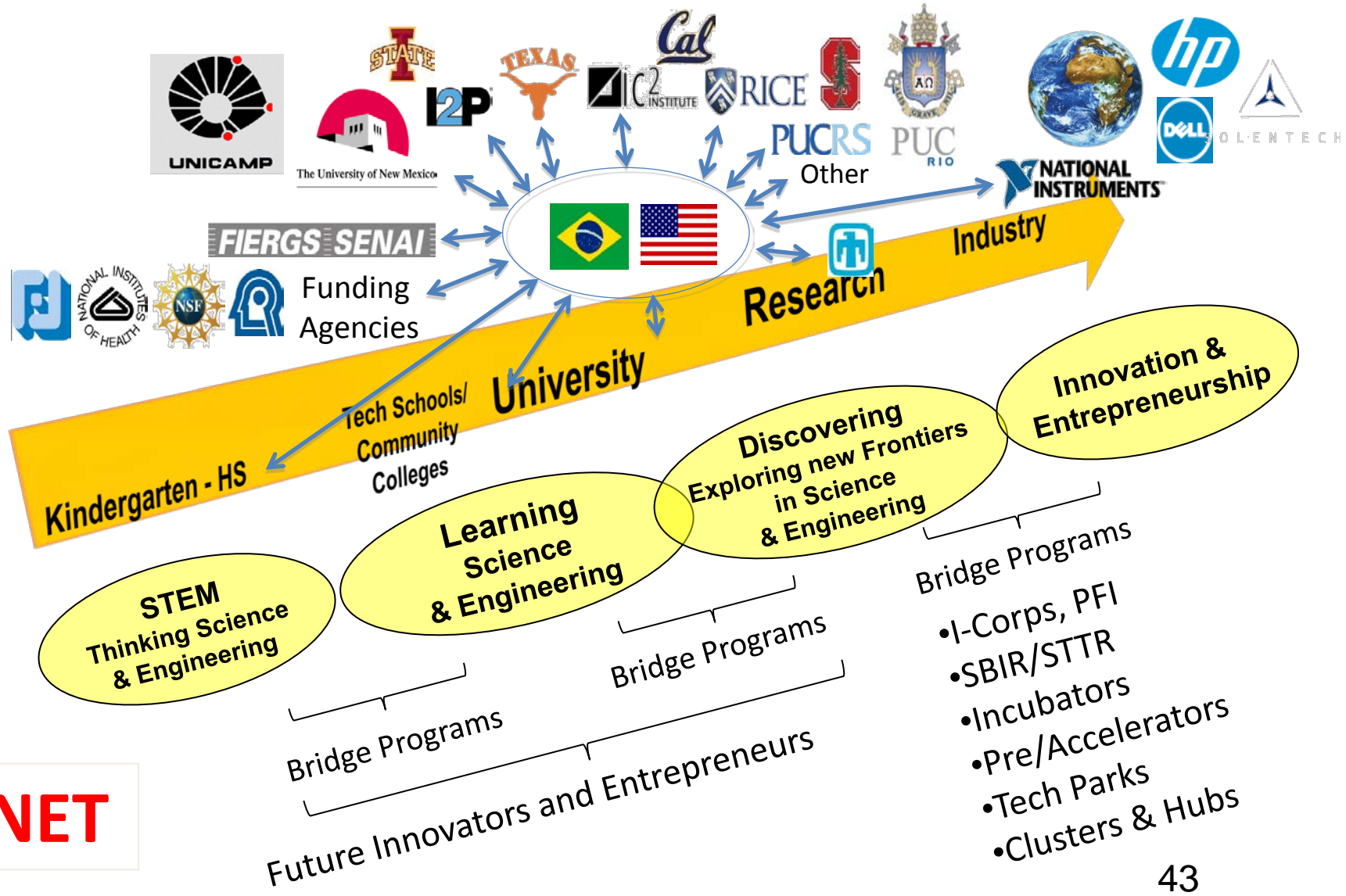
# Objectives

- **Building Capacity** and **Tech Transfer** through identification of innovative ideas and through strategic alliances with investors, industry and government agencies, which will bring these innovations to the marketplace.
- Foster global interaction among academic institutions to **accelerate R&D from the laboratory to the marketplace.**
- **Educate for, promote, and encourage** the generation of new products and services that can drive innovation and entrepreneurship.
- **Promote global entrepreneurship** through GINET events such as capacity building, business round tables, university-industry relations, investment activities, etc.
- **Facilitate international venture funding** through GINET to sponsor brilliant minds and projects.

# Contributing Areas



# Excellence in Education & Research, Innovation and World-class Entrepreneurship – a Continuum and Team Approach



**GINET**

# Summary-Conclusions





## Summary-Conclusions

In summary the SOE plan, aligned with UNM, is to foster **international economic-social development through education, innovation/creativity, policy, funding, and entrepreneurship (social and business)**. We want to be pro-active in establishing collaborative models that can be replicated globally.

**It's the human connectivity!!!!**





UNM

School of Engineering

**Looking for partners!!!**



**Go Green**



**Thank You  
Gracias  
Obrigado  
Merci**

**[www.ece.unm.edu](http://www.ece.unm.edu)**