



# **Technology Transfer Issues in the Asia Pacific Region: Lessons From the U.S. Experience**

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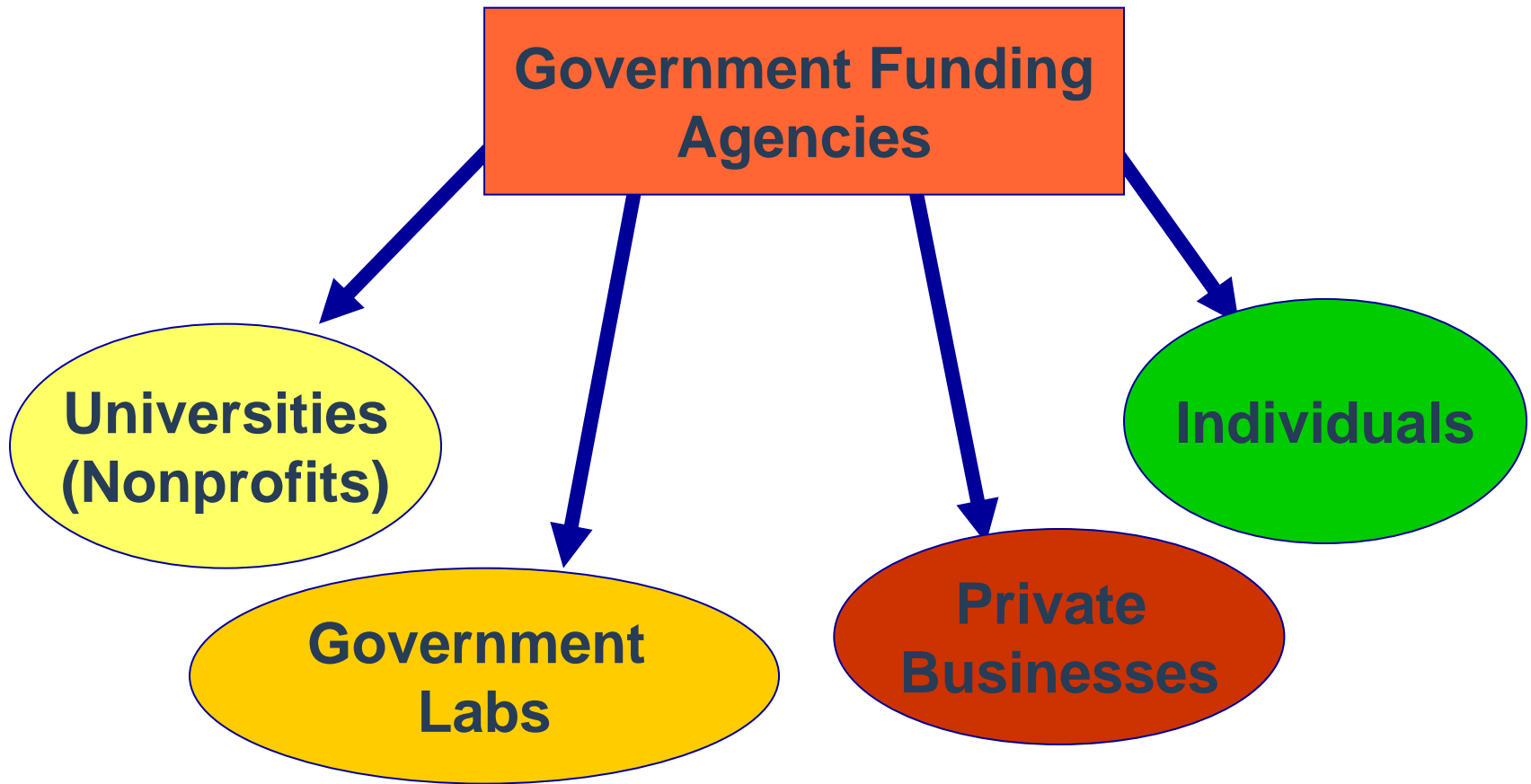
# Topics

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- ◆ Policy Followed in U.S. Before 1980
- ◆ Technology Transfer Laws
- ◆ Current policy: Promoting collaboration
- ◆ Effects of New Policy
- ◆ Keys to Successful Technology Transfer



# Research Funding





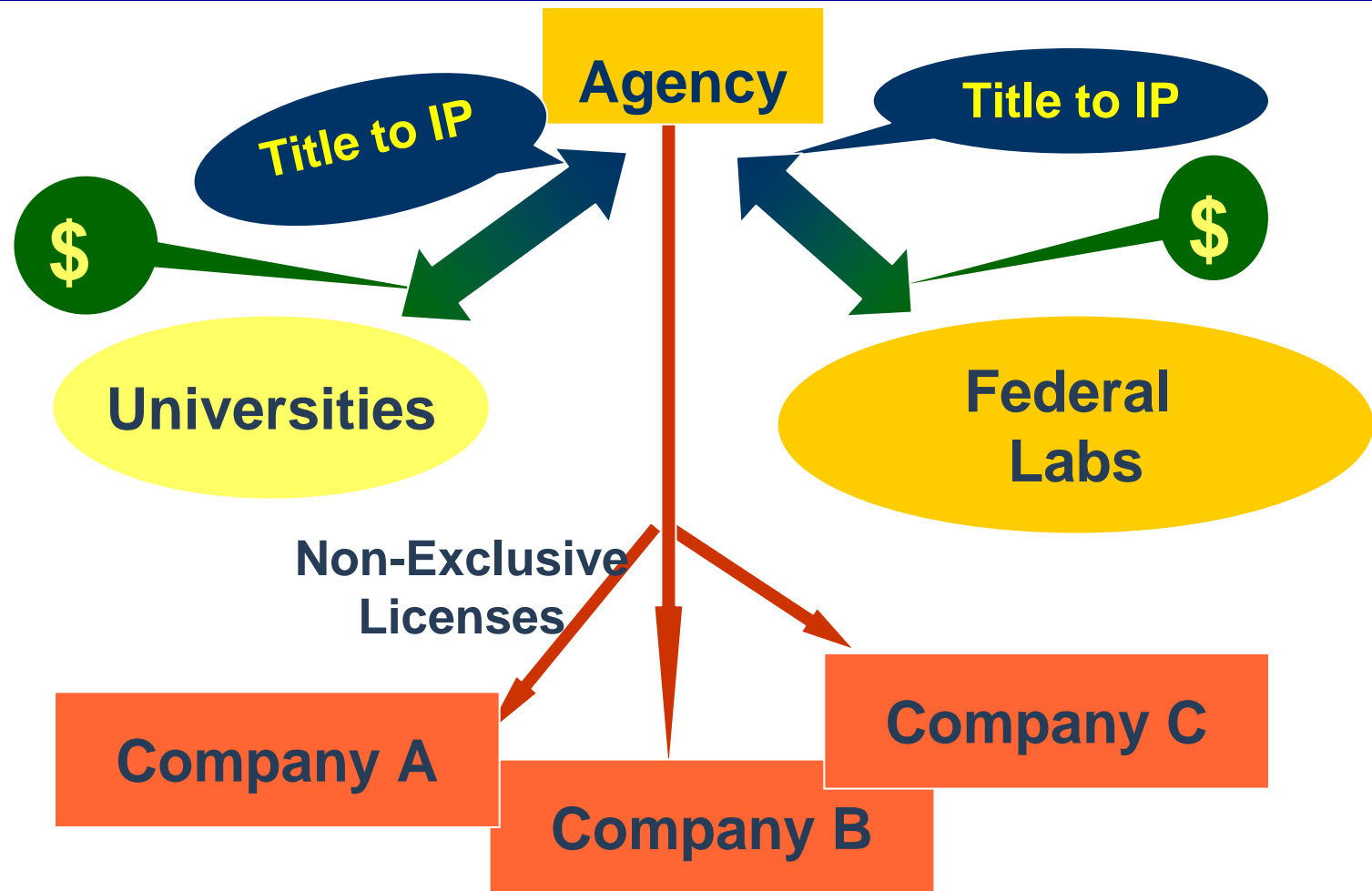
## Policy Before 1980

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- ◆ Federal Government retained ownership of patent rights.
- ◆ Only non-exclusive license available.
- ◆ Rationale:  
Public tax dollars paid for the invention; it should therefore be available for anyone to use



# Policy Before 1980





# Characteristics of Inventions by a University

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- ◆ Commercial potential usually unknown
  - fewer than half of disclosed inventions are licensed.
- ◆ Licensed inventions are embryonic (far from being products that generate revenue)
  - 12% of licensed technologies were ready for commercial use at time of license;
  - over 75% of inventions licensed were no more than proof of concepts (no prototype available or only lab scale prototype at the time of license).



# Characteristics of Inventions by a University

**Academic Invention**

**\$1.00**

+

**Product Development**

**\$10**

**Commercial Product**



# Characteristics of Inventions by a University

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- ◆ To develop University Innovations into Products:
  - Significant additional expenditures required for product development;
  - Successful commercialization often requires cooperation and involvement by inventor and licensee.





# Results of Policy Before 1980

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- ◆ Companies could not obtain exclusive rights.
- ◆ Competitors could later acquire licenses and then manufacture and sell the same products.
- ◆ Companies were reluctant to invest in developing new products and markets.



# Results of Policy Before 1980

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- ◆ Many printed publications.
- ◆ Little conversion into products.
  - In 1980, the government held title to approximately 28,000 patents
  - Fewer than 5% had been licensed
  - Few of those licenses related to commercial products



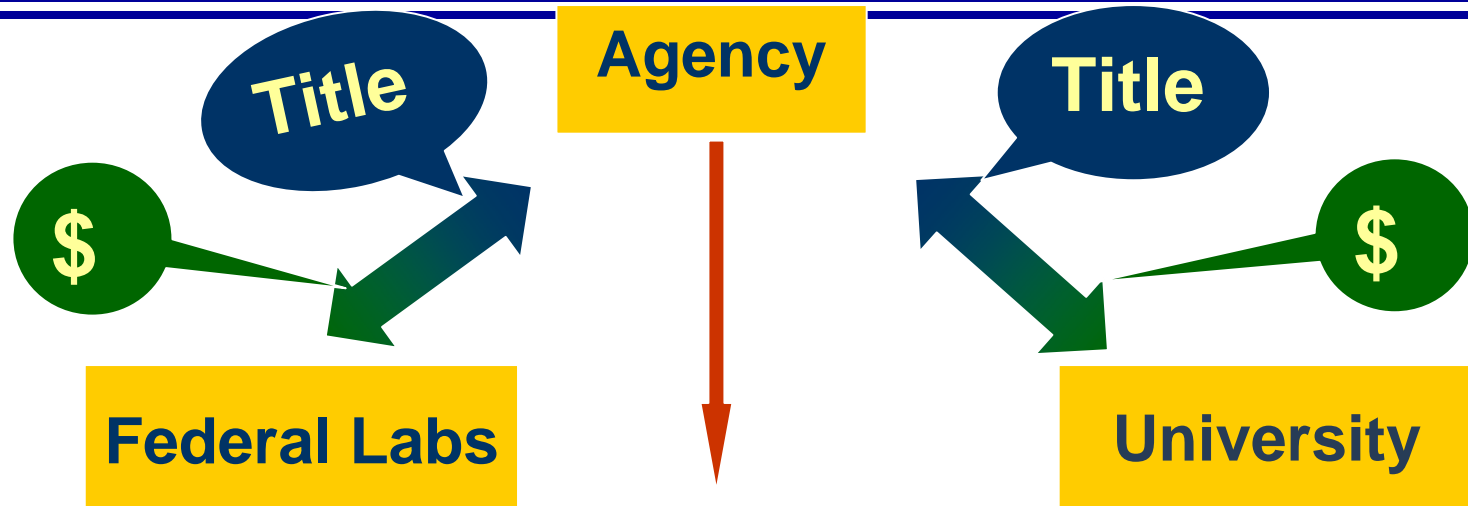
## Results of Policy Before 1980

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- ◆ Taxpayers did not benefit from
  - New, useful products
  - New jobs
  - Economic activity resulting from the manufacture and sale of these products.
- ◆ Congress was concerned about competitiveness in the global economy.



# Results of Policy Before 1980



- Many scientific articles; few patents
  - Few Licenses
  - Few Products
- Few University/Business Collaborations
  - No Significant Return on \$



# Policy Changed in 1980

## ◆ Policy Goals:

- Promote economic development;
- Enhance U.S. competitiveness through innovation;
- Benefit public by encouraging commercialization of technologies that would otherwise not be developed into products due to lack of incentives.



# Legislative Framework to Further Policy Goals

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- ◆ Bayh-Dole Act of 1980;
- ◆ Stevenson-Wydler Technology Innovation Act of 1980;
- ◆ Federal Technology Transfer Act of 1986 (FTTA);
- ◆ Executive Order 12591 “Facilitating Access to Science and Technology”, April 10, 1987;
- ◆ The National Competitiveness Technology Transfer Act of 1989



# The Bayh-Dole Act, 1980

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- ◆ University and Small Business Patent Procedures Act ;
- ◆ Codified in 35 U.S.C. § 200-212.



## 35 U.S.C. 200 Policy and Objective

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### To use the patent system:

- ◆ utilization of inventions ;
- ◆ maximum participation of small business firms, universities ;
- ◆ collaboration ;
- ◆ inventions are used in a manner to promote free competition and enterprise ;
- ◆ commercialization and public availability of inventions ;
- ◆ Government obtains sufficient rights to meet the needs of the Government and protect the public.





# Highlights of Bayh-Dole Act

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- ◆ Universities may elect to retain title to invention; must file for patents on inventions they elect.
- ◆ Encourage collaboration with industry.
- ◆ Preference for small businesses.
- ◆ Exclusive or partially exclusive licensing allowed.
- ◆ Retain March-in rights (require or grant license to a third party).
- ◆ Identify Government interest in patent text.



# Results of Bayh-Dole Act Implementation

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## Prior to 1980

- ◆ Less than 250 patents issued to Universities per year
- ◆ About 24 Universities engaged in technology transfer

## 2005

- ◆ Universities received more than 3000 patents
- ◆ About 200 Universities engaged in technology transfer based on AUTM membership



# Results of Bayh-Dole Act Implementation

Licensing of innovations by U.S. universities and other non-profits:

## ◆ By 2000:

- added about **\$40 billion** to the U.S. economy
- supported about **260,000 jobs**

## ◆ 2005:

- 527 new products introduced into the market (3,641 introduced from 1998 through 2005)
- 628 new spinoffs created (5,171 since 1980)
- 28,349 current, active licenses (each single license represents a one-on-one relationship between a company and a university)
- 4,932 new licenses signed in 2005

source: <http://www.autm.net>



# Stevenson-Wydler Act, 1980

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Technology Transfer is a mission of the Federal Government:

- ◆ Applicable to inventions developed by Federal laboratories.
- ◆ Requires Federal laboratories to actively seek opportunities to transfer technology to industry, universities, and state and local governments.
- ◆ Requires preference be given to industrial partners that agreed to manufacture in the United States.



# Federal Technology Transfer Act (FTTA)

**Technology transfer is a priority for Government Owned Government Operated (GOGO) Laboratories employees.**

## Technology Transfer Activities:

- ◆ Technical assistance
- ◆ Grants
- ◆ Patent licenses
- ◆ Educational partnerships
- ◆ Cooperative agreements
- ◆ Cooperative Research and Development Agreements (CRADAs)



# Executive Order 12591 (1987)

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## Facilitating Access to Science and Technology

- promote the commercialization;
- grant to all contractors, the title to patents made in whole or in part with Federal funds, in exchange for royalty-free use by or on behalf of the government;
- implement royalty-sharing programs with inventors who were employees of the agency, and cash award programs.



# National Competitiveness Technology Transfer Act (1989)

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- ◆ Made technology transfer a mission of government-owned, contractor-operated (GOCO) laboratories and their employees.
- ◆ Clarified the manner in which CRADAs are implemented.



# Creative Research and Development Agreements (CRADA)

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- ◆ Created by FTTA in 1986;
- ◆ Cost-Shared collaborations between a Federal Lab and private company permitted;
- ◆ Labs may accept and use funds, personnel, services, and property from collaborator.





# Intellectual Property Under CRADA

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- ◆ Lab Director given authority to negotiate agreements for inventions or other intellectual property.
- ◆ Collaborator has option to choose exclusive license for pre-negotiated field of use for any governmentally-funded invention arising under CRADA.
- ◆ Government is normally granted license in inventions made by collaborator in course of R&D under CRADA.



# Federal Technology Transfer Offices

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Examples:

## **National Aeronautics and Space Administration (NASA)**

Goddard Space Flight Center Innovative Partnerships Program (IPP) Office

## **United States Department of Agriculture (USDA)**

Office of Technology Transfer-Agricultural Research Service (OTT-ARS)

## **National Institutes of Health (NIH)**

Office of Technology Transfer (OTT)



# Technology Transfer Office *Responsibilities*

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- ❖ Material Transfer Agreements and Confidentiality Agreements
- ❖ Cooperative Research and Development Agreements (CRADAs)
- ❖ Invention Licenses



# NIH Research

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28+ Billion budget (FY2007)

Over **80%** of budget funds grants and contracts ("***extramural***")

Supports over 3,000 Institutions, including  
325,000 scientists and other research staff

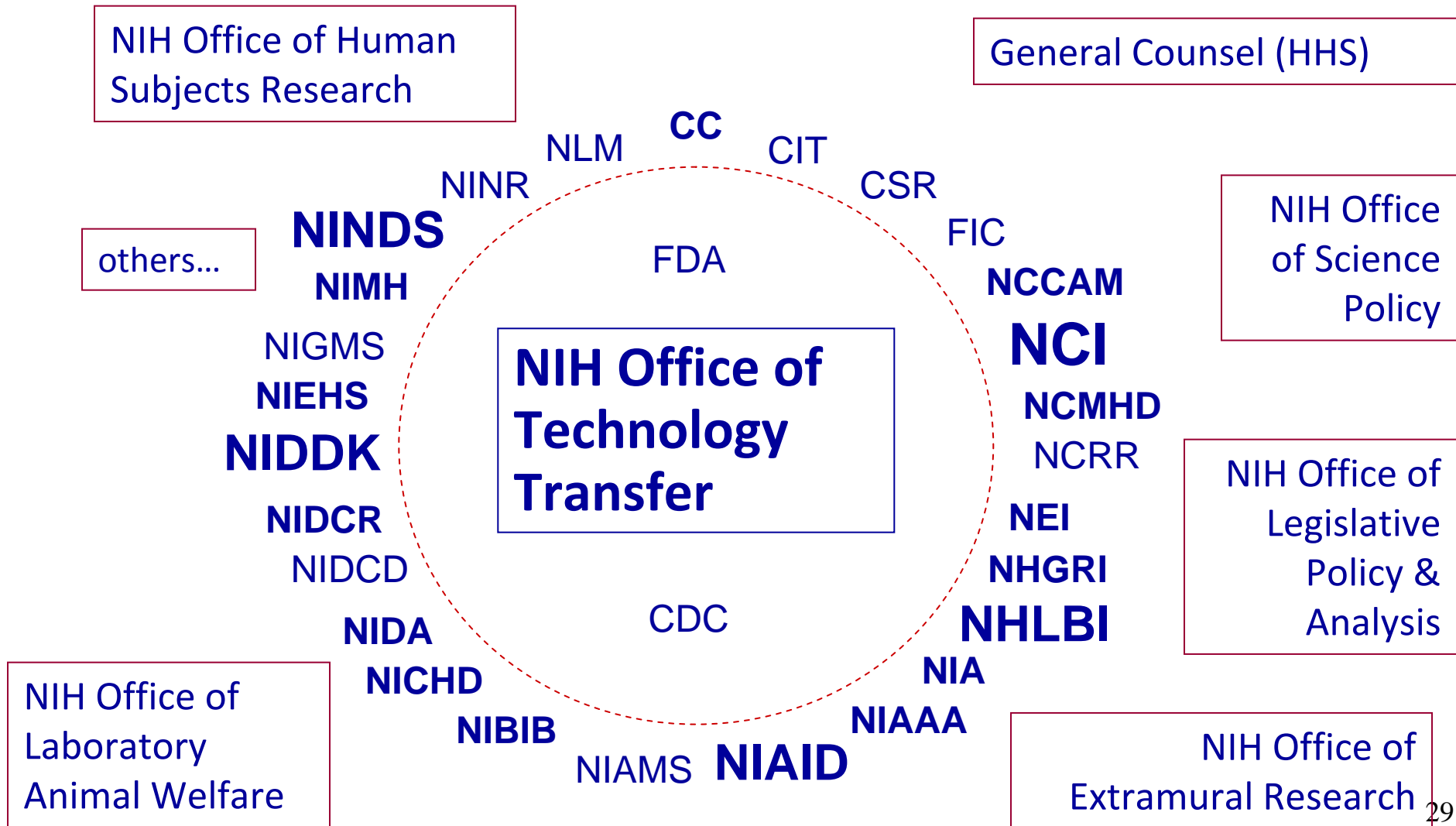
~**10%** supports NIH's own internal research  
("***intramural***")

6,000 scientists; >2,000 active projects



# TT at NIH – Operationally

## *~200 people for Public Health Services*





# Intramural NIH Inventions

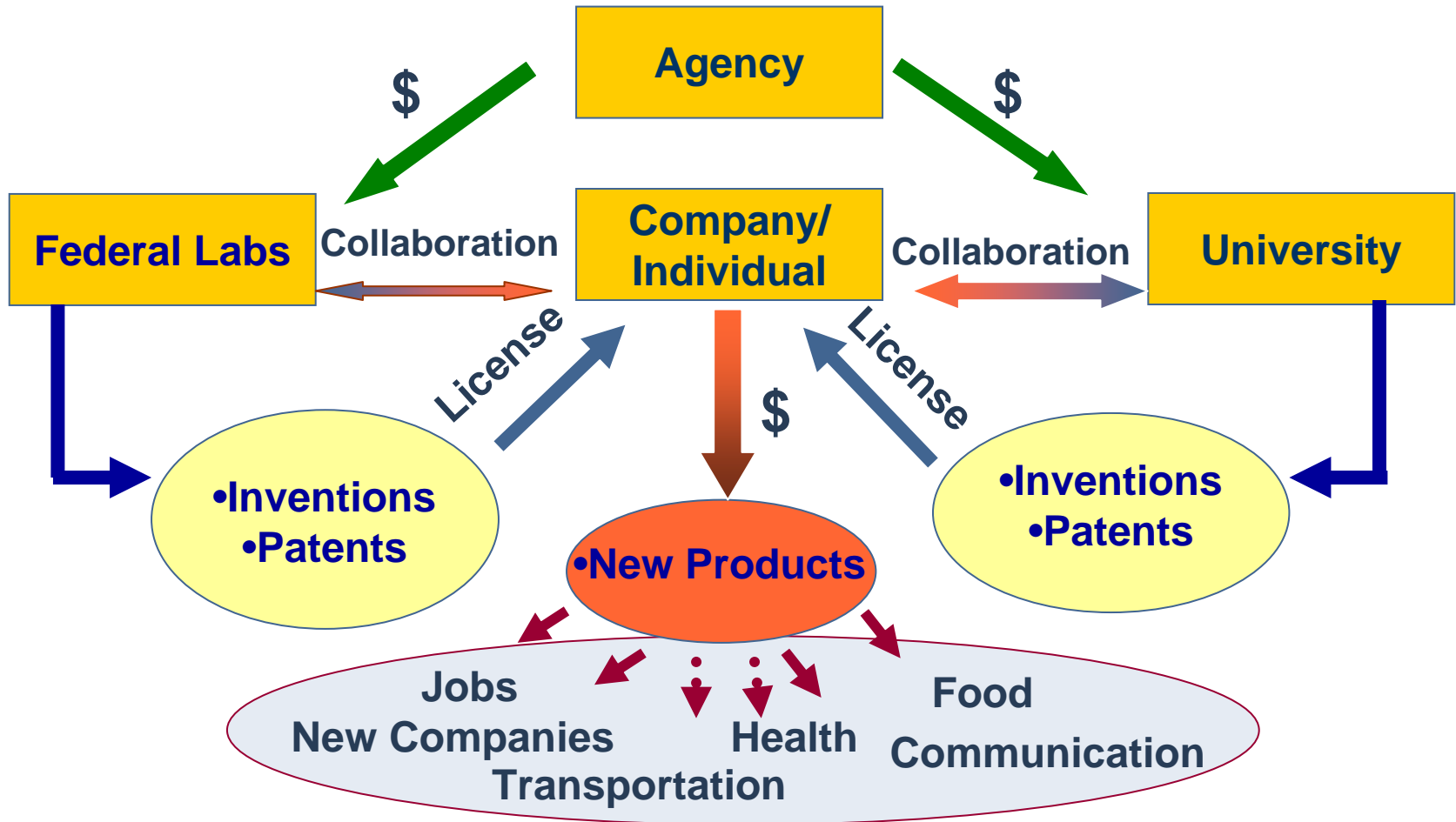
New Invention Disclosures	~400/year
Newly issued US patents	~100/year
Invention licenses executed	~250/year
Royalties	~\$90M/year (on ~\$4.7B sales)

## Top Royalty-Earning Inventions:

TAXUS Express2 (paclitaxel stents); Synagis (RSV mAb); Videx (ddI); Thyrogen (rTSH); HIV Ab (AIDS Test Kit); Twinrix (hepatitis A & B); Velcade (multiple myeloma); Ocuville (macular degeneration); Zevalin (NH lymphoma)



# Current U.S. Policy Effects





# Benefits to Inventors

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- ❖ Patents/Publications
- ❖ Share of license income
- ❖ Basis for promotion





# Benefits to Licensees

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- ❖ New process reduces cost of production.
- ❖ Novel product replaces existing competing products.
- ❖ Improved product increases market share.
- ❖ New business is created.



## Benefits to Society

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- ❖ Availability of new products and services.
- ❖ Less expensive or improved products and services.
- ❖ Creation or retention of local jobs.
- ❖ Downstream impacts on other businesses providing supporting products or services.
- ❖ Impacts on the quality of life for consumers.



# Measures of Return

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- ◆ New technologies extend life, improve quality of life.
- ◆ New technologies improve productivity.
- ◆ Job creation.
- ◆ Return to federal government from royalties.
- ◆ Return to federal government from tax revenues.



# Measures of Return

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- ◆ The benefit of increased life expectancy in the U.S. as a result of advances in health care creates annual net gains of about \$2.4 trillion.
- ◆ If only 10 percent of these increases in value (\$240 billion) are the result of NIH-funded medical research, it indicates a payoff of about 15 times the taxpayers' annual NIH investment of \$16 billion.

-Joint Economic Committee Report (2000)



# Keys to Successful Technology Transfer and Product Development

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## ◆ Laws

- Promote university-industry and public-private cooperation

## ◆ Build infrastructure of people

- Research and development; business development; IP

## ◆ Cultural assumptions

- Encourage innovation; market access

## ◆ Resources

- Public and private funding

## ◆ Institutions

- Universities; Government Labs; Business organizations



# Questions?

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