NON-PROFIT SUPPORT FOR RESEARCH

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Views expressed here are my own.

ALFRED P. SLOAN FOUNDATION

Plan

1. Sloan (what can be done?)
2. Public Goods (why?)
3. U.S. Context (where?)
4. Philanthropy vs. Government (how?)
5. Science Philanthropy Alliance (who?)

The Alfred P. Sloan Foundation

- Not-for-profit grant-making institution based in New York City
- Employees: ~30 (including ~7 program officers)
- Endowment: ~ US$ 1.9 billion (all spending from earnings)
- Grants approved per year: ~ 330
- Dollars dispersed per year: ~ $80 million (including expenses)
- **Mission Statement:** "The Alfred P. Sloan Foundation makes grants primarily to support original research and broad-based education related to science, technology, economic performance and the quality of American life."

Alfred P. Sloan Jr.

- President of General Motors
- Founded the Foundation in 1934
- Served as Foundation President and Chairman until early 1960s
- Believed science and a scientific understanding of the world is the driver of innovation, which is the driver of economic prosperity
- Also founded the Sloan School of Management at MIT as well as Memorial Sloan Kettering Cancer Center in New York

Major Program Areas

- Basic Research:
  - Deep Carbon Observatory
  - Microbiology of the Built Environment
- Economic Performance and the Quality of Life
  - Economic Institutions, Behavior, and Performance
  - Working Longer
- STEM Higher Education
  - The Science of Learning Stem
  - Education and Professional Advancement for Underrepresented Groups
- Public Understanding of Science, Technology, & Economics
  - Radio, Film, Television, Books, Theater, New Media
- Digital Information Technology:
  - Data and Computational Research
  - Scholarly Communication
  - Universal Access to Knowledge
- Sloan Research Fellowships
- Civic Initiatives

Sloan Philosophy

- Support basic research and education in science, technology, and economics using investment income from the endowment.
- Fund "policy-relevant research" that ends up in peer-reviewed journals and report notes.
- Sloan does not fund "policy research" or advocacy with pre-determined answers.
- Prefer to pose important *questions* and let the results fall where they may.
- "The Public Goods Business" (nonrival and nonexcludable products)

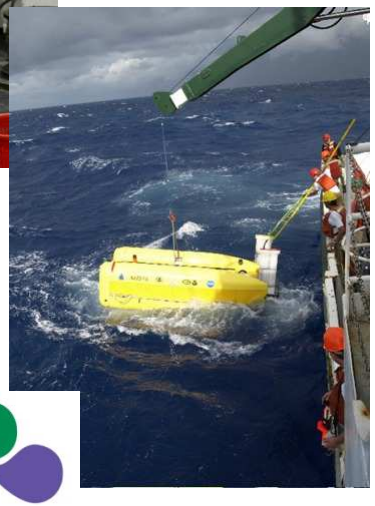
"Public Goods Business"

- Nonexcludable and nonrival commodities, like lighthouses, parks, defense, or clean air.
- Notoriously hard to finance due to free rider problem: great benefits for society overall, but too unpredictable in time and space for the investor to appropriate.
- Discoveries (before intellectual property restrictions)
- Open Datasets: For Researchers (measurements); About Research (public resources); From Research (knowledge)
- Displays

Sloan Digital Sky Survey

- Major astronomical initiative to map an image the sky using a 2.5 meter telescope at Apache Point, NM
- Led to discovery of distant quasars, large populations of sub-stellar objects, systematic characterization of the galaxy
- Advanced data collection, management, and dissemination
- www.sdss3.org

Census of Marine Life



CENSUS OF MARINE LIFE

- Ten-year international observation program to asses and explain the diversity, distribution and abundance of marine life
- 14 field projects with scientists from over 80 countries participating
  - 2,700 scientists
  - 540 expeditions
  - 2,600+ scientific publications
  - 6,000+ potential new species
- Creation of set of governing and coordinating institutions
- Creation of Ocean Biographical Information System (OBIS) to organize and systematize data
- www.coml.org

Encyclopedia of Life

- Goal: Create a website with a page for every one of the 1.8m named species of plant and animals
- Launched in 2008 with 30,000 species pages
- Now has 1.4 million species pages with links to over 14m pages of biodiversity literature
- www. eol.org

DNA Barcoding

CONSORTIUM FOR THE BARCODE OF LIFE

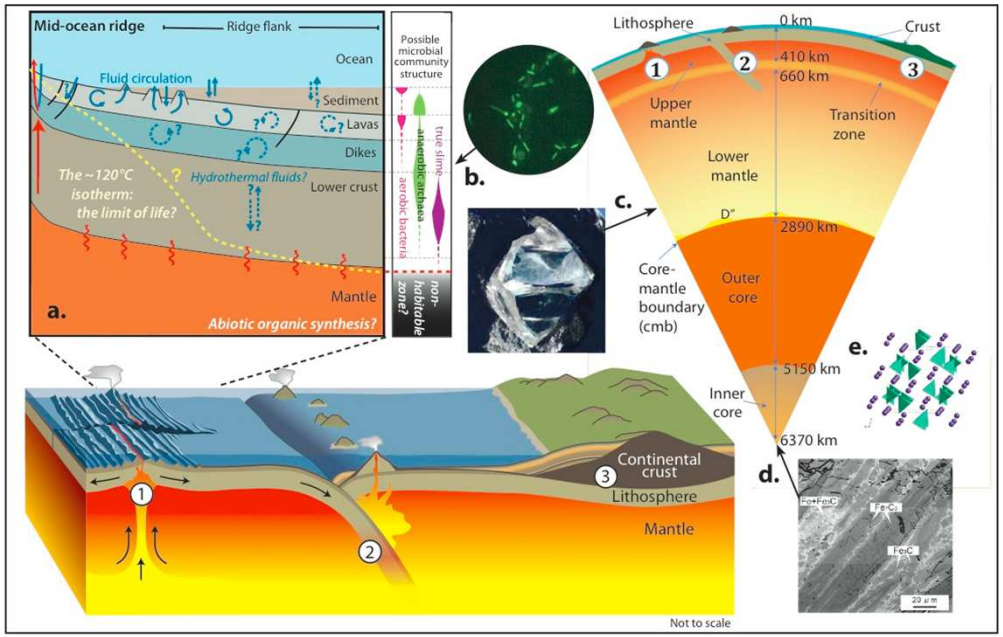
FISH-BOL

ABBI

iBOL
INTERNATIONAL BARCODE OF LIFE

- International effort to speed the building of a library of short DNA sequences for identifying animals and plants reliably and cheaply
- 10 different project groups working on plants, fish, birds, bees, other insects, etc.
- Creation of common set of standards and a governing institutional apparatus: the Consortium for the Barcode of Life
- Creation of Barcode of Life Database housing over 800,000 records.
- The technology is now being adopted by the FDA and regulatory agencies concerned with consumer and environmental protection.

Deep Carbon Observatory



- The primary mission of the DCO is to promote the transformational understanding of the chemical and biological roles of carbon in Earth's interior related to: reservoirs and fluxes, deep energy, and extreme physics and chemistry.

Science Workforce

The Scientific and Engineering Workforce Project, based at the National Bureau for Economic Research, networks researchers studying labor markets and immigration.

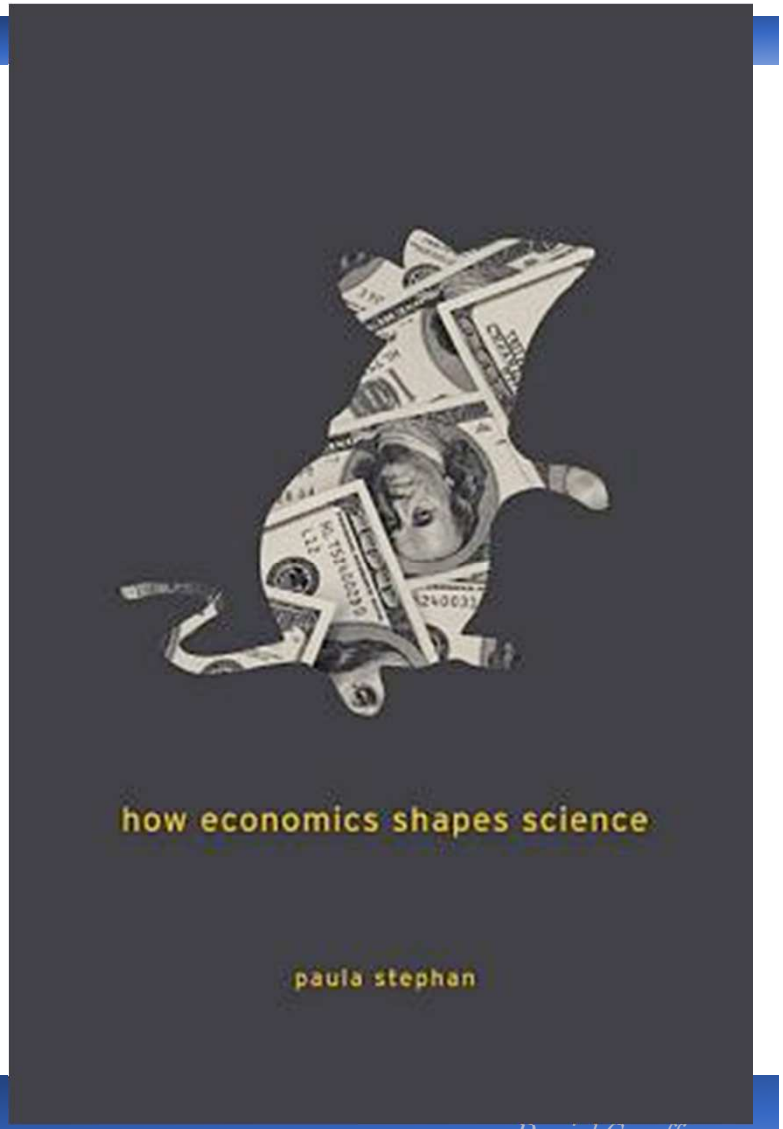
S|E|W|P

Science & Engineering Workforce Project
at the National Bureau of Economic Research (NBER)

NBER

Economics of Science

"How Economics Shapes Science" by Paula Stephan is an acclaimed book that benefited from Sloan support through SEWP.



Macro-Financial Modeling

Led by Andrew Lo and Lars Hansen, working groups of junior scholars, Nobel Laureates, and other experts are building better macro models to assess systemic risk.

Sloan Research Fellows

- The Sloan Research Fellowships supports fundamental research by early-career scientists.
- Since its inception in 1955, 42 Sloan Research Fellows have been awarded the Nobel Prize in their respective fields and 16 have been awarded the Fields Medal by the International Mathematical Union
- Two-year fellowships are awarded yearly to 126 researchers in the following fields:
  - Chemistry
  - Computational & Evolutionary Molecular Biology
  - Computer Science
  - Economics
  - Mathematics
  - Neuroscience
  - Ocean Sciences
  - Physics

Data Science Initiative

Three primary goals:

Develop sustained collaborations between subject specific fields and methodological fields.

Establish career paths for multidisciplinary researchers.

Build analytical tools and research practices that are sustainable, reusable, and extensible.

UNIVERSITY OF WASHINGTON

UNIVERSITY OF CALIFORNIA BERKELEY

NYU

Center for Open Science

The Mission: to increase openness, integrity, and reproducibility of scientific research.

Infrastructure: The Open Science Framework

Approach: Design workflow tools that make openness easy.

Research: Reproducibility Project in Psychology

Data Repositories

Dataverse, a repository at Harvard's Institute for Quantitative Social Science is working with journals to archive data for reuse.

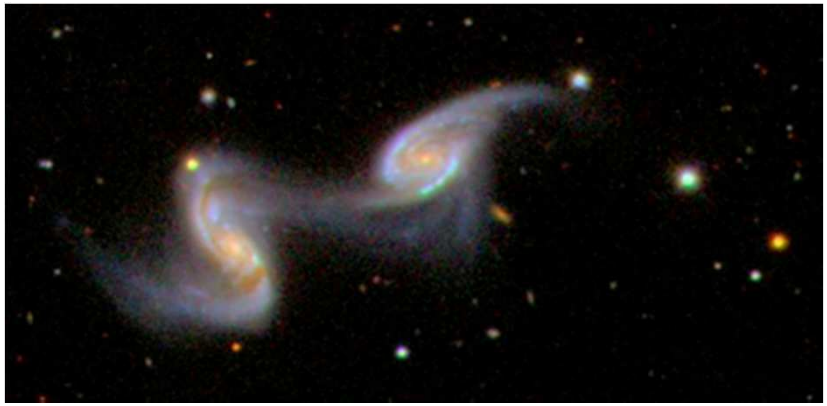
Interuniversity Consortium for Political and Social Research (ICPSR), a repository in Ann Arbor, is working with funders to establish grant agreement standards that help open science.

Transparent Social Science

The Berkeley Initiative for Transparencey in Social Science (BITSS) is developing useful strategies and tools for maintaining research transparency, including the use of study registries, pre-analysis plans, data sharing, and replication.

Training for graduate students takes place at summer institutes.

Citizen Science



- Galaxy Zoo
- How do galaxies merge?
- One important area of research in astronomy studies is the role of interacting galaxies.

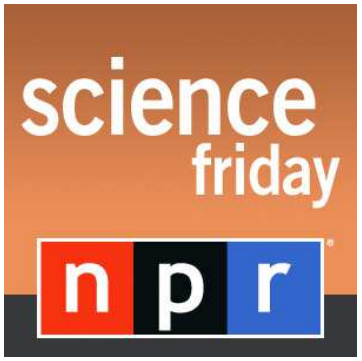
Real Science Online: The Zooniverse and the suite of projects it contains is produced, maintained, and developed by the Citizen Science Alliance.

The CSA works with many partners around the world to produce projects that use volunteers to help scientists and researchers deal with the flood of data that confronts them.

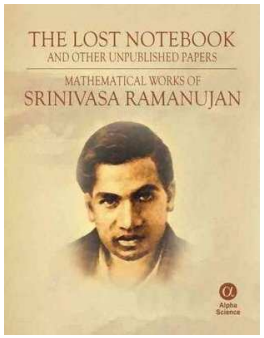
Example from Zooniverse: Old Weather

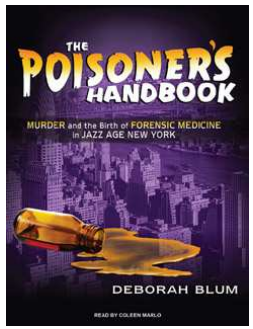
- Model Earth's climate using wartime ship logs
- Help scientists recover worldwide weather observations made by Royal Navy ships around the time of World War I
- Transcripts will contribute to climate model projections and improve the database of weather extremes
- Work will help to track past ship movements and the stories of the people on board

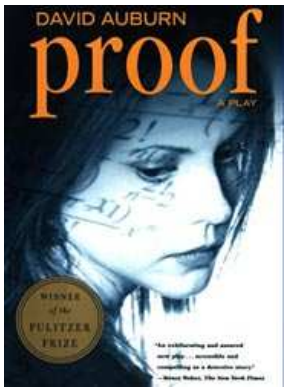
Media Sponsorship



RADIOLAB





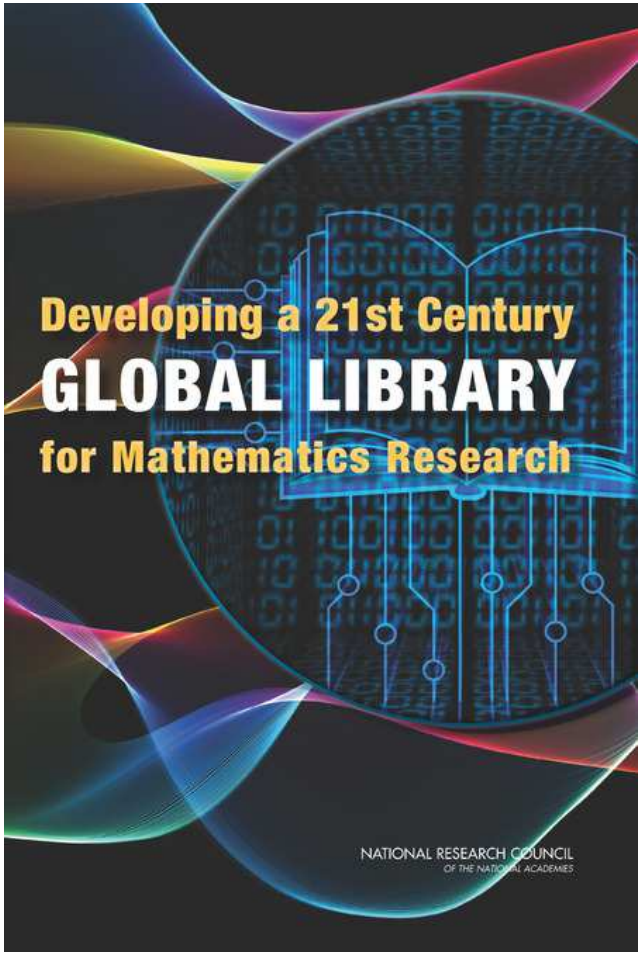


Digital Public Library of America

DIGITAL PUBLIC LIBRARY OF AMERICA

- Sloan support began at the outset in October 2010
- Launched in April 2013
- *Time* called DPLA one of the "50 best websites of 2013."
- Digitized over seven million items serving as a link to cultural institutions around the country

Mathematical Heritage Library



- Sloan supported a National Academies committee which prepared a peer-reviewed report on the scope, costs, benefits, risks, and potential strategies associated with creating a Mathematical Heritage Library - A fully computable, open online database of the historical mathematics literature

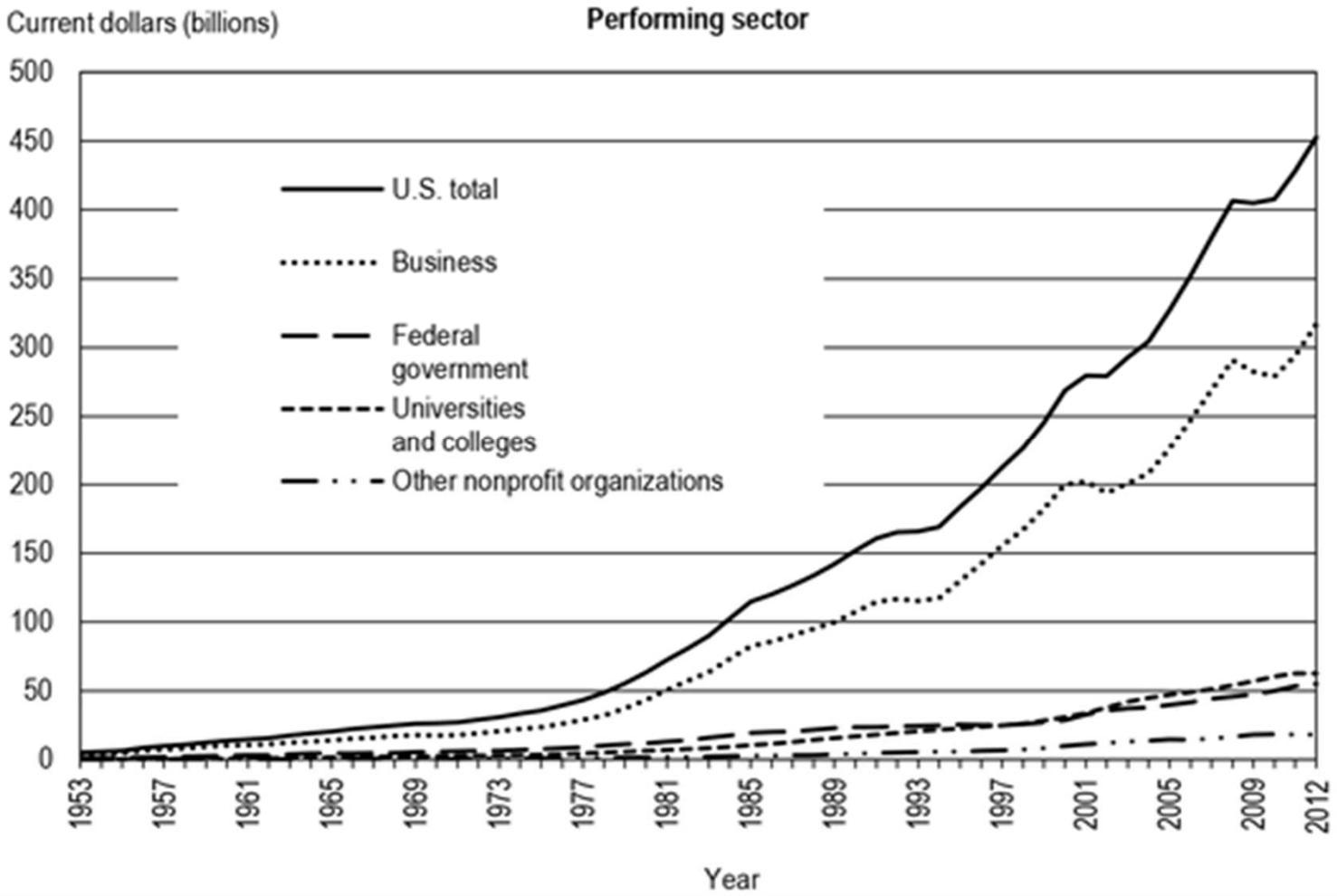
Wikipedia

- Sloan is one of the original and largest funders.
- Encouraged the formulation of strategic, quality control, and fundraising plans
- Over 32M pages, 100,000 regular contributors, and 365m readers
- Sometimes called the biggest public good in history

U.S. Context

- Public goods need taxes or philanthropy
- U.S. is a big country that mistrusts government
- Tax laws favor private decision-making and risk-taking
- Outstanding venture capital and entrepreneurship
- Relatively robust and active philanthropic sector

U.S. R&D by Performing Sector



Government Funding

Research and Development (R&D) Expenditures as a Percent of Gross Domestic Product in 2009:

- U.S.: 2.79%
- Japan: 3.44%
- France: 2.11%
- Germany: 2.68%
- UK: 1.77%

U.S. Federal Funding of R&D

In 2010, total Federal Research and Development in the US was over $149 billion, with Defense R&D making up $86 billion of those dollars (58%). NSF made up only 3% of total R&D.

Federal Agency	2010
Total Research and Development	149
$ Department of Defense	83
Health and Human Services (NIH)	31
Department of Energy	11
NASA	9
National Science Foundation	5
Other	10

U.S. Philanthropy

- Charitable donations in 2012 from foundations, individuals, and corporations totaled about $316 billion.
- Individual donations were 72%, or $229 billion.
- Foundations, with estimated assets totaling $690 billion, had annual expenditures of approximately $46 billion, or 15% of the total. About $2 billion of this is for science.
- But about 75% of foundation support for science goes to medical and biological research (grateful patients).

Philanthropy in the US: University Based Research

U.S. philanthropy plays a large part in funding university-based scientific, engineering, and medical research.

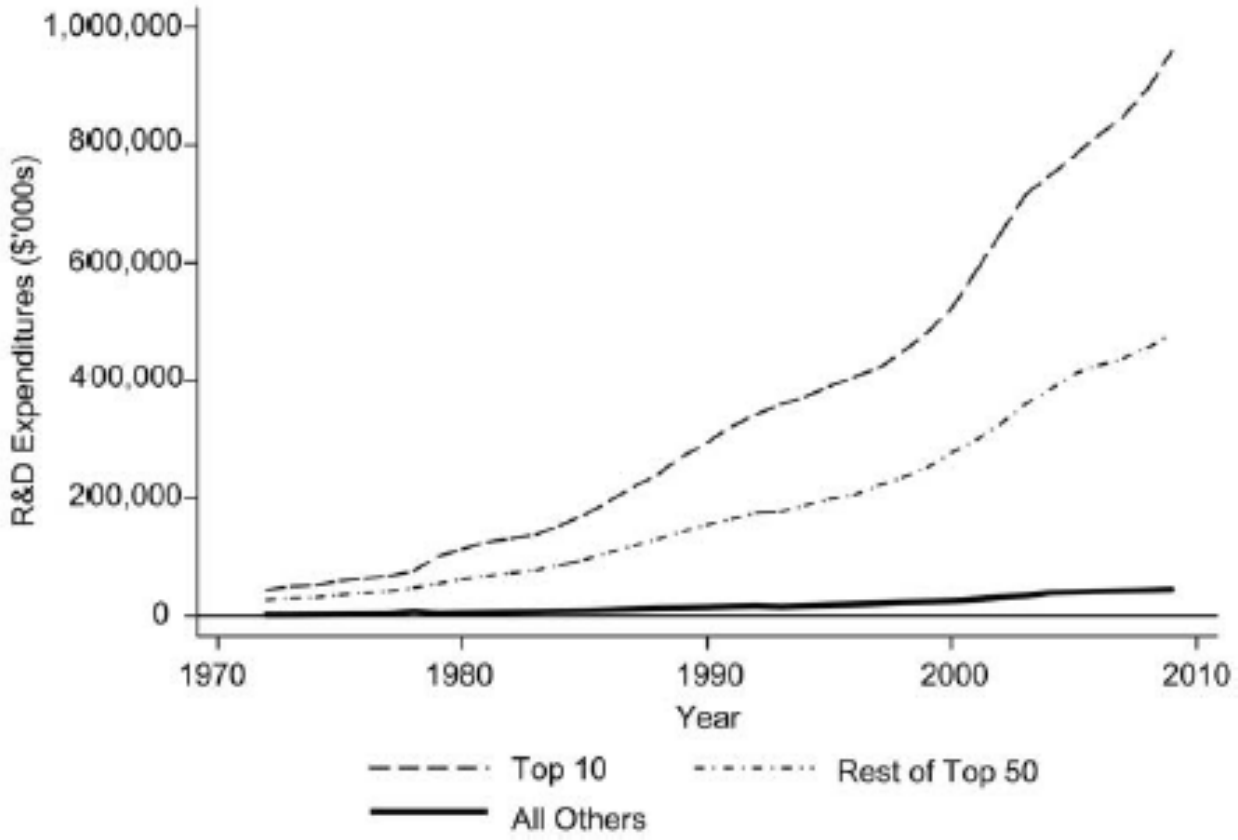
- Roughly $4 billion given annually to operations, endowment, and buildings devoted to research.
- Endowment income provides another $3 billion.
- About 30% of annual research funds at top universities.

University Giving: UK

- British universities have tried to increase giving.
- British higher education accrued total donations of £774 million in 2011-12 (approximately $1.3 billion)
- Oxford and Cambridge raised 45% of these new funds.
- Fundraising efforts cost 36 pence per pound raised.

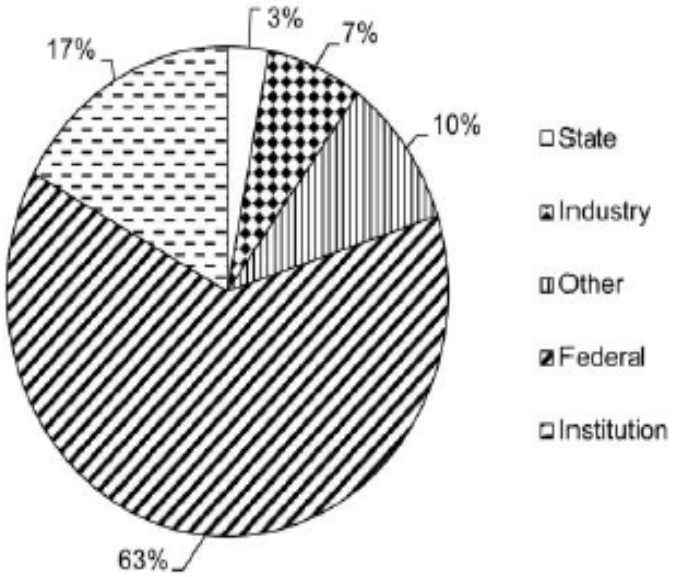
US Top 10 and 50 Universities: R&D Expenditure

Average total R&D expenditure by groups of US universities



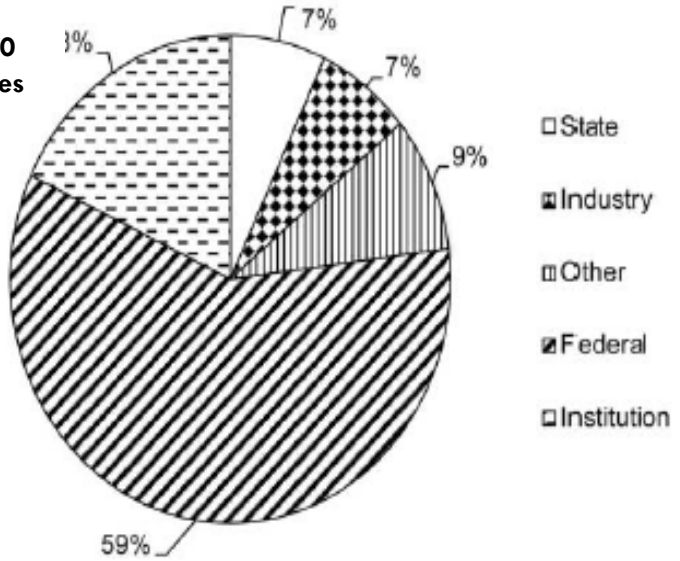
US Top 10 and 50 Universities: R&D Funding Sources

Top 10 Universities



Total Expenditure: $9.6BN
Average Expenditure per University: $961M

Top 10-50 Universities



Total Expenditure: $16.3BN
Average Expenditure per University: $479M

US Government vs Philanthropy

Comparison of Federal Funding Obligations to Academia by Research Field (2008) to Major Philanthropic Gifts (>$10 Million) by Field (2005–11 Average) for the Period 1999–2009 in US$ Millions

	Federal ($ Millions) (2008)	Federal Percentage	Philanthropy Big Gifts ($ Millions)*	Philanthropy Percentage
Life science	7,907	26	183	15
Physical sciences (plus math and computer science)	4,215	14	50	4
Social science	1,447	5	98	8
Engineering and architecture	4,705	15	152	12
Energy and environment	1,826	6	51	4
Medicine	10,757	35	713	57
Fundamental	13,569	44	332	27
Translational	17,288	56	916	73

Institutional Complementarities

	Philanthropy	Government
Inspiration & Motivation	Need	Fear
Identity & Purpose	Founder	Civil Service
Decision Criteria	Trustee Respect	Factional Appeasement
Success Metric	Productivity	Spending
Cycle Time	Weeks or Months	Months or Years
Planning Horizon	Decades	Annual Budget

Philanthropies

Qualitatively and quantitatively different from government:

- More nimble
- More risk-tolerant
- More patient
- More catalytic
- Much, much smaller scale

Solving a public goods problem requires institutions with leadership, vision, rewards, norms, boundaries, etc.
(not necessarily lots of people or money to begin with).

Philanthropic Sector

- Private Foundation vs. Public Charity
- Foundation vs. Operating Foundation
- More prominent in U.S. due to tax codes
- IRS Form 990 reporting and regulation
- Role of State Attorneys General
- Restrictions on activities like lobbying by foundations
- Guidestar, Foundation Center, NCCS, etc.
- Council of Foundations, Independent Sector, etc.

- Alfred P. Sloan Foundation
- Howard Hughes Medical Institution
- Gordon and Betty Moore Foundation
- Simons Foundation
- Kavli Foundation
- Research Corporation

"Educating philanthropists about how and why to support research."

U.S. Tradition

JP Morgan supported dinosaur hunts before Nathan Myhrvold.

Rockefeller supported telescopes before George Mitchell.

Scripps supported oceanography before Eric Schmidt.

Carnegie supported public libraries before Wikepedia.

Smithsonian Institution started with James Smithson's funds.

Science Philanthropy

Opportunities:

- Crowdfunding
- Science Bonds
- Catalogues
- University Funds
- Donor Advised Funds

Concerns:

- Ethics
- Fraud
- Return on Investment?
- Gov Substitute?
- Private Control

Thank you

For more information please see:

www.sloan.org

https://www.census.gov/compendia/statab/cats/science_technology/expenditures_research_development.html

http://www.nsf.gov/statistics

"Evaluating the Role of Science Philanthropy in American Research Universities" by Fiona Murray, MIT (2012)

Underrepresented Groups

- Sloan Minority PhD Program
- Sloan Indigenous Graduate Partnership
- Leadership Diversity Program
- Regional Olympiad Program
- Women in Mathematics and Computer Science

Civic Mathematic Centers

MOMATH
MUSEUM OF MATHEMATICS

Center for Mathematical Talent

Data Science and Reproducibility

- Open Knowledge Foundation
- Center for Open Science, BITSS
- CODATA and Data Citation Standards
- Behavioral Economics, RCTs, Experiment Registries
- Differential Privacy, Fully Homomorphic Encryption
- Dataverse, ICPSR, Repository Sustainability
- Ebay, LinkedIn, StarMetrics, Redistricting, etc.
- Orgpedia, OpenCorporates
- Legal Entity Initiative (LEI) at the Financial Stability Board

Public Understanding of Science

- Goal: To foster a better public understanding of the increasingly scientific and technological world in which we live
- Separate sub-programs by media: books, radio, television, film, theater, etc.
- Recently expanded to include advancing the public understanding of economics, business, and finance
- Deep roots: Earliest grant making was in educating the public about economics

Sloan Research Fellows in Math

MATHEMATICS SELECTION COMMITTEE

Dr. Tomasz S. Mrowka, Massachusetts Institute of Technology

Dr. Karl Rubin, University of California, Irvine

Dr. Margaret H. Wright, New York University

Sloan Research Fellows Awarded the Fields Medal

John W. Milnor, Paul J. Cohen, Isadore M. Singer, Peter D. Lax, Raoul H. Bott, Michael H. Freedman, John McCarthy, Louis Nirenberg, Stephen Smale, Shing-Tung Yau, Felix E. Browder, Ronald R. Coifman, John G. Thompson, Karen K. Uhlenbeck, Elias M. Stein, Hyman Bass, Srinivasa Varadhan, Barry Mazur

Data Science Initiative

- Partnership with New York University, the University of California, Berkeley, and the University of Washington to harness the potential of data scientists and big data for basic research and scientific discovery
- 5-year, $37.8 million, cross-institutional effort in conjunction with support from the Gordon and Betty Moore Foundation
- Three primary goals:

1. Develop sustained collaborations between subject specific fields and methodological fields
2. Establish career paths for multidisciplinary researchers
3. Build analytical tools and research practices that are sustainable, reusable, and extensible

Digital Information Technology

- Goal: To increase access to knowledge and culture while developing a better framework for understanding the information economy
- Early grant making focused on supporting efforts to digitize materials in the public domain, set quality standards, and develop platforms ensuring easy access to such materials.
- Program expanding to include work on IP and the economics of information goods

NYU's CUSP

- Provided New York University's Center for Urban Science and Progress with a planning grant in 2013
- CUSP uses data to better understand how cities work

MathOverflow

- Joined the Stack Exchange Network
- Development funding provided to:
  - Facilitate links to the mathematical literature on MathOverflow
  - Ensure the accessibility and endurance of the MathOverflow database
  - Extend connections with other Math 2.0 projects
  - Community development and outreach