

# SCIENCE & TECHNOLOGY POLICY FELLOWSHIPS: A BRIDGE BETWEEN ACADEMIA AND CONGRESS

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Office of Senator Al Franken  
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Department of Energy  
Office of Energy Policy  
and Systems Analysis

Postdoctoral Workshop

Department of Terrestrial Magnetism / Geophysical Lab

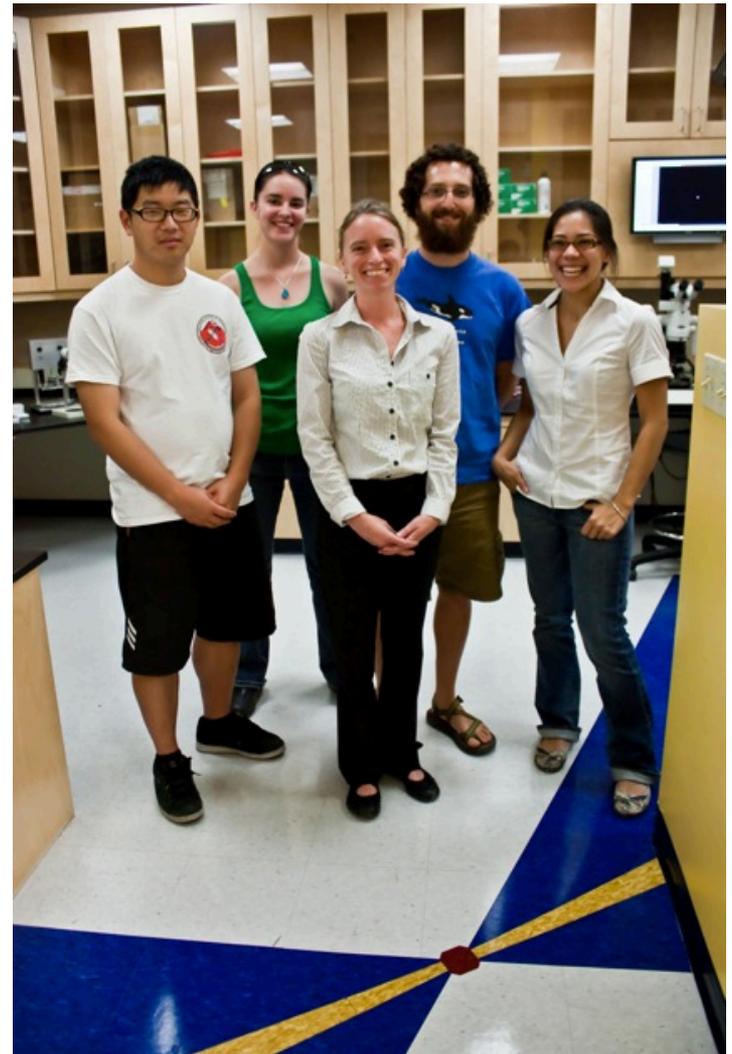
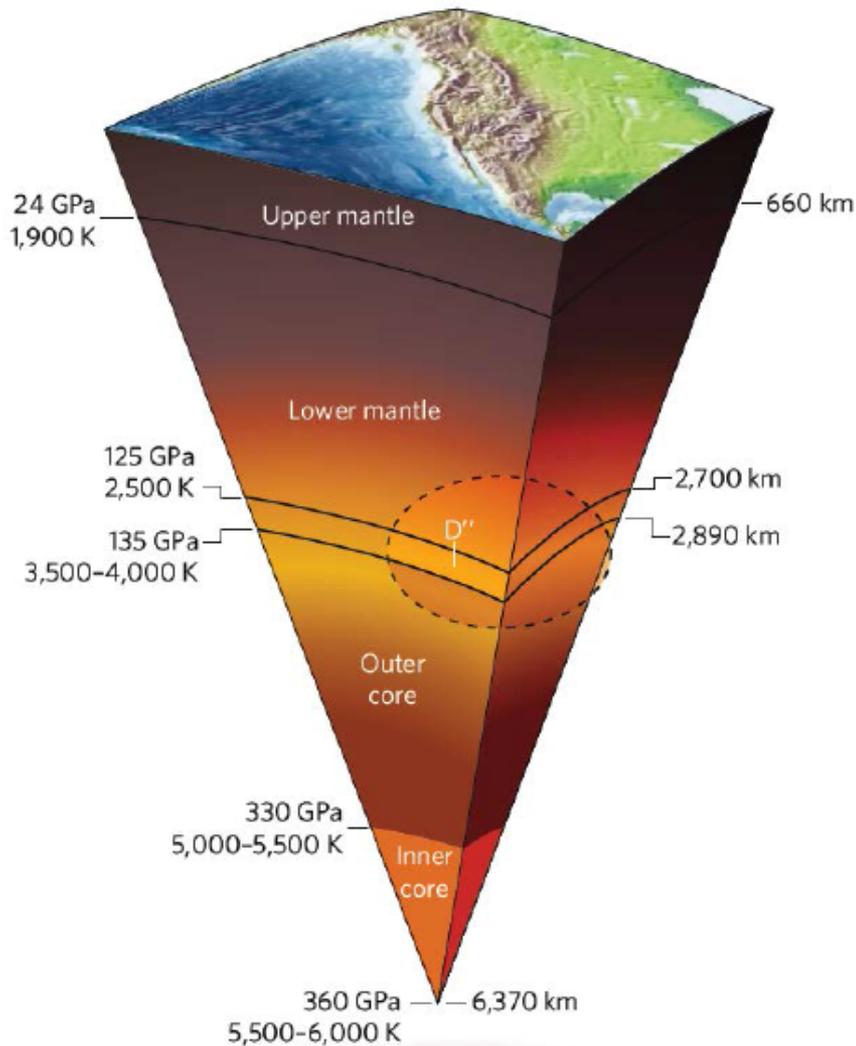
December 2, 2015

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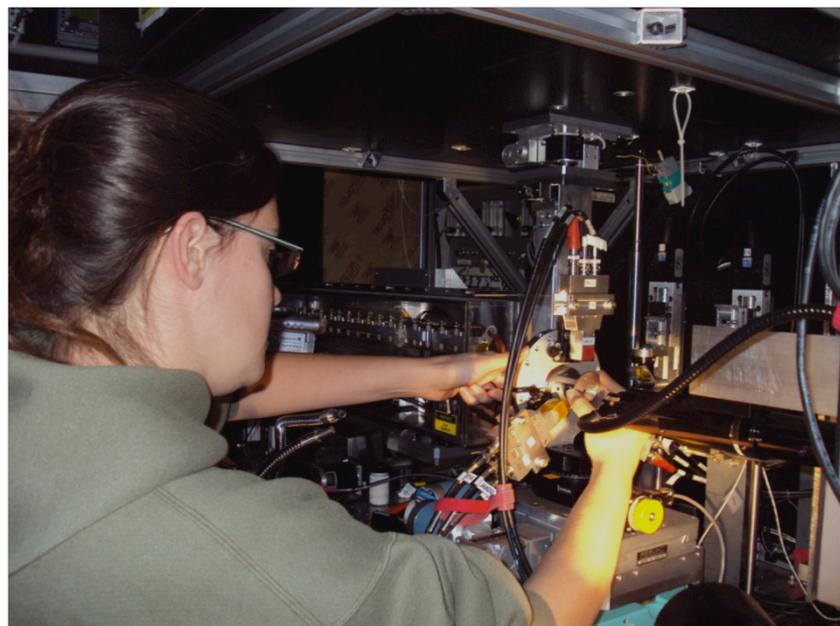
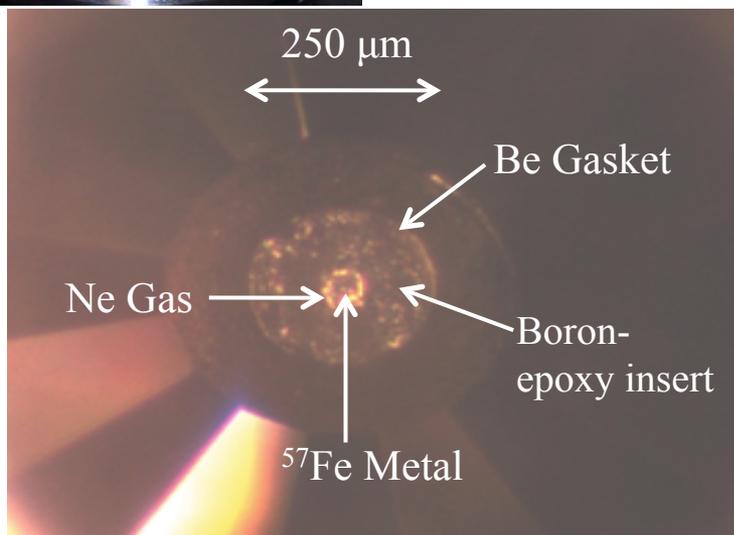
# Rough Outline

- My Academic Research
- Ph.D. on Capitol Hill
  - AAAS Science & Technology Policy Fellowships
  - General Experience in the Senate
  - Example 1: Staffing the Senator (for Science)
  - Example 2: Climate Change Policy
  - Example 3: Bipartisan Energy Legislation
- Closing Remarks and Discussion

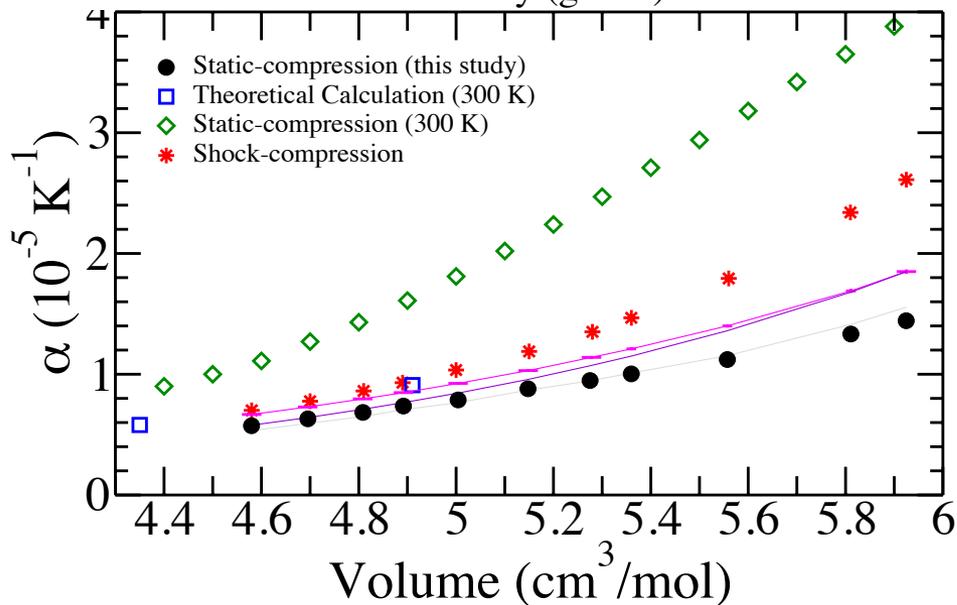
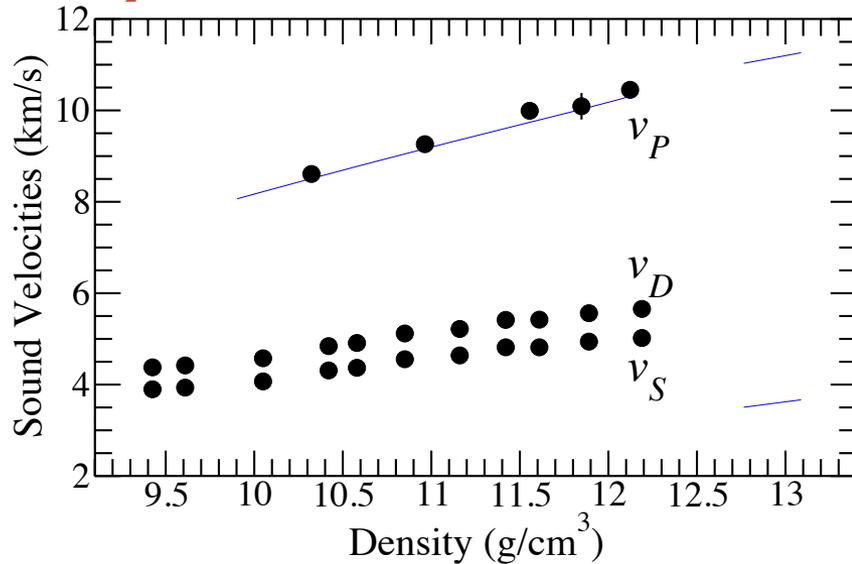
# My Academic Research: The Core



# My Academic Research: The Core



# My Academic Research: The Core



## Thermoelasticity of Hexagonal Close-Packed

### Iron from the Phonon Density of States

Thesis by

Caitlin A. Murphy

In Partial Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy



CALIFORNIA INSTITUTE OF TECHNOLOGY

Pasadena, California

# My Academic Research: The Core



# Academic Research: Is it for me?

What do I enjoy about  
academia / research / science?

- Quantitative nature (black and white / right and wrong)
- Communicating
- Teaching
- Conferences / meetings
- My colleagues
- Mentoring

What Can I live without?

- Bench-work
- Competitiveness
- Isolation
- Narrow focus
- Societally removed
- Certain colleagues...



Conversations with friends, family, and colleagues  
Webinars, networking events, career fairs, job lists...

# AAAS

• “The American Association for the Advancement of Science is an international non-profit organization dedicated to advancing science for the benefit of all people.”

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its use;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

# Science

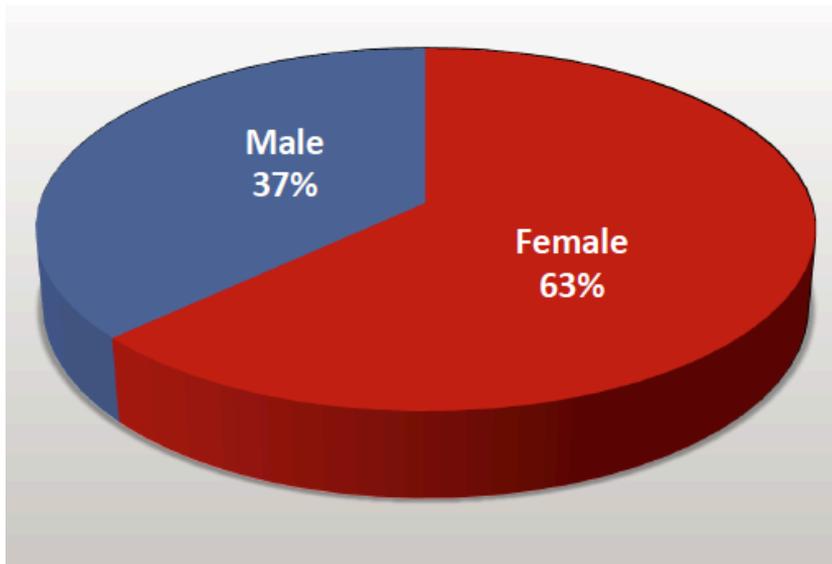


# AAAS Science & Technology Policy Fellows

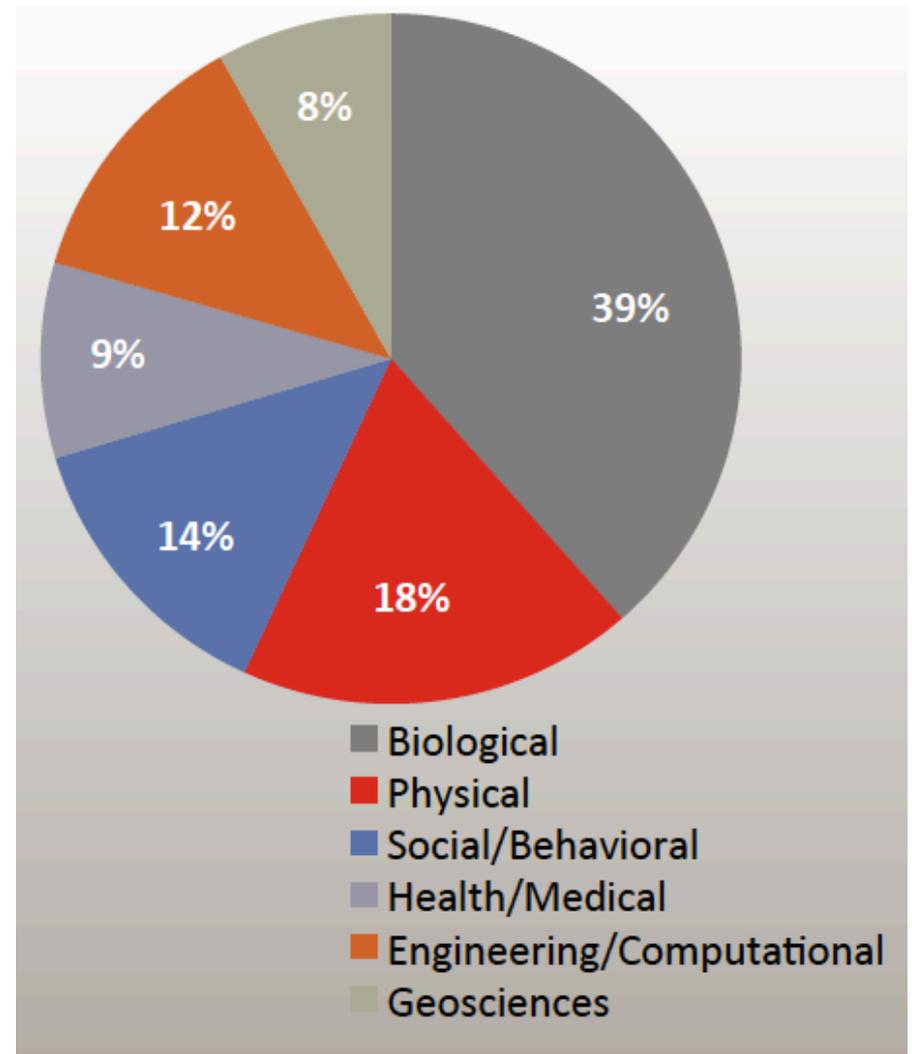


# AAAS Science and Technology Policy Fellows

## Demographics:



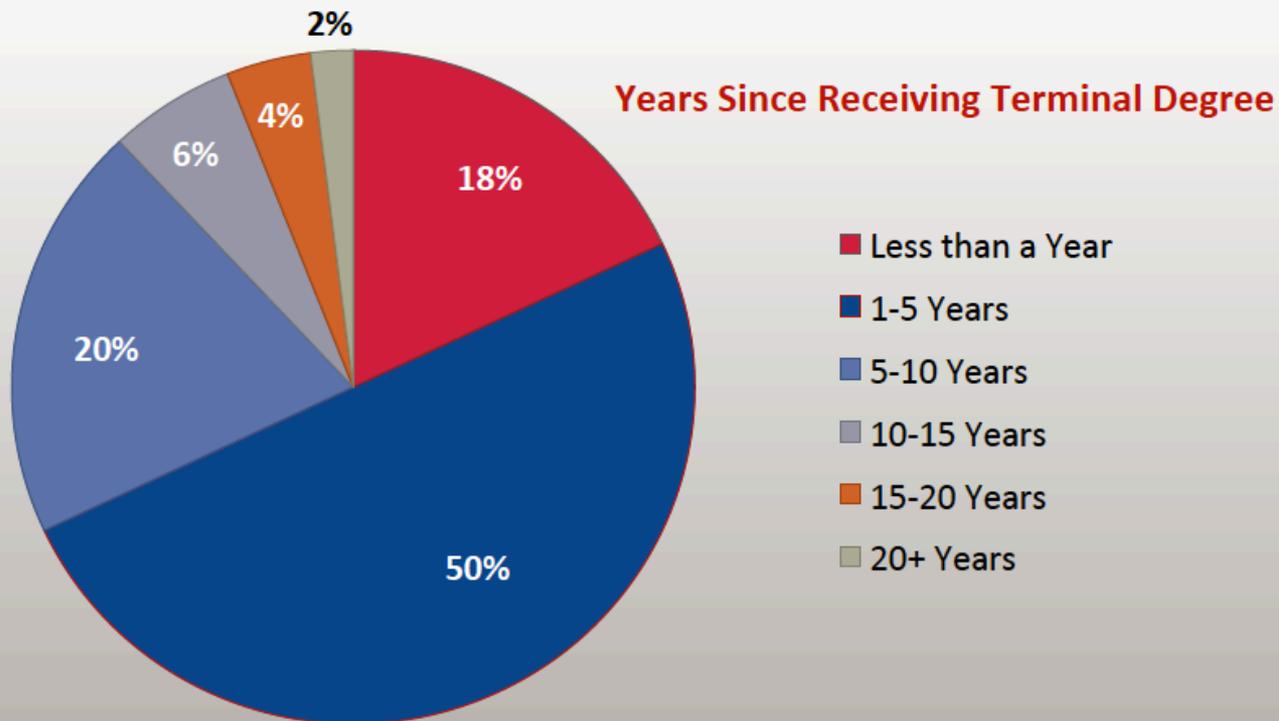
STEM Doctoral Degrees:  
41% female, 59% male



# AAAS Science and Technology Policy Fellows

## Career-stage

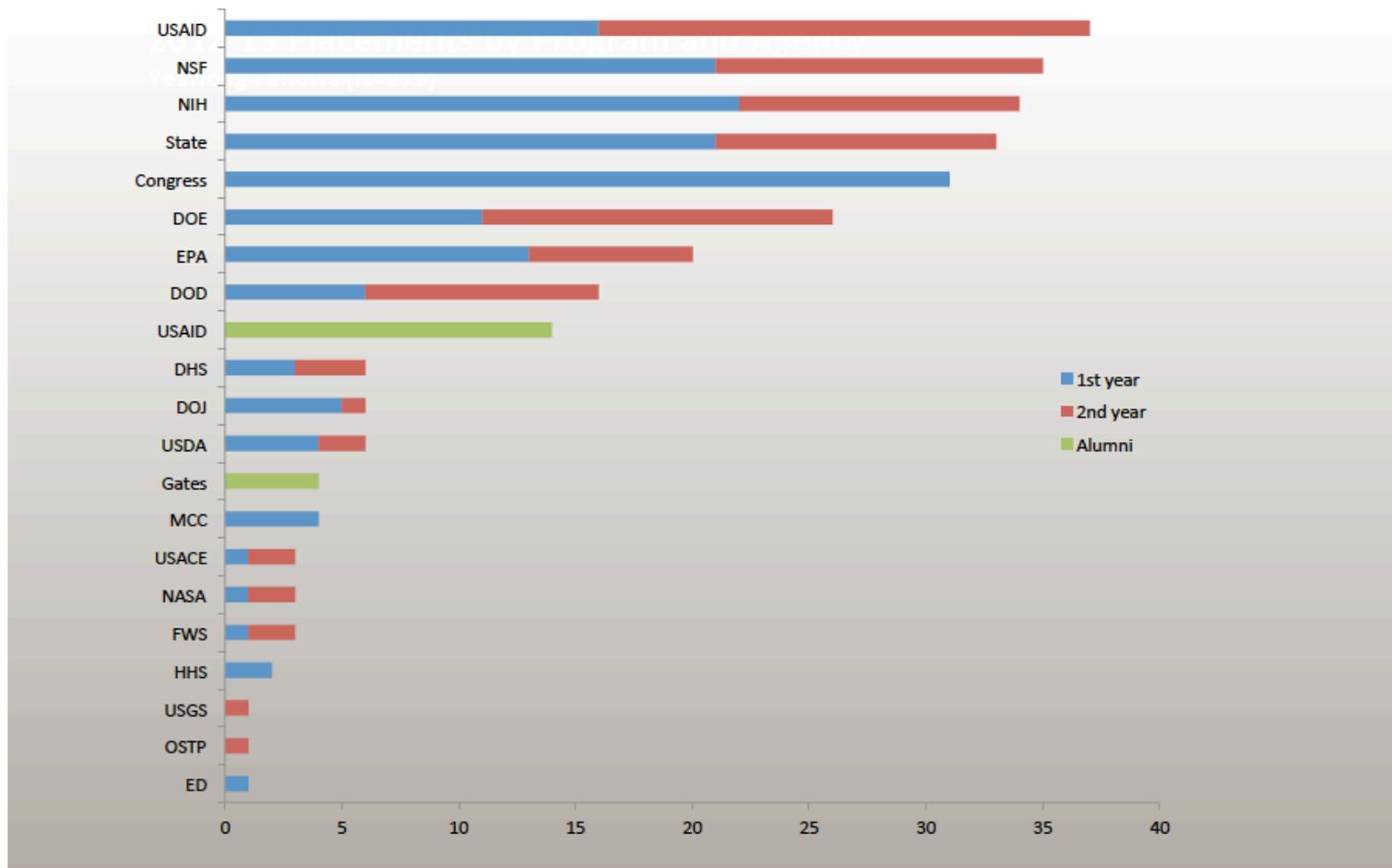
AAAS-administered fellows (N=249)



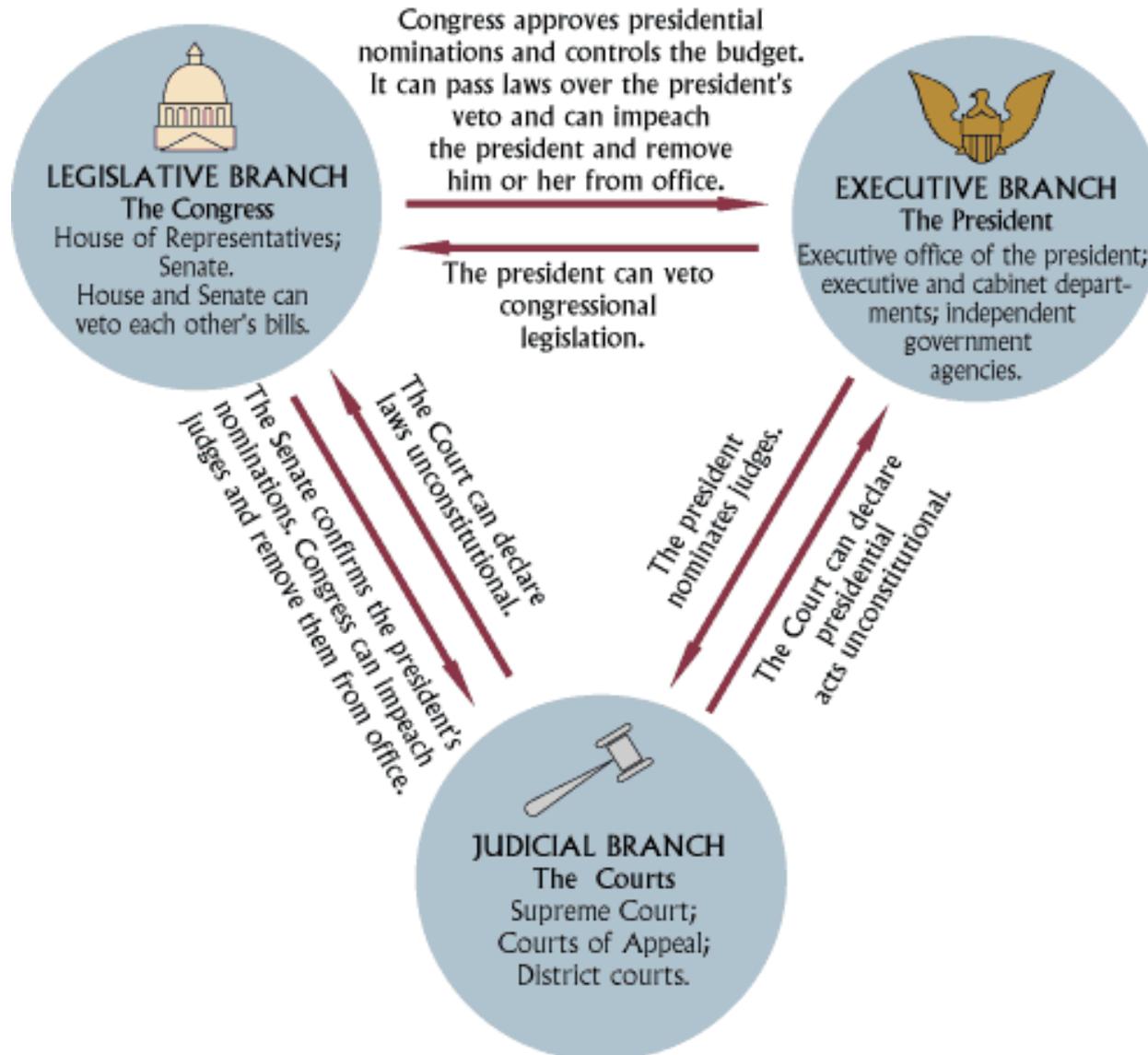
# AAAS Science and Technology Policy Fellows

## 2015-16 Fellows Placements

(n=280)



# Three Branches of US Government

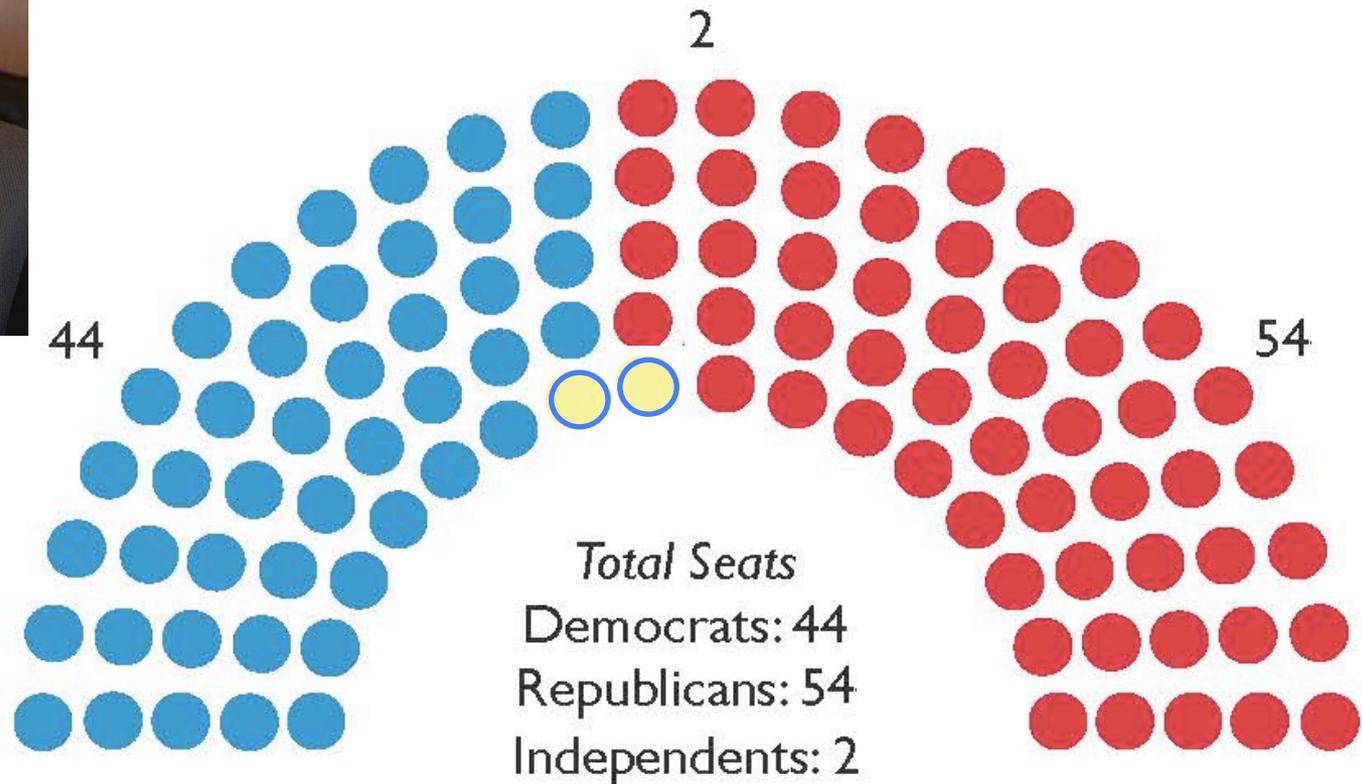


# University of the United States Senate

## Control of the 114<sup>th</sup> Senate (2014-2016)

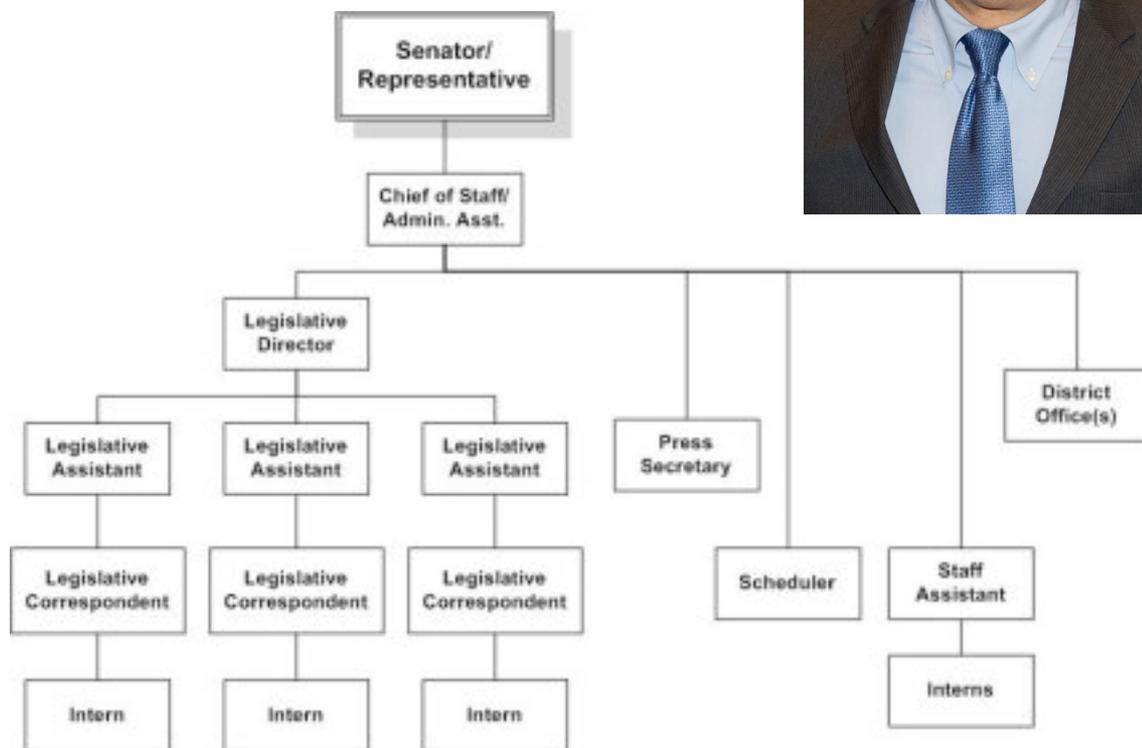


Sen. Al Franken  
(D-Minnesota)



# United States Senate: Ph.D.'s

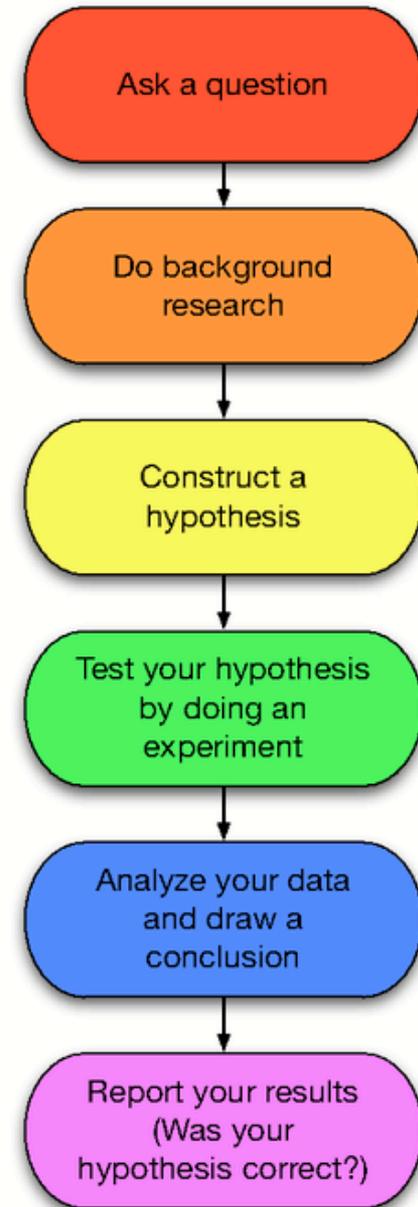
- How many Senators have Ph.D.'s? → 0!
- Ph.D. Congressional staffers are few and far between, but they can play an important role in advising members of Congress
  - Data-driven
  - Value/understand scientific research
  - Fight for science (funding, value, importance, etc.)



# My Experience: Relevant Skills?

- Critical thinking / skepticism
- Self-motivated / curious... learning!
- Logical / methodical
- Need for proof / detail-oriented
- Literature review / self sufficient
- Data analysis
- Numbers
- Processing/communicating information, *quickly*

## The Scientific Method



# Example 1: Staffing the Senator



Ernie Moniz, Ph.D.  
Secretary of Energy

- Iran nuclear deal
- DOE budget (R&D)



Ellen Williams, Ph.D.  
Director of ARPA-E

- Carbon sequestration R&D
- Energy storage R&D

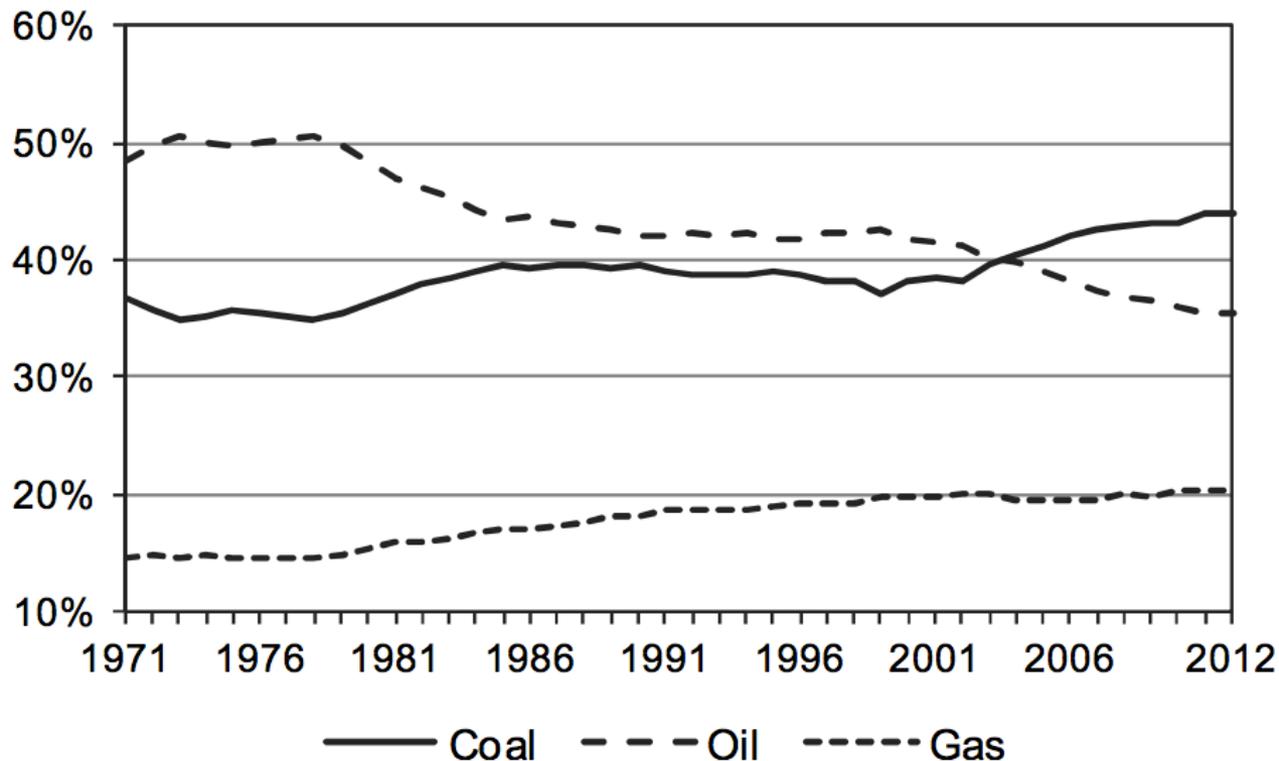


Peter Littlewood, Ph.D.  
Director of Argonne  
National Lab

- Energy storage R&D
- Synchrotron experiments

# Example 2: Climate Change Policy

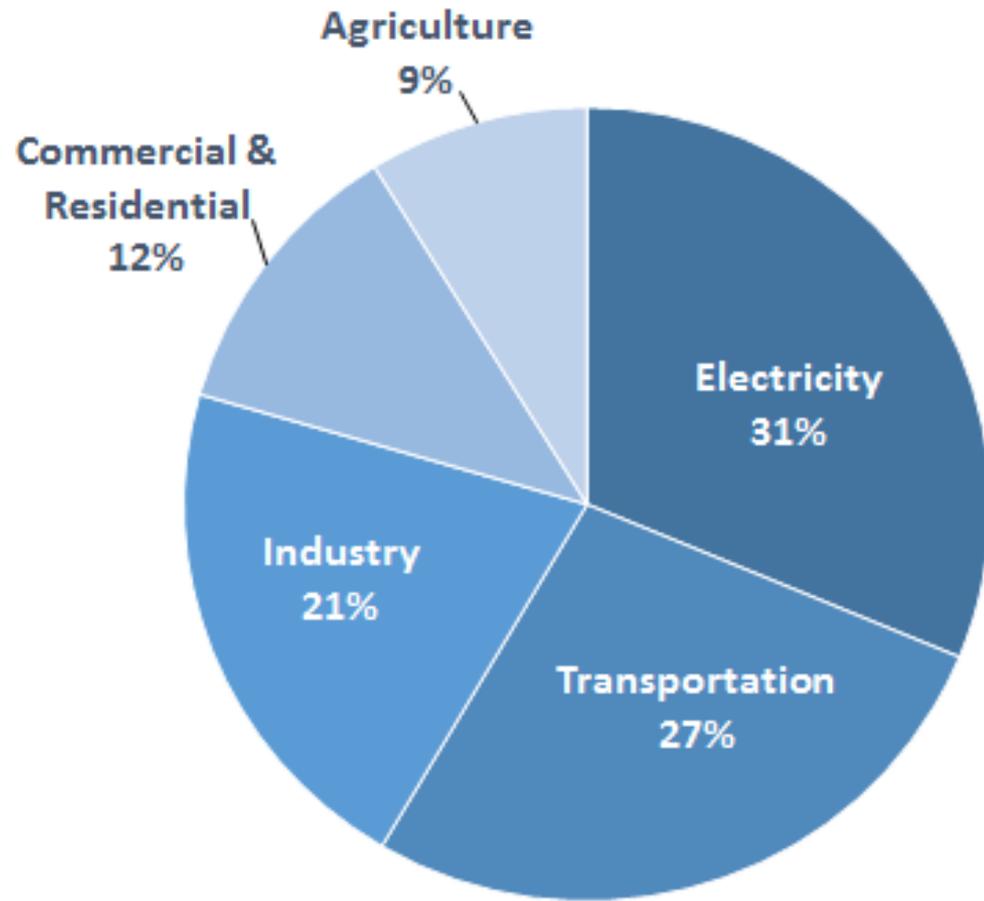
Figure 6. Fuel shares in global CO<sub>2</sub> emissions



- Obviously rooted in science, and a natural policy area to which Earth Scientists can contribute
- Highly political problem... what is the best way to tackle it?

# Example 2: Climate Change Policy

- **Electricity:** approximately 67% of our electricity comes from burning fossil fuels (e.g., coal and natural gas)
- **Transportation:** over 90% of the fuel used for our cars, trucks, ships, trains, and planes is petroleum based (e.g., gasoline and diesel)



# Example 2a: Keystone XL Pipeline

- 875 miles of 36-inch pipe, with the capacity to transport 830,000 bpd
- Requires a Presidential Permit from the State Department, predicated on the department's determination that the project would serve the national interest
  - Ultimately, this decision largely comes down to the environmental impacts, which are evaluated and documented in an environmental impact statement (EIS)



S.1

One Hundred Fourteenth Congress  
of the  
United States of America

AT THE FIRST SESSION

*Begun and held at the City of Washington on Tuesday,  
the sixth day of January, two thousand and fifteen*

An Act

To approve the Keystone XL Pipeline.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*  
**SECTION 1. SHORT TITLE.**

This Act may be cited as the “Keystone XL Pipeline Approval Act”.

**SEC. 2. KEYSTONE XL APPROVAL.**

(a) **IN GENERAL.**—TransCanada Keystone Pipeline, L.P. may construct, connect, operate, and maintain the pipeline and cross-border facilities described in the application filed on May 4, 2012, by TransCanada Corporation to the Department of State (including any subsequent revision to the pipeline route within the State of Nebraska required or authorized by the State of Nebraska).

(b) **ENVIRONMENTAL IMPACT STATEMENT.**—The Final Supplemental Environmental Impact Statement issued by the Secretary of State in January 2014, regarding the pipeline referred to in subsection (a), and the environmental analysis, consultation, and review described in that document (including appendices) shall be considered to fully satisfy—

# S.1: *The Top Priority*

- Energy security: reduce dependence on overseas sources of oil, while helping our friends to the North
  - Reduce diversity in our refineries
  - Little impact on the overall oil economy
- Jobs: “During construction, proposed Project spending would support approximately 42,100 jobs (direct, indirect, and induced).... The proposed Project would generate approximately 50 jobs during operations.”
  - Job = 1 year of employment for 1 person
  - Indirect/induced jobs
  - Permanent vs. temporary jobs
- Environmental impacts: regional and global

# S.1: Amendments

- Keystone XL is old, but amendments are all “new;” an opportunity for each Senator to add a layer to the legislation
  - 247 amendments introduced: 139 republican, 108 democrat\*
- *No* restriction on content
  - S.73: “To delist the lesser prairie-chicken as a threatened species under the Endangered Species Act of 1973.”
  - S.23: “To increase the quantity of solar photovoltaic electricity.”
- Track amendments, prepare vote recommendations for the Senator



# Sense of the Senate on Climate Change

- **Climate change is real and not a hoax**
- Climate change is caused by human activities
- Climate change has already caused devastating problems in the United States and around the world
- We should act immediately to mitigate the effects of climate change (e.g., severe weather events, sea level rise, etc.)
  
- Worldwide scientific opinion is not settled on the extent to which human activities may be causing climate change
- The Energy Information Administration projects that fossil fuels will continue to produce 68% of the electricity in the United States through 2040

# Keystone XL Conclusions

- Of the 247 amendments that were introduced, the Senate ultimately voted on 42 of them, and only 5 amendments passed
- The House of Representatives passed the same version of the bill, but President Obama ultimately vetoed it
- The Presidential Permit process continued until last month, when the application was denied

## SEC. 5. SENSE OF THE SENATE REGARDING CLIMATE CHANGE.

It is the sense of the Senate that climate change is real and not a hoax.

## SEC. 6. SENSE OF SENATE REGARDING THE OIL SPILL LIABILITY TRUST FUND.

It is the sense of the Senate that—

(1) Congress should approve a bill to ensure that all forms of bitumen or synthetic crude oil derived from bitumen are subject to the per-barrel excise tax associated with the Oil Spill Liability Trust Fund established by [section 9509](#) of the Internal Revenue Code of 1986;



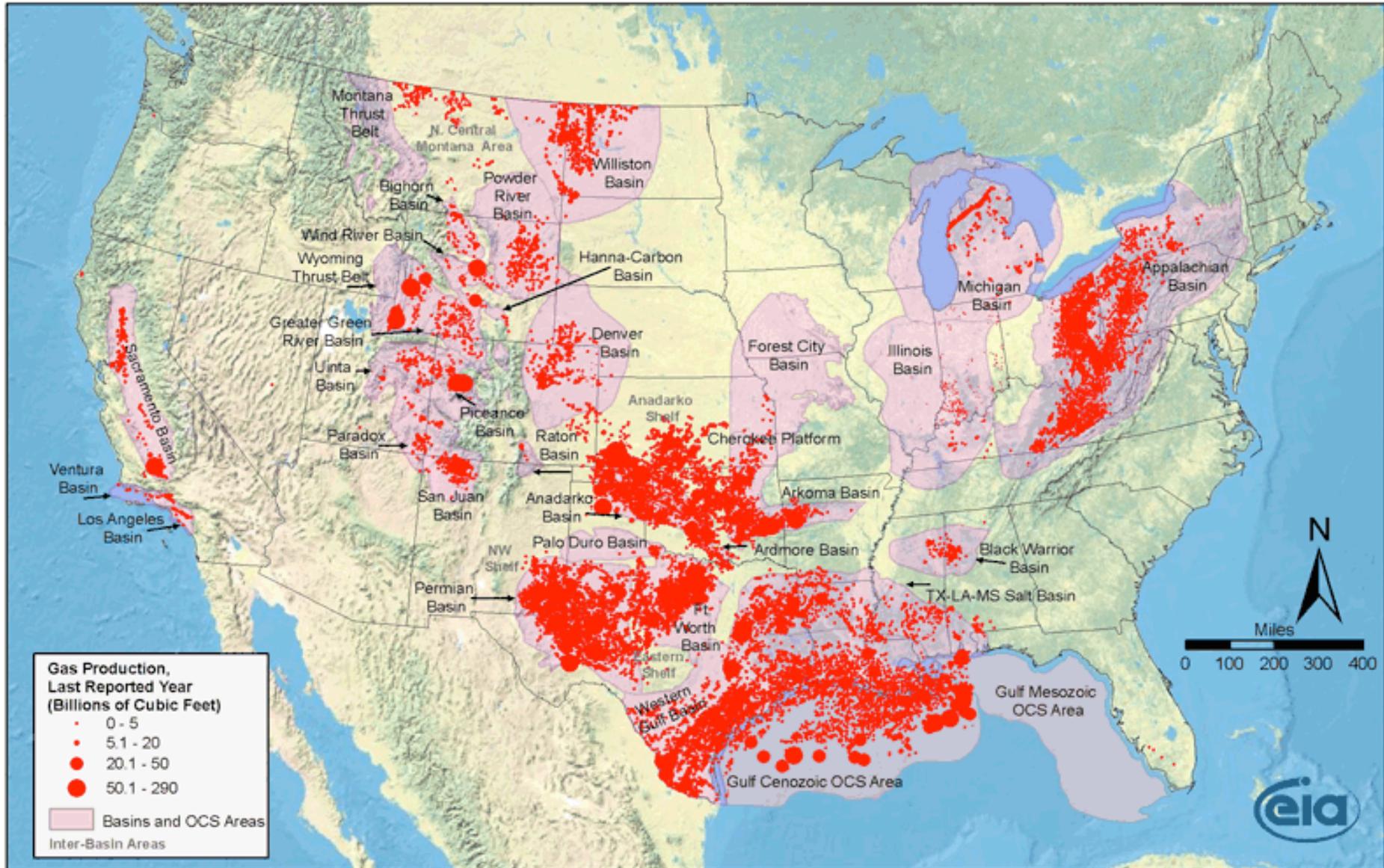
# Example 2b: LNG Exports

World LNG Estimated November 2013 Landed Prices



- With the natural gas boom that came from hydraulic fracturing, the petroleum industry is eager to find new markets for their product
- Real profits are found overseas, but this requires federal approval
  - Similar to the Keystone XL example, a determination of “national interest” depends on both economic and environmental impacts
- Bipartisan issue, but also a *regional one*

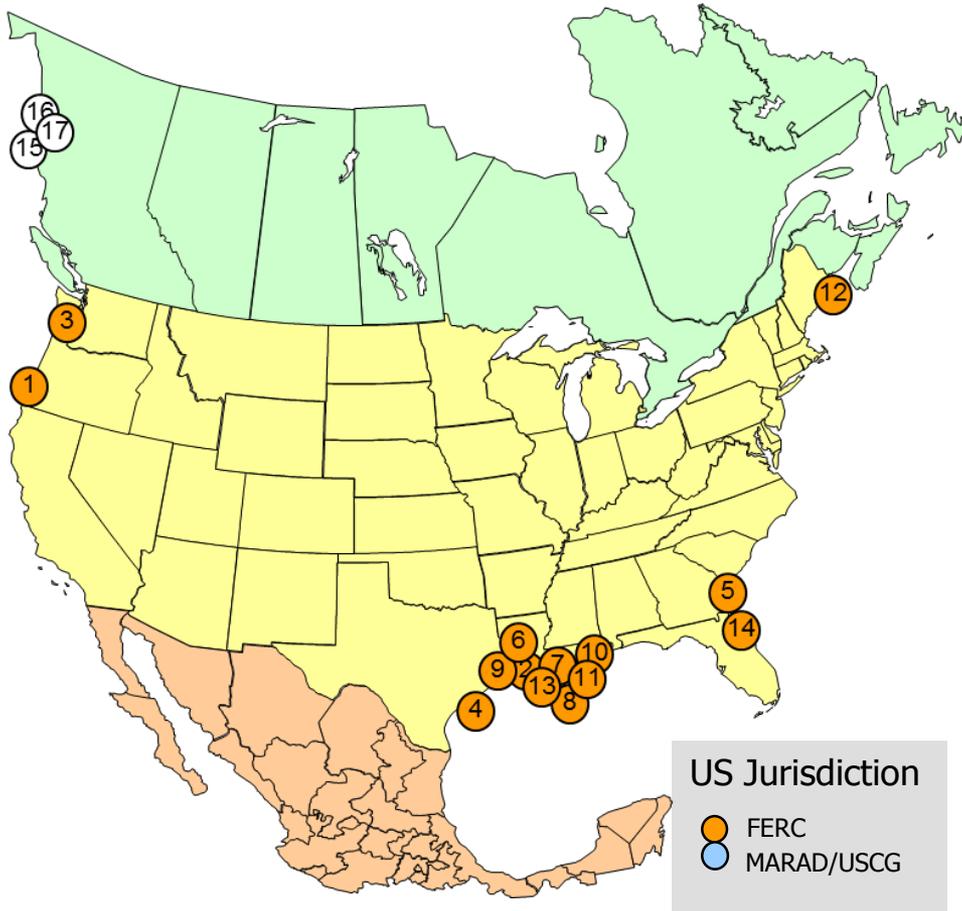
# Natural Gas Production in the US



Source: Energy Information Administration based on data from HPDI, IN Geological Survey, USGS



# North American LNG Export Terminals *Proposed*



## Export Terminal PROPOSED TO FERC

- 1. Coos Bay, OR:** 0.9 Bcfd (Jordan Cove Energy Project) (CP13-483)
- 2. Lake Charles, LA:** 2.2 Bcfd (Southern Union - Trunkline LNG) (CP14-120)
- 3. Astoria, OR:** 1.25 Bcfd (Oregon LNG) (CP09-6)
- 4. Lavaca Bay, TX:** 1.38 Bcfd (Excelerate Liquefaction) (CP14-71 & 72)
- 5. Elba Island, GA:** 0.35 Bcfd (Southern LNG Company) (CP14-103)
- 6. Sabine Pass, LA:** 1.40 Bcfd (Sabine Pass Liquefaction) (CP13-552)
- 7. Lake Charles, LA:** 1.07 Bcfd (Magnolia LNG) (CP14-347)
- 8. Plaquemines Parish, LA:** 1.07 Bcfd (CE FLNG) (PF13-11)
- 9. Sabine Pass, TX:** 2.1 Bcfd (ExxonMobil – Golden Pass) (CP14-517)
- 10. Pascagoula, MS:** 1.5 Bcfd (Gulf LNG Liquefaction) (PF13-4)
- 11. Plaquemines Parish, LA:** 0.30 Bcfd (Louisiana LNG) (PF14-17)
- 12. Robbinston, ME:** 0.45 Bcfd (Kestrel Energy - Downeast LNG) (PF14-19)
- 13. Cameron Parish, LA:** 1.34 Bcfd (Venture Global) (PF15-2)
- 14. Jacksonville, FL:** 0.075 Bcfd (Eagle LNG Partners) (PF15-7)

## PROPOSED CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS

- 15. Kitimat, BC:** 1.28 Bcfd (Apache Canada Ltd.)
- 16. Douglas Island, BC:** 0.23 Bcfd (BC LNG Export Cooperative)
- 17. Kitimat, BC:** 3.23 Bcfd (LNG Canada)

As of February 5, 2015

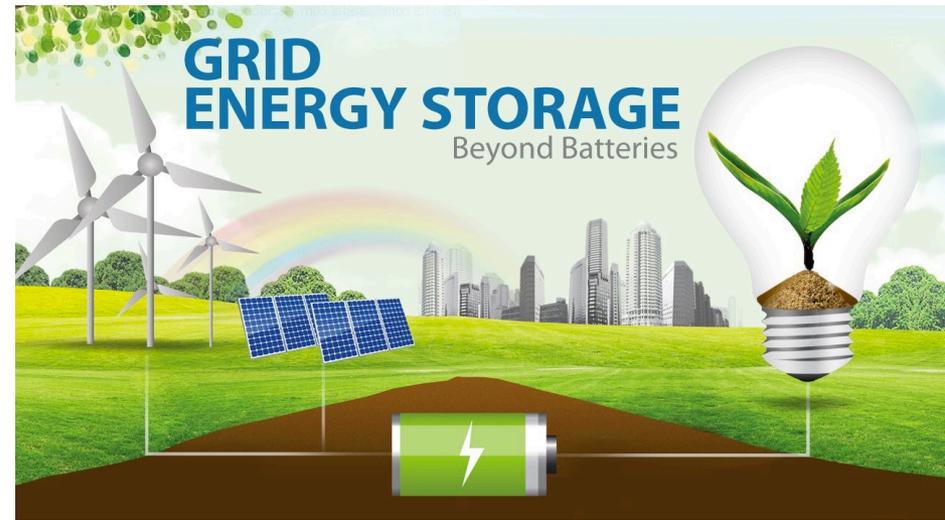
*Office of Energy Projects*

# LNG Exports: A “Research Project”

- Many colloquial arguments for/against LNG exports... but what do the numbers say?
- Background research → **go through emissions/economic models**
  - What are the climate/economic impacts of increased LNG production and use in global electricity/industrial markets?
  - What are the sources of GHG emissions from the natural gas sector?
- Prepare questions for Energy committee hearings → **legislation**
  - Fugitive emissions, displacing renewable energy development in other countries, meeting our GHG emissions reduction goals
- Help Senator Franken present his arguments in the most effective and meaningful way possible → **letter to Sec. Moniz**
  - What is the best way to use the numbers?
  - Questioning the models vs. the conclusions

# Example 3: Bipartisan Energy Legislation

- The Senate Energy Committee developed bipartisan energy legislation for the first time since 2007
- The first draft of the bill included a number of progressive energy provisions:
  - Strong federal funding for energy storage R&D
  - Enhanced federal support for the deployment of clean energy technologies
  - A renewed commitment to land and water conservation (paid for by oil & gas development)



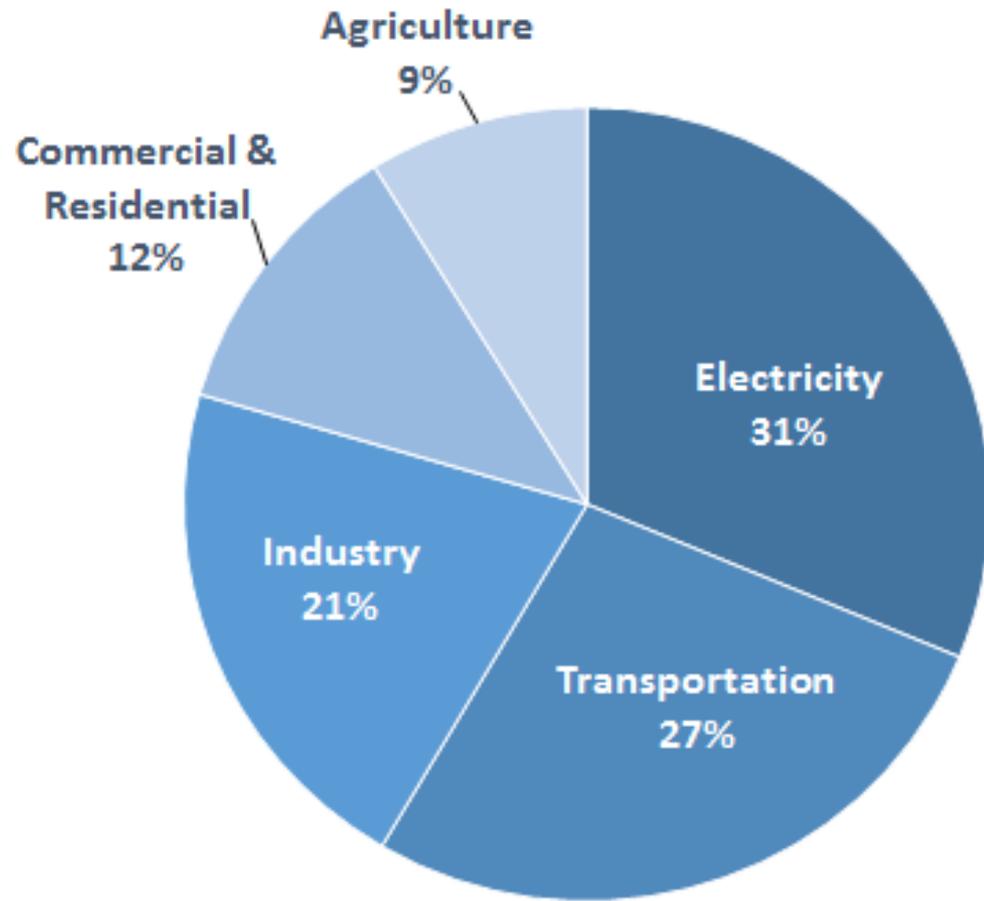
# Example 3: Bipartisan Energy Legislation

- Amendments served as an opportunity to shape the discussion about what we think is good energy policy:
  - The importance of federal funding for basic energy research
  - Continued federal support for the development of clean energy technologies
  - *Dramatically improving our energy efficiency*
  - *Developing and deploying more alternative vehicles*



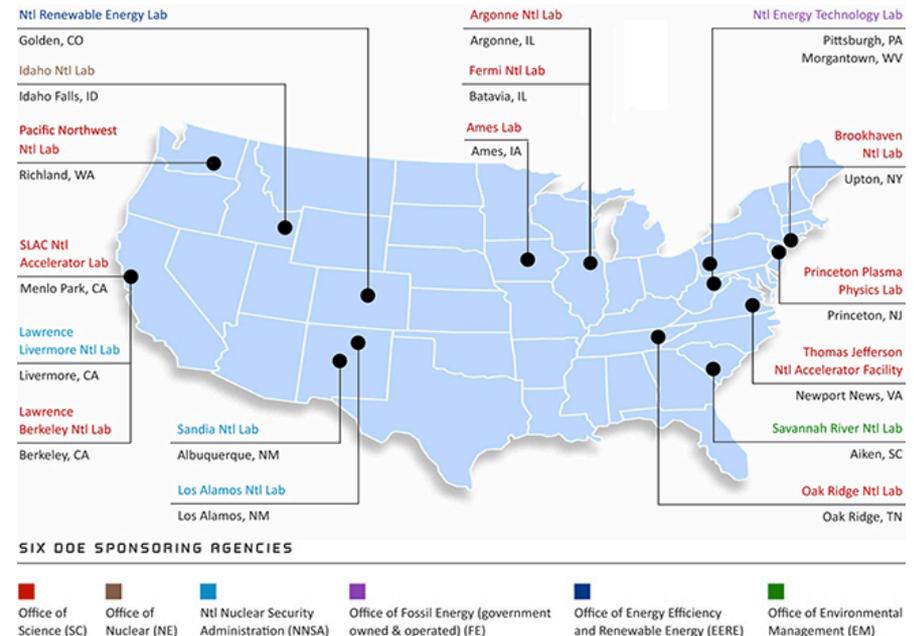
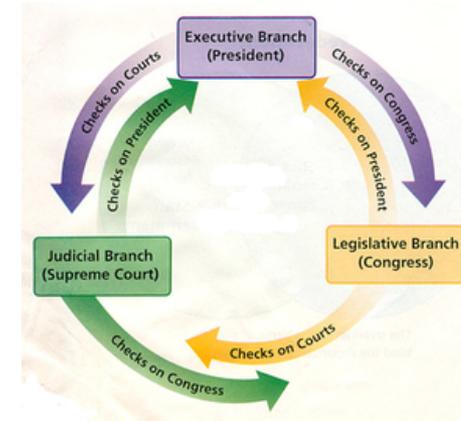
# Transition to Department of Energy

- Orchestrating computer modeling for how to best reduce GHG emissions in the electricity sector
- Organizing public-private partnerships for voluntary reductions of methane emissions from the oil and gas sector
- Developing strategies for increasing end-use energy efficiency



# Transition to Department of Energy

- Holistic understanding of how federal policy is developed, legislated, and implemented/executed
- More quantitative analysis of federal policy
- Close interaction with DOE national labs
- Outreach to industries and private sector entities
- Active involvement in policy implementation



# Concluding Remarks

- By spending a year as an S&T Policy Fellow, I have gained/developed a number of invaluable skills:
  - E.g., Negotiation, compromise, fast-paced working, multitasking, and how to communicate/work effectively with non-scientists
- I have also learned a lot about how the federal government works, and the important role that scientists can play in the legislative process
- The experience gave me unique opportunities to interact with a wide array of elected officials and public servants, and exposed to me a variety of new career paths
- *But at the same time, I still have the ability to return to an academic position!*

# How Can You Get Involved?

- Start by getting ideas from your...
  - Professional societies, alumni networks, NYU
- Congressional Visit Day
  - Check your professional societies to see when they are planning a visit, or work with any advocacy group that you are passionate about
- Volunteer / Outreach activities
  - Anything you want, as long as it demonstrates that you are interested in something beyond your research
  - Examples: judging science fairs, STEM outreach activities, tutoring, volunteering with SOME, write a blog

# Apply for a Fellowship!

- Congressional Science Fellowships are offered by many Earth Science societies, with applications due in January and February
- 1 year position, *right here in DC!*
- Good pay
- Learn a lot!
  - How to make a difference
  - How the government works
  - How to work *quickly*
  - Collaboration
  - Networking
  - Breadth / range
  - “Gray area”
  - Respectfully disagreeing
  - Career doesn’t have to be “serious”
  - You win some, you lose some

2014-15 AAAS Science & Technology Policy Fellows

