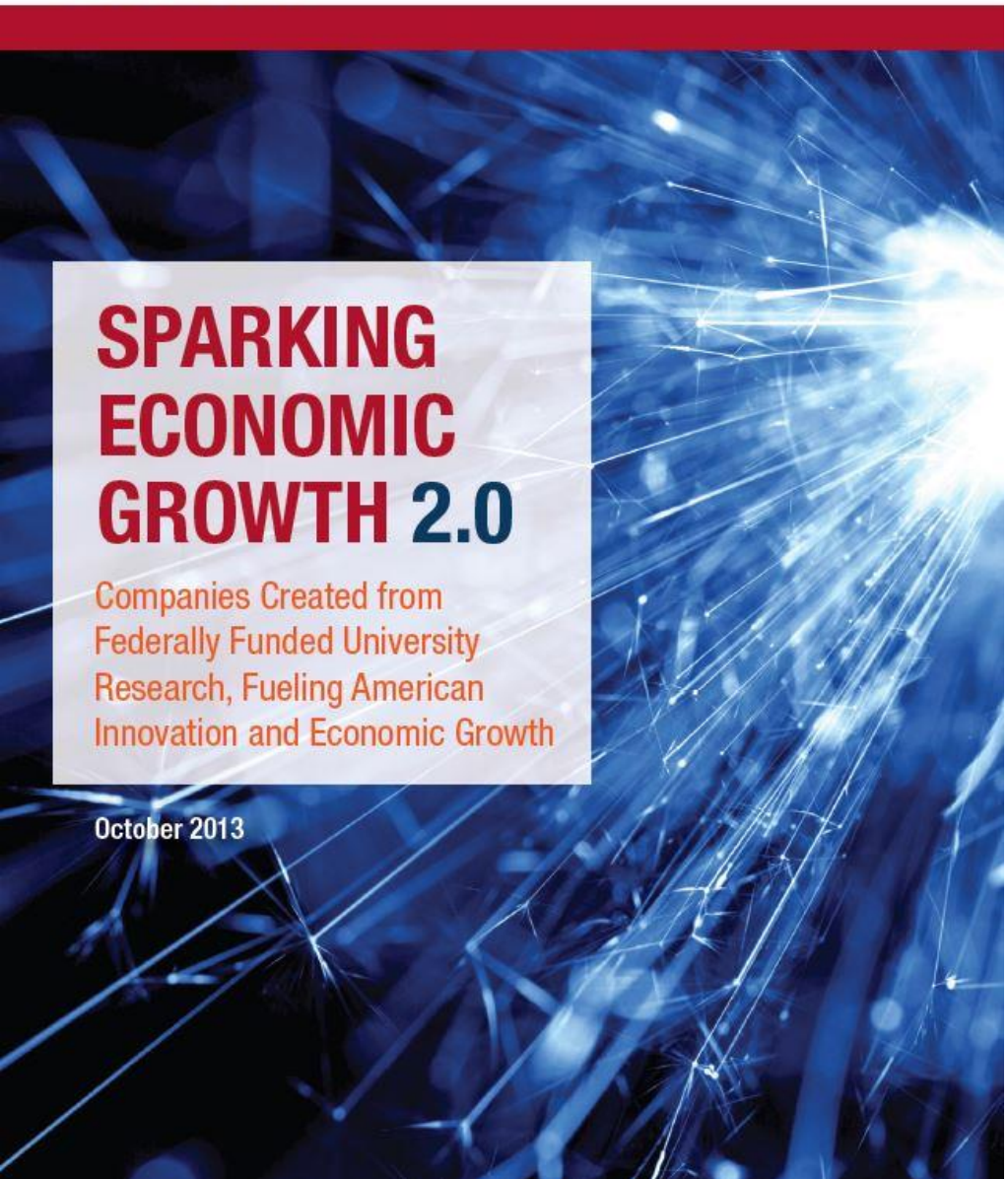
THE SCIENCE COALITION



House Science and National Labs Caucus

March 13, 2014

JOHN S. SWARTLEY, MBA Ph.D.

Associate Vice Provost for Research *and*

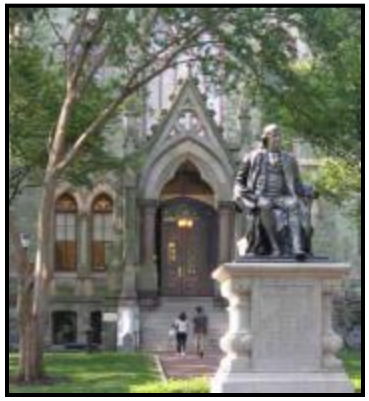
Executive Director, Center for Technology Transfer

University of Pennsylvania

Universities – A Modified Core Mission

THE NEW INTERFACE

Academic Research ("Pushing back the Frontiers")



Teaching Scholarship ("Human Capital")

Translating Discoveries to Benefit Society ("Reducing to Practice")

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Center for Technology Transfer

Success of Bayh-Dole

- US Universities reported consolidated licensing income of $1.8B in 2011 and formation of over 600 startup companies in that year alone
- A recent BIO study showed university partnerships have engendered a $187 billion positive impact on economy and a $457 billion addition to GNP
- The number of universities with Technology Transfer offices has risen from 25 in 1980 to over 300 today
- >50% of pharmaceutical drugs derived from discoveries made at academic institutions transferred to industry
- Millions of lives have already been transformed by these activities

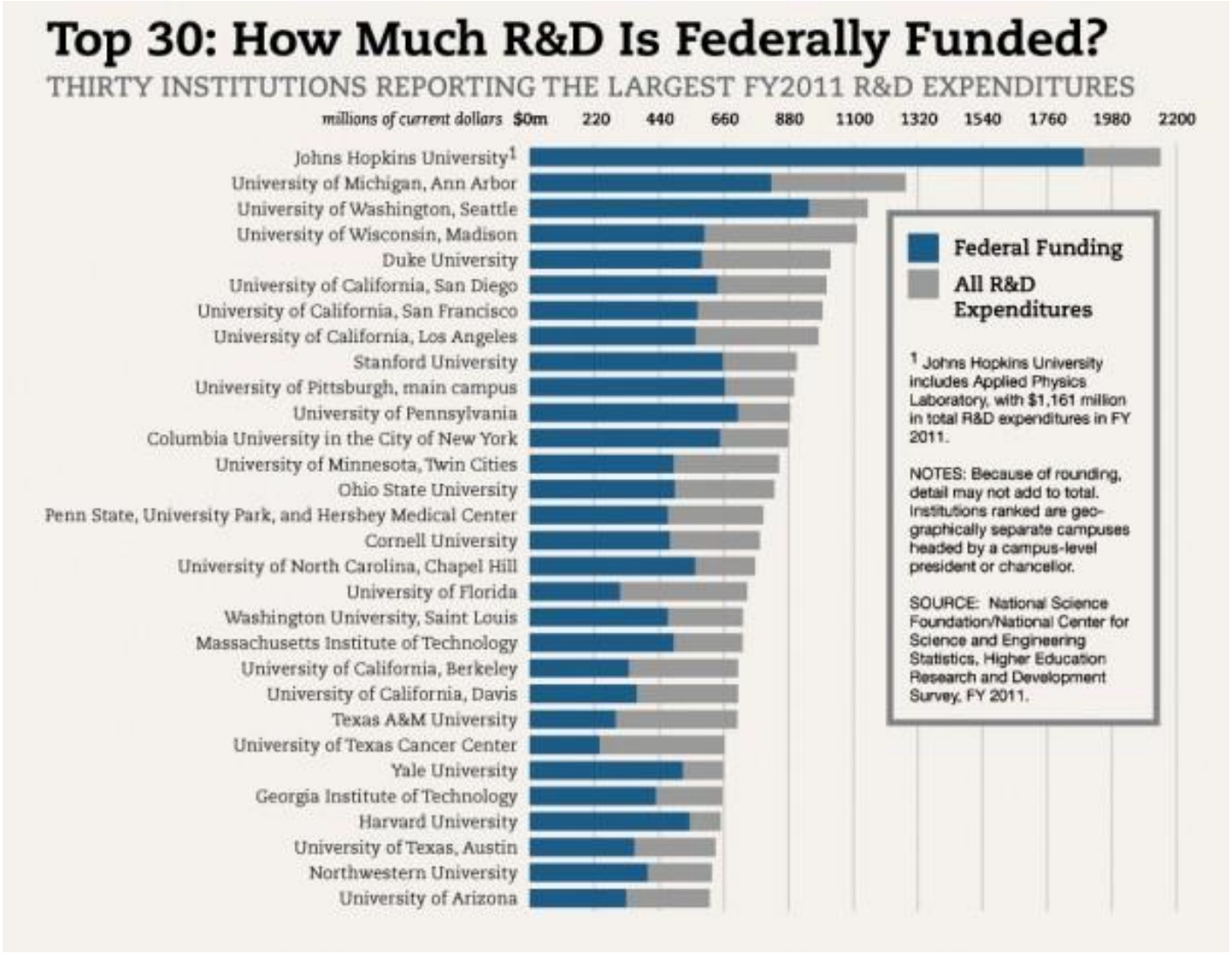
Penn CTT
Center for Technology Transfer

Penn Research Enterprise Economic Impact

- Nearly $1 Billion in total research awards / year
- An estimated $4 billion additional impact*
- ~22,000 research / research support positions
- Nearly 400 new research discoveries annually
- Over 100 new research licenses annually
- Since 1990, >100 new companies & >1500 employees located in Philadelphia

*TrippUmbach

Federal Funding the Lifeblood of R&D at Most Major US Universities



Trends in Federal Research Funding

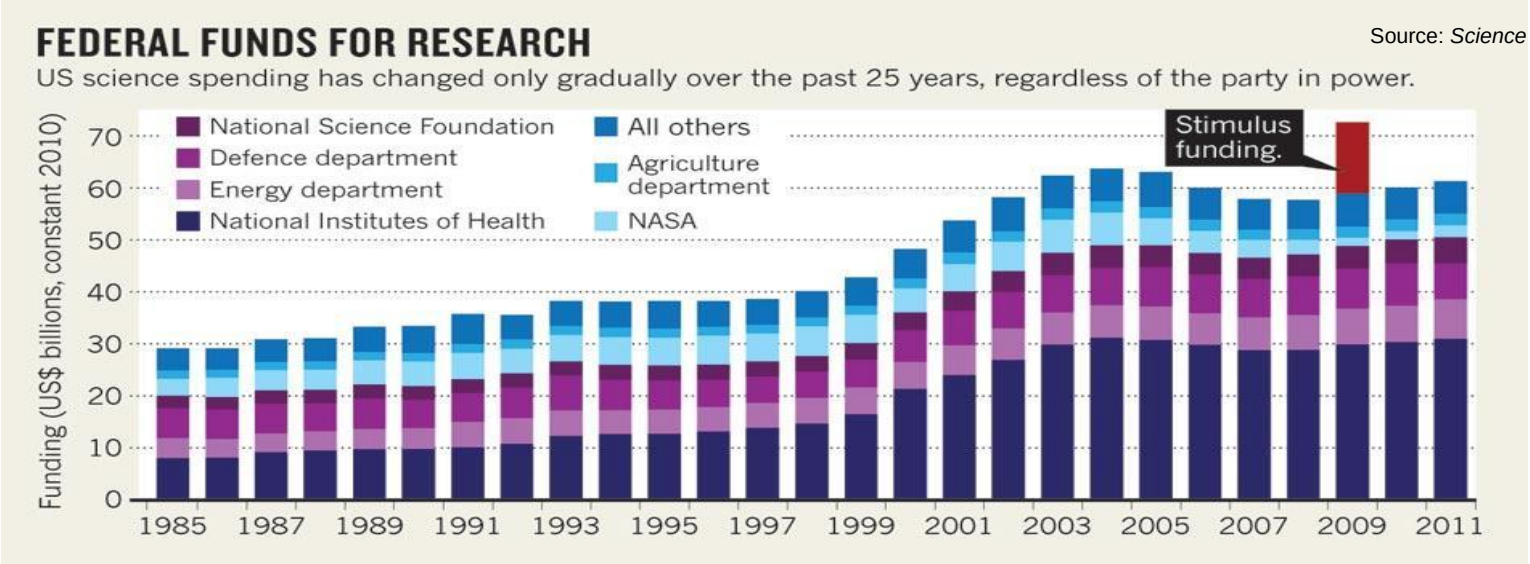
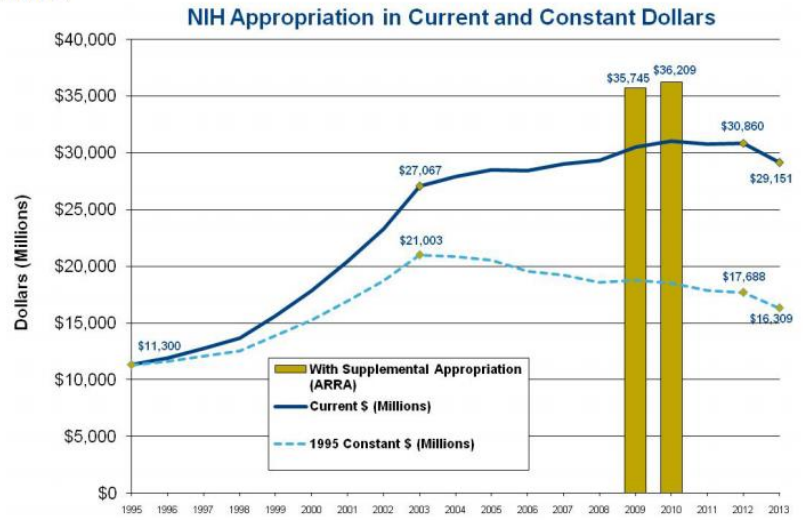
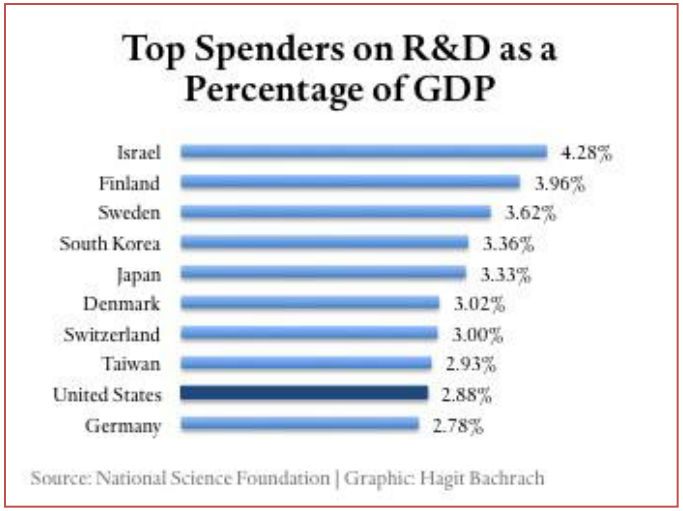


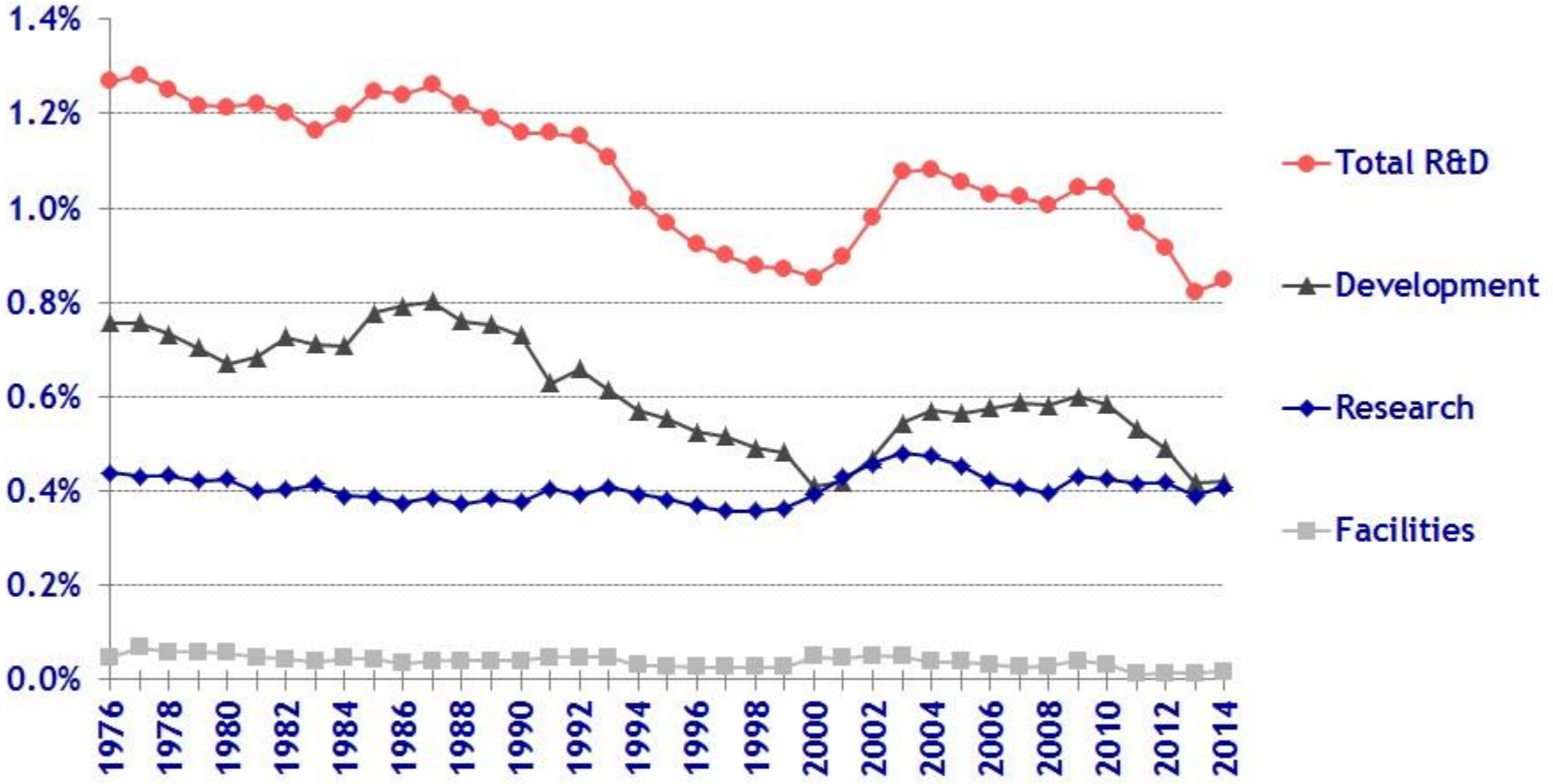
Figure 1





Trends in Federal R&D

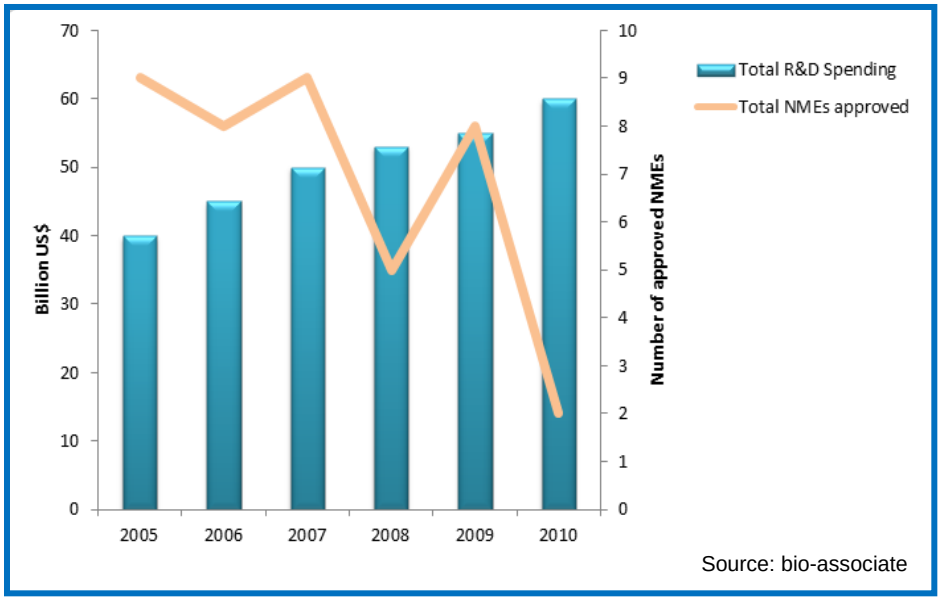
As a percent of GDP

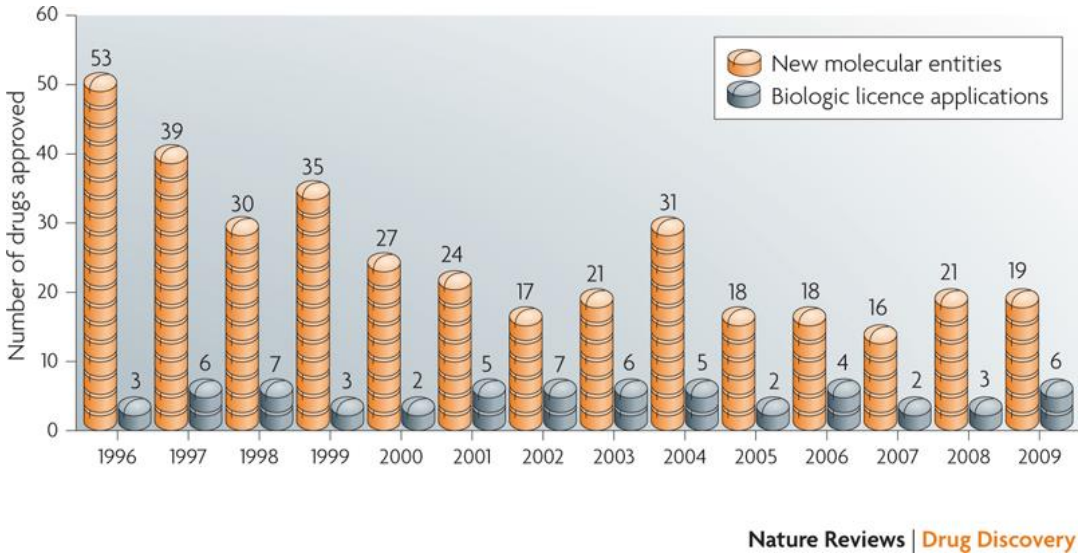


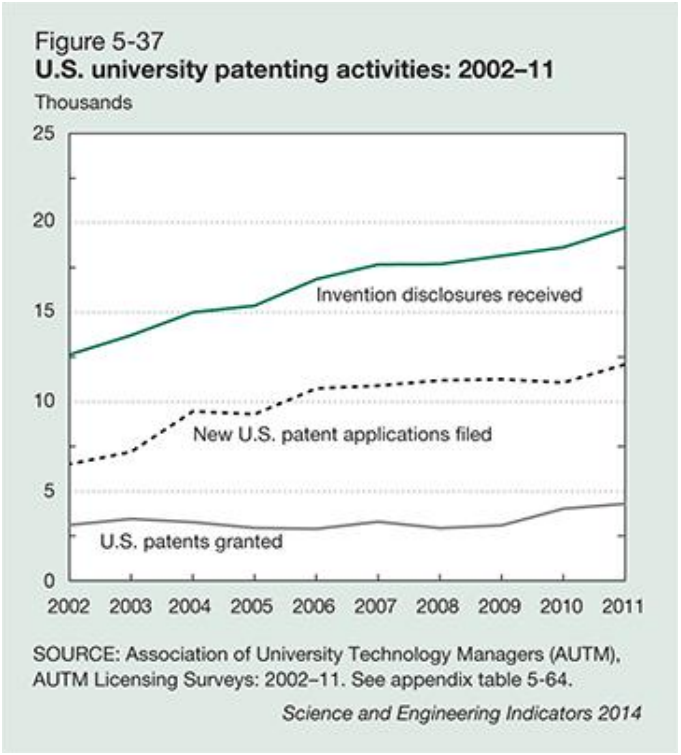
Source: Up to 1994 - National Science Foundation, Survey of Federal Funds for Research and Development; 1995 to Present - AAAS *Research and Development* series. GDP figures are from *Budget of the U.S. Government FY 2014*. FY 2013 and FY 2014 figures are latest estimates.

AAAS

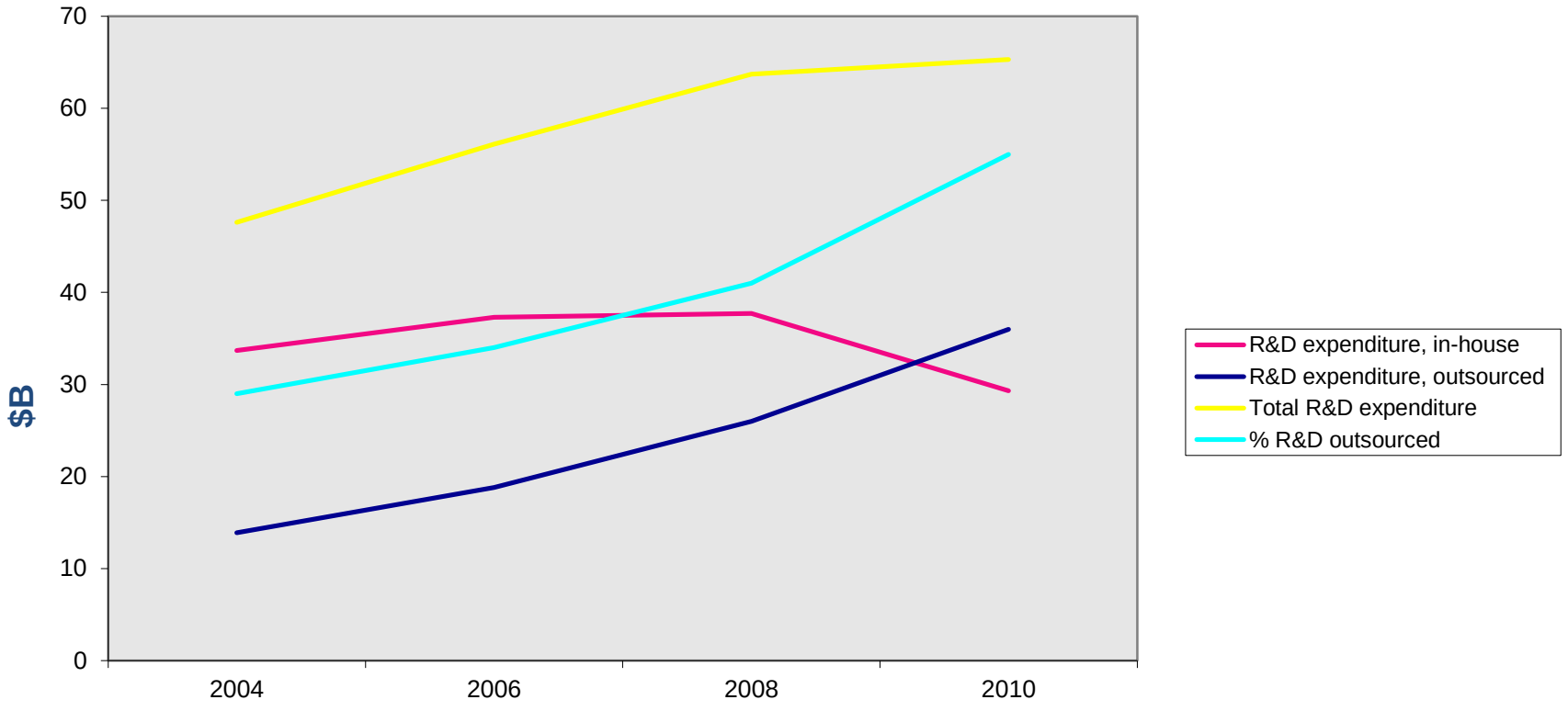
Trends in Pharma, FDA and PTO Approvals







Biopharma R&D Expenditure Trends – 2004 to 2010



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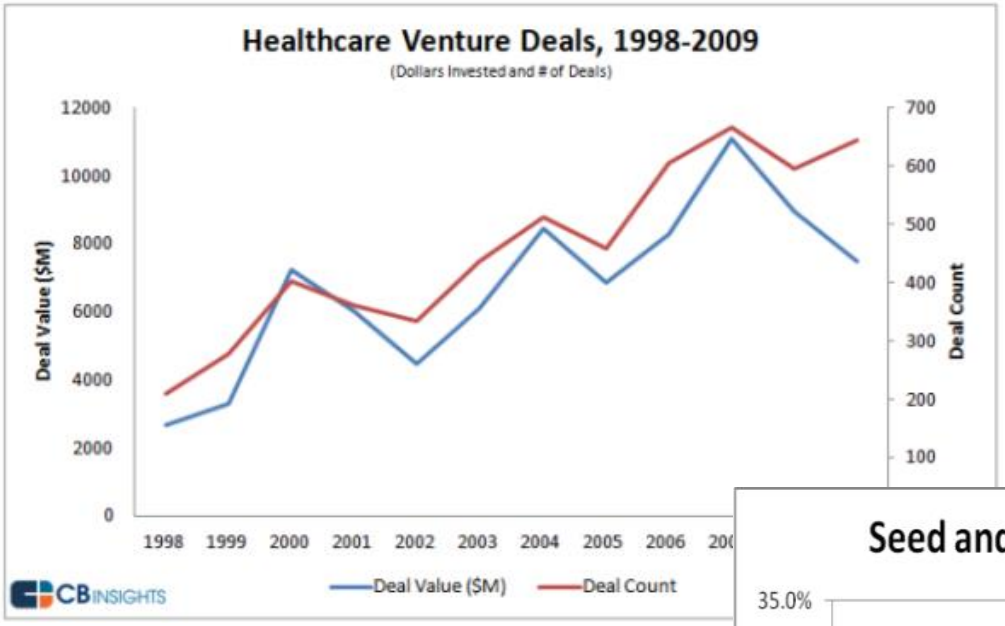
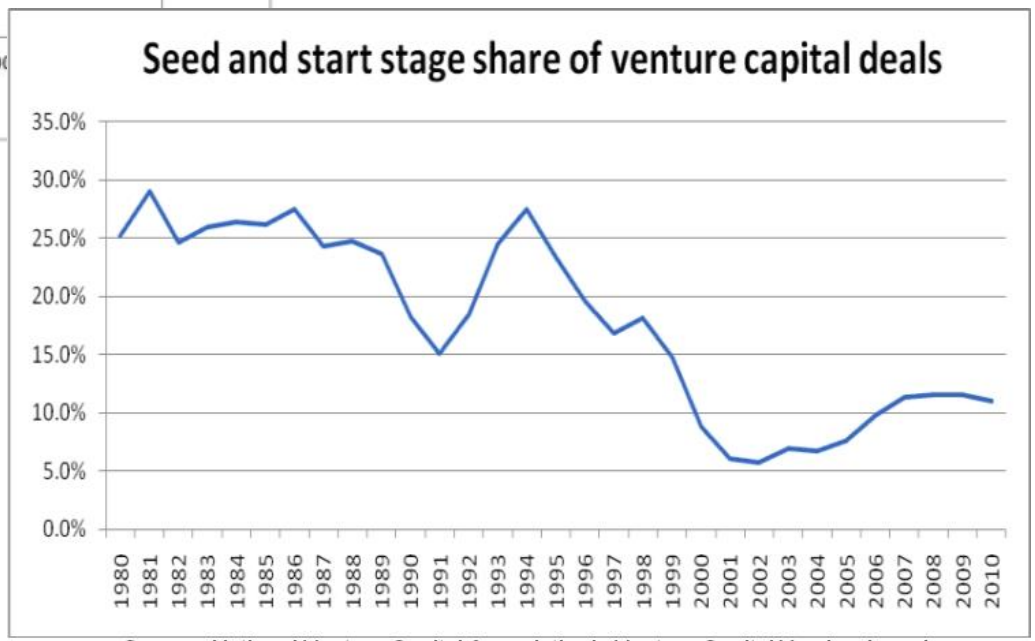
Sources: Pharmaceutical R&D Outsourcing Strategies, PhRMA

Trends in Venture Capital





Source: National Venture Capital Association's Venture Capital Yearbook, various years

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Adapt to Thrive

- Seek out complementary sources of R&D and new venture funding
- Identify creative new ways to incubate technologies and achieve POC
- Aggressively seek partnerships with industry and foundations
- Reward innovation and embrace it as a critical part of the institutional culture and mission
- Adapt, adapt, adapt

How Can Washington Help Even Further?

- Offer incentives to universities receiving federal funds that encourage them to partner more aggressively with the private sector
- Provide additional grant funds and programs aimed at stimulating development and translation of new products and businesses
- Relax UBIT and private business use thresholds
- Extend unemployment and/or extend low-cost health benefits to workers seeking to shift towards translating early stage research
- Accelerate approval of new drugs and provide facilitated means to perform early proof of principle studies at qualified universities
- Streamline patent processing and restrict obstructive and frivolous challenges
- Support enforcement of federally sponsored patent rights by university title holders

RONALD RUTH, PHD

Professor, SLAC National Accelerator Laboratory
Stanford University
Founder & Chairman of the Board
Lyncean Technologies, Inc.

The Story of Lyncean's "Compact Light Source"

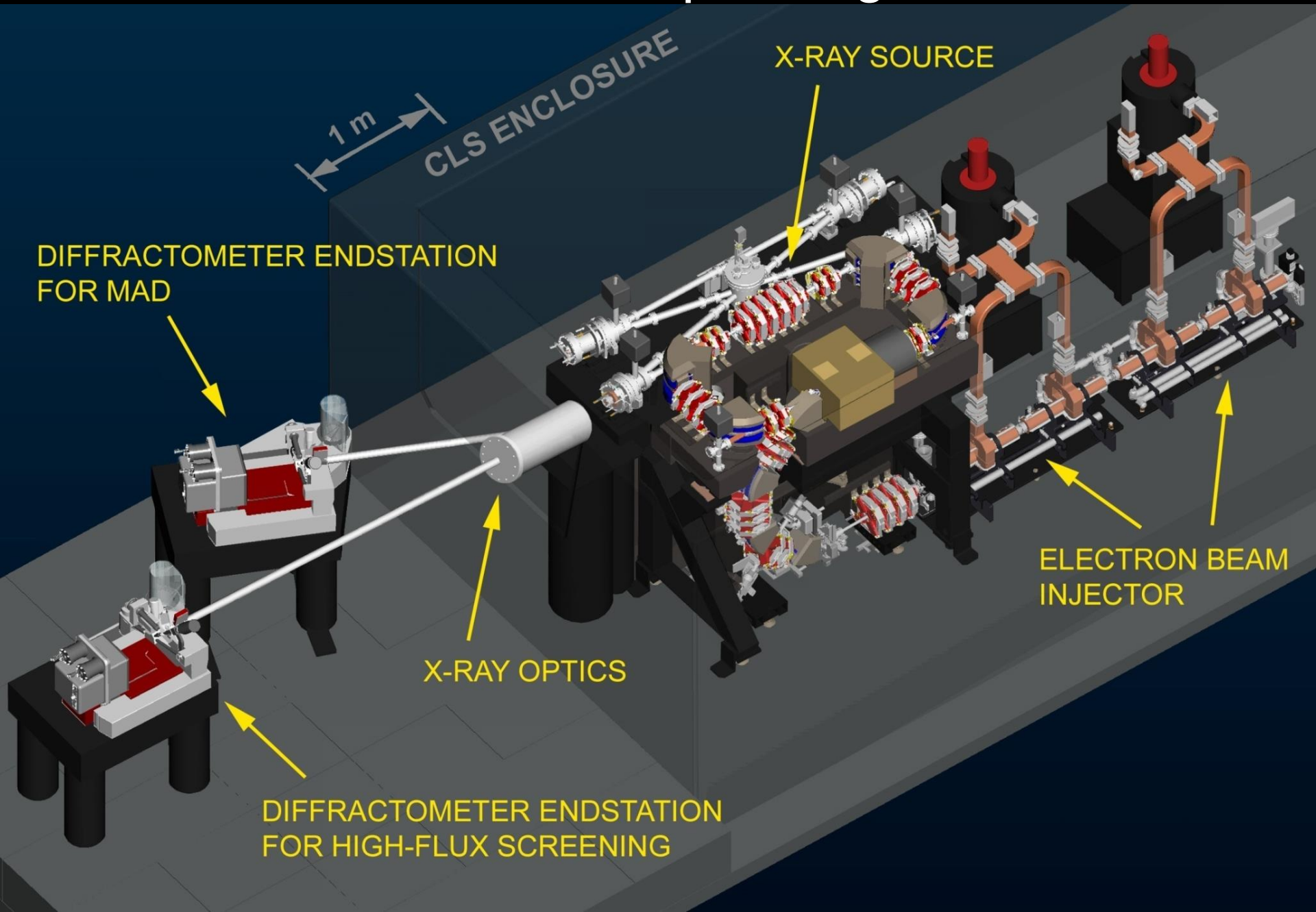
(A SLAC and Stanford Spinoff)

My Connection to National Labs

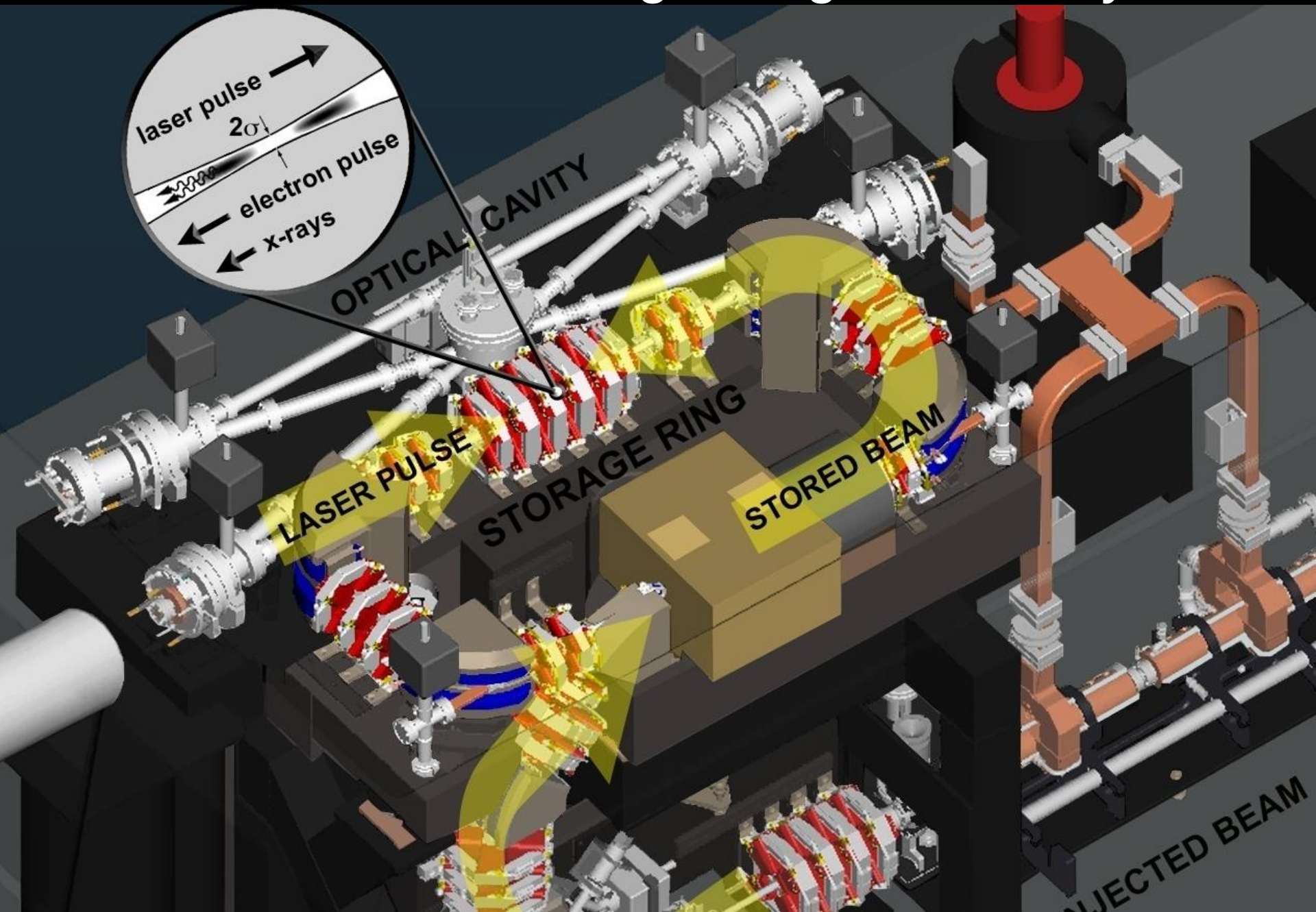
- PhD Research at Brookhaven National Lab
- First job at Lawrence Berkeley National Lab
- Two years at CERN
- 30 years at SLAC
- 23 years as Professor at SLAC/Stanford
- Founder of Lyncean Technologies, Inc.

The largest synchrotron in the US: billion-dollar scale ‘APS’, a ‘supercomputer’ of X-ray Science

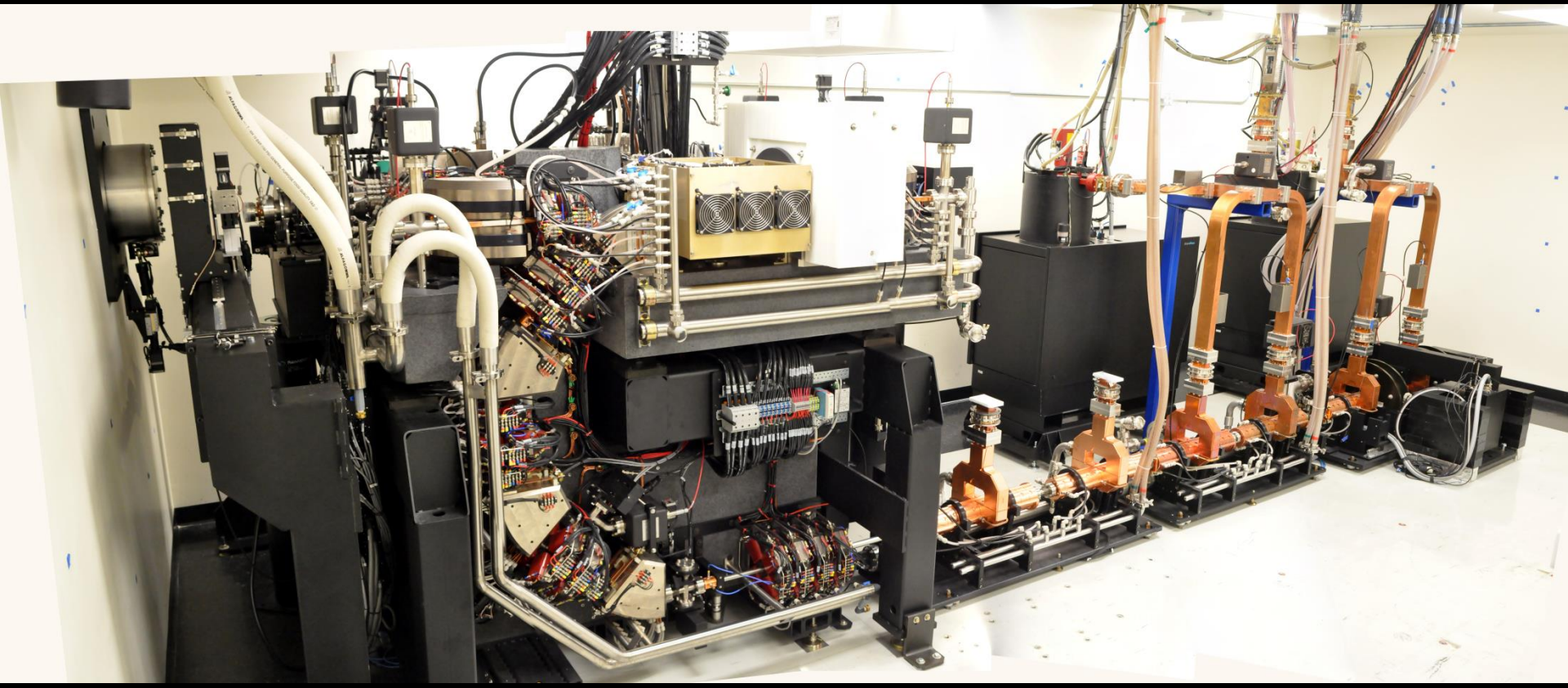
The CLS: The Compact Light Source



Detail: CLS Storage Ring and Cavity



The Compact Light Source today



Compact Light Source Applications

Applications span the broad set available with the large synchrotrons, For example:

- **Biological Imaging**, Medical Research
  - Special high resolution techniques for seeing tiny details in soft tissue.
- **Crystallography:** protein diffraction studies
  - For Drug Discovery
- **Semiconductor metrology for next and future chip production**
  - Measure Critical Dimensions for lithographic production of chips

For illustrations of these applications see:
http://www.lynceantech.com/applications.html

Summary and Outlook

- The Synchrotrons have generated many applications which have commercial value in medicine and industry.
- The x-ray science field has been asking for a compact synchrotron for decades to bring these applications to the marketplace.
- Lyncean's Compact Light Source is that device.
- The Compact Light Source holds the promise of being a driving force for innovation and could increase the breadth of the impact of x-ray science throughout the world.

Acknowledgements-Funding

Concept Development: SLAC/Stanford, US DOE HEP

Grant Funding (Lyncean):

- **CLS SBIR Grant Funding NIGMS** R44-GM6651
  CLS prototype
- **CXS Grant Funding NIGMS** R44-GM074437
  Crystallography development
- **CXS ARRA Grant Funding NIGMS** R44-GM074437
  CLS Intensity upgrade
- **ATCG3D Funding Protein Structure Init.** U54-GM074961
  CLS Beta/product development
- **CHRIS SBIR Grant Funding NCRR** R43-RR025730
  Imaging development
- **CLS Development SBIR Grant DOE** DE-SC0009622

DR. SIVA SIVANANTHAN

Professor of Physics

University of Illinois at Chicago

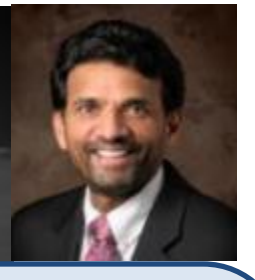
Founder, EPIR Technologies

EPIR: Infrared Night Vision Technology

UIC UNIVERSITY OF ILLINOIS AT CHICAGO

EPIR Technologies

EPIR Technologies, Inc.
Founded in 1997 to Commercialize Infrared Night Vision Technology



- EPIR is built on a passion for **protecting our soldiers** and national security
- EPIR specializes in infrared night vision technology for military and space applications
- Headquartered in Chicago
  - 34,000 sqft facility, 17 years old, 50+ headcount

White House Champion of Change

"Friend of the night"

From the Lab to the Marketplace

Microphysics Laboratory
UIC UNIVERSITY OF ILLINOIS AT CHICAGO

Cultivation

Foundation

Federal Funding

Incubation

EPIR Technologies

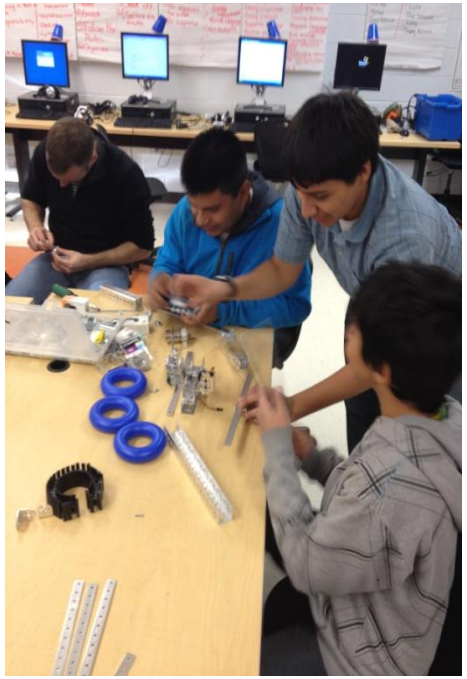
Innovation

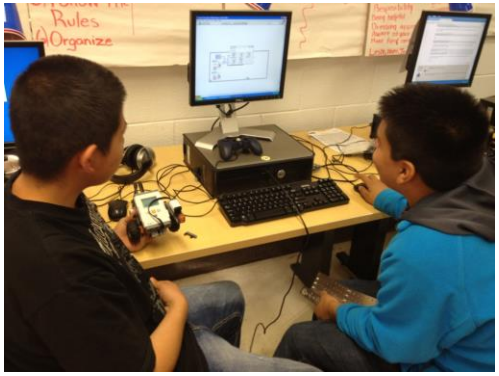
ARL
Raytheon
FLIR
LOCKHEED MARTIN
DRS Technologies
A Finmeccanica Company

EPIR Gives Back to the Community

UIC UNIVERSITY OF ILLINOIS AT CHICAGO

EPIR Technologies





BENITO JUÁREZ
COMMUNITY ACADEMY

Military Systems Supply Chain Risk

UIC UNIVERSITY OF ILLINOIS AT CHICAGO

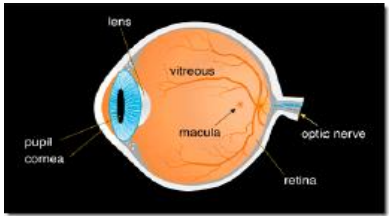
EPIR Technologies

PRIME CONTRACTORS

BOEING | United Technologies | LOCKHEED MARTIN | Honeywell | GENERAL DYNAMICS | NORTHROP GRUMMAN | Raytheon

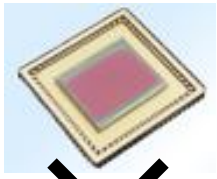
SUB-SYSTEM MANUFACTURERS

Specialized Systems
U.S. Small Companies
U.S. Universities



DRS Technologies A Finmeccanica Company | FLIR | BAE SYSTEMS | L3 | Raytheon

MATERIAL MANUFACTURERS



~~DRS Technologies A Finmeccanica Company~~ | ~~BAE SYSTEMS~~ | ~~Raytheon~~

Used to be 7, now down to 2 material manufacturers

PAULA COLLINS

Vice President, Government Relations

Texas Instruments

Key Points

- Research drives innovation, growth and job creation across the country.

- Funding basic research is a fundamental role of the federal government. It won't get done on the scale it needs to without the federal government's involvement.

- Research is essential to building a science and engineering workforce, producing our next Nobel Laureates, and ensuring the unparalleled excellence of our universities.

- The stakes are higher than ever. Other countries have the US playbook and are using it. Now is not the time to pull back.

FOR MORE INFORMATION ON COMPANIES CREATED FROM FEDERALLY FUNDED RESEARCH

www.ScienceCoalition.org/SuccessStories