Current Trends and Challenges in University Commercialization

Clustering for 21st Century Prosperity

National Academies of Science
Association of University Research Parks

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President Elect, AUTM
Executive Director, Technology Transfer
Boston University

February 25, 2010
Washington, DC
Universities and Clusters
The very phrase rattles the teeth. It implies bureaucracy. It suggests government will pick winners and losers. Done badly, it would certainly hurt America. But with the cold war over and a global economy taking shape, America needs to shore up its competitiveness.

How? Certainly, by investing in education and infrastructure. But that’s not enough. We must recharge the “knowledge base”—the basic science and technology that are the foundation of an advanced industrial society. Perhaps we should call it a growth policy.
October 19, 1992

BusinessWeek -- HotSpots

HOT SPOTS

Greetings from

Silicon Prairie

Medical Alley

Optics Valley

AMERICA'S NEW GROWTH REGIONS

Page 90
HOT SPOTS
AMERICA'S NEW GROWTH REGIONS ARE BLOSSOMING DESPITE THE SLUMP

BOOMTOWN BOISE
Major Industries: Semiconductor, aerospace, laser printers
25 companies, 14,300 jobs
Startups: Mentor Graphics, Extended Systems

MEDICAL ALLEY
Major Industries: Medical instruments, health care
500 companies, 40,000 jobs
Startups: All Medical, Pharmacia

BIOMED MOUNTAINS
Major Industries: Medical devices, artificial organs
73 companies, 8,000 jobs
Startups: Boston Scientific, Vascular Access, Vern Medical

SOFTWARE VALLEY
Major Industries: Software
175 companies, 13,000 jobs
Startups: WordPerfect, Novell

CERAMICS CORRIDOR
Major Industries: Ceramics, electronics packaging
110 companies, 31,000 jobs
Startups: Hiltech Ceramics, Xylan Materials

PRINCETON CORRIDOR
Major Industries: Biotech, telecommunications
400 companies, 122,000 jobs
Startups: Cytogen, Liposome

MEDICAL MILE
Major Industries: Biotech, medical products
300 companies, 100,000 jobs
Startups: Biocatalyst, Cyphatech

SILICON PRAIRIE
Major Industry: Software
63 companies, 5,500 jobs
Startups: Wulf Research, Kiek & Associates

SILICON STRIP
Major Industry: Software, medical technology
500 companies, 15,000 jobs
Startups: MicroPoint, Integrated Health

WASHINGTON WEST
Major Industry: Systems integration
1,100 companies, 40,000 jobs
Startups: Legato, Landmark Systems

TELECOM CORRIDOR
Major Industries: Telecommunications systems and components, software
500 companies, 20,000 jobs
Startups: Intercon, Integrall

OPTICS VALLEY
Major Industry: Lasers, electronics
30 companies, 1,000 jobs
Startups: Wyko, Photonics

LASER LANE
Major Industry: Lasers, electronics
35 companies, 5,000 jobs
Startups: Solartron Electro-Optics, Laser Photonics

SILICON HILLS
Major Industry: Computer manufacturing, chips
456 companies, 55,000 jobs
Startups: Dell Computer, Compaq

GOLDEN TRIANGLE
Major Industry: Biotechnology, communications
103 companies, 1,000 jobs
Startups: Hybritech, Qualcomm

SALT LAKE CITY
Major Industries: Medical devices, biotechnology
75 companies, 8,000 jobs
Startups: Zogenix, Children's Medical Center

RICHARDSON
Major Industry: Computer manufacturing, chips
456 companies, 55,000 jobs
Startups: Dell Computer, Compaq

CERAMICS CORRIDOR
Major Industries: Ceramics, electronics packaging
110 companies, 31,000 jobs
Startups: Hiltech Ceramics, Xylan Materials

WILLISTON
Major Industry: Aerospace
19 companies, 1,000 jobs
Startups: Aerojet General, Northrop

MONTREAL
Major Industry: Biotechnology
30 companies, 5,000 jobs
Startups: Novartis, Genetix

5
Ingredients of a High Tech Cluster

- A major research university
- Quality of life
- Build on local industry
- Cooperation between local university, business and gov’t.
- Technology transfer from the university
- Funding sources -- state, VC, angels
- Incubators

Phases of Economic Development
- Start-ups
- New division of major US company
- Foreign companies move in
- Export led growth
The Pharmaceutical Industry in Massachusetts
Pharmaceuticals in Massachusetts

- In 1975, one pharmaceutical company in Massachusetts
  - US HQ of Astra AB
- Two events:
  - Spin-outs from Harvard, MIT, BU
  - Massachusetts Biotechnology Research Park
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Invention Disclosures Received

Source: AUTM 2008 Licensing Activity Survey unless otherwise noted
US Technology Transfer Employment

- Total
- Professional FTE's
- Support FTE's


Total FTEs: 0, 500, 750, 1,000, 1,500, 2,000, 2,500

Professional FTEs: 0, 500, 750, 1,000, 1,500, 2,000, 2,500

Support FTEs: 0, 500, 750, 1,000, 1,500, 2,000, 2,500
People or Patents
-- Ratio of Patent Budget to Operating Budget

Average: 0.91:1

Source: Abrams, Leung & Stevens, 2010
Technology Transfer Budget as % of Research Budget

Overall – 0.59%

Source: Abrams, Leung & Stevens, 2010
### 2008 Licensing Activity Survey

<table>
<thead>
<tr>
<th>Invention Disclosures</th>
<th>20,115</th>
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<tbody>
<tr>
<td>New US Patent Applications filed</td>
<td>12,072</td>
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<tr>
<td>Licenses Signed</td>
<td>5,132</td>
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<tr>
<td>US Patents Issued</td>
<td>3,280</td>
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<tr>
<td>Start-Ups formed</td>
<td>595</td>
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<tr>
<td>Active Licenses</td>
<td>20,115</td>
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Why Is This So Hard?

- Academic inventions are embryonic
- Average success rate (2008) 25.6%
- Median success rate (2008)
  - All institutions 21.7%
  - More than $200 million research 22.9%
  - Over 100 disclosures 19.7%
  - MIT (2004-2008) 22.2%
  - Stanford (2004-2008) 23.0%
  - WARF (2004-2008) 34.0%
Why Is This So Hard?

- Should we be more selective?
  - Research Corporation Technologies accepted 228 inventions from 1991-2008
    - ~13/year
    - 29% licensing success rate
Why Is This So Hard?

- Should we invest more to make them less embryonic?
- Translational Research
  - von Liebig (UCSD) and Deshpande (MIT) Centers
  - Philanthropically funded
    - Von Liebig $10 million
    - Deshpande $20 million
  - Founded 2001 and 2002
<table>
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<tr>
<th>Category</th>
<th>Von Liebig</th>
<th>Deshpande</th>
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<tbody>
<tr>
<td>Annual Investment</td>
<td>$1.2 mm</td>
<td>$1.7 mm</td>
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<tr>
<td>Projects Funded</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>Licenses</td>
<td>4 6%</td>
<td>1 2%</td>
</tr>
<tr>
<td>Start-Ups</td>
<td>16 24%</td>
<td>1016%</td>
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<tr>
<td>Capital Raised</td>
<td>$71 mm</td>
<td>$88.7 mm</td>
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Source: Kauffman Foundation, 2008
## Financial Performance

<table>
<thead>
<tr>
<th>Financial Contribution</th>
<th>Number</th>
<th>%</th>
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<tr>
<td>Loss making</td>
<td>68</td>
<td>52.3%</td>
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<tr>
<td>Gross profitable</td>
<td>27</td>
<td>20.8%</td>
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<tr>
<td>Net profitable</td>
<td>14</td>
<td>10.8%</td>
</tr>
<tr>
<td>Self sustaining</td>
<td>21</td>
<td>16.2%</td>
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<tr>
<td>Total</td>
<td>130</td>
<td></td>
</tr>
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</table>

Source: Abrams, Leung & Stevens, 2010
Why Such a Difficult Business Model?

- Income is distributed very unevenly
  - A business of a few “big hits”
  - 153 drugs, vaccines, biologics and *in vivo* diagnostics* approved by FDA
    - 1985 - 2009
  - Northwestern monetized its Lyrica royalties December 2007
    - 50% interest
    - $700 million
  - Only 198 licenses generated over $1 million in income in 2008
    - Out of 15,498 generating some sort of income
    - 1.3%

* Source: Stevens, Jensen, Wyller, Chatterjee, London and Rohrbaugh, forthcoming
Was Bayh-Dole an Unfunded Mandate?

• Supplied no new funding
• Intended to be funded through IDC
  – Then we got the 26% administrative cap!
  – Much longer timeline to sustainability from income than expected
    • And patents expire!
One Man’s Proposal

• Entrepreneurial Postdoctoral Fellowships
  – For graduating Ph.D. students or current postdocs
    • Commercialize the science they’re working on
  – Statewide selection
    • Competitive peer review
  – Two years support
    • Proof-of-concept scientific experiments
    • Business plan development
  – Business school for entrepreneurial education
  – Mentorship program