A Strategic Vision for NSF Investments in Antarctic and Southern Ocean Research

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council

The National Academies [www.nas.edu]

- National Academy of Sciences (founded in 1863)
- National Academy of Engineering
- Institute of Medicine
- National Research Council

"Advisers to the nation" on science, technology, engineering, and medicine:

– to advise scientific research planning

– to provide a scientific foundation for public policy debates

All studies carried out by expert committees serving in a 'pro bono' volunteer capacity.

Study goal:

This study will identify priorities for NSF's investments in Antarctic and Southern Ocean research for the coming decade, anchored by community engagement and input.

The committee will develop consensus recommendations on the most compelling research that could be undertaken in the coming decade, and outline practical steps forward to implement this research.

Primary Audience:

NSF Division of Polar Programs

Possible Secondary Audiences:

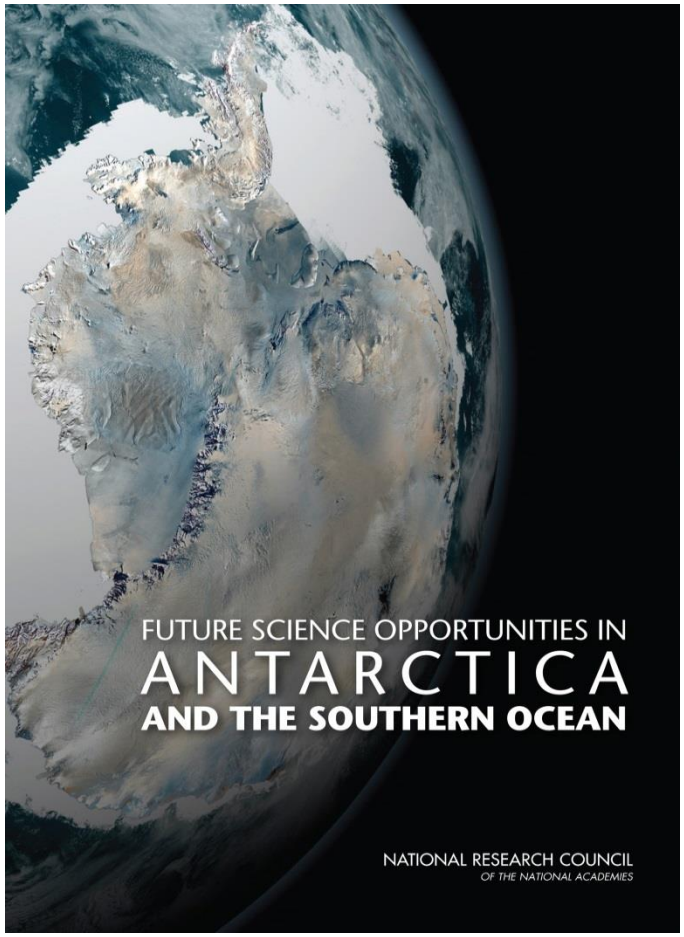
- Congress and OSTP/OMB
- other federal agencies
- the research community

Committee Members

- **Robin Bell (Co-Chair)**, Lamont Doherty Earth Observatory, Columbia University
- **Robert Weller (Co-Chair),** Woods Hole Oceanographic Institution
- **David Bromwich,** The Ohio State University**,** Byrd Polar Research Center
- **John Carlstrom,** The University of Chicago
- **Chi-Hing Christina Cheng,** University of Illinois at Urbana-Champaign
- **Calvin Robert Clauer,** Virginia Polytechnic Institute and State University
- **Craig Dorman,** University of Alaska (ret.)
- **Robert Dunbar,** Stanford University
- **David Marchant,** Boston University
- **Mark Parsons,** Research Data Alliance; Rensselaer Center for the Digital Society
- **Jean Pennycook,** Penguin Science
- **A.R. Ravishankara,** Colorado State University
- **Ted Scambos,** National Snow and Ice Data Center**,** Univ. of Colorado
- **William Schlesinger,** Cary Institute of Ecosystem Studies
- **Oscar M.E. Schofield,** Rutgers University
- **Jeffrey Severinghaus,** Scripps Institution of Oceanography, UCSD
- **Cristina Takacs-Vesbach,** The University of New Mexico
- **Laurie Geller, Lauren Brown, Shelly Freeland,** NRC staff

A key foundation for our work:

NRC, 2011: *Future Science Opportunities in Antarctica and the Southern Ocean*



High-level science questions from NRC, 2011

Global Change

1] How will Antarctica contribute to changes in global sea level?

2] What is the role of Antarctica and the Southern Ocean in the global climate system?

3] What is the response of Antarctic biota and ecosystems to change?

4] What role has Antarctica played in changing the planet in the past?

Discovery

5] What can records preserved in Antarctica and the Southern Ocean reveal about past and future climates?

6] How has life adapted to the Antarctic and Southern Ocean environments?

7] What can the Antarctic platform reveal about the interactions between the Earth and the space environment?

8] How did the Universe begin, what is it made of, and what determines its evolution?

High-level science questions from NRC, 2011

Global Change

1] How will Antarctica contribute to changes in global sea level?

2] What is the role of Antarctica and the Southern Ocean in the global climate system?

3] What is the response of Antarctic biota and ecosystems to change?

4] What role has Antarctica played in changing the planet in the past?

Discovery

5] What can records preserved in Antarctica and the Southern Ocean reveal about past and future climates?

6] How has life adapted to the Antarctic and Southern Ocean environments?

7] What can the Antarctic platform reveal about the interactions between the Earth and the space environment?

8] How did the Universe begin, what is it made of, and what determines its evolution?

The input we seek:

What are some key research areas that are ripe for major advances in understanding and that could feasibly be achieved in the coming decade ?

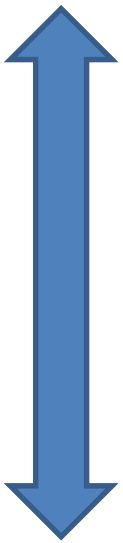
Also……

What specific activities and developments (e.g., technological, infrastructure, data-sharing) would help advance this research?

What are some possible opportunities to advance this research through new interagency or international cooperation, or other innovative arrangements?

What level of detail are we looking for?

the high-level science questions proposed in NRC, 2011 (the “big 8”)



…..somewhere in this middle range

the details you would put into a funding proposal to NSF

Suggest WHAT [yellow post-it notes]

- key research areas ripe for major advances in understanding, that could feasibly be achieved in the coming decade

Suggest HOW [pink post-it notes]

- specific activities and developments (e.g., technological, infrastructure, data-sharing) needed to enable this research
- opportunities to advance this research through new interagency or international cooperation

---

indicate which of the 'big 8' questions (if any) your suggestions fall under.

Supplemental slides

ideas can be submitted to our "virtual townhall" website:

http://tinyurl.com/AntStudy

community engagement

hosting small ‘regional’ gatherings

joining community-wide events

reaching out to early-career scientists

encouraging innovative thinking

dates	Outreach events
May 7	Ohio State Univ
May 22	Washington DC (for DC, MD, VA, DE area)
June 9	Antarctic meteorology conference in Charleston
July 30	Woods Hole (for Boston / Cape Cod area)
Aug 25- 28	SCAR Open Science Conference in New Zealand
Sept 25, 26	WAIS ice core conf. in LaJolla CA WAIS ice sheet conf. in Camp Julien CA
Oct 8	Univ. of Colorado --Boulder
Oct 15	LDEO (for NY, NJ area)
Oct 21	Univ. of Wisconsin (for upper midwest area)
Nov 12	Stanford Univ. (for Bay Area, pacific NW?)
Dec 15-19	informal outreach at fall AGU
	Others…..TBD

Statement of Task *[longer version]*

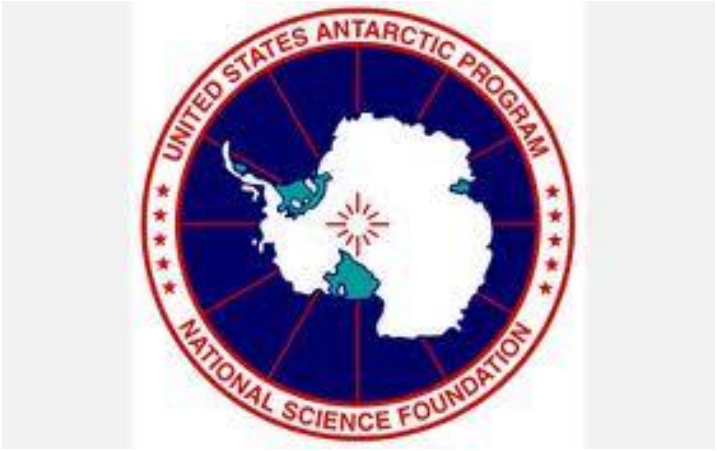
Goal: To develop, through widespread community engagement, a decadal-scale vision of high priority Antarctic and Southern Ocean research questions, and to outline a roadmap of strategic steps forward to implement this vision.

Specific tasks include:

- Recommend priorities for strategic investments in compelling research that may yield the highest potential reward for Antarctic research over the coming decade (building upon the high-level scientific questions identified in *Future Science Opportunities in the Antarctic and Southern Ocean).*
- Identify research infrastructure needed to address these priority research topics.
- Guidance on the most effective portfolio of investments should include efforts to assess trade-offs among options, assess the impact of new initiatives and /or modification of existing programs on the overall portfolio, identify activities that should be considered for phase-out.
- Recommend how the current portfolio of NSF's USAP investments might evolve in order to achieve the recommended vision.

U.S Antarctic Program

http://www.usap.gov/

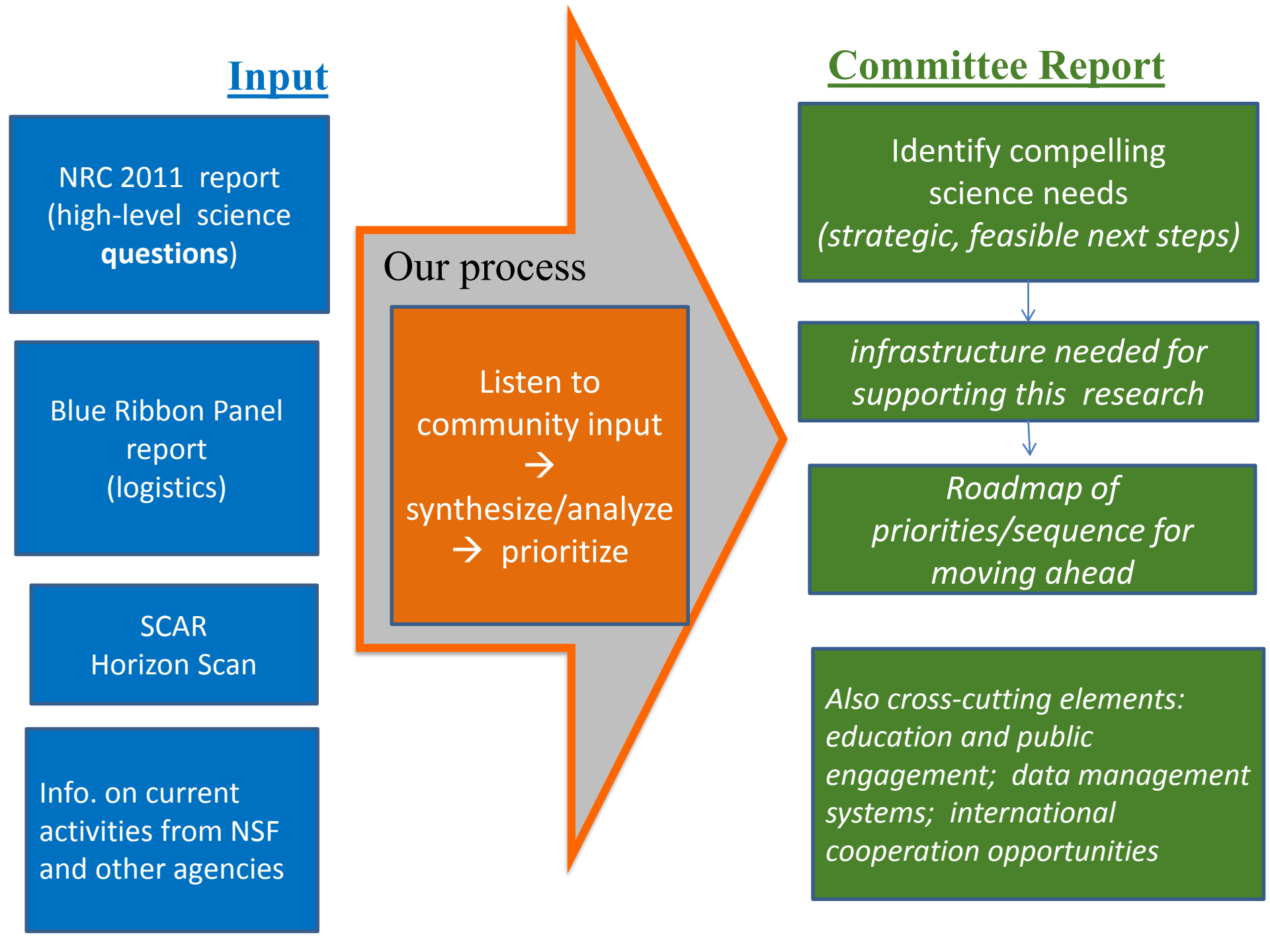


USAP funding program categories:

- Astrophysics and Geospace Sciences
- Earth Sciences Program
- Glaciology Program
- Integrated System Science
- Ocean and Atmospheric Sciences
- Organisms and Ecosystems

Scientific goals:

- to understand the Antarctic and its associated ecosystems;
- to understand the region's effects on, and responses to, global processes such as climate;
- and to use Antarctica's unique features for scientific research that cannot be done as well elsewhere


Input
NRC 2011 report (high-level science **questions**)
Blue Ribbon Panel report (logistics)
SCAR Horizon Scan
Info. on current activities from NSF and other agencies
Our process
Listen to community input → synthesize/analyze → prioritize
Committee Report
Identify compelling science needs *(strategic, feasible next steps)*
infrastructure needed for supporting this research
Roadmap of priorities/sequence for moving ahead
Also cross-cutting elements: education and public engagement; data management systems; international cooperation opportunities