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