

# Globalization of Research – University Perspective

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# University Mission – Basic Research

- *Basic research is systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and has the potential for broad, rather than specific, application.*

*Assessment of Department of Defense Basic Research  
National Research Council  
of the National Academies, 2005*

# MSE Research – Circa 1965

- U.S. Center of Mat'l Sci. & Eng. Research
  - Limited/slow international information transfer
    - Journal publication
    - Presentation
- Limited Number of U. S. Universities
  - Northeast, Midwest, West Coast
    - MIT, Case, CMU, Un. Cal.-Berkeley
- Funding Adequate
  - Stipends(\$5,000)
- Large Int. Student Source
  - Europe, Japan, India, China
- Career paths (Starting salary -\$15,000)
  - University
  - Government Laboratories
  - Industrial Laboratories
    - Bell Laboratories, U.S.Steel, Reynolds Aluminum

# MSE Research – Circa 1965

- Many/most Int. Students remained in US
  - Few career paths at “home”
- Career paths (Starting salary -\$15,000)
  - University
  - Government Laboratories
  - Industrial Laboratories
    - Bell Laboratories, U.S.Steel, Reynolds Aluminum

# MSE Research – Circa 2005

- Mission
  - Basic research (remains)
  - Applied research
  - Economic development (engine for economic growth)
- Character - International
  - Travel
  - Increase in “post-doc’s”
    - Primarily international
  - Rapid information transfer – Information technology
    - Wealth enhancement
    - Remote control of equipment

# MSE Research – Circa 2005

- Graduate Student Population
  - U. S. graduate student population stagnant
    - Alternative career opportunities (bigger \$)
    - UG indebtedness
    - US UG “tired” of school (inspiration)
  - Foreign graduate students remaining home
    - Visa issues – post 9/11
    - Increasing quality of “home” institutions
  - Mid-career Int’l Graduates returning home
  - Foreign students returning home
    - After graduation 50 pct returning home
    - Increasing opportunity
      - » Migration of manufacturing base
      - » U.S. sponsored laboratories

# MSE Research – Circa 2005

- US student career opportunities
  - Short term (Now generation - Societal)
  - UG indebtedness
  - Doubtful future (“never be manager”)
    - University
    - Government Laboratories
    - Industrial Laboratories(?)
    - Industrial (Not laboratory)
  - PhD: \$60K, B.S.: \$45K, MBA: \$75K

# MSE Research – Circa 2005

- Expanded Number of U. S. Universities
  - Northeast, Midwest, West Coast
    - MIT, Case, CMU, Un. Cal.-Berkeley
    - Un. Florida, UC-Santa Barbara, Georgia Tech
- Funding
  - Stipends(\$20,000)
  - More competition for decreasing basic research funding
    - Short term gain/long term pain

# US MSE Research – Circa ?

- What should/must/might be done to assure US access to the best MSE R(D)?
  - Increase career opportunities
  - Increase number of U.S. graduate students
  - Increase interaction with non-US institutions

# US MSE Research – Circa ?

- Potential action items
  - Career opportunities  
(Jobs/Salary/Advancement)
    - » ENHANCED U.S. R&D
    - » Research tax credits for US Industrial Laboratories
    - » Increased governmental (federal/state) basic(6.1) research budget
    - » Increase involvement of University in 6.2/6.3/7.8

# US MSE Research – Circa ?

## – Increase Number of U.S. Graduate Students

- Increase graduate salaries
  - Competitive with UG starting salaries
- Forgive UG loans
- Enhance the experience
  - Retention
  - Undergraduate research
    - » Team/interdisciplinary
      - MSE graduate students
      - BS – ME/Physics/Chem/Biology
    - » Co-op - Industrial experience + research
      - Continuity
      - Payment – work in laboratories
      - NOT service industries
    - » Foreign experience
      - INTREU

# International Research Experience for Undergraduate Students

- Pilot program (Summer 2005)
  - NAE/NSF/University
    - Foster long term co-operative research
    - Focus on incorporating unique technology not available in US
  - Clemson University
    - National Technical University – Donetsk, Ukraine
    - Team concept (Ukrainian + US [OSU, VPI, UC-Davis])
    - Faculty mentors
      - » Clemson(Rack) + Donetsk(Orlov)
    - High pressure deformation processing (twist extrusion)

# INTREU

- Future
  - Integrate into UG curricula(MSE, ME, CHE)
  - Expand to other technologies(ESR, Planar casting, Ultra-fine ceramics)
  - Seek industrial cooperative sponsorship

# Globalization of Research – University Perspective

- The future is what we make of it!!!
- Thank you