



**Matchmaking:
SciSIP PIs – Meet – Policymakers**

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Dr. Marburger's call and NSF's response

1. THE SciSIP PROGRAM

Science of Science Policy



Planning, implementation, evaluation and improvement

“My policy speeches from 2005 and thereafter expressed my frustration over the inadequacy of data and analytical tools commensurate with science policymaking in a rapidly changing environment.”

“...I am not at all confident that the right questions are being asked or answered to provide guidance for action.”

“Policies are guides to action.”

John H. Marburger, III, “Why Policy Implementation Needs a Science of Science Policy”

Marburger 2007

“...federal funding for science will not grow fast enough...to keep up with the geometrically expanding research capacity, and...**state and private sector resources should be considered more systematically in formulating federal science policy.**”

“I argued that the ratio of federal science funding to GDP is not necessarily a meaningful indicator of a nation’s science strength. I called for **better benchmarks and new ‘science of science policy’ that would give us a surer foundation for setting priorities and better arguments for taking action.**”

Marburger 2005 “...the nascent field of the social science of science policy needs to grow up, and quickly, to provide a basis for understanding the enormously complex dynamic of today’s global, technology-based society.” (emphasis added)

Demand for useful results and tools

2. WHAT POLICYMAKERS WANT AT THEIR FINGERTIPS

Selected Illustrative Policy Issues

- **Competitiveness**
 - What may be the long-term effects in the U.S. of the disappearance of big private-sector research labs doing basic research?
- **Data Extraction & Manipulation**
 - What are emerging ways by which new data, metrics and visual analytics can be used to address S&T policy questions?
- **Geospatial Clusters**
 - What are regional and international hot spots for basic research and innovative activities?
- **Innovation**
 - Under what circumstances can public policy affect the speed of diffusion of new ideas?
- **Role of Government**
 - What is the expected employment yield of public expenditures on S&T?
- **Strategic Policy Design**
 - What can be learned from the private sector on the efficacy of cross-functional teams?
- **Technology Transfer**
 - How can universities do more to transfer technology to the marketplace?
- **Transformative Research**
 - How best to identify high-impact multidisciplinary research opportunities that are underfunded?

Specific Remarks

Tom Kalil (OSTP)

- Closer interactions between policymakers and academic researchers could have led to more productive outcomes.
- Gives example of Richard Freeman's Hamilton Project, which had a specific proposal based on research.
- Suggests that NSF develop **specific activities** to capitalize on key broader impacts of research that the SciSIP program has supported.

Joel Scheraga (EPA)

- Challenged the SciSIP community to **build "a lasting bridge"** that would facilitate information exchange between social scientists, natural scientists, the private sector, and policymakers, to yield better outcomes in a timely fashion.

Specific Remarks (cont.)

William Colglazier (Academies) Panelists Discussion

- "It is incumbent on us to understand the interest and the issues of concern to the stakeholders including up on Capitol Hill, and to **communicate in plain English** to them the implications of the science for the things that they care about."
- There will not be a model that "spits out the right answer to all those difficult questions."
- Improvements in frameworks, metrics and solution sets is possible, and the SciSIP community is expected to produce advances in these areas.

Supply of useful findings and room for development

3. SOME SciSIP RESEARCH DELIVERABLES

Incentives, Governance & Innovation

- Not a one-size-fits all policy outcomes (**Fuchs**)
 - Should the U.S. encourage companies to keep plants in the U.S.? If fabrication operations move overseas, then firms generally stopped innovating; not the case when only assembly operations were moved overseas (auto industry example).
- Uncertainty and confusion about rules influenced researchers to be more conservative in stem-cell materials used; they could move toward private funding (**Owen-Smith**)

Incentives, Governance & Innovation

- Tracing links between science and jobs is difficult; instead can assess effects of scientific activity on wages & real estate prices (proxies) **(Weinberg)**
- Open-access programs (e.g., biological resource centers, research on mice) related to increase in authors and institutions involved in related research, and the diversity of research topics pursued **(Stern)**
- In pharma, the gains to consumers from generics have been greater than the losses to producers; entry of generic drug decreases latter-stage innovation more than early-stage innovation **(Higgins)**

Incentives, Governance & Innovation

- Culture affects methods of scientific inquiry and rates of innovation; has implications for policy & institutional design **(TallBear, Taylor)**
- Textual analysis shows whether funding lags behind research in particular areas **(Ribarsky)**
- Venture philanthropy and federal funding have different roles and outcomes and provide different incentives in university research **(Feldman)**

Incentives, Governance & Innovation

- Since FY2005, less research-intensive institutions experienced a much steeper decline in federal funds with little recourse than research-intensive universities (**Blume-Kohout**)
- Social science research could yield policy outcomes closer to what the public values than natural science-based research, example environmental research (**Sarewitz**)

Work & Collaboration

- The creativity process is aided by analogy, but outcomes are not linear (**Paletz, Schunn**)
- Science institutes designed to foster private-public collaboration can have perverse effects, creating new sets of barriers (**Feinstein**)
- Funding diverse teams (different addresses, refer to more articles) yields positive outcomes—papers in better journals and papers with higher impact factors (**Freeman**)

Work & Collaboration

- U.S. researchers consider promotion more beneficial than Europeans researchers, who value having international educations experiences more than their counterparts in the U.S.—could affect team dynamics **(Youtie)**
- U.S. researchers have among the lowest rates of international experience compared with those from other developed countries—could affect team dynamics **(Cozzens)**

Work & Collaboration

- Visa policy that requires applicants who wish to study in the U.S. to demonstrate financial means hurts scientific productivity in the U.S. **(Stuen)**
- Low-income countries benefit from return requirement, but students from low-income countries facing that requirement have reduced productivity (upon return to home country) compared to their peers **(MacGarvie)**

Work & Collaboration

- Federally funded research lab study found that scientists in the larger labs reported projects with less time for creativity, freedom to explore new ideas and to take risks; larger labs had less time spent on research and more time spent on seeking outside funding and on internal administration (**Hage**)

21st Century Data

- Disambiguation tools are improving, allowing assessment of research funding inputs and related outputs (**Giles, Fleming**)
 - E.g., allowed **Fleming et al.** to find that non-compete rules decrease the diffusion of people and ideas within regions
- Experimental methodology/dataset revealed that a weatherization project in Texas only had 16/233 homeowners sign up and why (**Eckel**)

21st Century Data

- Text-mining programs are used to redefine the S&E taxonomy as new areas emerge
(Newman)
- Data visualization tools allow researchers, program directors and university administrators to see linkages between disciplines/fields of study—shows emerging areas/disciplines (e.g., biochem decades ago)
(Porter)

21st Century Data

- Mapping patents linked to publications, university policies, funding sources, & inventions helps to understand the ecological system of innovation **(Lei)**
- Data infrastructure that is “people centered” rather than document-centered is key to linking outputs/outcomes to inputs, particularly addressing the question of how research funding influences socio-economic outcome
(Lane)

Bridging the gap between research and practice

4. LOOKING FORWARD

Ways Forward

- Mine **broader impacts** in awards and annual & final reports for useful policy applications
- Develop a feasible and sustainable bridge of **communication** between science-based results and policy
- Curate **stories** based on social-science research to advise policymakers
- Develop more/alternative/better **data** sources
- ***Create Policy Collaboratory/Maker-space***



Thank You!

<http://www.nap.edu/catalog/18741/science-of-science-and-innovation-policy-principal-investigators-conference-summary>

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Pipeline Metaphor

Research Agenda

Frameworks

- Curated knowledge from various areas of study related to understanding and assessing underrepresentation in STEM fields.

Education

- Curated knowledge from various areas of study assessing educational attainment, contextualizing educational access, opportunities, and outcomes, and identifying critical causes of underrepresentation in STEM fields.

Measures

- Curated data, metrics and statistics from various areas of study related to assessing underrepresentation in STEM fields.

Workforce

- Curated knowledge from various areas of study for identifying workforce dimensions and dynamics, contextualizing occupational access, opportunities, and outcomes, and investigating recruitment, retention network inadequacies leading to underrepresentation in the STEM workforce.