



# Building an Innovation Ecosystem The Role of the ERCs

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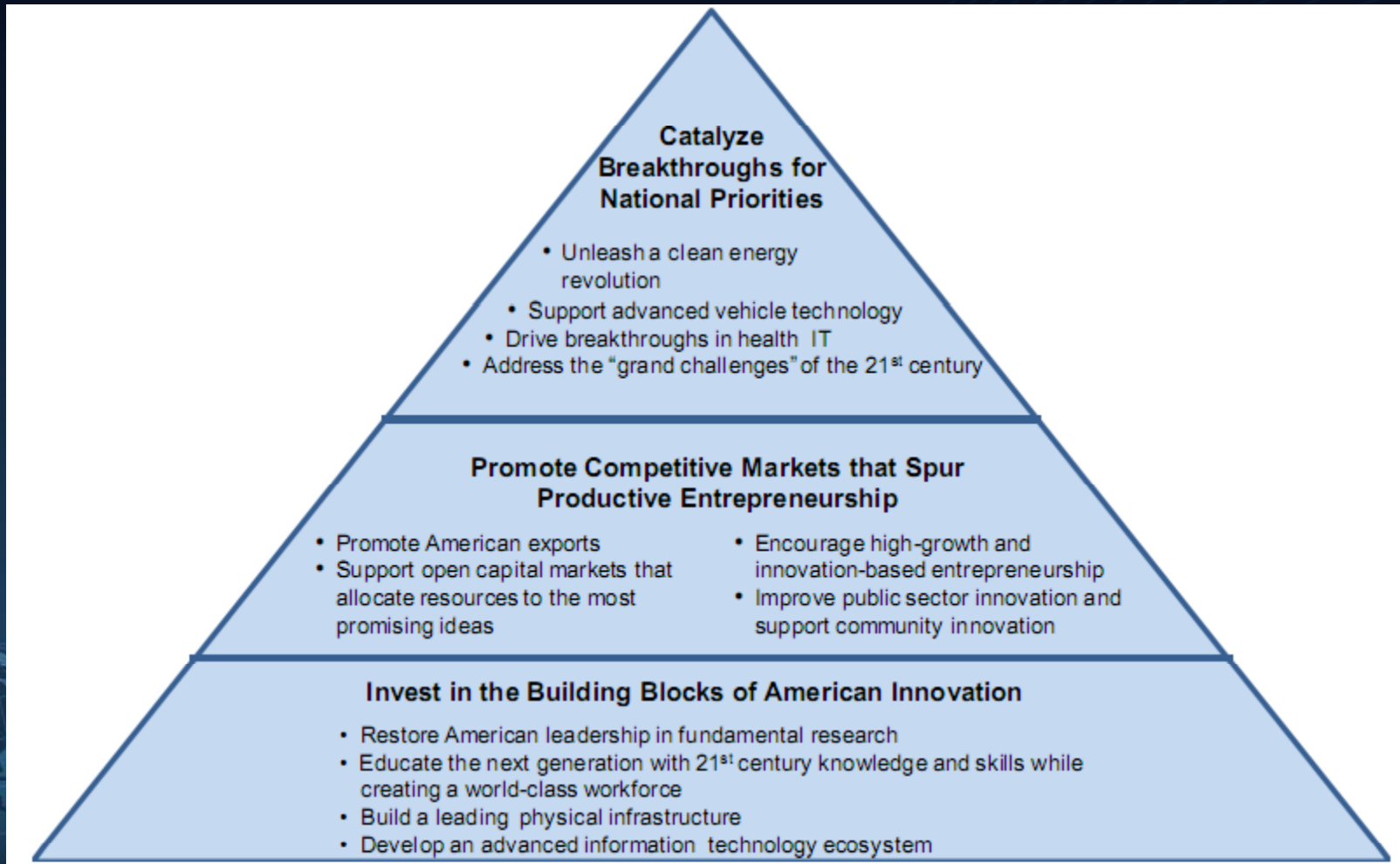


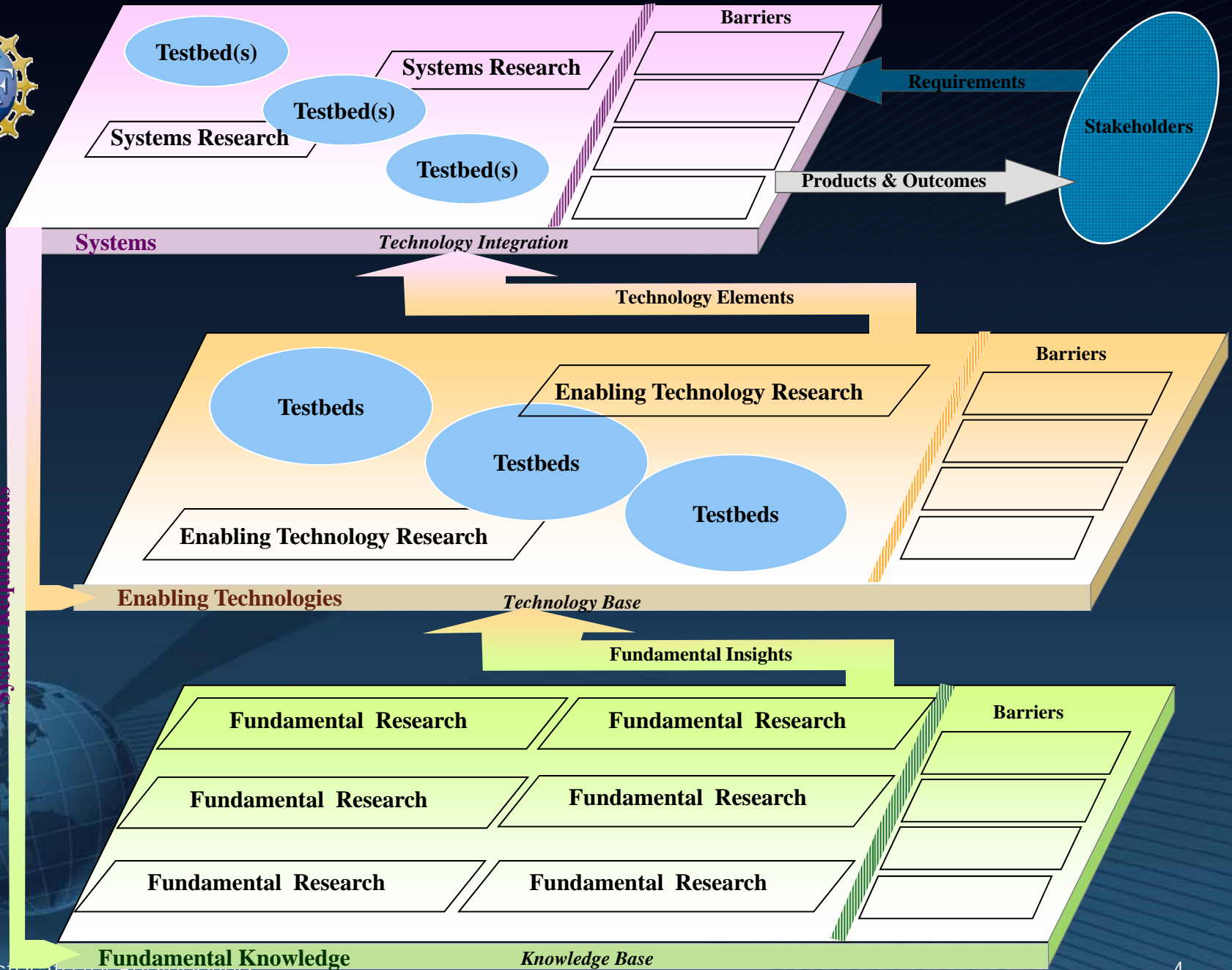
# Creating an Innovation Ecosystem





# Innovation for Growth







# Innovation

- There are numerous innovative definitions of Innovation
- There are multiple elements in the Innovation Process
- For purposes of THIS presentation:  
Focus on **NSF-funded research** that has led to direct, **quantifiable economic benefit** (a product, process, practice, service, social change)



# Science of Science and Innovation Policy (SciSIP)

- **UC Davis**

*How the DOE can accelerate the rate of progress in energy innovation*

- **UNC Greensboro**

*Assessing the Innovative performance of University Research Parks*

- **U Georgia**

*Impact of programmatic university resource investments on innovation*

- **U Kansas**

*Contributions of foreign students to knowledge creation and diffusion*

- **Arizona State U**

*Innovation as characterized by public values contribution*



# Innovation Through Translational Research





# Translational Research

- Is interdisciplinary by nature
- Involves a team
- Relies on partnerships
- Results in clear benefit to society





## NSF Engineering Centers Programs

The Directorate for Engineering supports two Centers programs that build university cultures that join discovery and innovation in partnership with industry:

- **Engineering Research Centers (ERC)**  
Established in 1985, 48 Centers funded
- **Industry/University Cooperative Research Centers (I/UCRC)**  
Established in 1979, 72 Centers funded

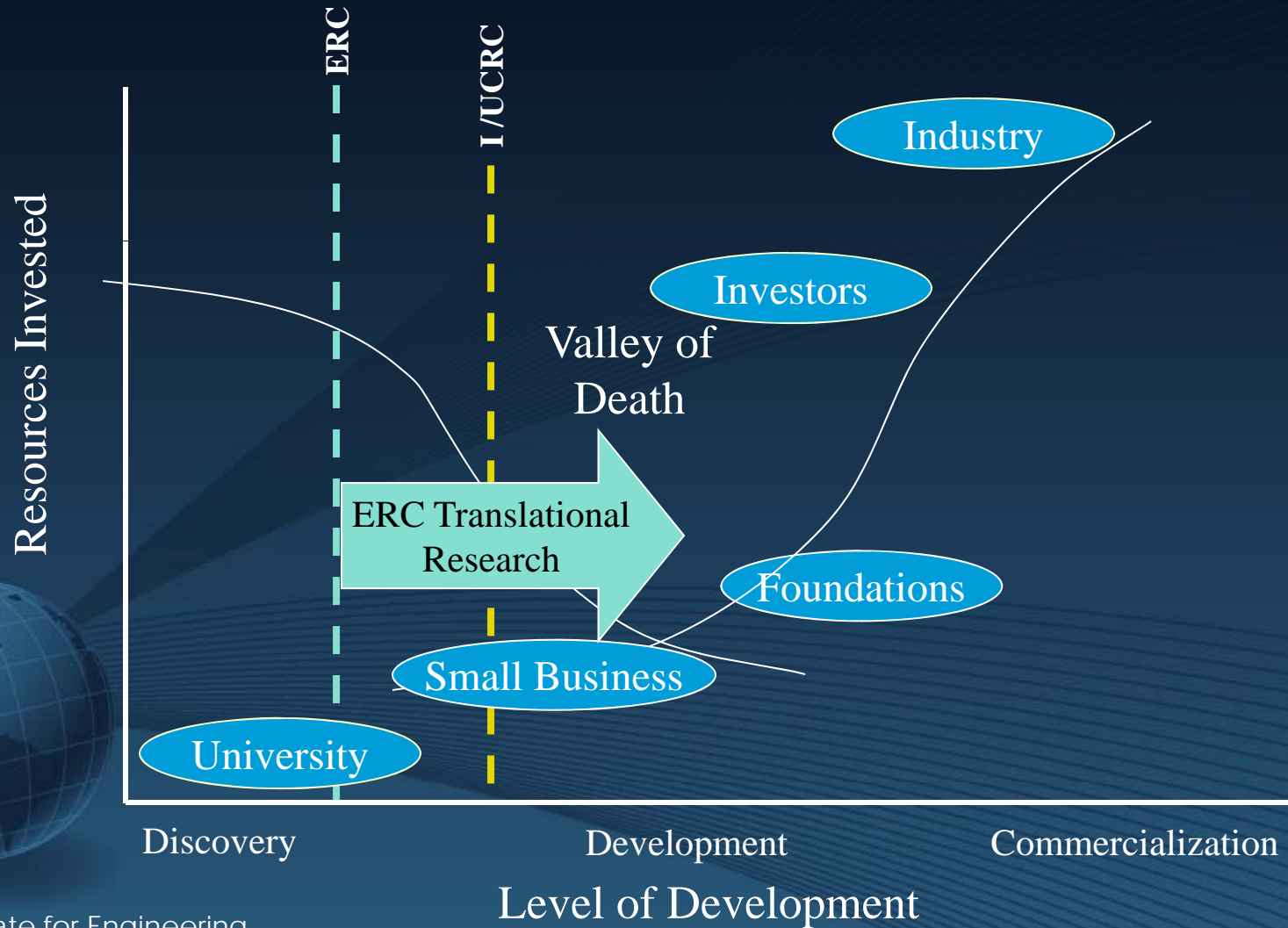


## Engineering Centers Program Goals

- **Create a culture** in academe that joins research, education, and innovation
- **Build partnerships with industry** to strengthen the innovative capacity of the U.S. in a global context
- **Leverage NSF funds** with industry to support graduate students performing industrially relevant research
- **Produce engineering graduates** who are creative and innovative practitioners, more capable of leading teams to advance technology in established firms or leading new firms



# The Innovation Spectrum





# All Technology Sectors

Lead Institution shown



● Advanced Electronics (15)

● Biotechnology, Healthcare and Service (16)

● Advanced Manufacturing and Fabrication (19)

● Energy, Sustainability, and Infrastructure (18)

● Directorate for Engineering (4)

● Information, Communication, and Computing (14)



# Innovations and Economic Impact

Market value of products, processes  
and startups in tens of billions.

For example, DigitalPersona (1996), a spin-off company from the Caltech ERC that specializes in fingerprint ID/password management, generates \$20M/year in sales and has 30 million users worldwide.



# Innovations and Economic Impact:

*PerSeptive Biosystems*

- 1991 MIT BPEC Spinoff Company
- Focus on Perfusion chromatography
- \$100M annual sales
- Sold in 1998 for \$360M



*BPEC graduate Dr. Noubar Afeyan has founded a number of successful biotech companies*

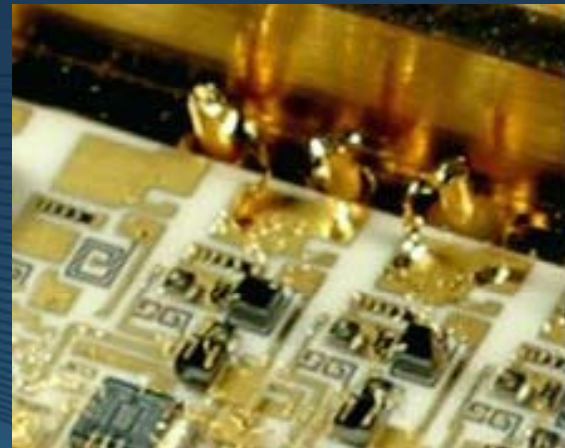




# Innovations and Economic Impact:

## *RF Solutions*

- 1998 Georgia Tech Packaging Research Center Spinoff Company
- Founded by 4 PRC students and a faculty member; company acquired by *Anadigics* (WLAN Center of Excellence)
- Wireless LAN power amplifiers for notebooks
- Over 100M units shipped

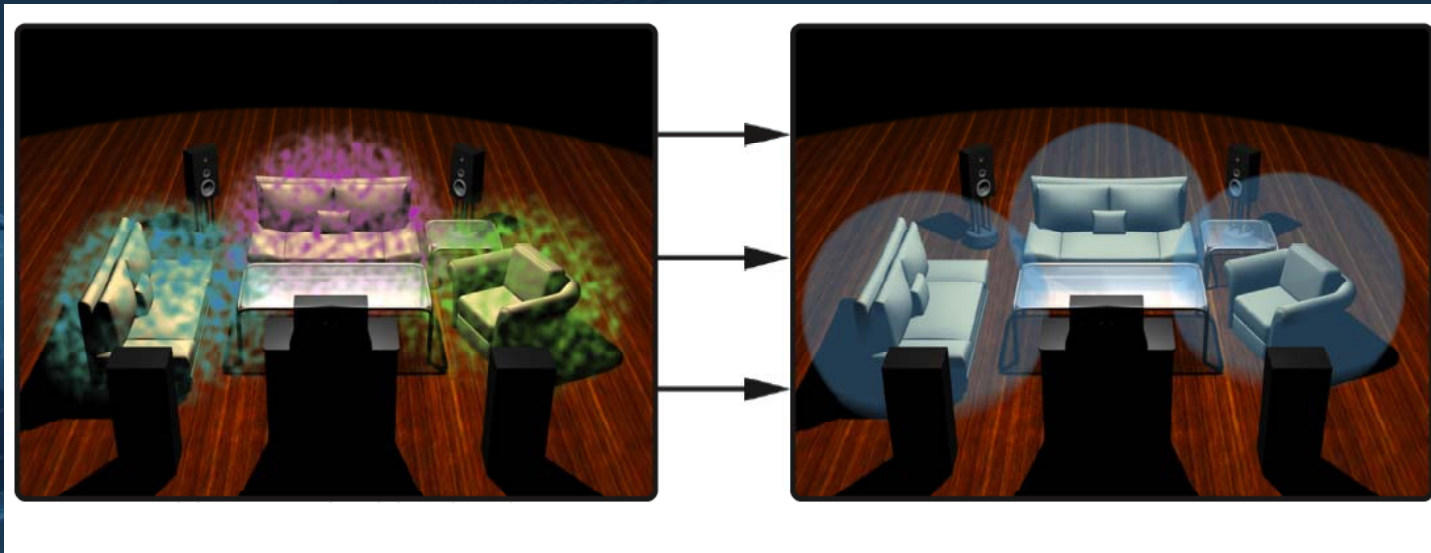




# Innovations and Economic Impact:

## *Audysey Labs*

- ◉ 2002, USC Integrated Media Systems Center Spinoff Company
- ◉ Audio signal processing & optimization
- ◉ Over 1M products shipped





# Innovations and Economic Impact:

## *Discera*

- 2001 University of Michigan ERC Spinoff
- Their CMOS MEMS resonator-based timing devices will dominate global \$3.5B market
- 2009 *WSJ* Technology Innovation Award





## Innovations and Economic Impact: *Orora Design Technologies*

- Founded in 1998 by the University of Washington former Center for Design of Analog-Digital Integrated Circuits (CDADIC) faculty researcher
- To develop solutions for analog/RF design automation
- Company's software are now being used worldwide by analog designers in aerospace, defense, computer, memory and RFID industries



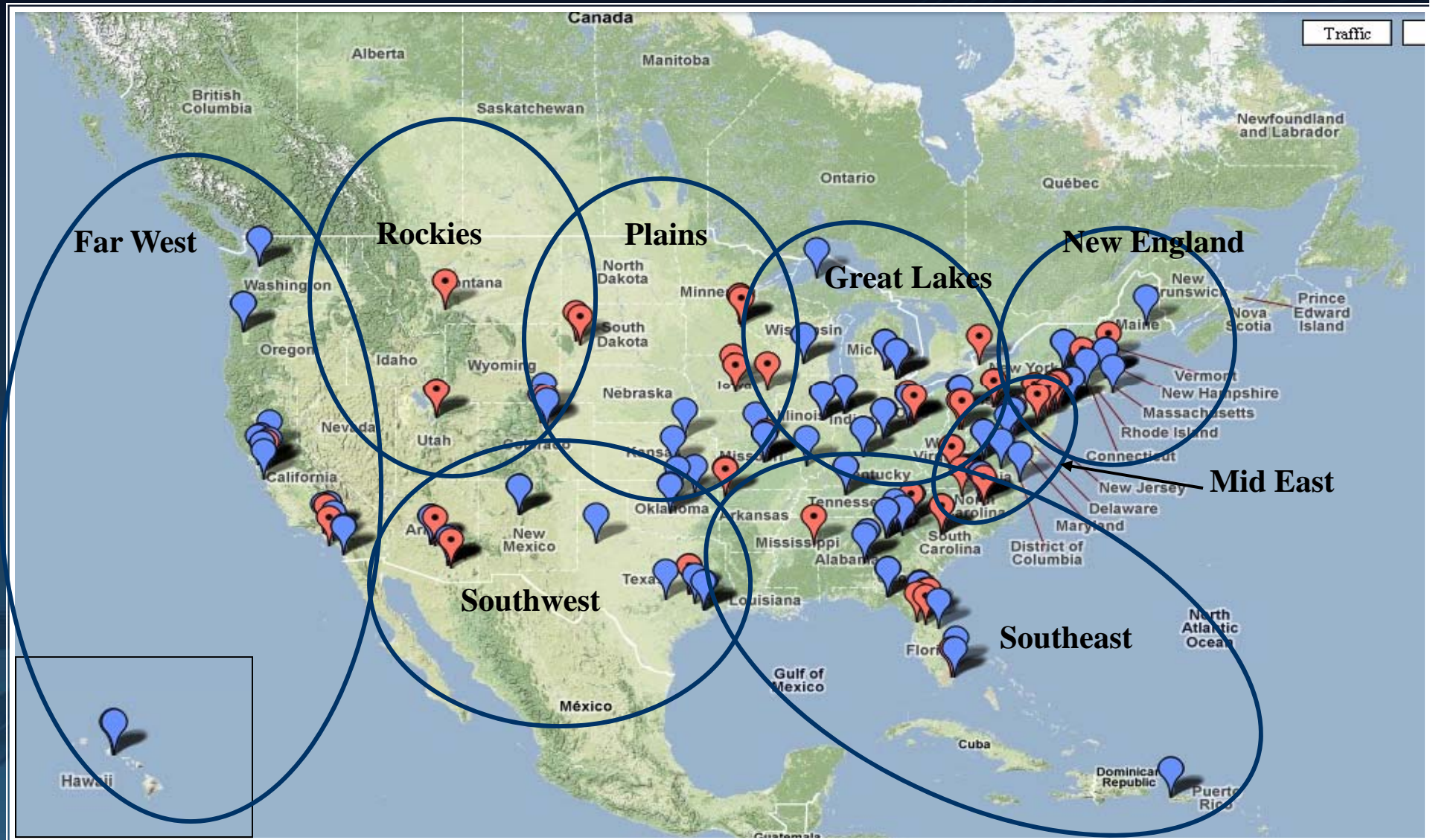
# Innovations and Economic Impact

The partnership has yielded rich dividends.

In the first 20 years of the program, ERCs have been awarded over 500 patents and have been granted over 1,800 licenses; and the ERCs have spun off 113 firms with over 1,300 employees.



# NSF Engineering Centers





# Characteristics of the Innovation Ecosystem

- ◉ University research is key, often driven by industrial needs.
- ◉ Faculty are involved along the innovation continuum, working with industry at all stages.
- ◉ A focus on translational research smoothes the handoff of technology from universities to industry—resulting in rapid, efficient innovation.



# NSF Resources for the Innovation Ecosystem

- ◉ Grow the existing portfolio and strengthen the translational phase
- ◉ Extend the reach of industry-driven research initiatives
- ◉ Educate to innovate
- ◉ Better understand the social dimensions of innovation (SciSIP)



# NSF

## Where Discoveries Begin

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