

Regional Strategies for Building High Tech Clusters:

*The Role of Innovation Capacity in
Regional Economic Development*

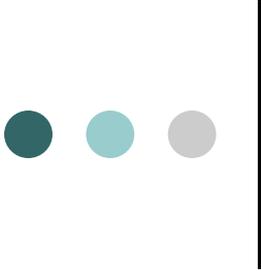
Carolyn Lee

Director of Research
Global CONNECT

Nebraska Innovation Forum, March 30, 2006

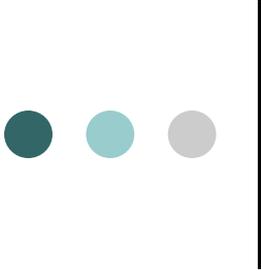
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Why Regional Innovation Capacity Matters

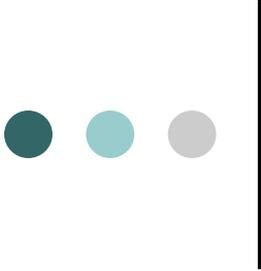
- In a knowledge-driven economy, new job and wealth creation derive from the accelerated commercialization of innovative, world-class technological breakthroughs
- A region's accumulated research and innovation assets is *the* “seed corn” that enables the growth of entrepreneurial science-based enterprises in that region
- Every region's research assets (“seed corn”) differs (***Are you growing “soybeans” or “wheat”?***)
- “Seed Corn” that is tossed on infertile growing conditions will not generate a rich harvest of jobs or wealth.



Mapping The Characteristics of Innovative Regions

- **World class research institutions** as sources of intellectual capital
- **Appropriate business assistance programs** to accelerate technology commercialization
- **Seasoned senior managers with entrepreneurial “know-how”** that can work in tandem with scientists and engineers on teams to jump-start enterprise creation
- **Sources of “intelligent” startup capital** beyond what “sweat equity/boot-strapping” and “family and friends” capital can provide
- **Active entrepreneurial networks** that can support all the players involved in enterprise creation activities
- **Institutions of higher learning** that can train and quickly upgrade the skills of a world-class workforce for the region’s growing high tech companies

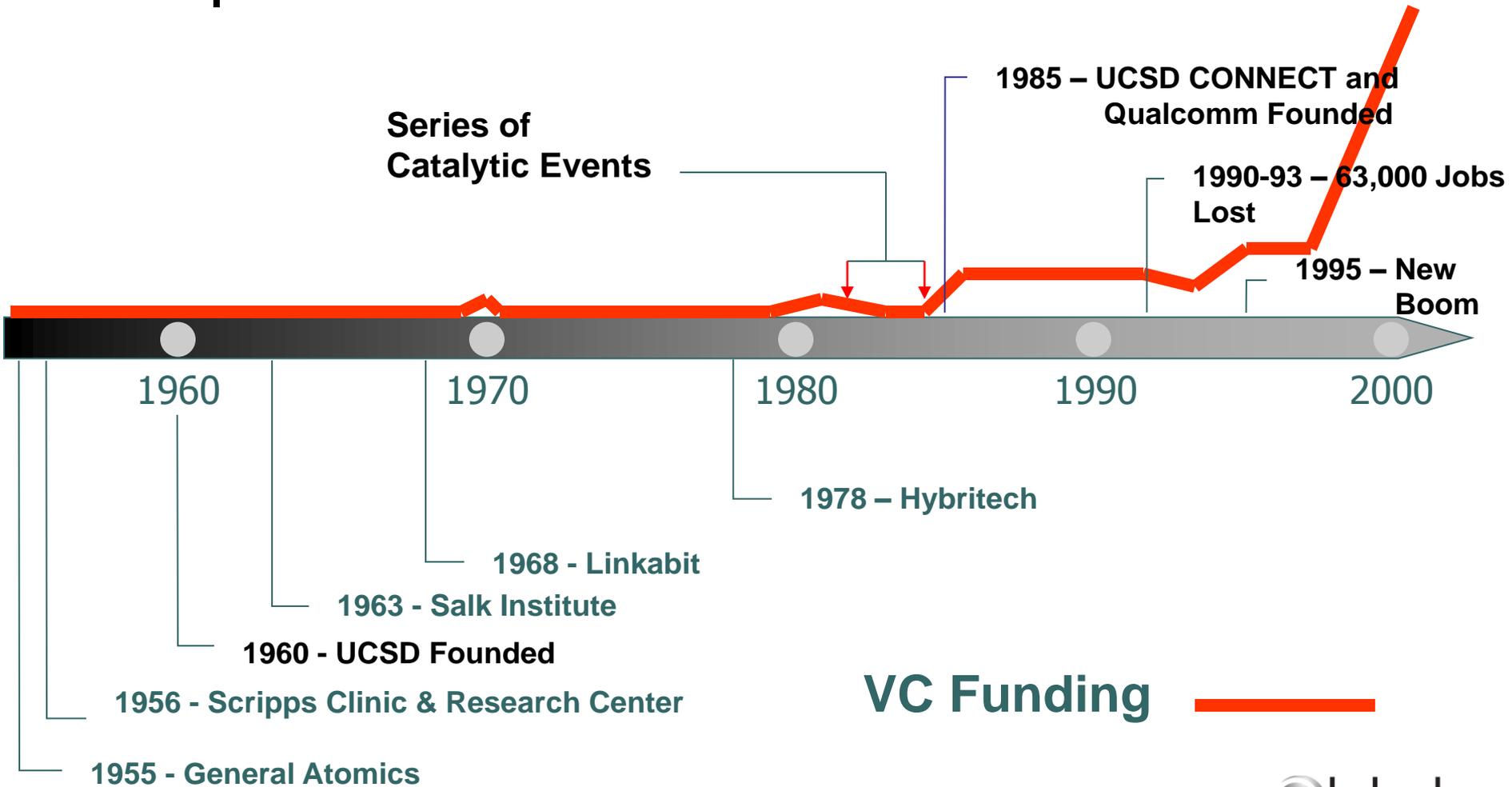
All of these regional assets must be integrated for the entire eco-system to work!



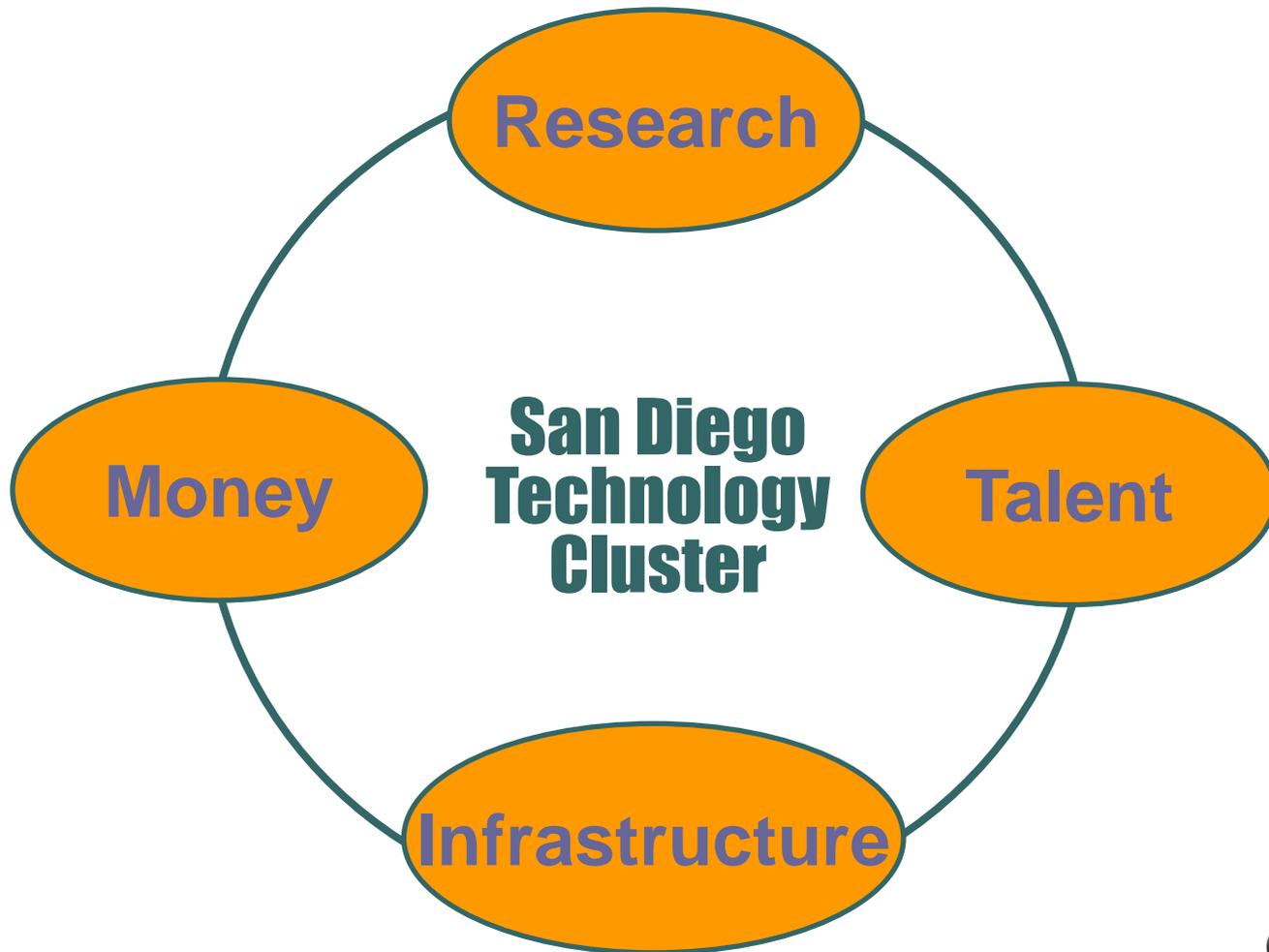
Some Regional Case Studies of Biotech Clusters

- **San Diego**
- St. Louis
- Philadelphia

I. San Diego's High Tech History



Key Elements of a Technology Cluster



San Diego BioResearch Centers

La Jolla Institute for Allergy & Immunology

Sidney Kimmel Cancer Center

Burnham Institute

Torrey Pines Institute for Molecular Studies

Genomics Institute of Novartis Foundation

Scripps Research Institute

Gene Research Institute

Neurosciences Institute

San Diego Supercomputer Center

Salk Institute

UCSD School of Pharmacy

UCSD School of Medicine

UCSD Campus

Scripps Institution of Oceanography

Juvenile Diabetes Foundation International

La Jolla Bioengineering Institute

Center for Molecular Medicine

Moore's Cancer Center

Stein Clinical Research Facility

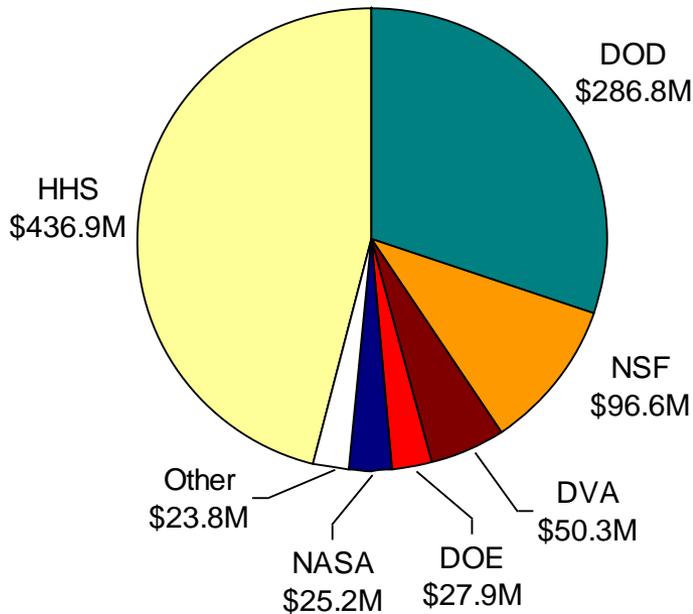
La Jolla Institute for Molecular Medicine

Hubbs-Sea World Research Institute

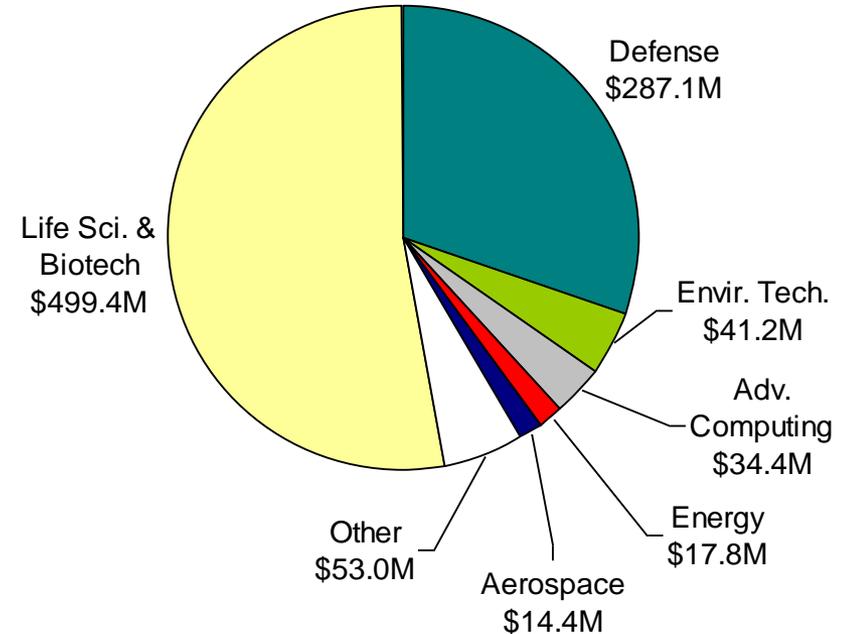
Human Biomolecular Research Institute

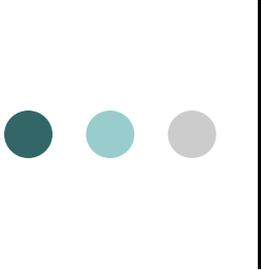
Federal Funding to San Diego's Research Base (\$947.5 Million, 2002)

By Agency



By Technology Sector





Effective Tech Transfer Processes

UCSD

120 start-ups with UCSD licensed technology

Scripps

40 companies since late 80's

Salk

20 companies have been founded using Salk technology

Burnham

4 FDA-approved products, 6 in clinical trials

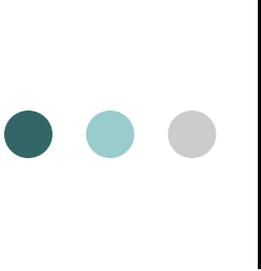
Source: *Nature*, UCSD, TSRI, Burnham, Salk



Federal SBIR Funding to San Diego High Tech Companies

Tech Sector	FY2002 Funding (\$M)	% of Funding	No. of Companies	% of Companies
Life Sciences & Biotech	28.87	77%	183	60%
Aerospace	4.02	11%	25	8%
Other S&T	2.00	5%	21	7%
Energy	1.78	5%	17	6%
Environmental Tech.	0.39	1%	5	2%
Transportation	0.37	1%	2	1%
Agricultural	0.20	1%	4	1%
Advanced Computing	NA	NA	2	1%
Defense	NA	NA	46	15%
Total	37.62	100%	305	100%

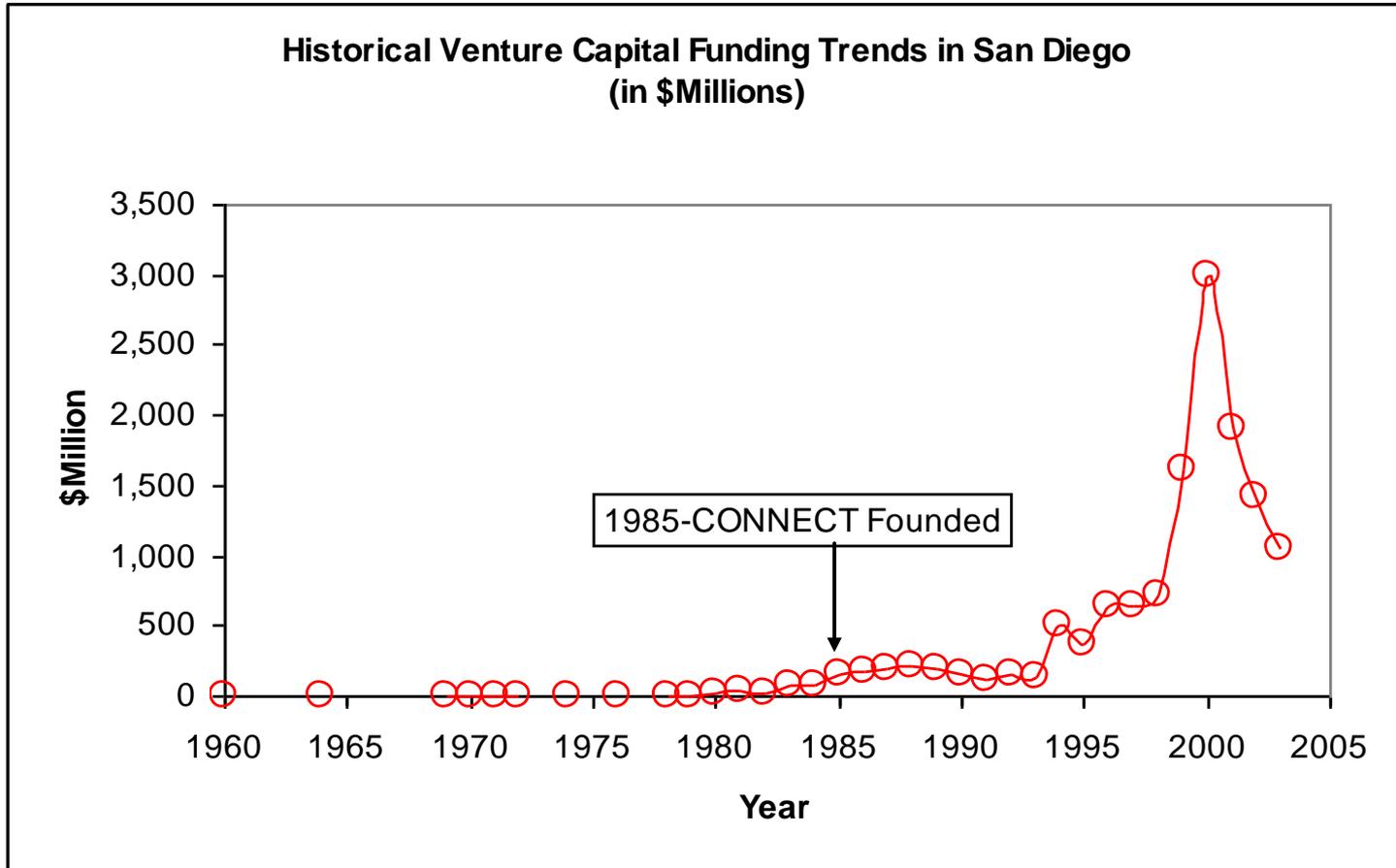
Note: DOD SBIR funding is unavailable at this time.

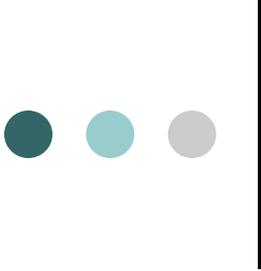


Other Regional Capital Sources to Fuel Company Formation and Growth

- Bootstrapping
- Family and Friends
- Business Angels (Tech Coast Angels)
- Institutional and Corporate Venture Capitalists
- Public Markets

San Diego Venture Capital Funding Trends

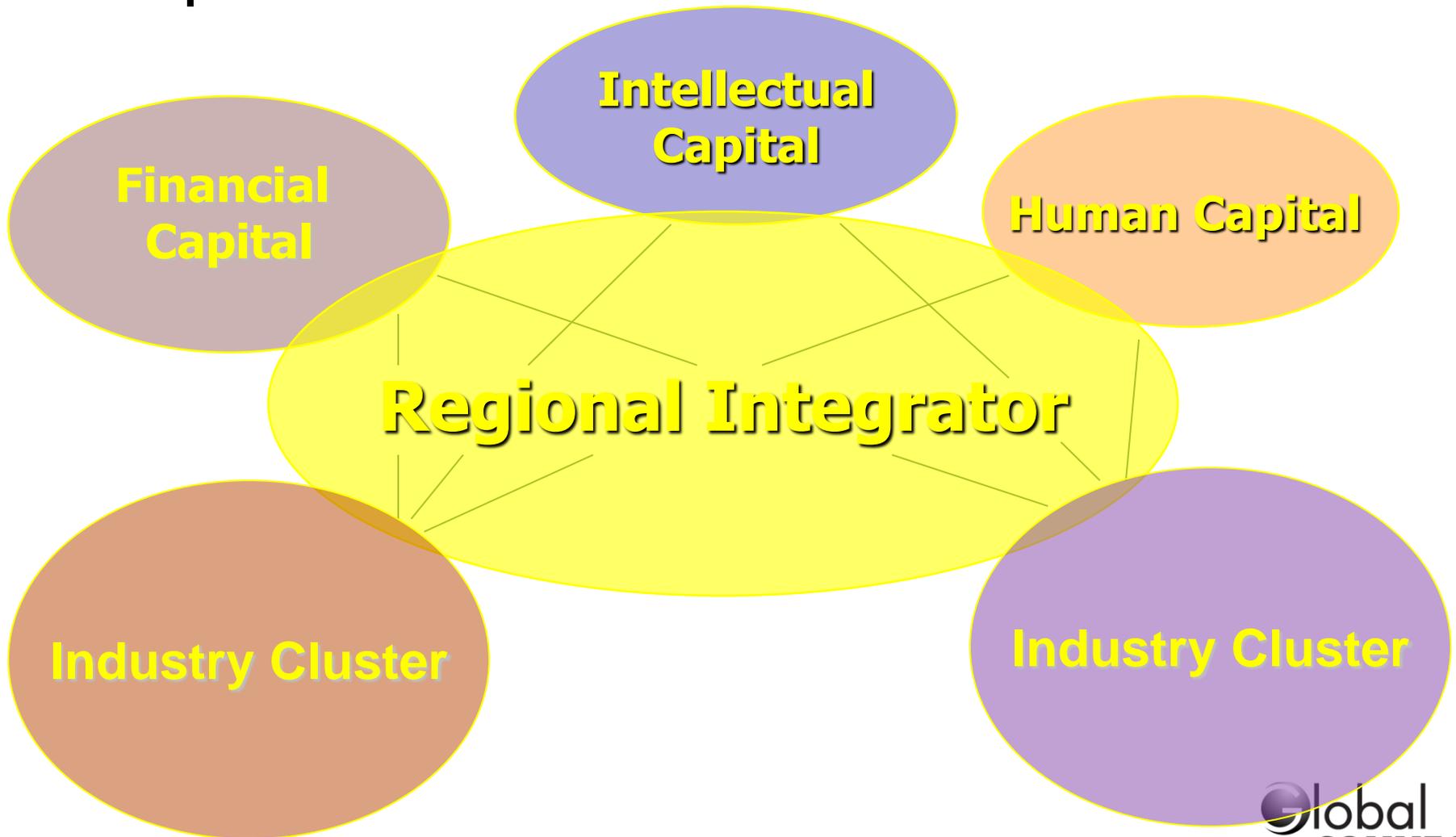


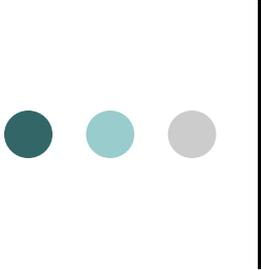


VC & Corporate Investors in San Diego

- Amgen Ventures
- Ampersand Ventures
- Avalon Partners
- Biogen Idec
- Enterprise Partners
- Forward Ventures
- Forrest Binkley Brown
- Hamilton BioVentures
- Hamilton Technology
- Inglewood Ventures
- Johnson & Johnson
- Mission Ventures
- ProQuest
- Shepherd Ventures
- Sorrento Ventures
- Timeline Ventures
- Ventana Capital
- Windamere Partners
- Windward Ventures
- QUALCOMM Ventures

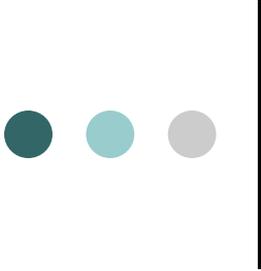
Leveraging Regional Inputs to Build San Diego's Industry Clusters





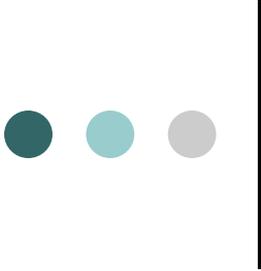
How CONNECT Got Started

- High unemployment and loss of bids to host federally funded industry consortiums (Sematech, MCC) motivated regional leaders to pursue new approaches to economic growth
- The early entrepreneurial successes of IMED, IVAC and Linkabit suggested entrepreneurial science-based companies might be the key to future prosperity
- Community and university leaders worked together to develop an approach to implementing change, which built on knowledge about the early successes in the region
- The change model was to create a new community of entrepreneurs, scientists and business service providers who had deep knowledge of where science and technology were going and had ready access to the distinctive business competencies needed in entrepreneurial companies
- The UCSD Program in Technology and Entrepreneurship (soon branded “UCSD CONNECT”) was a program dedicated to achieving the above



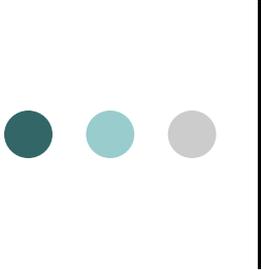
CONNECT's Financial Support

- Self-supporting through memberships and sponsorships
- Receives no outside funding from the university, federal, state or local government
- Business and community leaders volunteer:
 - business plan review, mentoring, coaching



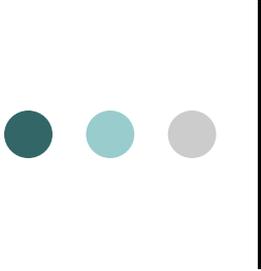
Springboard Program

- Entrepreneur assistance for 6-10 weeks
 - Formulate business plan and presentation
- Graduation
 - Investor presentation to a customized panel of domain experts, CEO's, investors, and service providers
- 20-30 companies graduate each year
 - About 25% of total applicants
- 200 companies have graduated since program's 1993 inception
- \$550 million raised by Springboard companies
- 58% survival rate 10+ years out



Technology and Life Sciences Financial Forums

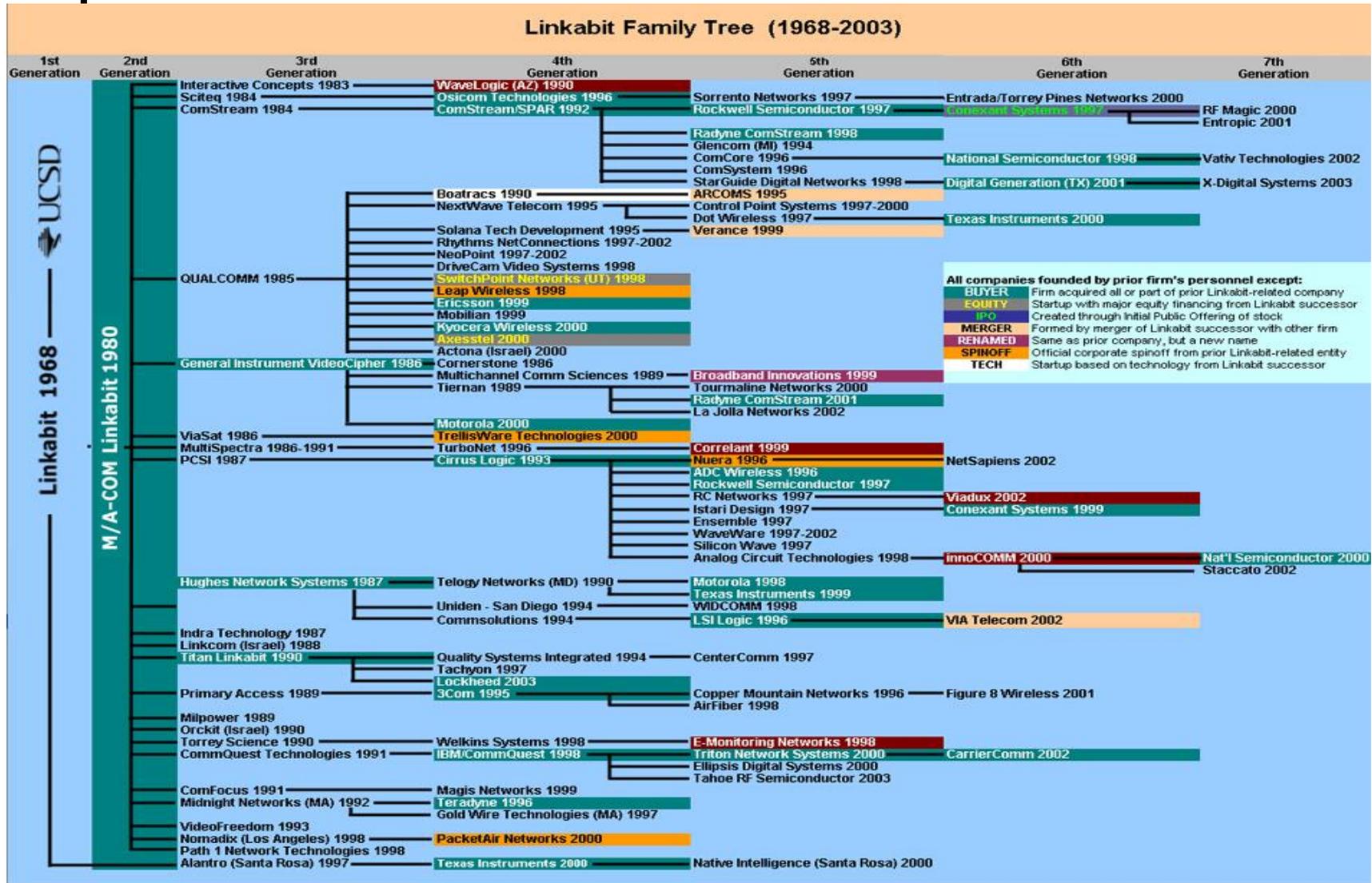
- Two annual forums:
 - Technology Financial Forum (1985-present)
 - Life Sciences Financial Forum (1989-present)
- Forums showcase 30 innovative, fundable companies to capital providers
- Companies are pre-qualified by competitive review process
- 400 attendees, 100+ capital providers per event
- Presenting companies have raised \$6.8 billion
- Over 400 companies have presented



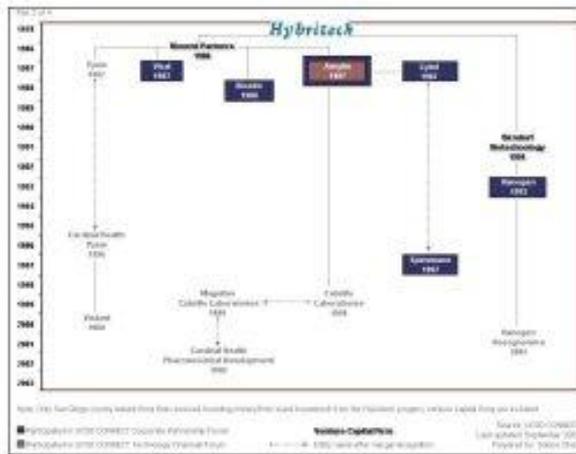
Most Innovative New Product (MIP) Awards

- Annual competition honoring the vision and perseverance that transform ideas and technologies into products
- Judges review hundreds of applications and select winners
- MIP Awards benefit San Diego!
 - Innovative companies get recognition and exposure
 - Showcases San Diego's emerging technologies
 - Builds community excitement and celebrates regional success

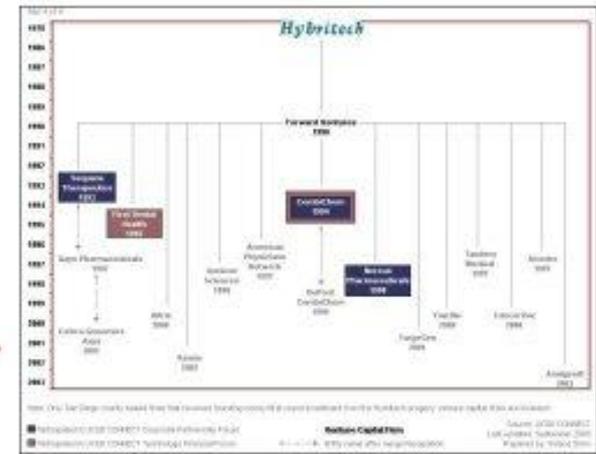
How We Measure Success



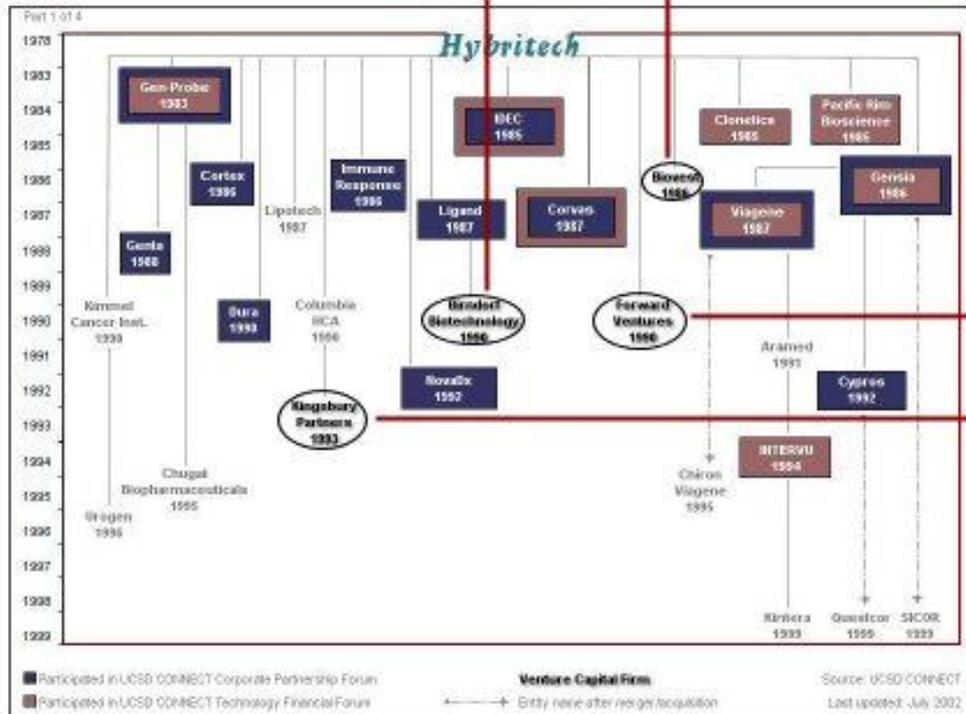
Biovest
Partners
&
Birndorf
Biotechnology



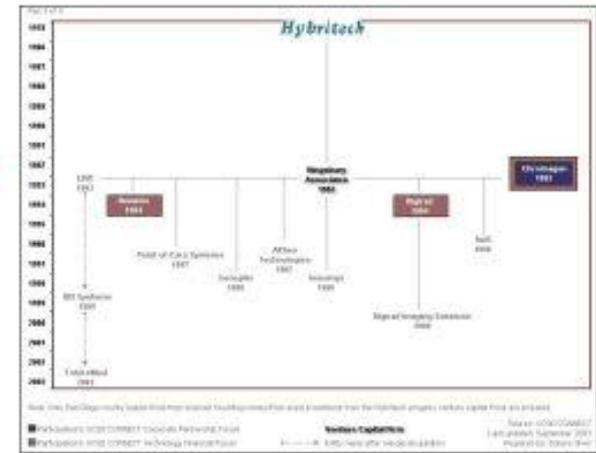
Forward Ventures



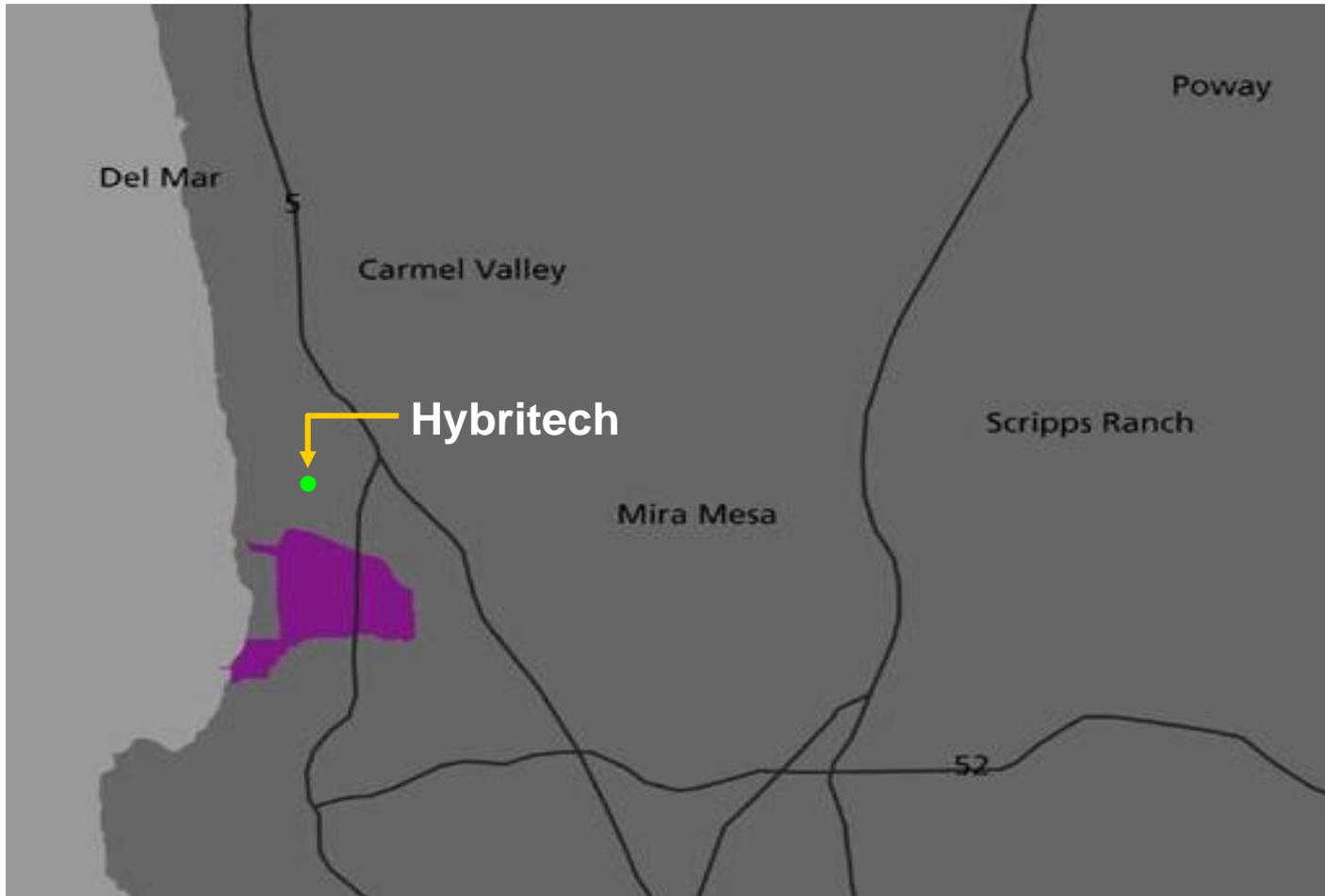
Hybritech



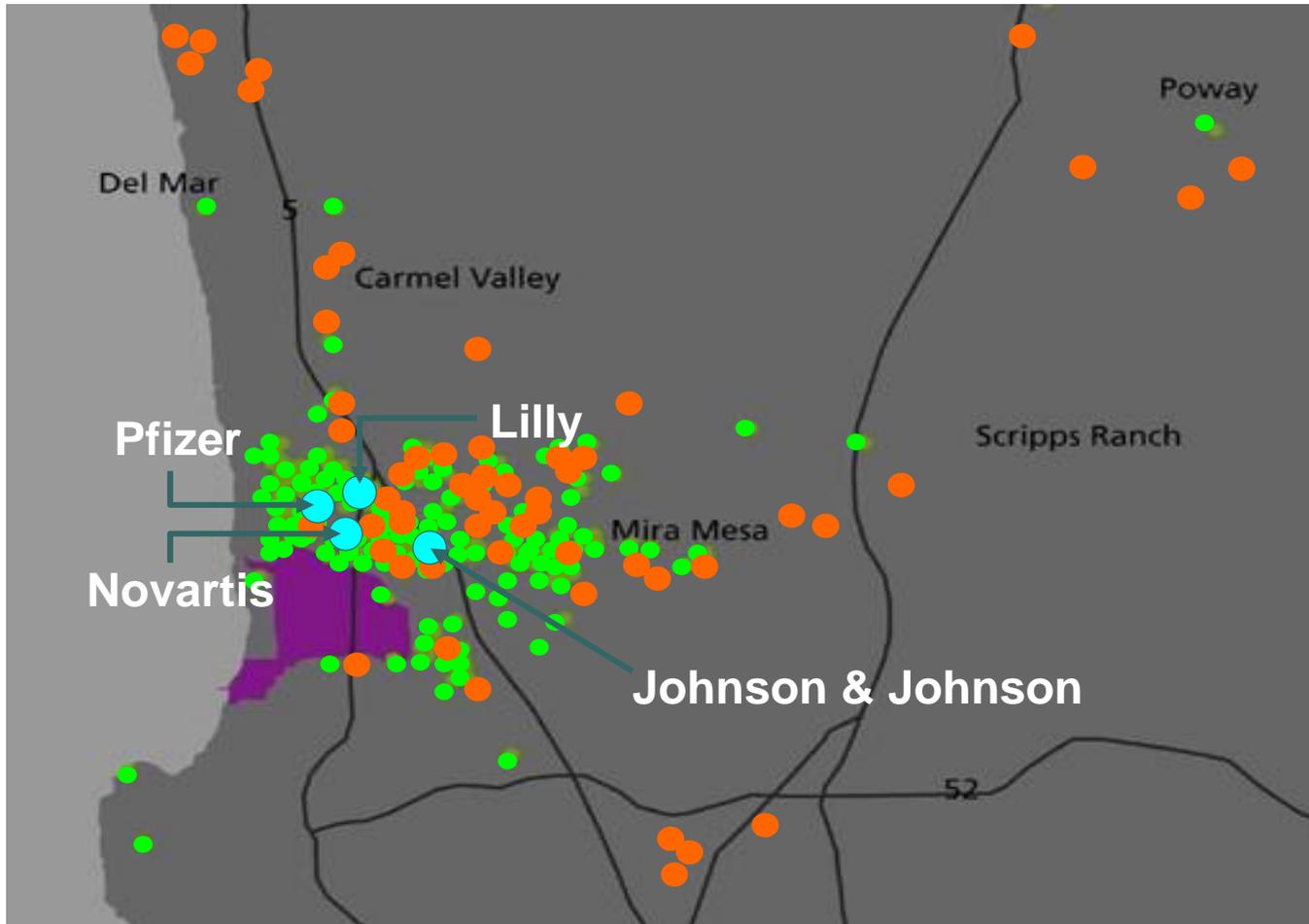
Kingsbury Associates

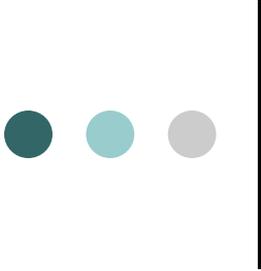


San Diego's First Biotech Company (1978)



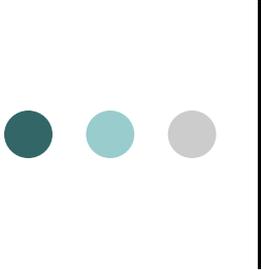
San Diego's Biotech Cluster (2005)





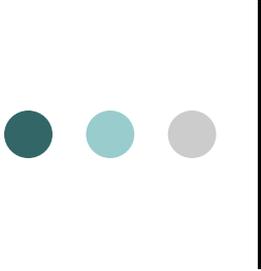
Some More Recent **CONNECT** Success Stories

- Immusol
- Tarari/Intel
- Egea Biosciences
- Zyray Wireless
- Innercool Therapies
- Global **CONNECT**'s Australian Bridge Program
 - TASKey



II. St. Louis' Regional Assets

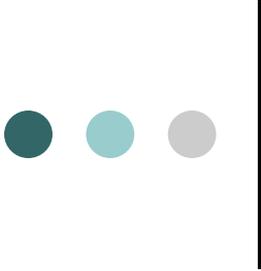
- **Home to world-class universities and research institutions**
 - Washington University
 - St. Louis University (School of Medicine)
 - Missouri Botanical Gardens
 - University of Missouri in nearby Columbia, MO
- **Established healthcare industry**
- **New push to establish ag-biotech**
- **Established wealth in region**
 - St. Louis has US' 2nd largest population of wealthy inhabitants who live off trust funds!
- **Population (2.7 Million) not growing, young moving away**
- **Missed out on the Internet Boom of the 1990's**



1995-2005 BioBelt Initiative Outcomes

- Coalesced extensive community support for Initiative
- Danforth Foundation, Monsanto Fund and Missouri State funding to create the Donald Danforth Plant Sciences Center (1998)
- RCGA embarked on multi-million dollar marketing campaign to promote the St. Louis BioBelt region (2000 onwards)
- RCGA created Technology Gateway, St. Louis' Science & Technology Council, "modeled on CONNECT" (2000)
- Land set aside for science parks next to Monsanto/Danforth Plant Sciences Center
- NIDUS-life sciences business incubator created (2000)
- Washington U. Skandalaris Center for Entrepreneurship created (2001, 2003 received Kauffman support)
 - Olin Cup business plan competition for Wash. U. students
 - The Hatchery and Bear Cub Seed Funds
 - IdeaBounce

Result? St. Louis is still struggling to build its biotech cluster...



Road Map for Collaboration:

Global CONNECT's Engagement with Wash. U.'s Skandalaris Center for Entrepreneurship Studies, January 2006

- St. Louis region receives \$837Million/yr in research funding from federal sources (**almost all received by Boeing and Washington Univ.**)
- St. Louis' strength lies in genomics, healthcare informatics and disease management, **not plant sciences**
- Genomics research at Wash. U. focused on human, mouse, nematode and zebrafish sequencing (**\$382 Million, 1993-2003**)
- Donald Danforth Center's Consortium on Maize Genomics is a minor fraction of total genomics research to St. Louis region (**\$3.95 Million 1993-2003**)
- Plant sciences & agricultural research represent a small base of federally funded research to region (**\$6.72 Million in 2003**)
- SBIR funding has risen significantly in past decade but funding is still woefully inadequate (**\$14.1Million over 11 years**)
- SBIR funded firms scattered all over St. Louis' metropolitan region despite regional efforts to consolidate cluster geographically
- **Despite Wash. U.' pre-eminence in genomics research, few genomics firms have been spun out...WHY?**

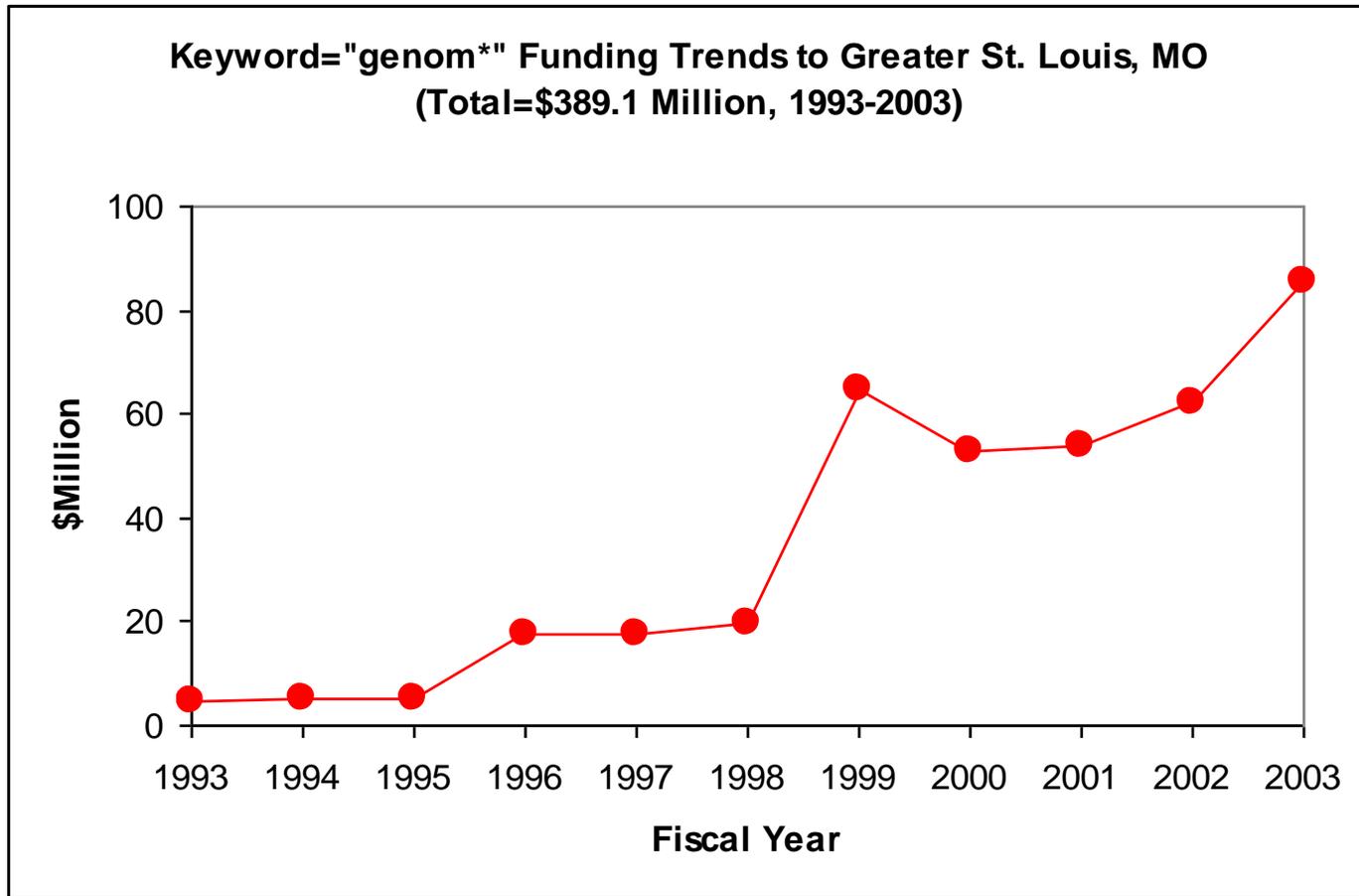
Source:

Carolyn W.B. Lee & Mary L. Walshok, *Road Map for Collaboration:*

Identifying St. Louis' Research and Innovation Assets through RaDiUS.

A report for Washington University's Skandalaris Center for Entrepreneurial Studies, January, 2006.

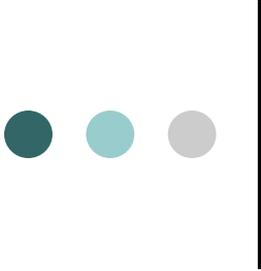
Documenting Wash. U.'s Rise in Genomics



Why So Little

Commercialization Activity in Genomics?

- NIH's Human Genome Sequencing Project conceived to put human genome sequence in public domain
- Scientists involved opposed private sequestering of human genome mapping results
 - Bob Waterston at Wash. U. was one of key critics of Craig Venter
 - Waterston was a proponent of public advancement of genomic knowledge
- Disengagement between St. Louis' regional leadership and scientific leadership about spinning off technologies related to human genome sequencing project
 - RCGA too focused on promoting/branding region as plant sciences hub
 - Technology Gateway, modeled after CONNECT did not link business & academic community
- In 2002, Bob Waterston moved from Wash. U. to become Chair of Dept. of Genomic Sciences at the Univ. of Washington in Seattle taking his research team with him...

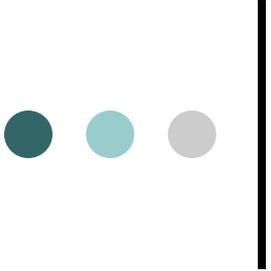


Finally, Leadership Matters...

Helping researchers commercialize technology isn't the university's mission, [Chancellor Wrighton] said. It is a fundamental research institution, charged with attracting the most talented teachers and providing the best possible education.

Wrighton dismisses the suggestion that star researchers with an entrepreneurial bent are repelled by the university's conservative culture. He disagrees with business supporters who say the community is missing out as researchers are discouraged or delayed in commercializing.

--St. Louis Post-Dispatch (2/26/2006)



III. Philadelphia (2001)

○ **Land-locked urban campuses**

- U. of Pennsylvania located in downtown Philadelphia
- Other universities (Drexel Hahnemann, Temple Univ.) also located downtown
- Incubator park next to U. of PA's campus populated by mid/large sized companies, few start-ups

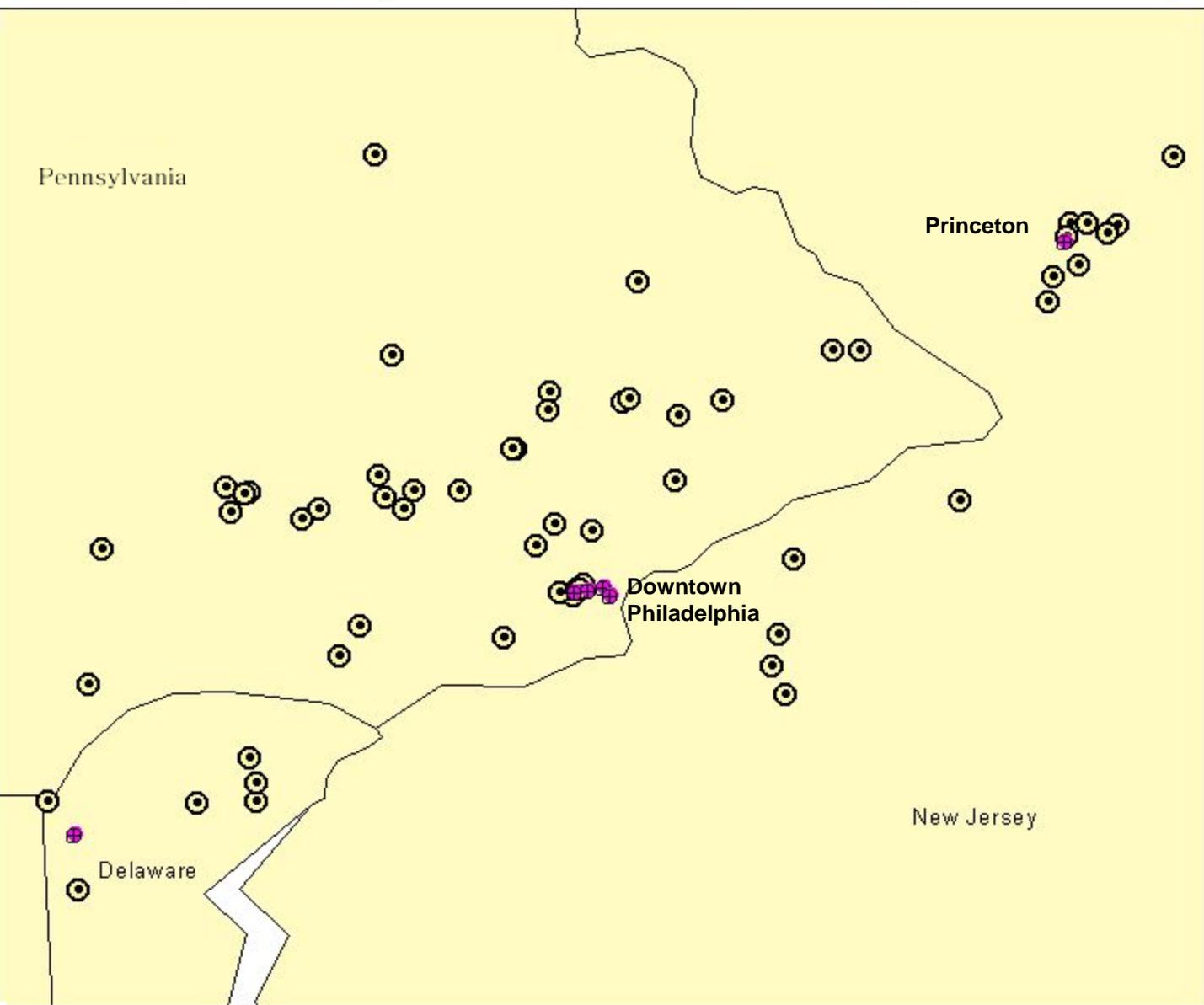
○ **No proximity effect between academic research institutions and emerging companies**

- Available land for new company formation in suburbs and exurbs
- Pattern of SBIR funded firms clustered around second “ring road” highway, 30-60 miles outside of Philadelphia, near corporate research centers (Merck and others) on road between NYC and DC

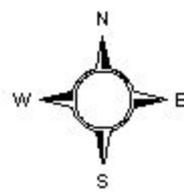
● ● ● | Philadelphia (cont.)

- **Small No. of SBIR funded awards, mostly Phase I funding, relative to R&D funding base**
- **Disengagement between universities and regional economic dev. authorities**
 - Very few spin-offs from U. of PA and other corporate research centers
 - Innovation Philadelphia, a networking organization to seed cross-talk and encourage new business creation, founded in 2001

Philadelphia County Life Sciences SBIR Firms (71 total firms)

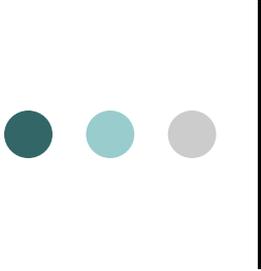


- Universities**
 - University of Pennsylvania
 - Thomas Jefferson University
 - Drexel University
 - Hahnemann
 - Princeton University
 - University of Delaware
- Life Sciences Firms**



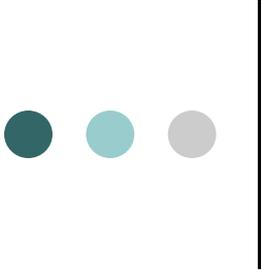
Summary of Lessons Learned

- **Each region's innovation capacity (“regional DNA”) differs**
 - Every region has its unique path to building its cluster
 - Scientific expertise concentrated in a region is distinct from other regions
 - Regions need to understand what they *truly* have as assets
- **Must couple world-class scientific with business smarts for successful tech. commercialization**
 - Synergy in a cluster depends on functional social structures between technologists and business community



Summary of Lessons Learned (cont.)

- **Research capacity asset mapping is a tool**
 - engages regional leadership in an initial dialogue
 - in depth understanding of regional assets
- **Social networks that can accelerate business transactions are a necessary part of the “soft” infrastructure to any successful region**
- **Collaborative institutions are not built overnight**
 - Must engage ALL stakeholders (inclusiveness)
 - Trust building before transactions is key



For Additional Information:

Carolyn Lee

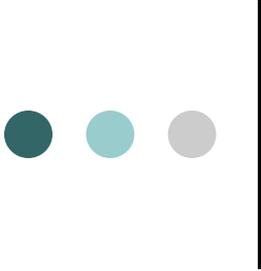
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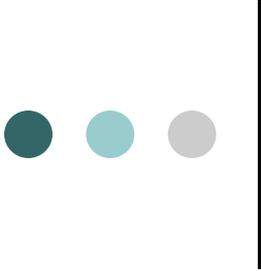
<http://globalconnect.ucsd.edu>



“Successful regions do not rely on chance, but rather seek to institutionalize the innovative process...to create continuous innovation and entrepreneurship.”

—Michael Porter

Clusters of Innovation Initiative, 2001



Some Useful References

Michael Porter/US Council on Competitiveness' Regional Innovation Project

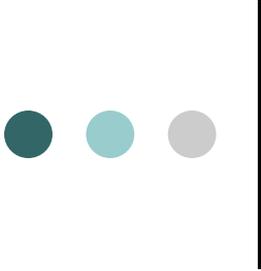
- http://www.compete.org/nri/clusters_innovation.asp

Books about the Silicon Valley Phenomenon

- Chong Moon Lee, William F. Miller, Marguerite Gong Hancock, Henry S. Rowen, ***The Silicon Valley Edge: A Habitat for Innovation and Entrepreneurship***, Stanford Univ. Press, c. 2000.
- Martin Kenney (Ed.), ***Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region***, Stanford Univ. Press, c. 2000.
- Annalee Saxenian, ***Regional Advantage: Culture and Competition in Silicon Valley and Route 128***, Harvard U. Press, c.1994.

Recent Journalists' Accounts of Particular Regions and Industries

- David Mock, ***The Qualcomm Equation: How a Fledgling Telecom Company Forged a New Path to Big Profits and Market Dominance***, American Management Assoc.(AMACOM), c. 2005.
- David Rosenberg, ***Cloning Silicon Valley: The Next Generation High-Tech Hotspots***, Reuters Press, c. 2002.



Some Useful References (cont.)

Richard Florida's work on "knowledge workers"

- Richard Florida, *The Flight of the Creative Class: The New Global Competition for Talent*, Harper Collins Pub., c. 2005.
- Richard Florida, *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*, Basic Books, c. 2002.

Social Networks and Reaching Critical Mass

- Malcolm Gladwell, *The Tipping Point: How Little Things Can Make a Difference*, Little Brown & Co., c. 2000.
- Duncan J. Watts, *Six Degrees: The Science of a Connected Age*, W.W. Norton & Co, c. 2003.