Accelerating Innovation in Virginia
The Role of Research Universities

William R. Knocke, Ph.D.
Associate Vice President for Research Programs
Virginia Tech

Thomas C. Skalak, Ph.D.
Vice President for Research
University of Virginia

State Council of Higher Education in Virginia
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Why does Innovation matter?

• Innovation penetrates all areas of endeavor

• **Artists** fill the blank canvas – through innovation
• **Poets** fill the blank page – through innovation
• **Research** creates growth – through innovation

• **Innovation-based economies** will provide for freedom, peace, and societal health

Singapore

Silicon Valley
Game-changing start-ups are out there. We just don’t know where to look.

*WIRED Magazine - Dec, 2009*

- Today’s giants have one thing in common: they tried to change the world!
- Google had an audacious goal: “to organize the world’s information”
- Are today’s states and universities moving fast enough to address public needs?
Why is true innovation so hard to recognize?

• A revolution makes life permanently different – people have trouble imagining change

• Innovation is invisible, until it bursts into view!
March 20, 2009 - 6 miles off of Tonga.
What are the past sources of growth?

- Nobel Laureate (1987) Robert Solow showed that over a 40 year period (1909-1949), almost \( \frac{2}{3} \) of growth in gross national product (GNP) was due to technological innovation.

- His point? Technological and related innovation is the predominant causative factor behind the bulk of U.S. economic growth.
What are today’s sources of innovation?

“R&D 100 Awards” as an indicator

25 years ago: 70% of awards from Fortune 500 companies

Today: 70% of awards from public organizations, universities

Universities are now a primary pipeline for innovation
R&D Philosophy: *Explore, Discover, Invent*

“Every child is an artist. The problem is how to remain an artist once one grows up.”

*Pablo Picasso*
Translating knowledge to society

Universities - Leading a state transformation

*Virginia will produce more jobs, exports, and health for Virginians via investments in research and innovation challenges.*

People -------- Patents ------- Products

- Improving childhood surgery
- Imaging the heart
- Treating brain cancer
- Producing sufficient and safe foods
- Providing affordable and reliable energy sources
- Insuring access to next generation information technology
The “Full Circle” of Innovation

Outcomes: Jobs, GDP increases, Health, Security

Post-market monitoring

Basic Discovery & understanding

Proof-of-concept funding

Product launch

Devices, materials, drugs, food, manufacturing, IT, energy

Virginia
State Models

Commonwealth Research Commercialization Fund:
- Established in 2000 by General Assembly.
  (as the Commonwealth Technology Research Fund)
- Investment areas have changed over time.
  The CRCF currently supports:
  1) SBIR Matching Funds Program
  2) Matching Funds Program
  3) Facilities Enhancement Loan Program
  4) Commercialization Program
  5) Eminent Researcher Recruitment Program

CRCF Funding:
- 2003: $8.5M
- 2004: $6.4M
- 2005: $0
- 2006: $0
- 2007: $5M
- 2008: $1M
- 2009: $1M
- 2010: $1M
- 2011: $6M

Virginia Tech CRC:
- 140 companies
- Employs 2,200 people
- 27 buildings
- 956,000 sq.ft. on 120 acres
- Phase II projections
  18 buildings
  870,00 sq. ft.
  3,000 employees
  ...over the next decade
State Models

Commonwealth Research Initiative:
- More than $200 million to state universities for the 2006-08 biennium.
- Supported:
  1) Growth of focused research groups
  2) New academic programs
  3) Start-up packages for faculty with targeted expertise
  4) Research equipment
  5) Graduate students
  6) Multi-university collaborations

ICTAS Nanoscale Characterization and Fabrication Laboratory
Established in 2007, the facility is equipped with more than $10 million in highly specialized equipment, more than half of which was made possible through funding provided by Commonwealth Research Initiative.

Fralin Life Science Institute
Virginia Bioinformatics Institute
Targeted CRI investments in Infectious Diseases (host-pathogen environment interactions) provided critical investments enabling significant growth in sponsored research for both institutes.
## State Investment in R&D

### TABLE 3. State agency expenditures for R&D and basic research, states ranked by all R&D expenditures: FY 2007 (Dollars)

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>All R&amp;D expenditures</th>
<th>Total R&amp;D expenditures</th>
<th>% all R&amp;D</th>
<th>Rank</th>
<th>State</th>
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<th>Total R&amp;D expenditures</th>
<th>% all R&amp;D</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>New York</td>
<td>123,351,067</td>
<td>27,400,226</td>
<td>21.3</td>
<td>27</td>
<td>Oklahoma</td>
<td>10,731,059</td>
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<td>2</td>
<td>Ohio</td>
<td>114,097,009</td>
<td>1,722,183</td>
<td>1.5</td>
<td>28</td>
<td>Minnesota</td>
<td>10,523,048</td>
<td>1,765,369</td>
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<td>3</td>
<td>Pennsylvania</td>
<td>100,973,448</td>
<td>63,114,546</td>
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<td>North Dakota</td>
<td>9,968,722</td>
<td>4,397,874</td>
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<td>4</td>
<td>Florida</td>
<td>96,986,573</td>
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<td>Alaska</td>
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<td>5</td>
<td>California</td>
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<td>Montana</td>
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<td>Arkansas</td>
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<td>Alabama</td>
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<td>Maryland</td>
<td>40,296,081</td>
<td>6,295,957</td>
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<td>35</td>
<td>Iowa</td>
<td>6,790,053</td>
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<td>10</td>
<td>North Carolina</td>
<td>37,307,109</td>
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<td>Louisiana</td>
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<td>Michigan</td>
<td>32,845,199</td>
<td>2,540,000</td>
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<td>37</td>
<td>Massachusetts</td>
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<tr>
<td>12</td>
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<td>South Dakota</td>
<td>5,473,653</td>
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<td>13</td>
<td>Texas</td>
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<td>1,398,035</td>
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<td>Georgia</td>
<td>4,886,948</td>
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<tr>
<td>14</td>
<td>Connecticut</td>
<td>20,285,710</td>
<td>12,857,444</td>
<td>43.2</td>
<td>40</td>
<td>Tennessee</td>
<td>4,549,928</td>
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<tr>
<td>15</td>
<td>Maine</td>
<td>27,525,562</td>
<td>85,000</td>
<td>0.3</td>
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<td>Nebraska</td>
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<td>16</td>
<td>Washington</td>
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<td>21.7</td>
<td>42</td>
<td>Mississippi</td>
<td>2,883,892</td>
<td>275,000</td>
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<tr>
<td>17</td>
<td>Hawaii</td>
<td>22,643,560</td>
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<td>43</td>
<td>Utah</td>
<td>2,752,228</td>
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<tr>
<td>18</td>
<td>West Virginia</td>
<td>22,178,890</td>
<td>17,512,415</td>
<td>79.0</td>
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<td>Idaho</td>
<td>2,739,915</td>
<td>1,103,973</td>
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<td>19</td>
<td>Arizona</td>
<td>20,446,955</td>
<td>11,988,318</td>
<td>54.2</td>
<td>45</td>
<td>Delaware</td>
<td>2,611,108</td>
<td>154,100</td>
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<td>20</td>
<td>Wyoming</td>
<td>19,500,357</td>
<td>4,703,069</td>
<td>24.6</td>
<td>46</td>
<td>Puerto Rico</td>
<td>2,336,241</td>
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<td>21</td>
<td>Missouri</td>
<td>15,877,277</td>
<td>119,940</td>
<td>0.8</td>
<td>47</td>
<td>District of Columbia</td>
<td>2,000,000</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>22</td>
<td>Virginia</td>
<td>15,406,506</td>
<td>2,099,708</td>
<td>13.6</td>
<td>48</td>
<td>Rhode Island</td>
<td>1,771,949</td>
<td>1,342,685</td>
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<tr>
<td>23</td>
<td>Wisconsin</td>
<td>12,636,572</td>
<td>100,500</td>
<td>0.8</td>
<td>49</td>
<td>Nevada</td>
<td>1,748,776</td>
<td>180,989</td>
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<td>24</td>
<td>Kentucky</td>
<td>11,990,624</td>
<td>790,900</td>
<td>6.5</td>
<td>50</td>
<td>New Hampshire</td>
<td>1,663,178</td>
<td>160,470</td>
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<td>25</td>
<td>Colorado</td>
<td>11,924,581</td>
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<td>51</td>
<td>Vermont</td>
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<tr>
<td>26</td>
<td>Kansas</td>
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<td>1,163,475</td>
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<td>52</td>
<td>New Mexico</td>
<td>1,072,321</td>
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</tr>
</tbody>
</table>

**NOTE:** State R&D expenditures survey includes Puerto Rico and District of Columbia.

**SOURCE:** National Science Foundation/Division of Science Resources Statistics, Survey of FY 2007 State R&D Expenditures.

### Ten States Account for More than 60% of State Agencies' FY 2007 R&D Expenditures
# A National Perspective

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Year</th>
<th>State VA</th>
<th>US Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial Research and Development Inputs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Agency R&amp;D Expenditures per $1 Million of Gross Domestic Product</td>
<td>2007</td>
<td>40</td>
<td>89</td>
</tr>
<tr>
<td>State Agency R&amp;D Expenditures per Civilian Worker</td>
<td>2007</td>
<td>3.94</td>
<td>8.42</td>
</tr>
<tr>
<td>State Agency R&amp;D Expenditures per Individual in S&amp;E Occupation</td>
<td>2007</td>
<td>61</td>
<td>219</td>
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<tr>
<td><strong>Science and Technology in the Economy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Annual Federal SBIR Funding per $1 Million of Gross Domestic Product</td>
<td>2006-08</td>
<td>252</td>
<td>127</td>
</tr>
<tr>
<td>Venture Capital Disbursed per $1,000 of Gross Domestic Product</td>
<td>2008</td>
<td>1.22</td>
<td>2</td>
</tr>
</tbody>
</table>

Do state investments in university innovation pay off?

- **Major initiatives produced by such processes:**
  
  AstraZeneca partnership ($4M) – top 10 drug company (UVa)
  Private foundation seed funds (UVa) ($4 M/year)
  Rolls-Royce education/research (VA Tech & UVa)
  Micron and NRI consortium for nanoelectronics

- **State can leverage outstanding existing research base**
  Invest in regional proof of concept funds (UVa)
  Coulter program produced independently-audited 7-1 ROI
  Attract top talent to universities
  Invest in innovation programs with impact
Trends Worth Noting

• **Linking** FDA, federal agencies, universities, co’s– for **globally-competitive innovation**

• **Companies Partnering with universities** for early pipeline ideas – new VA partnerships

• Federal and state governments committing to fund “**PROOF-OF-CONCEPT**” research - bills in U.S. Senate and Congress today cite UVa Coulter model outcomes

• **Venture Capital** seeking projects groomed by these new partnerships – **form VC relations!**
  (UVa – hosts annual UVa Venture Summit with $15B/year)
WEAVEonline®
Assessment Management System

• A web-based program developed by VCU staff for VCU’s accreditation in 2004

• Incubated at VCU for 1 year – 20 subscribers

• Centrieva Corporation – a new VCU start-up company in the Greater Richmond Region

• 10 employees and more than 180 subscribers - universities and colleges in the US, Europe, the Caribbean, and the Middle East
What new things could the state do to spark innovation and growth?

• **Invest in** proof-of-concept funds at each research university (proven 7-1 ROI)
• **Enhance the** Equipment Trust Fund with a new allocation for moving research to market applications
• **Enhance** support for graduate students at research universities – they are the next generation of innovators
• **Recognize that** universities are the innovation engines for the economy
Solving Grand Challenges through Collaboration

Example: National Energy Technology Laboratory Regional University Alliance (NETL-RUA)
Economic Assets: Intellectual Capital

Many consider transfer of a university’s intellectual property to be its major contribution to economic development.

But...

...a more accurate statement would be that a university’s intellectual capital is its true economic impact.

Ref: Timothy Mulcahy, Vice President for Research, University of Minnesota