Academic Research and Education

Robert E. Barnhill
U. of Akron President’s Leadership Team
March 31, 2010
Orchestrating Leadership

“When you go before an orchestra, you need to have a clear idea in your mind - a sound image - of what you are trying to achieve…If your imagination is clear, then you will communicate with the orchestra even if your beat and technique are not first-rate…I learned that they generally played below the level they were capable of achieving, and that they were happier when I made them play at their highest level. A sense of accomplishment is the best gift that any conductor can bestow on an orchestra.”

~ Sir George Solti
Research & Education

• National
• University System of Ohio
  – Choose Ohio First! Scholarships Program
• University of Akron
  – Kansas University as an example
    ● Economic impact of university
    ● Research/training grants
    ● Collaborations
    ● Diversity
American Academic Research: History and Background

American academic research enterprise

– “Sustaining technology” mode (Innovator’s Dilemma,) until major external event such as WW II or Sputnik
– Then: “Disruptive technology” mode
  ● WW II itself: radar, bombs
  ● Post WWII: Vannevar Bush’s Science: The Endless Frontier
  ● Post Sputnik: NDEA fellowships, federal research support
  ● Vannevar Bush: health, wealth and defense
  ● Other Vannevar Bush priorities
    – Trained workforce
    – Commercialization
Sustainability of Each Type of University Support

• The current situation
  – Federal government and industry: variable, depends on subject and other factors
  – State: down
  – Endowments and foundations: down somewhat
Historical Perspective
R&D Balance Includes Setting Priorities
(obligations, in 1996 constant dollars)

Source: National Science Foundation
Federal Support of Research

• Great Recession Economy $\rightarrow$ less money for all discretionary federal spending, including research
• Not all dichotomies are false: R. vs. D.
• (At best) Incremental-thinking federal funding agencies
• Lack of new Members knowledgeable about STEM (Losses include: George Brown, Vern Ehlers, ...)

Dr. Robert E. Barnhill
U. of Akron March 31, 2010
Why Support Research?

- Leon Lederman, Director Emeritus, Fermilab and 1998 Nobel Laureate in Physics

  - “Support of basic research offers a double-whammy of a solid payback to the Treasury of between 30% and 60% per year (after a waiting period of 5 and 10 years), as well as an array of new knowledge and technologies that create wealth, add to human health and longevity, and help fulfill human potential.”

  - “The combination of education and research may be the most powerful capability the nation can nurture in times of stress and uncertainty.”
Why Support Research?

- Hart-Rudman Commission on National Security to 2025:
  - “warned” that our failure to invest in science and to reform math and science education was the second biggest threat to our national security---with only the threat of a weapon of mass destruction in an American city to be of greater danger.
  - unanimously concluded that the danger from under-investing in math and science and failing to reform U.S. math and science education was greater than the danger from any conceivable conventional war. This is important from K-12 schooling to under-graduate education, graduate and lifetime learning.
The Added Value of Science to Society
Sheila Tobias et al.

• “Human resources in science are a national treasure that add value to the world.”
• Beyond “new wealth” to “new sources of wealth”
• “...benefits to the economy in general that flow from technological innovation”
• Social rate of return (Jack Gibbons, Lester Thurow)
Workforce Issues

- International students
  - Post 9/11 situation now and in future
- Under-represented American citizen student groups
  - Very difficult problem, solvable only with skilled leadership and then substantial resources
  - Mentoring is essential (Greek: MENTOR)
  - Example: KU/Haskell collaboration
  - REB talk at NASULGC International Relations Conference, summer 2002 (see References)
Prologue

(Part of a Greek play preceding the entry of the chorus)

Athena: Greek goddess of wisdom, skill and contemplation

Mentor: Odysseus’ trusted counselor, under whose disguise Athena became the guardian and teacher of Telemachus
Scholarship Reconsidered
Ernest L. Boyer

• “Now is the time, we conclude, to build bridges across the disciplines, and connect the campus to the larger world.”

• “The conclusion is clear. We need scholars who not only skillfully explore the frontiers of knowledge, but also integrate ideas, connect thought to action, and inspire students.”
University System of Ohio

- Chancellor Eric Fingerhut
- Strategic Plan for Higher Education 2008-2017 Goals:
  - Graduate more students
  - Keep graduates in Ohio
  - Attract more talent to Ohio
  - An example: Choose Ohio First! Scholarship Program (COFSP)
Choose Ohio First Scholarship Program

- Choose Ohio First Scholarship Program Overview

  The primary objectives of the Choose Ohio First Scholarship Program (COFSP) are to support increased higher education participation and success of Ohio students majoring in STEMM and STEMM education fields and, in so doing, to advance the economic growth of each region of the state. By increasing the numbers of STEMM graduates, as well as the professional sophistication of Ohio's technical workforce, it is anticipated that new technology-based business opportunities will be created and new technology-based companies will be attracted to Ohio, each of which will have beneficial economic impacts for the regions of the state. This program advances these purposes by providing direct scholarship support to current and future higher education students who are pursuing STEMM and STEMM education degrees. The Choose Ohio First Scholarship Program is complementary to the other program included in the Ohio Innovation Partnership, the Ohio Research Scholars Program. Both programs develop human talent and statewide capacity for sustained innovation, technology advancement, and the commercialization of new technologies.
Choose Ohio First Scholarship Program

- Educate the future STEM workforce for Ohio. Portfolio approach emphasizing:
  - Key Ohio industries/govt. labs
  - Strengths of the universities
- Key National and Ohio ingredient: Innovation
Choose Ohio First Scholarships Program

- Ohio Innovation Partnership
- $100 million total over 2 years
- RFP
  - Current state of Ohio economy
  - National context as revealed in nat’l studies
  - Evaluation criteria included:
    - Specific connections between STEM fields & economy of at least one region of Ohio
    - Student internships, mentoring
Choose Ohio First Scholarships Program (cont.)

• Mid-course video conference between System and Universities
• Held 3 rounds with total of approx. $70 million in awards
University of Akron – COFSP Award

• Promoting STEM Undergraduate Engagement, Advancement, and Retention:

• Increasing the Knowledge and Capabilities of Ohio's Workforce (COFSP-08-13)
  – Amount received: $6,500,000
  – PI: Dr. Rex Ramsier, Associate Provost
Ohio STEM Education

• Governor Announces Host Universities and School Districts for Woodrow Wilson Teaching Fellowships

• Ohio is One of Three States to Participate in Program that Prepares Math and Science Teachers for Hard-to-Staff Schools

For Immediate Release | March 2, 2010
Ohio STEM Education Month

- Chancellor Fingerhut will provide opening remarks at the Akron Region STEM Education Conference, the second in a series of events promoting Ohio STEM Education Month as recognized by Governor Strickland, Wednesday, March 10, 2010.
Innovative thinking

- The Innovator’s Dilemma, Clayton Christensen

- “Disruptive technologies” → Disruptive thinking and action

  ● Application to research and to research leadership
Innovative Thinking

• *The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.*

  ~ Albert Einstein

• “*The human mind treats a new idea the same way the body treats a strange protein: it rejects it.*”

  ~ P.B. Medwar

• “*Hell, there are no rules here, we’re trying to accomplish something.*”

  ~ Thomas Edison
Institutional Leadership

“Institutional research competitiveness requires leadership at every level of the university.”

~AAAS Research Competitiveness meeting & book 1995
Michael Crow

• Variation, not replication, as key for universities.
• Universities as central to societal transformation through their graduates
• The New American University
  – Universal access
  – Embedded in the community
  – Flexible/agile
Luis Proenza

• How do we organize collectively?
  – What is our research/education portfolio?
    • (Cf. COFSP and Ohio’s high-tech portfolio.)
  – Strategic intent
    • “An ambitious and compelling...dream that energizes a company...that provides the emotional and intellectual energy for the journey...to the future.” Thus strategic intent conveys “a sense of direction...a sense of discovery...(and) a sense of destiny...It implies a significant stretch for the organization.”
University of Akron Strategic Plan

• Mission
  – NE Ohio’s unique history
  – Global economy
  – Collaborations
  – Innovation

• Vision
  – Model to lead industry to high-technology
  – Entrepreneurship
  – Access: inclusion and diversity
University of Akron Strategic Goals

- Curricula → entrepreneurial, high-tech
- Cross-disciplinary clusters of distinction
- Access broadened, completion to degree
- Collaboration and innovation
- Vibrant, healthy and diverse campus
  - Engages surrounding communities
  - Catalyzes economic growth
Example with Relevant Experiences

• Kansas University
  – Lawrence campus, Medical Center in KC
  – 30,000 students
  – Research I university
  – Member of AAU
  – Haskell Indian Nations University
  – Near Kansas City
    • Industrial city seeking biosciences
    • Major but secondary airport
State Support of Research

• State support of public universities is decreasing and will not proportionally increase after and if the economy improves.

• Universities should properly portray their contributions to state economic development.
  – Graduates are the best form of “tech transfer”
Kansas Jobs Created by KU Research

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Jobs Created</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>3,700</td>
</tr>
<tr>
<td>1993</td>
<td>4,200</td>
</tr>
<tr>
<td>1994</td>
<td>4,700</td>
</tr>
<tr>
<td>1995</td>
<td>5,000</td>
</tr>
<tr>
<td>1996</td>
<td>5,000</td>
</tr>
<tr>
<td>1997</td>
<td>5,400</td>
</tr>
<tr>
<td>1998</td>
<td>6,000</td>
</tr>
<tr>
<td>1999</td>
<td>6,700</td>
</tr>
<tr>
<td>2000</td>
<td>8,200</td>
</tr>
<tr>
<td>2001</td>
<td>9,500</td>
</tr>
<tr>
<td>2002</td>
<td>10,250</td>
</tr>
</tbody>
</table>
State Support: Steps to Take

- Targeted requests for major research facilities and personnel
  - Example: Kansas bond issue
- Economic development for
  - The state
  - The university community
University Support: Steps to Take

• Team-oriented, interdisciplinary research as the norm.
• How to organize?
  – Research centers, not departments
  – Research/education: a false dichotomy?
    • Implications for Academic Affairs/Research
    • The current tenure system
  – Example: KU Centers (next slides)
Designated Research Centers

- Schiefelbusch Institute for Life Span Studies
- Biodiversity Research Center
- Center for Research on Learning
- Higuchi Biosciences Center
- Hall Center for the Humanities
- Information and Telecomm. Technology Center
Designated Center Criteria

• Interdisciplinary research focus
• World class
  – Invited to all the right meetings
  – $5 million funding/year ($10 million as a near term target) or equivalent stature in field
  – Prestige (publications, presentations, etc.)
  – “You know you are in a center”
• Ties to academic units
• Education, especially graduate education
• Significant return on investment
Growth of Sponsored Project Research Expenditures in Centers at KU Lawrence Campus
Relative Growth in Federal S&E Research Expenditures
University of Kansas Compared to All U.S. Universities
KU Lawrence Campus Market Share
of Federally Financed Science & Engineering Research Expenditures at all Universities
FY 1993-2001

FY96-01: 44% Increase
Federally Financed Science & Engineering Research Expenditures at KU Lawrence

- 14.2% growth rate
- 5.7% growth rate
Key Elements for Collaborations

• Trust

• Winning
  – REB: “We have no failures, only pauses between successes.”

• Vision
  – Proverbs: “Without vision, the people perish.”
Collaborations (cont.)

- **Strategic planning**
  - Less amateurism, more professionalism

- **Strategic intent**
  - Competing for the Future, Hamel & Prahalad
  - “Only extraordinary goals provoke extraordinary efforts.”

- Crow 1998, Proenza 1999, REB responses to each, KU Merrill Center articles (see references)
Collaborations (cont.)

• **Tipping point** (Ian Gladwell)
  - A relatively few people can have a large impact.
  - Leadership at every level is needed for research competitiveness (AAAS, 1995).
  - “On Friday afternoons he would discuss only Great Thoughts and he would invite people to share a table, provided they were willing to think big.” (R. Hamming)

• **Collegiality**
  - “The music that can deepest reach, And cure all ills is cordial speech.” (Ralph Waldo Emerson)
American High-Tech Workforce, again

• Where will the next generation American high-tech workforce come from?
• Innovator’s Dilemma: find a group that is underserved under current conditions.
• Underrepresented minorities in STEM!
SACNAS

- Society for the Advancement of Chicanos & Native Americans in Science
- Founded 37 years ago by Marigold Linton and a few other American Indian & Hispanic scientists.
- Now: 22,000 members/affiliates across USA
- 2008 decision: add science policy and strategic planning to portfolio.
  - REB, Vice President, Science Policy & Strategic Initiatives
  - DC presence, “host institutions” for annual meetings, regional chapters et al.
Research university/tribal college collaboration

• Kansas University
  – 30,000 students
  – Research I university

• Haskell Indian Nations University
  – 900 students from 150 Indian Nations
  – Tribal college reporting to the BIA
KU/Haskell: Example of Best Practice Collaboration

• (A real) MOU between KU and Haskell
• Marigold Linton: $18 million from NIH & NSF to KU/Haskell to bring more American Indians into mathematics, science and engineering
  – AIHEC CEO praise
• KUCR administration of Haskell’s sponsored projects
  – Training program towards self sufficiency
REB Closing Thought

• Voltaire: “The best way to be boring is to leave nothing out.”
References: General


References: General (cont.)

- Michael Crow, Organizing to Respond to External Research Opportunities, KU Merrill Advanced Studies Center presentation (July 1998).
References: General (cont.)


References: General (cont.)


References: General (cont.)

• Luis Proenza, Clusters and Collaborations in the New Research Economy—Creating Strategic Intent among Universities, KU Merrill Advanced Studies Center presentation (July 1999).


References: General (cont.)


Barnhill References


- Redefining the International Agenda Post 9/11. NASULGC International Relations Council (July, 2002).
Barnhill References (cont.)

- Science at a Time of National Emergency, Merrill Advanced Studies Center presentation (June, 2002).

- NASULGC CRPGE Workshop for New VPRs and Summer Forum (June, 2002).

Barnhill References (cont.)