Leading Innovation and the Knowledge Economy

The role of the research institution in driving innovation and the knowledge-based economy:

- Economic development increasing with knowledge
- Innovation
- Universities bring research and education together
Research institutions are agents of change

Spur economic development

Strong research institutions attract resources and talent, new business and jobs
Universities Spur High-Technology Innovations

- Exploitation of knowledge through innovation is key to sustainable economic growth.
  - U.S. universities have introduced 3,114 new products, 3,680 patents issued for inventions and 16,871 patent disclosures since 1998.
  - U.S. universities received $1.2B in royalties from 4,800 licenses in FY2000.
  - U.S. universities have spun-off 462 companies, 75% located in home state. In 2002, universities took equity in 56% of those deals.

(Data from the Association of University Technology Managers, 2004)
The Role of the U.S. Federal Government

- Finances 33% of the nation’s research enterprise.

- Provides major support to universities through support of research and higher education. Primary and secondary education expenses are local.

- Encourages spin-off of government research to the private sector and public-private partnerships.
The 50 U.S. states compete with each other for income and jobs.

- Promote innovation to replace “rust belt” industries
- Responsible for education at all levels

States encourage their public universities to actively promote innovation.

- Through promoting university-industry research
- Creating incubators
- Attracting high tech firms with land grants, tax abatement, etc.
- Convening community leaders in research, business and local government
The Role of the University of California

ECONOMIC GROWTH

WEALTH AND JOBS

Private Non-Profit

United States Federal Government

Industry

Venture Capital

Intellectual Property and Workforce

State of California

UC San Diego

ECONOMIC GROWTH

WEALTH AND JOBS
University of California Campuses

- Berkeley
- Davis
- Irvine
- Los Angeles
- Merced
- Riverside
- San Diego
- San Francisco
- Santa Barbara
- Santa Cruz
UC San Diego is actively engaged with 416 R&D companies in California.

- UC Discovery Grants
- Other Sponsored Projects
- Participation in major UC centers
- Technology licensing
- Scientific advising by Faculty
- Faculty/alumni start-ups

- Each campus is represented by a different color.

- An R&D company is represented by a red disk and disks are stacked in specific cities.

- Each line represents an active research relationship between an R&D company and a campus.
San Diego Is a Cluster of Innovation

• San Diego, nicknamed “Wireless Mecca,” has been ranked by the Milken Institute as one of the nation’s most productive and diverse areas in the biotech field.

• A 2001 U.S. Council on Competitiveness study identified San Diego as a “cluster of innovation” that has benefited from a “culture of collaboration.” UCSD and UCSD CONNECT were singled out as prime movers behind the region’s economic growth and technological dominance.
Our Role in Regional Economic Development

- UCSD is San Diego County’s third largest employer.

- UC San Diego has spun off at least 200 companies, including a third of San Diego’s biotech companies.

- Between 1995 and 2005, UC San Diego generated:
  - 466 active U.S. patents
  - 435 active license agreements
  - 89 start-ups using UCSD technology
Our Role in Regional Economic Development

- UC San Diego is a magnet for state and federal funding.
  - The university’s annual research funding is $714 million.

- The National Science Foundation ranks UCSD 7th in the nation in federal R&D expenditures.

- Among U.S. medical schools, UCSD School of Medicine ranks 2nd in the nation in federal research funding per faculty member.
San Diego’s Economic Transformation

• In less than 20 years, San Diego transformed its economy from one highly dependent upon military, defense/aerospace and tourism to one that is knowledge-based.
  – Replaced 100,000 jobs lost in defense with 120,000 in new companies
  – 30,000+ employment in biotech; 25,000+ in information technology
  – $1.3 billion research base (more than doubled)
  – $1.2 billion venture capital (increase of 8-10 fold)
  – Dozens of global companies establishing facilities in San Diego
  – 14 million square feet occupied by biotechnology research facilities compared to 11 million in shopping malls
## Employment in San Diego

<table>
<thead>
<tr>
<th>Industry Cluster</th>
<th>1990</th>
<th>2000</th>
<th>2002*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotechnology/Biomedical</td>
<td>18,785</td>
<td>29,312</td>
<td>30,527</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>13,376</td>
<td>24,878</td>
<td>21,162</td>
</tr>
<tr>
<td>Electronics</td>
<td>21,583</td>
<td>24,169</td>
<td>18,843</td>
</tr>
<tr>
<td>Software</td>
<td>8,870</td>
<td>21,290</td>
<td>24,755</td>
</tr>
<tr>
<td>Defense Manufacturing</td>
<td>45,023</td>
<td>18,149</td>
<td>18,066</td>
</tr>
<tr>
<td>Others</td>
<td>239,070</td>
<td>309,815</td>
<td>306,347</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>346,707</td>
<td>427,613</td>
<td>419,700</td>
</tr>
</tbody>
</table>
The Keys to Success

Key Conditions for Developing a Technology Cluster:

- Research
- Talent
- Money

The key element in San Diego:

COLLABORATION
Torrey Mesa Research Institutes

- The Scripps Research Institute
- Burnham Institute
- Salk Institute
- Sidney Kimmel
- Neurosciences Institute
- La Jolla Institute of Allergies and Immunology
- Scripps Institute of Oceanography
- UCSD
- San Diego State University
First Biotech Company (1976)

San Diego Biotech, Biomedical and Pharma Companies (2006)
First Wireless Company

Wireless Companies (2006)
San Diego’s High Technology History

Series of Catalytic Events

1955 - General Atomics
1956 - Scripps Clinic & Research Center
1960 - UCSD Founded
1963 - Salk Institute
1968 - Linkabit
1978 – Hybritech
1985 – UCSD CONNECT and Qualcomm Founded
1990-93 – 63,000 Jobs Lost
1995 – New Boom

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VC Funding
Technology Convergence

San Diego Technology Convergence

- Bioscience Companies
- Telecom Companies
- Electronics Companies
- Information Tech. Companies
- Defense & Securities Companies
- Energy & Environ. Companies
Summary of San Diego’s Achievements:

- Growth in basic research institutions
- Regional ability to attract research and development, and risk capital
- Two new robust industry clusters over three decades
- Workforce training infrastructure via UCSD Extension (keeping pace with changing industry demands)
- Strong linkages between universities, research institutions and start-up companies, fostered through UCSD CONNECT
Universities benefit the economy in other ways besides research and S&E education:

- Knowledge and its exploitation through innovation are key to economic growth
- A growing local population of educated people who welcome and foster change
- Technical skills outside S&E: economics, law, management, arts, education, public policy
- Codified knowledge and information tools to access and transfer it
- Ethical values, creative culture
How Do Universities Benefit the Economy Besides Research and S&E Education?

- Science & Technology Commercialization:
  - Sustain and grow existing markets
  - Create new markets
  - Reinvent corporations
  - Create new companies and industries
  - Creates wealth
  - Fuels economic development

Additional University Benefits
Extending International Relationships

- All world-class universities are embracing globalization.
- Other nations are investing in creation of research universities as an economic development strategy.
- Universities offer increasingly robust exchange, collaboration and competition with international partners.
- San Diego shares the world’s busiest international border.
- UC San Diego has a unique geographical position near Latin America and on the Pacific Rim.
Extending International Relationships

How research universities in the U.S. and Asia can work with industry and government to optimally commercialize Science & Technology:

- The research landscape has become increasingly competitive on a global scale. Research carried out in American universities competes with, and also complements, work done in Asia and other global regions.
- Inter-institutional exchange of people. The best forms of knowledge transfer involve human interaction.
- Successful development of high-tech clusters with established, high-growth, young firms will still be only a small part of the economy.
Extending International Relationships

- Creating international companies that can lead major market segments requires a dynamic economic, social and political environment.
- Innovation cluster growth reflects a new paradigm for economic development in globally traded sectors.
- Universities in any country can decide to exchange personnel anywhere in the world or reach out across borders using the Internet or satellite communication links, effectively collaborating with other universities in other countries in research and education.
- Jointly invented intellectual property can be the basis for commercialization in either partner country.
The Research University: Leading Innovation and the Knowledge Economy

Thank You.