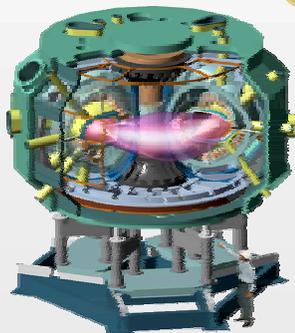
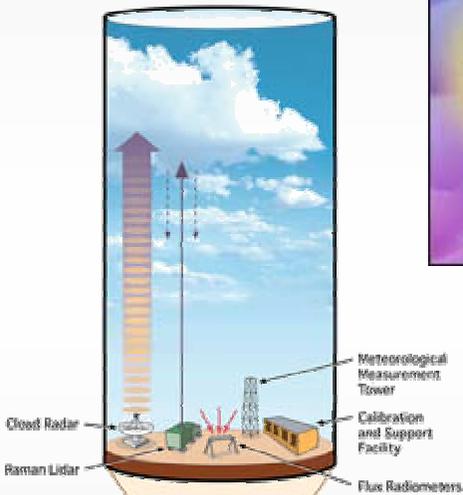
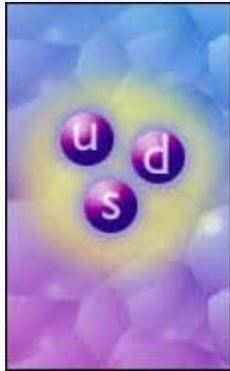
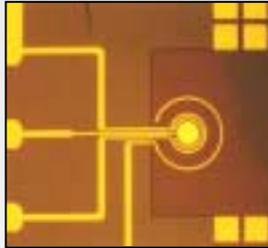


Science for DOE and the Nation

Office of Science Impacts on Industry & Academe – *SC Visualization Tools*

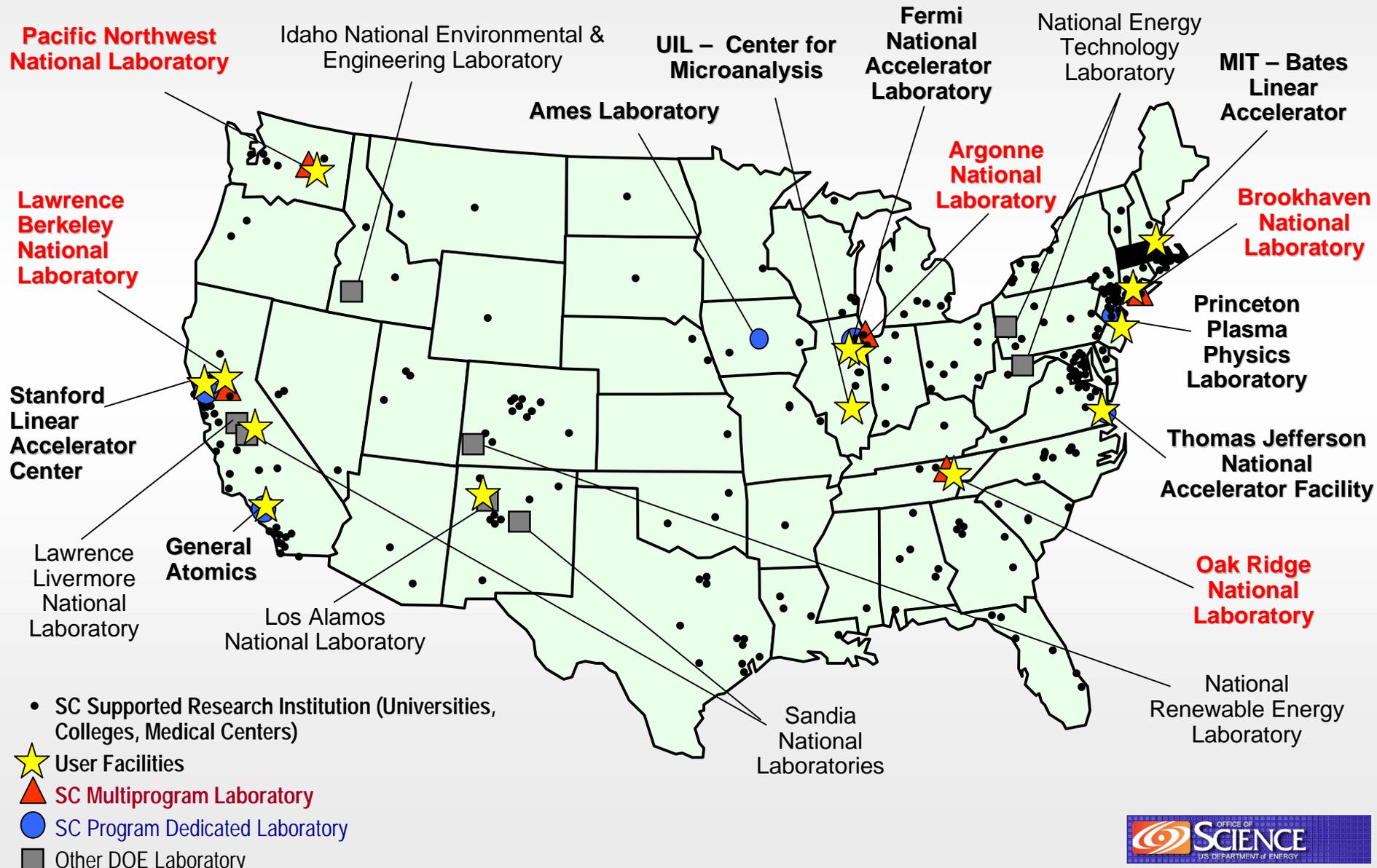


*Bill Valdez
Director,
Office of Planning and Analysis
Office of Science*

The Office of Science (SC)

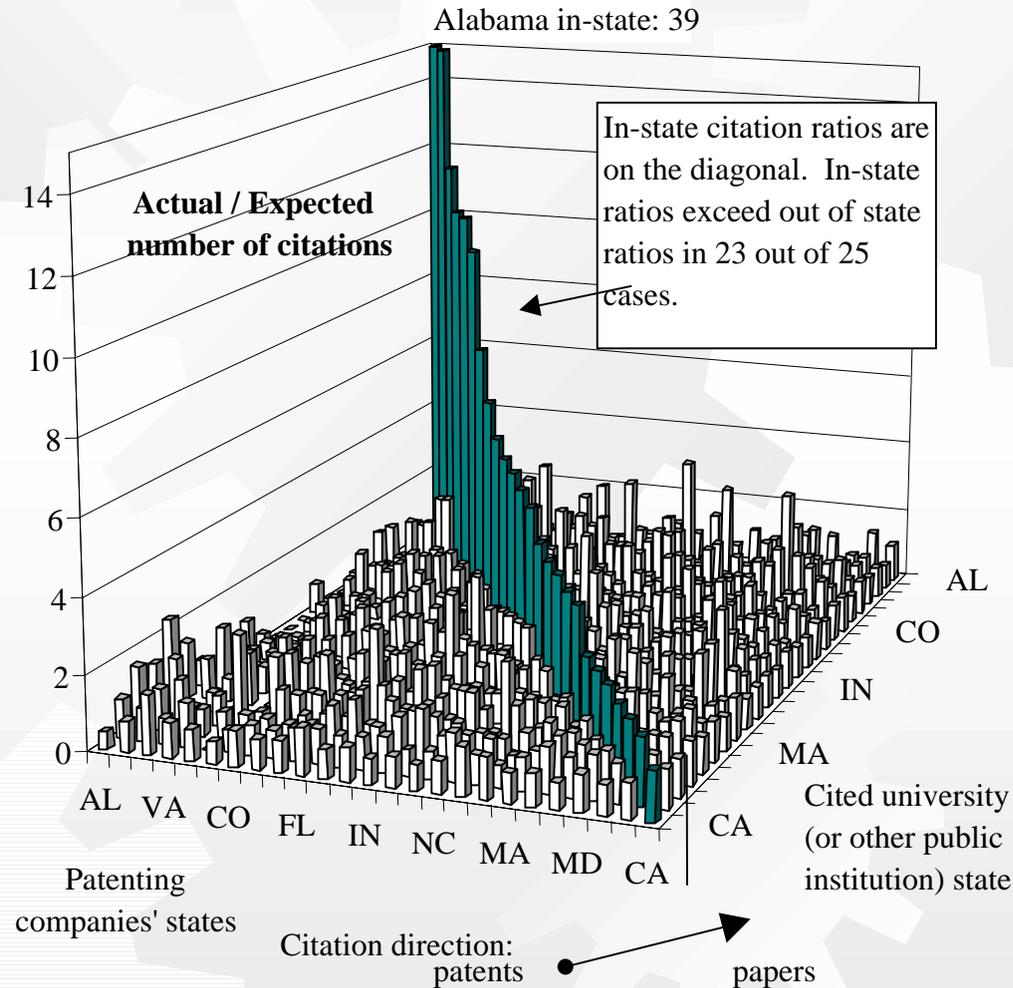
- ☀ Supports basic research that underpins DOE missions.
 - ✱ Provides over 40% of federal support to the physical sciences (including more than 90% of high energy and nuclear physics)
 - ✱ Provides sole support to select sub-fields (e.g. nuclear medicine, heavy element chemistry, magnetic fusion, etc.)
 - ✱ Supports the research of 15,000 PhDs and graduate students
- ☀ Constructs and operates large scientific facilities for the U.S. scientific community.
 - ✱ Accelerators, light sources, neutron sources, etc.
 - ✱ Used by about 18,000 researchers every year
- ☀ Provides infrastructure support for the ten SC labs.

SC Laboratories, User Facilities and the Institutions That Use Them



U.S. Companies Preferentially Cite In-State Public Sector Science in Their Patents

Citations from Industry Patents to Public Sector Papers



Expected # of citations = "patent state's" # of citations to all states multiplied by "paper state's" share of cites received from all states

SOURCE – CHI Research, inc.

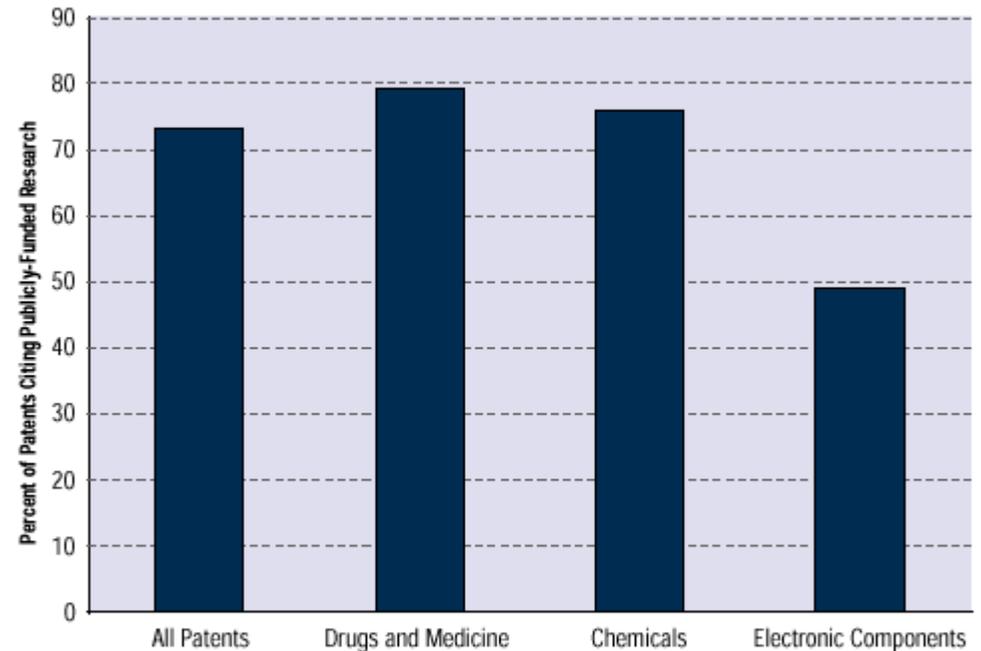
Study Finds Public Science Is Pillar Of Industry

By WILLIAM J. BROAD (NYT) - New study finds strong evidence that publicly financed scientific research plays surprisingly important role in breakthroughs of industrial innovation in United States; this suggests that impending cuts in Federal science budget might eventually hurt the economy; study, prepared for National Science Foundation, finds that 73 percent of main science papers cited by American industrial patents in two recent years were based on domestic and foreign research financed by government or nonprofit agencies; study sharply contradicts currently popular view that public support of basic research is passe; Democrats and Republicans are united in earmarking Government financing for science for sizable cuts as one way to reduce Federal deficit; Clinton Administration said to be aiming for 14 percent reduction over five years, while Republicans want 20 percent reduction; chart

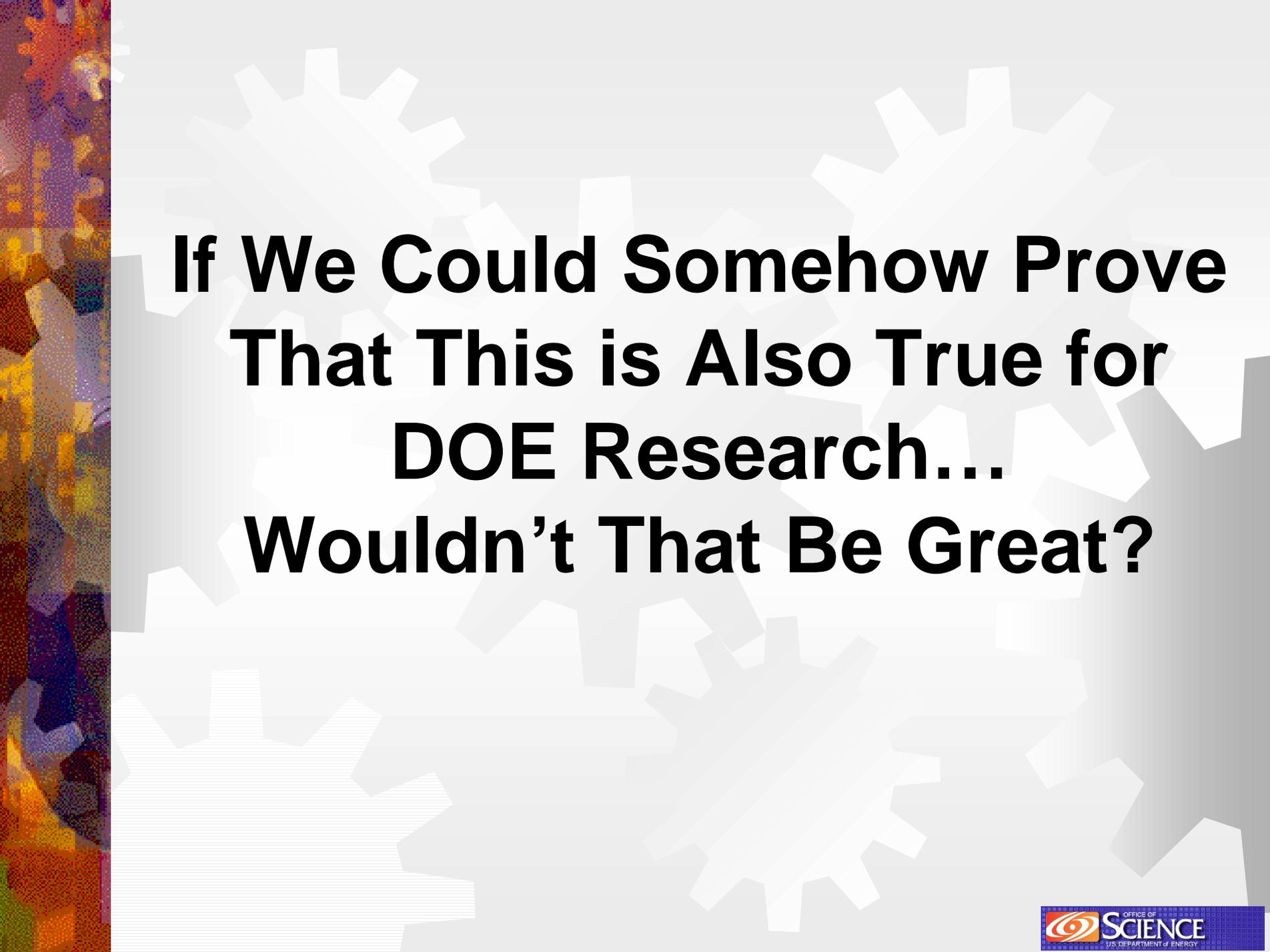
CHART 4.4

Private Industry Depends on Public Science to Fuel Innovation

Percent of U.S. Industry Patents Citing Publicly-Funded Research Papers, 1993-94



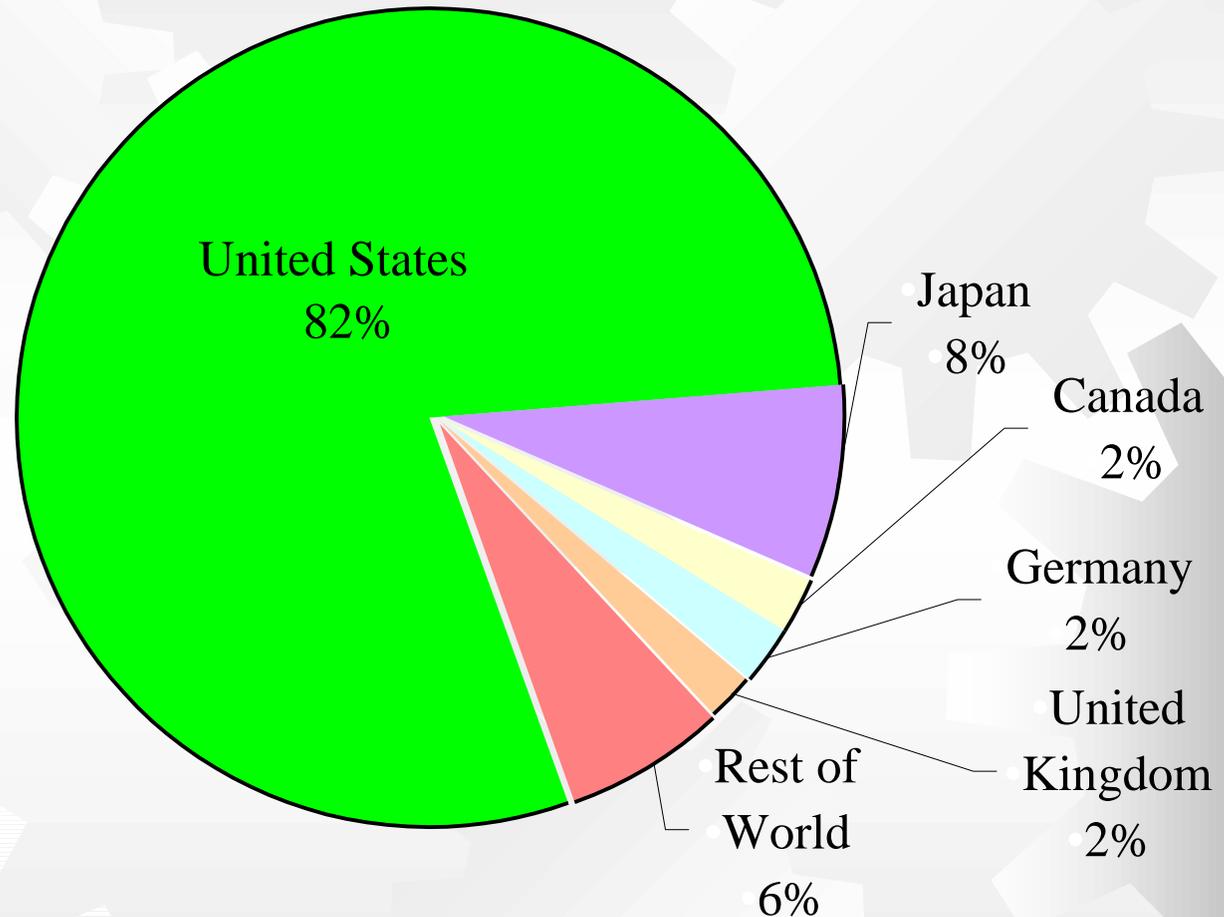
Source: Narin, Francis, Kimberly Hamilton and Dominic Olivastro, "Increasing Linkage Between U.S. Technology and Public Science," *AAAS Science and Technology Policy Yearbook 1998*, edited by Albert H. Teich, Stephen D. Nelson, and Celia McEnaney, p. 101.



**If We Could Somehow Prove
That This is Also True for
DOE Research...
Wouldn't That Be Great?**

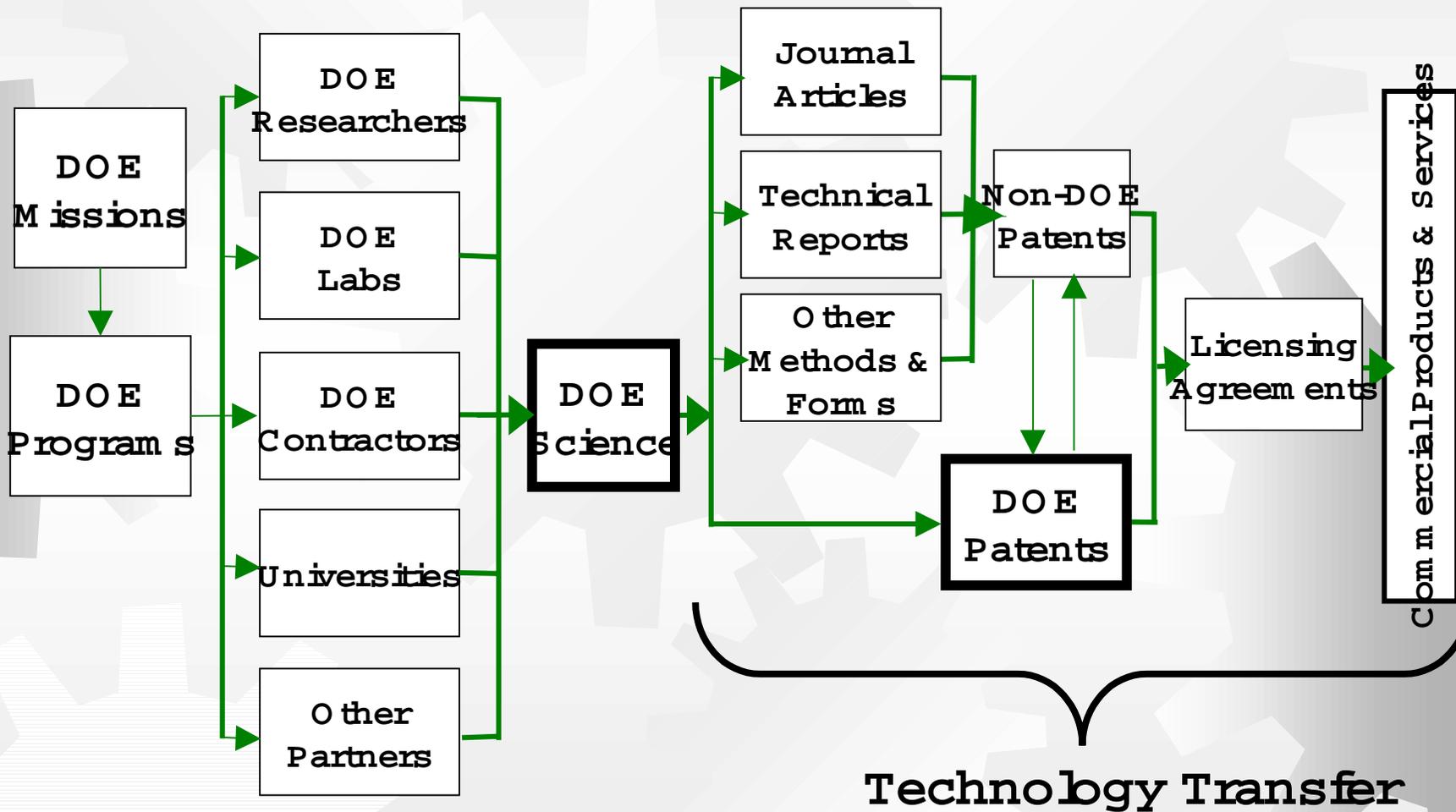
DOE science is used mostly in the US

Share of citing patents by inventor country



Note: citations were fractionally counted. That is, if a patent listed 2 US inventors and 1 Canadian inventor, the patent contributed 2/3 to the US total and 1/3 to the Canadian total. SOURCE – CHI Research, inc.

Tech Transfer Happens Many Ways



What We Are Doing and Why

- ✦ We Started This Project for:
 - ✦ Better Metrics
 - ✦ Better Outcome Descriptions
 - ✦ Portfolio Management Tools
 - ✦ Characterize Portfolio
 - ✦ Identify Undesirable Duplications and Gaps
 - ✦ Identify Areas for Study
 - ✦ Identify Emerging/Ebbing Fields
 - ✦ Trend Analysis Tools

A Tool is Only As Good as its Data

- ☀ Data Is Labor Intensive to Acquire
- ☀ Data Is Labor Intensive to Clean Up
- ☀ Data Is (and May Well Always Be) Incomplete
- ☀ Data Is On-going and So Remains Labor Intensive to Keep Current
- ☀ Good Sources of Data
 - ☀ CHI – Clean, Fulsome Set of Patent Information Linked to DOE Sponsored Citations
 - ☀ General Counsel's Patent Database (Paul Gottlieb)

The Data We Have (so far)

☀ Categories

- ☀ Invention Disclosures (potential patents)
- ☀ DOE Supported Patents (current patents)
- ☀ DOE Supported Research Papers or DOE Patents Cited in Non-DOE Patents (indirect patents)
- ☀ Abstracts of Research Supported and Papers Published

☀ Specifics

- ☀ Abstracts from 32,751 DOE projects (~ 7,800 SC projects)
- ☀ Abstracts from 32,141 NSF research projects
- ☀ Abstracts from 33,115 conference papers and technical reports assembled by the Office of Scientific and Technical Information
- ☀ Abstracts from 4,160 articles published in Science Magazine
- ☀ Abstracts and background data from 11,759 patents (3,917 SC Patents) originating from work sponsored by DOE
- ☀ Abstracts and background data from 43,493 patents that cite DOE patents as prior art (represents 61,191 citations)
- ☀ 28,220 energy-related terms from the International Energy Thesaurus
- ☀ 99,642 terms from the Princeton University WordNet dictionary

Cross-Cutting Tools We Have Developed/Utilized to Analyze Data

☀ Data Mining

- ☀ Spire
- ☀ Theme River

☀ Patent Research

- ☀ CHI
- ☀ SC Patent Tool

☀ Attributes

- ☀ Flexible interface (search by word/phrase, partial/exact match)
- ☀ “Point & Click” and “Drag & Drop” queries to minimize typing
- ☀ Embedded thesaurus to facilitate query creation
- ☀ Retrieves query results “in context” to facilitate interpretation
- ☀ Real-time “gisting” tools to quickly summarize results
- ☀ Correlation tools to show concordance and divergence among documents
- ☀ Visualization tools to show relationships among documents
- ☀ Visualization tools to show trends over time

Where We Are Going With This

- ☀ These Tools Can Be Used For:
 - ✿ Managing Patent and Intellectual Property Information;
 - ✿ Describing and Analyzing Portfolio;
 - ✿ Identifying and Analyzing Research Trends; and
 - ✿ Identifying Potential Partners.
- ☀ Sample Now Available

What We Still Need

- ☀ Beta test of the tool
- ☀ Verification of patent information
- ☀ Champions for more fulsome and consistent FWP/grant abstracts, PI information and user facility data.
- ☀ Information on application of DOE research, emerging areas of research, etc.
- ☀ Analysis Feedback
 - ☀ What does the current data tell us?
 - ☀ What are we missing in terms of analytical capabilities?
 - ☀ What other good data sources exist?