Building an Evidence Basis for S&T Policy

Understanding

develop usable knowledge and theories

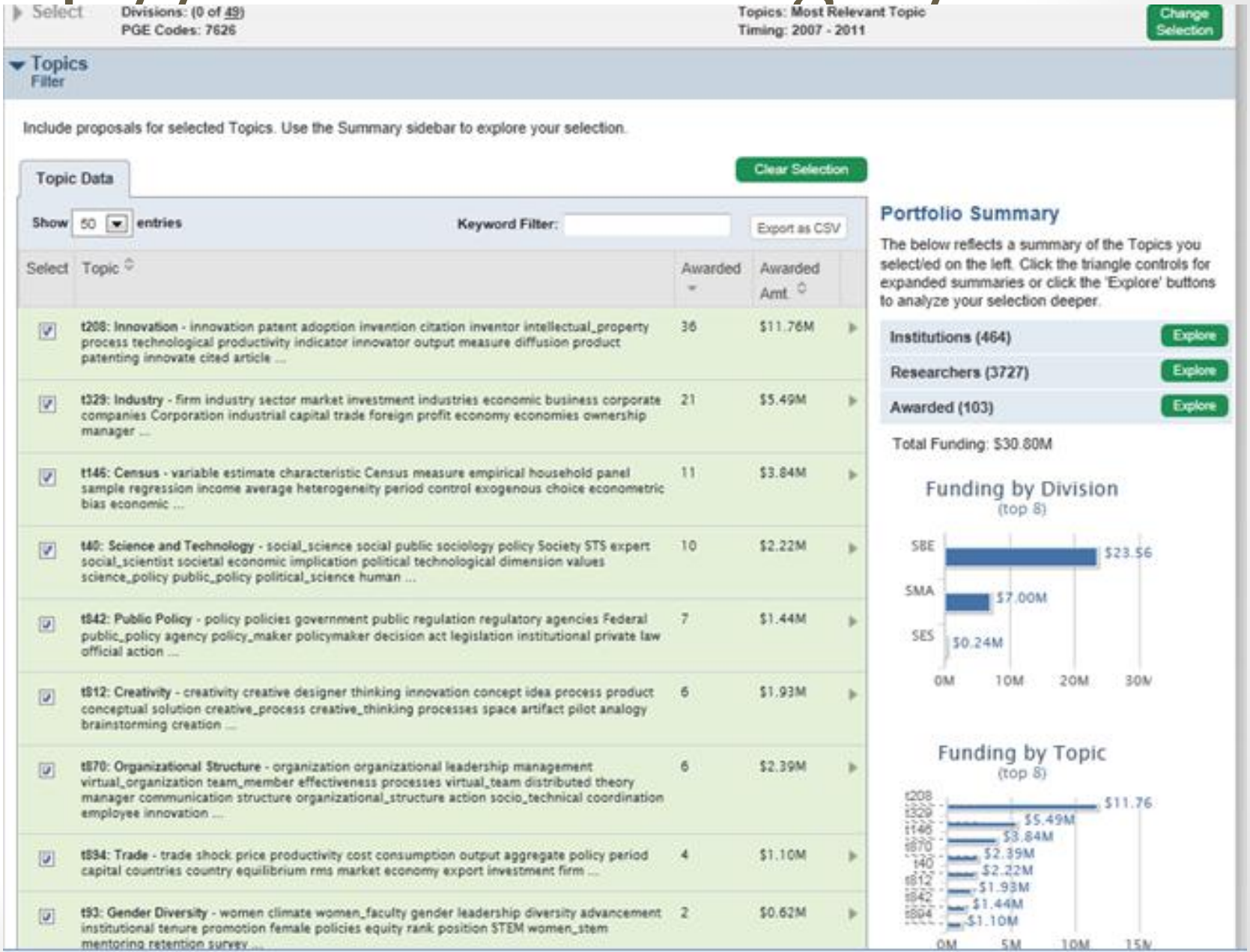
Measurement

improve and expand science metrics, datasets and analytical models and tools

Community of Practice

cultivate a community of practice focusing on SciSIP across the academy, the public sector and industry

http://readidata.nitrd.gov/star



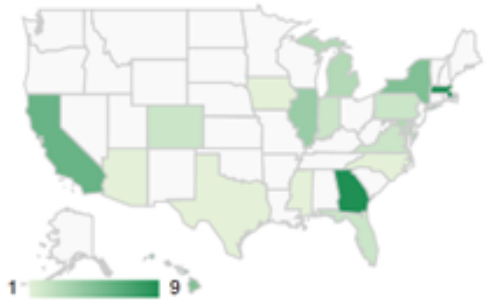
Portfolio Viewer

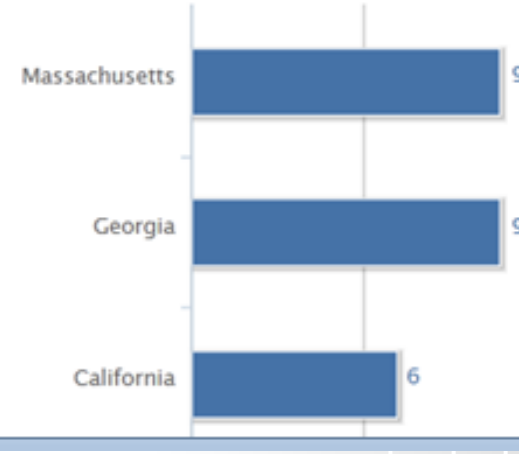
Awards | Researchers | Institutions

Show 50 entries Keyword Filter: Export as CSV

Name	Institution	Department	Count*	IDs**	Details
Lynne G Zucker	University of California-Los Angeles	Sociology & Public Policy	2	0830983, 1063988	
Alan L Porter	Georgia Institute of Technology	Public Policy	2	0830207, 1064146	
Kenneth Flamm	Brookings Institution	Economics	2	0830389, 0965013	
Lee Fleming	Harvard University	Institute for Quantitative Social Scienc	2	0830287, 0965279	
Francisco Veloso	Carnegie-Mellon University	Engineering and Public Policy	2	0830233, 0738182	
Ben Shneiderman	University of Maryland College Park	Department of Computer Science	1	0915645	
Myron P Gutmann	University of Michigan Ann Arbor	ICPSR	1	0937370	
Michael R Darby	University of California-Los Angeles	Anderson Graduate School of Management	1	0830983	
Martha E Crosby	University of Hawaii	Dept of Info and Computer Sciences	1	0738208	
Suzanne A Scotchmer	University of California-Berkeley	Institute of Business & Economic Res.	1	0830186	
Larry Leslie	University of Georgia	Higher Education	1	0830165	
Gary L Bradshaw	Mississippi State University	Department of Psychology	1	0915585	
Sheila Slaughter	University of Georgia	Higher Education	1	0830165	
Philip Shapira	Georgia Tech Research Corporation	School of Public Policy	1	0738126	
Robert Axtell	George Mason University	Computational Social Science	1	0915657	

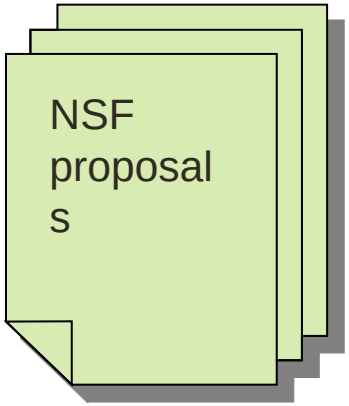
Researchers by State





A LOT HAS BEEN LEARNED: EXAMPLE – UNDERSTANDING SCIENCE INVESTMENTS

Capturing Scientific Outcomes: Topic modelling



Topic Model:
- Use words from (all) text
- Learn T topics

Automatically learned topics (e.g.):

…

t6. conflict violence war international military …

t7. model method data estimation variables …

t8. parameter method point local estimates …

t9. optimization uncertainty optimal stochastic …

t10. surface surfaces interfaces interface …

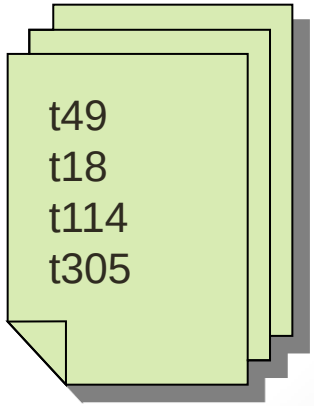
t11. speech sound acoustic recognition human …

t12. museum public exhibit center informal outreach

t13. particles particle colloidal granular material …

t14. ocean marine scientist oceanography …

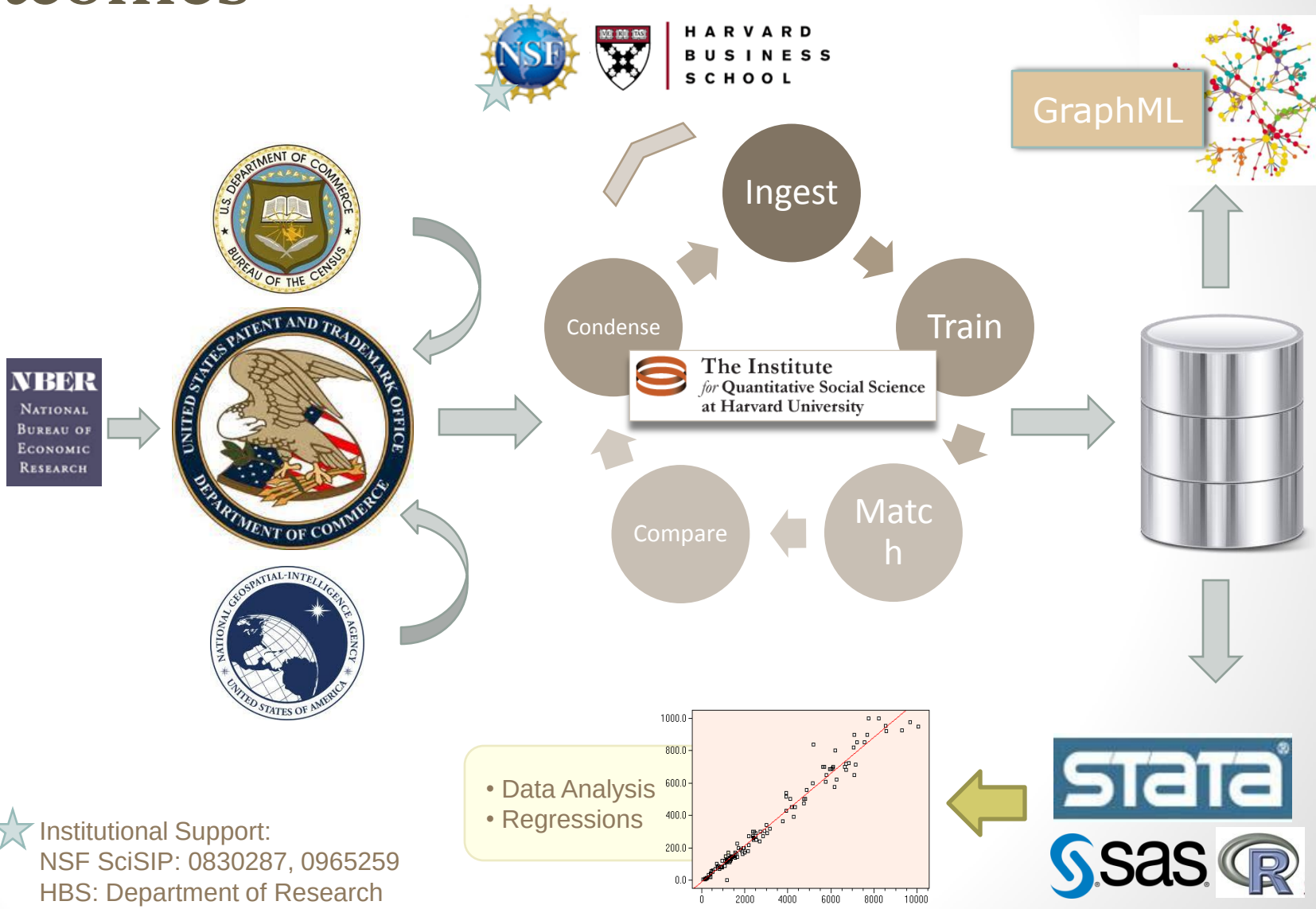
…



Topic tags for each and every proposal

David Newman - UC Irvine

Automated capture of economic outcomes



Institutional Support:
NSF SciSIP: 0830287, 0965259
HBS: Department of Research

Conceptual frameworks developed

- Ideas Arise
  - Funding, infrastructure, regulation shocks? => exogenous variation
  - Individual activity? => mobility
  - Serendipity?
- are tested,
  - Review by peers (scientific journals)
  - Within firms
- mature,
  - Adoption
- and…make a significant impact
  - Economic? Social? Scientific?

Regulatory Shock

Linking induced technological change, and environmental regulation: Evidence from patenting in the U.S. auto industry

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ABSTRACT

This article uses a carefully screened patent database in automobile emission control technologies and a detailed regulatory action analysis to examine firms' innovation in response to U.S. technology-forcing auto emissions standards enacted between 1970 and 1998. The study finds that under the *performance-based technology-forcing (PBTF)* auto emissions regulations, both automakers and component suppliers innovated and introduced more advanced emission control technologies for automobile applications. The study also shows that stringent PBTF regulation temporarily induced domestic U.S. firms to become more innovative than foreign firms that operated in the local U.S. market during the early phase of the regulatory regime. Findings of this research strongly imply that government intervention in the form of technology-forcing regulation can drive firms to invest in technological innovation.

- Careful construction of patent database
- Knowledge of automobile technologies
- Initial description
- Analytical drivers

Infrastructure Shock

Scientific freedom and openness are hallmarks of academia: relative to their counterparts in industry, academics maintain discretion over their research agenda and allow others to build on their discoveries. This paper examines the relationship between openness and freedom, building on recent models emphasizing that, from an economic perspective, freedom is the granting of control rights to researchers. Within this framework, openness of upstream research does not simply encourage higher levels of downstream exploitation. It also raises the incentives for additional upstream research by encouraging the establishment of entirely new research directions. In other words, within academia, restrictions on scientific openness (such as those created by formal intellectual property (IP)) may limit the diversity and experimentation of basic research itself. We test this hypothesis by examining a "natural experiment" in openness within the academic community: NIH agreements during the late 1990s that circumscribed IP restrictions for academics regarding certain genetically engineered mice. Using a sample of engineered mice that are linked to specific scientific papers (some affected by the NIH agreements and some not), we implement a differences-in-differences estimator to evaluate how the level and type of follow-on research using these mice changes after the NIH-induced increase in openness. We find a significant increase in the level of follow-on research. Moreover, this increase is driven by a substantial increase in the rate of exploration of more diverse research paths. Overall, our findings highlight a neglected cost of IP: reductions in the diversity of experimentation that follows from a single idea.

Of mice and academics: Murray, Aghion, Dewatripont, Kolev and Stern
Natural Experiment
Careful difference in difference
Careful hypothesis structuring

Idea transmission as human activity

ABSTRACT

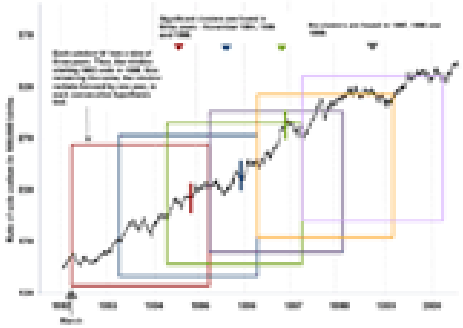
Are scientific knowledge flows embodied in individuals, or "in the air"? To answer this question, we measure the effect of labor mobility in a sample of 9,483 elite academic life scientists on the citation trajectories associated with individual articles (resp. patents) published (resp. granted) before the scientist moved to a new institution. We find that article-to-article citations from the scientific community at the superstar's origin location are barely affected by their departure. In contrast, article-to-patent citations, and especially patent-to-patent citations, decline at the origin location following a star's departure, suggesting that spillovers from academia to industry are not completely disembodied. We also find that article-to-article citations at the superstar's destination location markedly increase after they move. Our results suggest that, to be realized, knowledge flows to industry may require more face-to-face interaction than those to academics. Moreover, to the extent that academic scientists do not internalize the effect of their location decisions on the circulation of ideas, our results raise the intriguing possibility that barriers to labor mobility in academic science limit the recombination of individual bits of knowledge, resulting in a suboptimal rate of scientific exploration.

The Diffusion Of Scientific Knowledge Across Time And Space: Evidence From Professional Transitions For The Superstars Of Medicine (Azoulay, Graff-Zivin; Sampat)

- Focus on 10,450 elite life scientists
- Link individuals with their output
- Careful Difference in Difference estimates

Identifying impact

- “When and how did we become certain that smoking causes cancer, coffee does not, and human activity is producing global climate change?”
- Shwed and Bearman: analyzed substantive cases that are now considered facts, such as the carcinogenicity of smoking and the non-carcinogenicity of coffee, and then employed that same analysis to two currently contested cases: the suspected carcinogenicity of cellular phones and the relationship between vaccines and autism.
- http://understandingautism.columbia.edu/papers/t structure-of-scientific-consensus-formation.pdf



And..Building a better interagency system to answer agency questions STAR METRICS

Science and Technology in America's Reinvestment – Measuring the EffecTs of Research on Innovation, Competitiveness and Science

What is STAR METRICS

- Six federal agencies; 85 research institutions

Goal:

- Provide a better empirical basis for science policy.
  - By providing an open and automated data infrastructure that can be used by federal agencies, research institutions, and researchers
  - By documenting federal investments in science and
  - By analyzing the resulting relationship between inputs, outputs, and outcomes.

Approach: automatically capture data about the conduct of science – inputs, outputs and the connections between the two

Institutions

Grants

awarded to

support

employ

pay for

Scientific Workforce

People

Products

produce

train

co-author

use

Source: Ian Foster University of Chicago

SciENCV
Science Experts Network Curriculum Vitae

Level II: Building an Evidence Basis: Going Beyond the Workforce

- A data platform that can link inputs and outputs/outcomes using automated approaches leveraging existing data
- Collaborative development of data infrastructure on broad categories of impact:
  - knowledge (e.g. publication, citations…)
  - economic (patents, spin off companies…)
  - workforce (employment, student mobility…)
  - social (e.g. health, environment, energy…)

Portfolio Characterization

- For agencies
  - Gap analysis: What is being funded in which areas?
  - Expertise Locator: Who is doing research in which topics?
- For Researchers
  - Funding information: What programs are funding research like mine?
  - Expertise Locator: Who else is doing research like mine?
- For VPs for Research and their Institutions
  - Gap analysis: Where are my institutional research strengths?
  - Expertise Locator: How can I connect researchers?

Automatically generated from research proposals

STAR METRICS Portfolio Explorer

Limited Distribution
ALPHA-version

Home | Portfolio | Expertise | Patents | Maps | About | Feedback

Welcome

This site provides four tools that provide different views of scientific portfolios. The tools are provided by the STAR METRICS program; an interagency collaboration to provide a stronger empirical basis for science policy decisions.

Portfolio Viewer

The Portfolio Viewer provides information about portfolios at the program, division or directorate level based on scientific topics. You can view detailed information about proposals, awards, researchers and institutions. Detailed information is available at the left hand side of each page; summary statistics about selected areas is provided on the right hand side.

Expertise Locator

The Expertise Locator helps locate researchers who have submitted or been awarded proposals in different topic areas. The Expertise Locator provides detailed information on their proposals, their co-PIs and their institutions.

Patent Viewer

This tool provides information about patents that were received by NSF grantees. Users can view patent data by Division and/or Program Element Codes.

Map Viewer

This tool provides a geographic overview of NSF investments by institution and an earlier version of topics. It can be used to respond to requests on what research has been funded in what areas, as well as to understand the geographic dimensions of investments. A later release will update the topics to synchronize with the rest of the Portfolio Explorer tools.

Send Us Feedback

We would love to hear from you! Please email us at PEfeedback@nsf.gov with any questions or feedback. If you have a problem to report, please include the url of the page you were on together with a description of what happened.

STAR METRICS Portfolio Explorer

ALPHA-version distribution

Home | Portfolio | Expertise | Patents | Maps | About | Feedback

Topics
Filter

Expertise Locator

This tool allows you to locate researchers based on their expertise. Using the "ANY" option in the Inclusion dropdown yields researchers with awards in ANY of the Topics you select (check) in the list below. Using the "ALL" inclusion limits your selection to those researchers with awards in ALL of the topics you select.

Topic options: From 2007 to 2011 Update Topic List

Clear Selection

Topic Data

Show 50 entries Keyword Filter: tsu Export as CSV

Inclusion*: Awards matching ANY selected Topic

Select	Topic	Awarded	Awarded Amt.	Declined	Requested Amt.
☑	**t445: Tsunamis** - wave tsunami breaking wave_energy height interaction amplitude wave_propagation bottom surface_wave speed ocean propagation propagate depth standing tank propagating direction characteristic ...	60	$20.06M	89	$65.20M

Showing 1 to 1 of 1 entries (filtered from 941 total entries) First Previous 1 Next Last

Topic Relevance: each proposal is assigned a total of 4 Topics. The Topic set is either based on a) the top/most relevant topic for each proposal, or b) based on all four topics assigned to proposals.

Please note that the co-occurring topics noted within each Topic\'s details view represent those Topics that co-occur most frequently together on proposals. While a good indicator of expertise, please note that using the ALL inclusion method yields researchers with Topics assigned to any of their proposals (not just those with selected Topics assigned to individual proposals). **Internal NSF users:** the ALL inclusion method only regards Awarded proposals (Declines and Others are excluded).

Researcher Summary

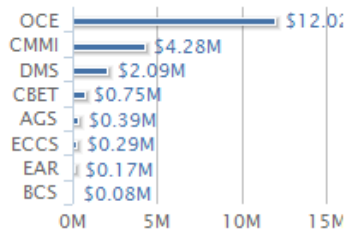
The below reflects a summary of the Topics you select/ed on the left. Click the triangle controls for expanded summaries or click the 'Explore' button to analyze your selection deeper.

Researchers (136) Explore

Awarded (60)

Total Funding: $20.06M

Funding by Division
(top 8)



STAR METRICS Portfolio Explorer

ALPHA-version distribution

Home | Portfolio | Expertise | Patents | Maps | About | Feedback

Topics Filter — 1 of 941 — t445: Tsunamis — Timing: 2007 - — Change Selection

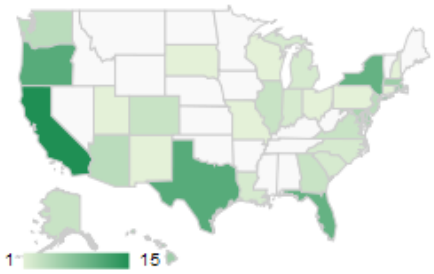
Expertise Locator

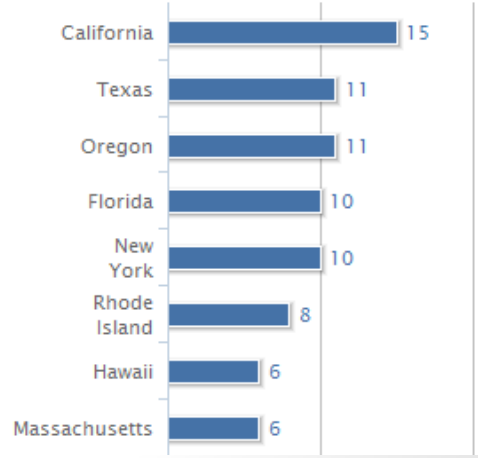
Researchers

Show 50 entries — Keyword Filter: — Export as CSV

PI ID	Name	Institution	Department	Count*	IDs**	Details
000032701	Philip L Liu	Cornell University	Civil & Environmental Engineering	10	0710751, 0751079, 0756327, 0925711, 0960512, 1041541, 0723578, 0828552, 0800372, 0967003	
269824301	Robert Weiss	Virginia Polytechnic Institute and State University	Geosciences	8	1136534, 1137611, 0934681, 1134926, 1135027, 0956094, 1056467, 1124295	
000013965	Harry H Yeh	Oregon State University	Civil & Cnstr. Engrg.	7	0742806, 1135768, 0723578, 0828552, 0935933, 1041531, 1129767	
000163080	Solomon C Yim	Oregon State University	Civil and Construction Engineering	6	0723277, 0800822, 1005740, 1037861, 0830365, 0936642	
269744680	Hermann M Fritz	Georgia Tech Research Corporation	GT-Savannah / CEE	5	1034886, 0936603, 1000694, 1105577, 1135768	
000052129	James H Duncan	University of Maryland College Park	Department of Mechanical Engineering	4	0962107, 0751853, 0928318, 0728770	
000160142	Costas E Synolakis	University of Southern California	Dept. of Civil Engineering	4	1000694, 1105577, 1135768, 1034886	
000193450	Stephan T Grilli	University of Rhode Island	Department of Ocean Engineering	4	0927014, 0940398, 0928293, 0830365	
000204919	Daniel T Cox	Oregon State University	Civil Engineering	4	0723277, 0800822, 1005627, 1134971	
000225937	Tetsu Hara	University of Rhode Island	Graduate School of Oceanography	4	0824906, 0927014, 0940398, 0820872	

Researchers by State





The pitfalls

- Need to paint full picture of scientific outcomes
  - => engagement of scientific community critical
  - => Open and transparent process
- Data misuse
  - => careful presentation of results
- Data quality
  - => full collaboration
  - => extensive use of pilots
- Confidentiality
  - => researcher, institution and agency controls

Ultimate Goals

- Fully fledged academic field
- Fully fledged analytical tool set across government agencies
  - Science policy in same analytical tier as tax policy
- Common empirical infrastructure available to all universities and science agencies to quickly respond to State, Congressional and OMB requests
- Common scientific infrastructure for researchers to develop and study science policy

Thank you

- Comments and questions?