The Importance of Geosciences to Federal, State and Local Governments

Tim Killeen, Assistant Director for Geosciences

Administration Priorities

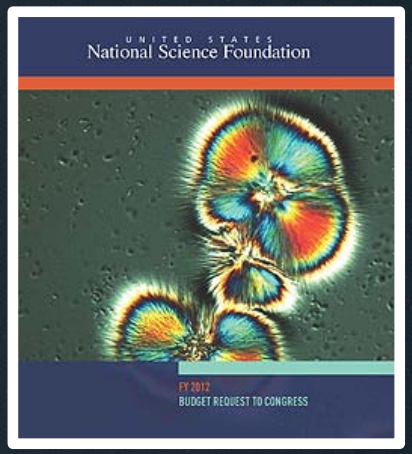
- Protecting our nation from the serious economic and strategic risks associated with our reliance on foreign oil and the destabilizing effects of a changing climate
- Advancing energy and climate security via promoting economic recovery efforts, accelerating job creation, and driving clean energy manufacturing

"We need to out-innovate, out-educate, and out-build the rest of the world."
President Barack Obama, State of the Union Address, January 25, 2011

NSF FY12 Budget Request

Three pillars of innovation

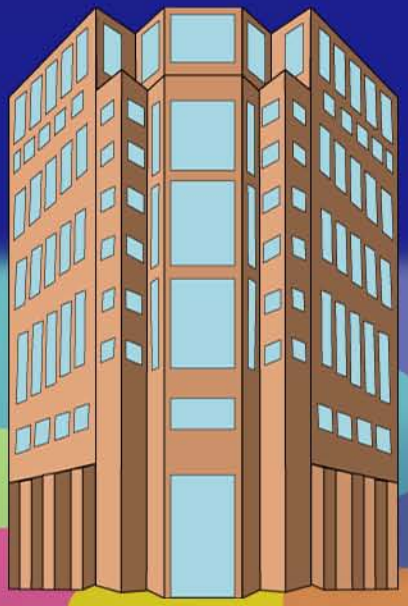
- Invest in the Building Blocks of American Innovation
- Promote Competitive Markets that Spur Productive Entrepreneurship
- Catalyze Breakthroughs for National Priorities



OneNSF

catalyze human capital development

improve organizational efficiency



create networks and infrastructure for the nation

spark greater innovation and opportunity for scientific discoveries

address multidisciplinary challenges of national/global significance

support fundamental research in all disciplines

Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)

- Foster and support interdisciplinary research (IDR) through
  - funding potentially transformative research through new awards program
  - identifying and lowering barriers to interdisciplinary research within NSF and in the research community — (e.g., augmenting staff and reviewer training to convey importance and value of IDR)
- Ensure that NSF's e-business systems and processes allow for the complexity of IDR;
- Foster exchange of best practices; outreach to research community.
- Establish an integrated evaluation system that supports longitudinal data collection of INSPIRE's impact on the advancement of science as well as on the career pathways of awardees over time.

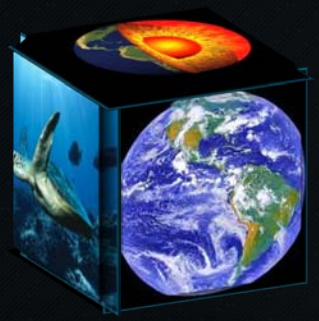
NSF Innovation Corps

- Public–private partnership to bring discoveries ready for transitioning into valuable products out of the university lab (www.nsf.gov/i-corps).
- "…I-Corps will contribute to an innovation ecosystem that firmly unites industry with academic researchers for the benefit of society." Dr. Subra Suresh, NSF Director

Expected outcomes

- New start-up businesses
- Licenses
- SBIR proposals
- Business plan suitable for review by third-party investors
- Students with entrepreneurial skills
- New or enhanced curricula

GEO in OneNSF



- GEO's FY2012 Budget Request provides exciting opportunities to:
  - Attack complex multidisciplinary challenges
  - Ignite innovation and opportunity for discovery
  - Catalyze breakthroughs across the sciences
  - Create new networks and cyberinfrastructure
  - Explore the planet in new and transformative ways

GEO Vision
A Strategic Plan for Geosciences

- Fostering a sustainable future through better understanding of our complex and changing planet.
  - Understanding complex Earth system
  - Reducing vulnerability and sustaining life
  - Growing geosciences workforce of the future

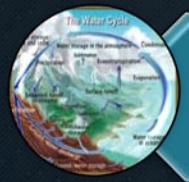
Geosciences at a Crossroads

The Dynamic Earth

The Changing Climate

Earth and Life

Geosphere-Biosphere Connection



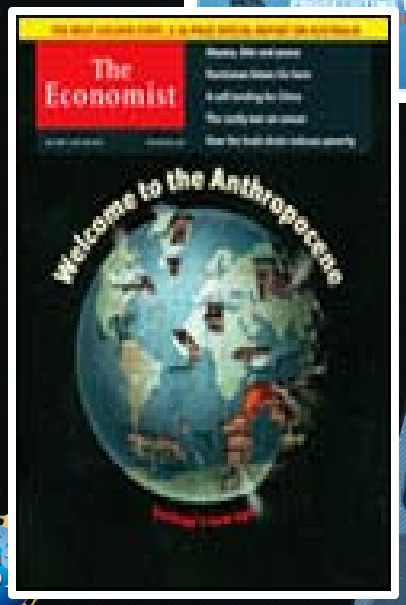
Water: Changing Perspectives

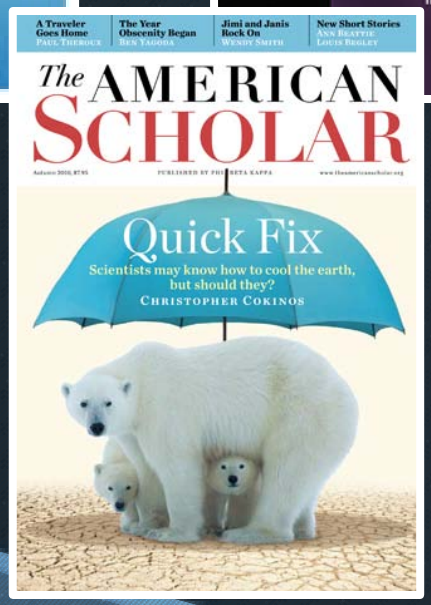
> " …the most urgent issues that pose unique and sustained hazards for the Earth and its inhabitants."

GEO Major Investments in 2012

- Science, Engineering and Education for Sustainability (SEES)
- Creating a More Disaster Resilient America (CaMRA)
- Continuing investments in Basic Research, Education & Diversity, Infrastructure
- Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21)

Sustainability Issues Remain at the Forefront





ROAD
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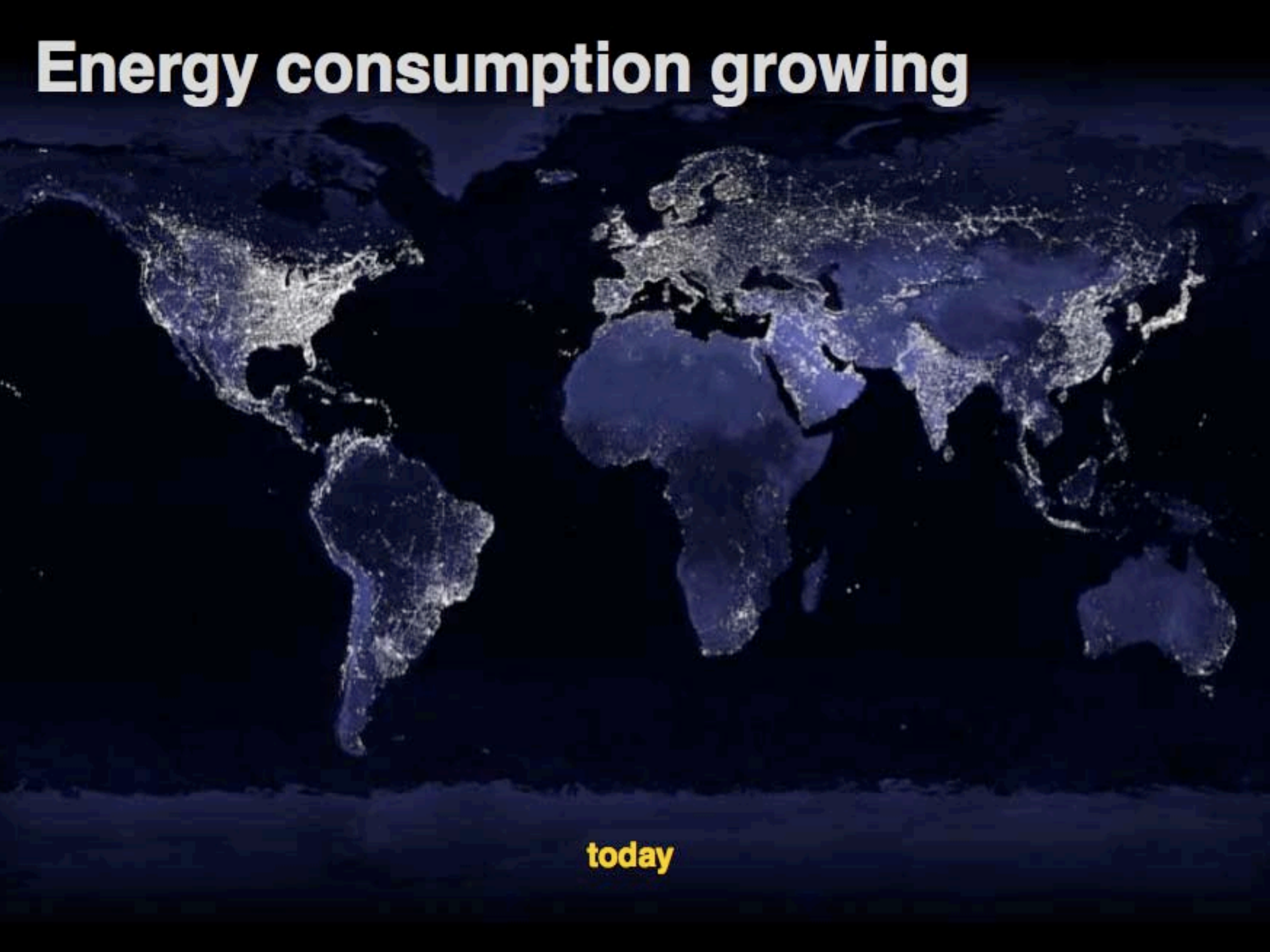
SEES Goals

Tremendous opportunity to build on NSF's strengths and efforts to:

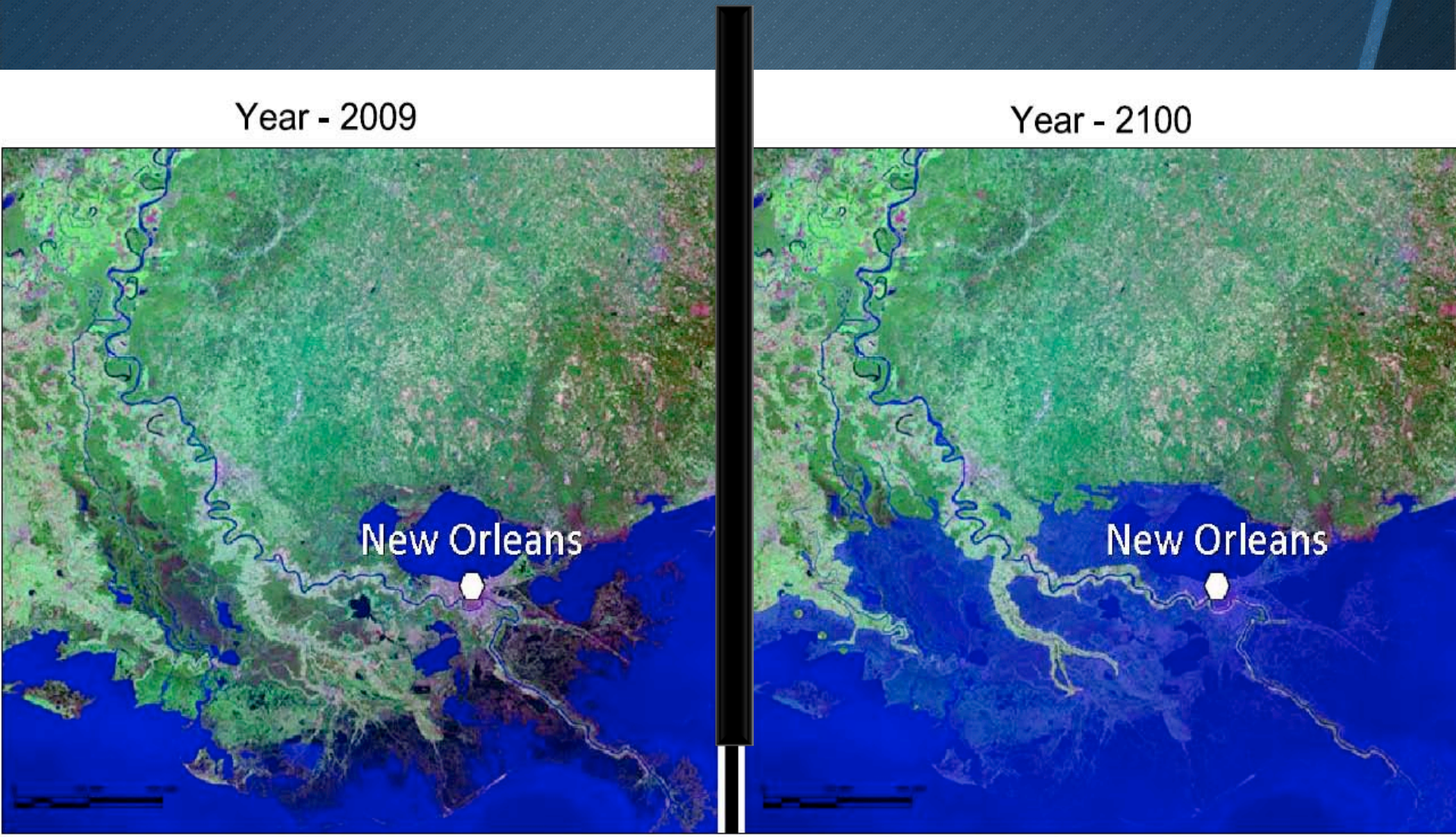
- Advance a clean energy future
- Nurture emerging workforce
- Expand research, education, knowledge dissemination
- Engage global partners
- Enhance inter-agency relationships

Energy consumption growing



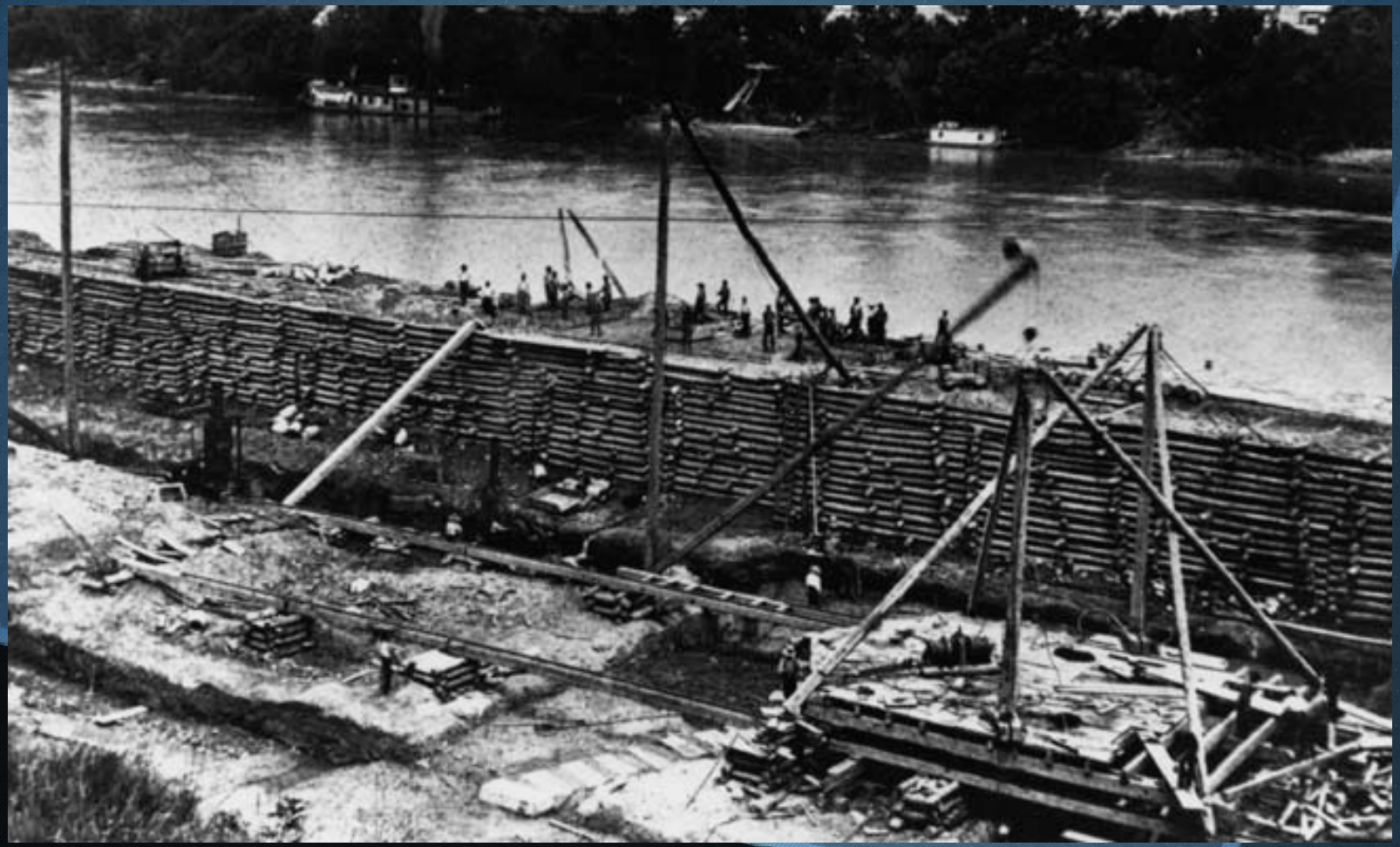
… to unprecedented demands

Changes that can affect us



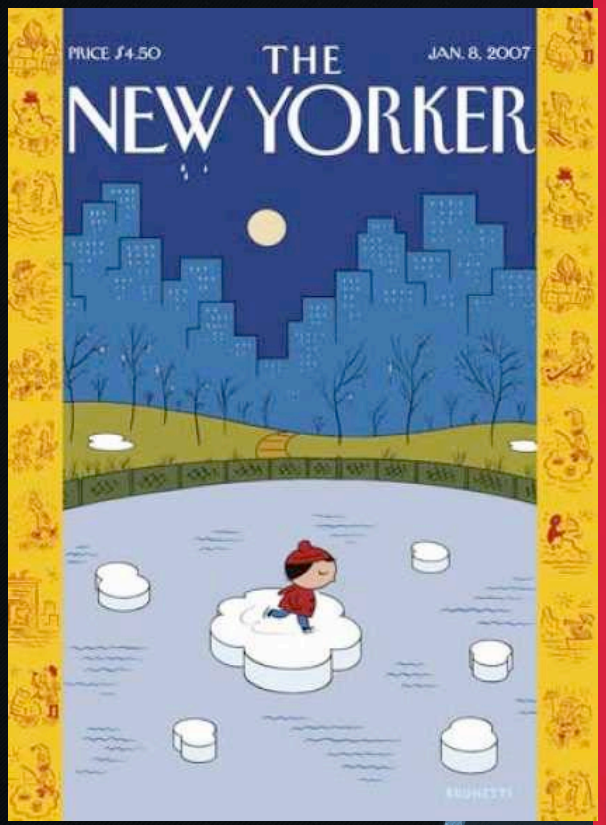
Map: Blum, M.D., and H.H. Roberts (2009), Drowning of the Mississippi delta due to insufficient sediment supply and global sea-level rise, *Nat. Geosci.*, 2, 488-491.

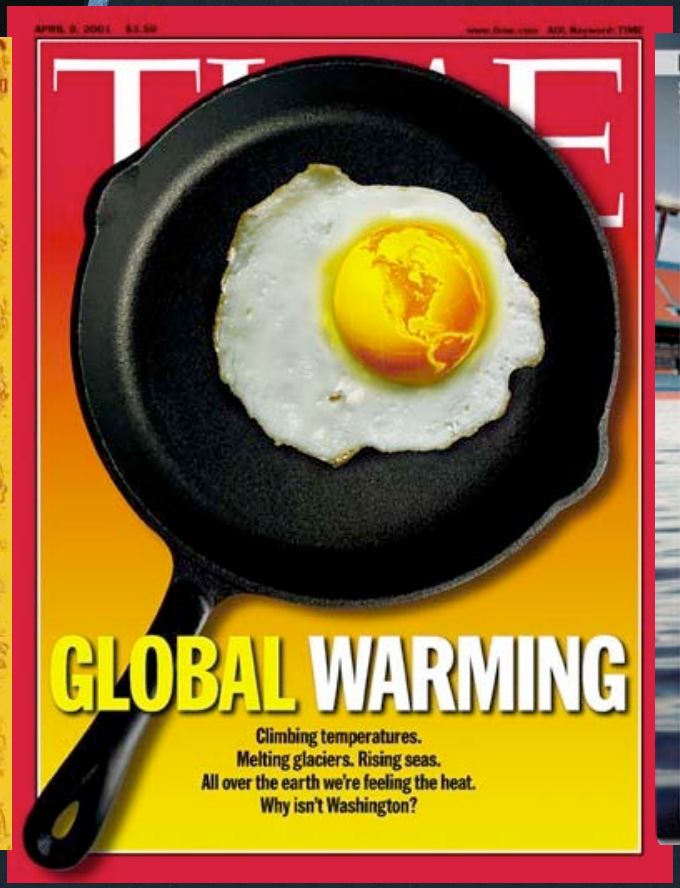
Mississippi River & Tributaries (MRT)



The Flood Control Act of 1928 put flood control on par with other major projects of its time with the largest public works appropriation ever.

Society demands reliable projections of coming changes…



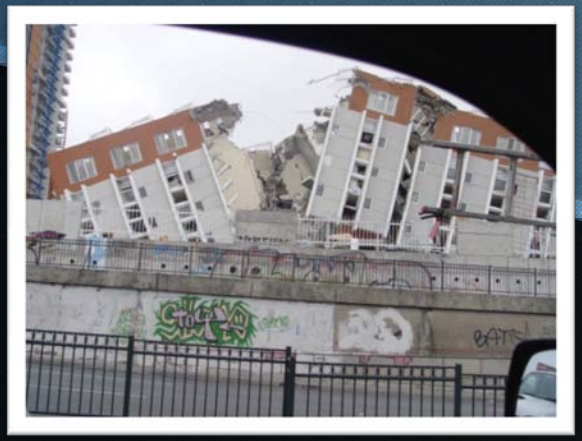


Hazards-related science, engineering, technology, and outreach

GEO planning to initiate a new program -- Creating a More Disaster-Resilient America (CaMRA)

- Catalyze basic research efforts in hazard-related science to improve forecasting and prediction of natural and man-made

GEO Support of Research on Natural and man-made disasters geo-hazards in 2010 using NSF RAPID award mechanism



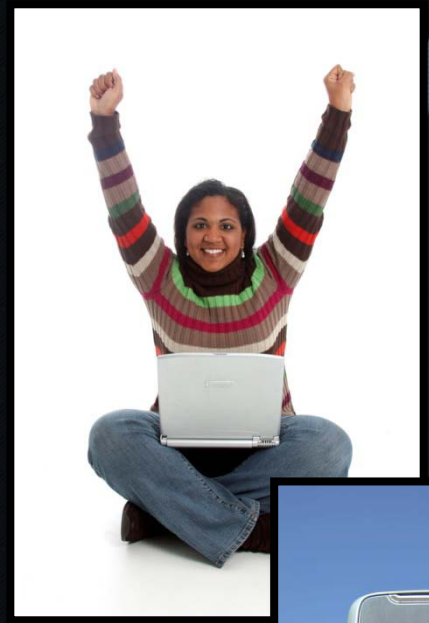
Earthquakes in Haiti, Chile and Baja; volcanic eruption in Iceland and Deep Horizon Gulf Oil Spill

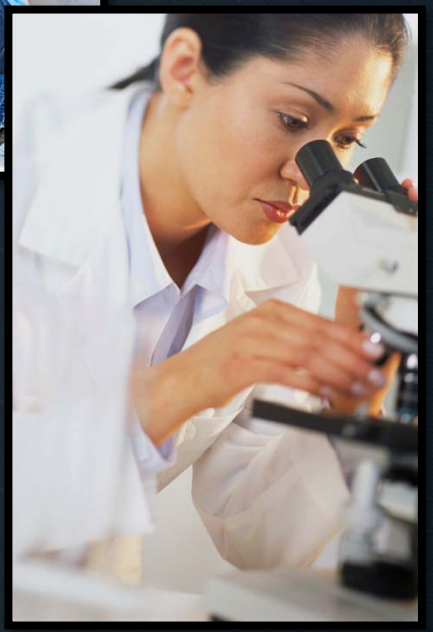
Grand Challenges in Education

- How does the nation train and develop its Science and Engineering workforce?
- How should we teach and learn science in the 21st Century?
- How does the nation create a science literate citizenry?
- How can we broaden and deepen participation in science and engineering?
- How does NSF most effectively deploy its resources in STEM education and learning?

Expeditions in Education – E^2

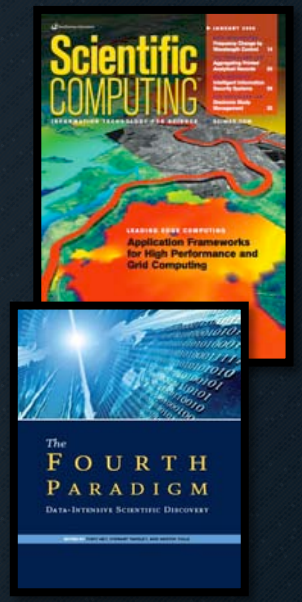
Engage, Empower, Energize





Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21)

- Comprehensive and integrated cyberinfrastructure to transform research, innovation and education
- Focus on computational and data-intensive science to address complex problems
- Four major components
  - Data-enabled science
  - New computational infrastructure
  - Community research networks
  - Access and connections to cyberinfrastructure facilities



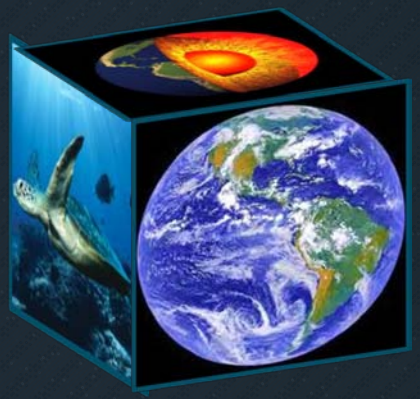
Overall Vision:

Building on the Internet Paradigm: An "Earth Cube"

- The Internet provided a knowledge system that transformed the modality of science

Internet for interoperability

- CIF21 investments must provide a framework of integrated and interactive services that support understanding and prediction of the Earth system as a whole



Interworkability for collaboration

STAR METRICS

Science and **T**echnology for **A**merica's **R**einvestment: **M**easuring he **E**ffec**T**s of **R**esearch and **I**nnovation, **C**ompetitiveness and **S**cience

A Federal and University partnership to document the outcomes of sciences investments to the public

- OSTP initiative partnering NIH, NSF, DOE and EPA
- 75 research institutions participating initially

STAR METRICS

Data about the conduct of science—inputs, outputs and connections between the two

- Level I: document the numbers an occupations of workforce supported by ARRA and base budget science spending
- Level II: collaborative development of measures of the impact of federal sciences investments