Geosciences Directorate Update

Unidata Strategic Advisory Committee Meeting

Bernard M. Grant

April 22, 2015
GEO Update:

“managing (facilities) has been made more challenging with the continued increase in O&M.....infrastructure expenses should not be allowed to escalate at the expense of core research”.....
- 8 broad priority science questions with the highest potential payoff

- Perform a portfolio review of infrastructure bounded by constrained budgets

- UNOLS, OOI, IODP

~3000 downloads 10 days after the released of the report
Important to plan when budgets are good. Absolutely critical to plan when budgets are constrained.
About the “Dynamic Earth” report

- Articulates GEO-wide priorities not individual division plans
- Serves as near-term plan for geosciences research supported by NSF
- NSF-level strategic goals, administration-level priorities and principles, and GEO Division perspectives are captured in this "living" document.
Research Imperatives

- **Highest Priority** - Continue strong emphasis on support of core research
- Engage in collaborative efforts to improve understanding of and resilience to hazards and extreme natural events
- Establish a collaborative effort to understand the water cycle
Community Resources and Infrastructure Imperatives

- Maintain state-of-the-art facilities
- Complete construction and begin full-scale operation of the Ocean Observatories Initiative (OOI)
- Implement strategic plans for logistics and operations for the Polar Regions
- Begin conceptualization and development of next-generation sun-earth-system community models
Research Highlights

FY16 NSF-Wide Priorities

1) Understanding the Brain
2) Broadening Participation
3) Risk & Resilience
4) INFEWS

- **PREEEVENTS** (*Prediction of and Resilience Against Extreme Events*)
  - GEO’s part of NSF’s Risk and Resilience activity. ($23.50M)

- **INFEWS** (*Innovation at the Nexus of Food, Energy, and Water*)
  - New interdisciplinary investment to study the food-energy-water nexus. ($14.78M)

- **SEES** (*Sci, Engineering, and Educ for Sustainability*)
  - GEO has been a leader in NSF’s SEES priority area. 2016 continues sunsetting for this investment. ($34M, $25M below FY15)
Prediction of and Resilience against Extreme Events (PREEVENTS)

- GEO’s contribution to NSF’s FY16 Risk & Resilience activity (co-lead ENG – CRISP: Critical Resilient Interdependent Infrastructure Systems and Processes)

- Focus on natural hazards and extreme events

- PREEVENTS is intended to:
  - Enhance understanding of the fundamental processes underlying geohazards and extreme events on various spatial and temporal scales
  - Improve models of geohazards, extreme events, and their impacts on natural, social, and economic systems
  - Develop new tools to enhance societal preparedness and resilience against such impacts

- Expecting to issue a Dear Colleague Letter announcing the upcoming program in FY15

- Program starts in FY16.
Inflation-Adjusted U.S. Insured Catastrophe Losses By Cause of Loss 1994-2013

2013 $ billion

Total: $398.7 billion

- Hurricanes and tropical storms: $159.1 billion (39.9%)
- Tornadoes: $148.3 billion (37.2%)
- Winter storms: $26.6 billion (6.7%)
- Geologic events: $18.4 billion (4.6%)
- Wind/hail/flood: $16.1 billion (4.0%)
- Fires: $5.9 billion (1.5%)
- Terrorism: $24.1 billion (6.0%)
- Other: $0.2 billion (0.1%)

2014 Total: 119 Events

- Geophysical Events (earthquake, tsunami, volcanic activity)
- Meteorological Events (tropical storm, extratropical storm, convective storm, local storm)
- Hydrological Events (flood, mass movement)
- Climatological Events (extreme temperature, drought, forest fire)
INFEWS is intended to:

- Support integrated research and modeling towards creating a comprehensive food-energy-water socio-technical systems model
- Advance knowledge & technologies that foster more safe, secure, and efficient use of resources within the food-energy-water nexus

Successor to SEES Water Sustainability & Climate (WSC)

Planning began in 2014 and will continue through 2015

Discussions with other agencies are ongoing
DEMAND INCREASES FOR FOOD, ENERGY & WATER

**FOOD**
- Demand will increase **50%**
- 2010: 7.2 billion
- 2050: 9.6 billion
- Biofuels

**ENERGY**
- Demand will increase **50%**
- 2010: 8.2 billion
- 2050: 9.6 billion
- Hydro-electric

**WATER**
- Demand will increase **30%**
- 2010: 7.2 billion
- 2050: 9.6 billion

WORLD’S POPULATION BOOMS
- 33% to >9 BILLION

URBAN AREAS ABSORB GROWTH
- 70% LIVE IN CITIES

Some Illustrative Examples of Implementation of Our Plan

Support for Core Research - $25M increment for core research in FY16 Request (accomplished by partial sunset of SEES by $25M)

Improve understanding of and resilience to hazards & extreme events – PREEVENTS (FY16 NSF-Wide Initiative under Risk & Resilience)

Water cycle – INFEWS (FY16 NSF-Wide Initiative)

Logistics and operations for the polar regions - AIMS
### Fiscal Year 2016 Budget Request

GEO fits within NSF’s Research and Related Activities Account

<table>
<thead>
<tr>
<th>R&amp;RA Funding</th>
<th>FY 2014</th>
<th>FY 2015 Estimate</th>
<th>FY 2016 Request</th>
<th>Change over FY 2015 Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual</td>
<td></td>
<td></td>
<td>Amount</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>$720.84</td>
<td>$731.03</td>
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<td>$16.89</td>
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<tr>
<td>Computer &amp; Information Science &amp; Engineering</td>
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<td>921.73</td>
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<td>Engineering</td>
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<tr>
<td>Geosciences</td>
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<td>1,304.39</td>
<td>1,365.41</td>
<td>61.02</td>
</tr>
<tr>
<td>Mathematical &amp; Physical Sciences</td>
<td>1,267.86</td>
<td>1,336.72</td>
<td>1,366.23</td>
<td>29.51</td>
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<tr>
<td>Social, Behavioral &amp; Economic Sciences</td>
<td>256.84</td>
<td>272.20</td>
<td>291.46</td>
<td>19.26</td>
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<tr>
<td>Office of International Science and Engineering</td>
<td>48.31</td>
<td>48.52</td>
<td>51.02</td>
<td>2.50</td>
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<td>Integrative Activities</td>
<td>433.12</td>
<td>425.34</td>
<td>459.15</td>
<td>33.81</td>
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<tr>
<td>U.S. Arctic Research Commission</td>
<td>1.30</td>
<td>1.41</td>
<td>1.48</td>
<td>0.07</td>
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<td>Total, R&amp;RA</td>
<td>$5,775.32</td>
<td>$5,933.65</td>
<td>$6,186.30</td>
<td>$252.66</td>
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Totals may not add due to rounding.
## Fiscal Year 2016 Budget Request by Division

### GEO Funding

(Dollars in Millions)

<table>
<thead>
<tr>
<th>Division</th>
<th>FY 2014 Actual</th>
<th>FY 2015 Estimate</th>
<th>FY 2016 Request</th>
<th>Change Over FY 2015 Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric and Geospace Sciences (AGS)</td>
<td>$250.85</td>
<td>$251.15</td>
<td>$262.88</td>
<td>$11.73 (4.7%)</td>
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<tr>
<td>Earth Sciences (EAR)</td>
<td>177.81</td>
<td>177.20</td>
<td>188.21</td>
<td>11.01 (6.2%)</td>
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<tr>
<td>Integrative and Collaborative Education and Research (ICER)</td>
<td>83.53</td>
<td>83.74</td>
<td>95.20</td>
<td>11.46 (13.7%)</td>
</tr>
<tr>
<td>Ocean Science (OCE)</td>
<td>356.27</td>
<td>355.95</td>
<td>369.61</td>
<td>13.66 (3.8%)</td>
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<tr>
<td>Polar Programs (PLR)</td>
<td>452.87</td>
<td>436.35</td>
<td>449.51</td>
<td>13.16 (3.0%)</td>
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<tr>
<td><em>U.S. Antarctic Logistical Support (USALS)</em></td>
<td>[68.94]</td>
<td>[67.52]</td>
<td>[67.52]</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total, GEO</strong></td>
<td><strong>$1,321.32</strong></td>
<td><strong>$1,304.39</strong></td>
<td><strong>$1,365.41</strong></td>
<td><strong>$61.02 (4.7%)</strong></td>
</tr>
</tbody>
</table>

Totals may not add due to rounding.
In particular, Congress should direct, and the administration should implement, a reallocation of NSF resources toward the kinds of science that has direct economic and industrial benefits for the United States. In particular, this means increasing NSF budgets for four key directorates: 1) math and physical sciences; 2) engineering; 3) computer and information sciences and engineering (CISE); and 4) biological sciences, **while permitting research budgets for the geosciences and social sciences to shrink**
Challenges

NSF FY15 appropriations

“Any increases provided above the request and not otherwise specified below shall be applied to math and physical sciences; computer and information science and engineering; engineering; and biological sciences”
Earth science is not hard science, congressional Republicans declare

By Jeffrey Mervis    13 March 2015 3:15 pm

U.S. geoscientists are accustomed to being used as a punching bag by climate change skeptics in Congress, who challenge the science of global warming. But some influential Republican legislators are now going a step further, by denigrating the discipline itself.
Dear Chairman Culberson and Ranking Member Fattah,

As you begin consideration of the FY2016 Commerce, Justice, Science, and Related Agencies Appropriations (CJS) bill, we ask that you fully fund the President’s request ….. for NSF’s Risk and Resilience initiative.....
Questions?