

ARCSS Program | Past Messages from the ARCSS Committee

This ARCSS Committee served until 2010, after which it was merged with the SEARCH Understanding task team, as both groups were funded by ARCSS and wrestling with the same issues. Current ARCSS information, including points of contact, can be found at the [NSF ARCSS website \(http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13426\)](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13426) and in the current [NSF Arctic Research Opportunities solicitation \(http://www.nsf.gov/pubs/2013/nsf13592/nsf13592.htm\)](http://www.nsf.gov/pubs/2013/nsf13592/nsf13592.htm).

Message from the ARCSS Committee: Recommendations for Successful Arctic System Science

This message from the Arctic System Science (ARCSS) Committee summarizes recommendations for successful planning and development of arctic system science. This will be the final communication from the ARCSS Committee as the committee has been dissolved; ARCSS-relevant science planning activities will be merged with activities of the Study of Environmental Arctic Change (SEARCH) program.

Background and ARCSS History

The ARCSS program started in 1989 and has consistently defined the state of the art in integrated, interdisciplinary system science. It has produced an enormous amount of societally-relevant research, trained a new generation of scholars committed to multi-disciplinary and system science, and launched important public education initiatives, including newspaper stories, radio pieces, and TV documentaries. It is a record of which ARCSS scientists and agency program managers can be proud.

A major reason for these successes has been the development of a strong and collaborative scientific community that works well with the funders in defining initiatives and in supporting highly integrative and cutting-edge research. We believe that maintaining and enhancing that community integration is the key to future successful Arctic System Science research.

At the time that the ARCSS program was started, global change was a concern in the scientific community but less so for the public, for whom changes a century out had limited relevance. This has changed—projections now suggest the Arctic Ocean may be ice-free during summer within decades, the lifespan of adults living today. The pace of environmental change appears to be accelerating, with some of the most visible and evocative changes occurring in the Arctic. These include not only sea ice loss, but changes in vegetation, animal populations and migrations, and how people live in and use the Arctic and its resources and ecosystem services.

Understanding these accelerating changes calls for new cycles of increasingly integrated and interdisciplinary research. Additionally, over the last several years, the SEARCH program has grown into a major inter-agency initiative that encompasses diverse aspects of arctic system science, aspects that synergize with "traditional" ARCSS initiatives. Thus, future research initiatives should integrate across programs and domains and should aggressively integrate work on human responses and drivers into the overall program.

Together these drivers call for new approaches to organize and manage arctic research. In recent years, planning has struggled to keep up with the science. The processes we had in place were linear—community visioning led to science plans and proposed programs, which led to NSF programs and Announcements of Opportunity, only then would funding flow to researchers; the process could take many years between initial ideas and new data. We believe that NSF and the science community need to reenergize the planning process but that process should be more nimble. Broad visioning, specific program development, and actual research programs should occur interactively and in parallel. Over the years we have learned a number of lessons about how to accomplish world-leading interdisciplinary research. We believe **the key is building integrated research communities**, regardless of the mechanisms used in developing and implementing specific research programs.

The Planning Phase: Strong System Science Needs Strong Community Science Planning

Identifying the areas in which major investments will most effectively advance understanding is a challenge—a challenge that requires *effective community engagement*. Arctic science depends on a clear, broad-based vision of scientific priorities—articulating the big questions that require programmatic approaches to answering them.

1. The planning process works best when ideas and vision grow from the community with support from NSF. Mechanisms should help develop community vision and allow different groups to explore areas of common interest and opportunity. Supporting this effort is a major task, because the "Arctic Community" is, in fact, a collection of smaller communities interacting to varying degrees (as illustrated at right). It takes time for different groups to come together and learn each other's language and thinking. These relationships are fragile and require nurturing.

2. The planning process should be open and transparent. Whatever the planning process, sub-communities should be engaged and empowered. Groups may not get what they want, but they need to know they were involved and they need to understand the decision-making process. Planning should therefore be overseen by an entity that all stakeholders see as focused on the good of the science without a vested interest in the specific outcome. The community should also have confidence that ideas with broad community consensus will help frame programmatic priorities.

The Action Phase: Doing Integrated Programmatic Science

In our experience, several things are necessary to ensure that any group of funded projects becomes a "program"—that is, something that adds up to more than the sum of its parts.

1. Clear integrating goal
2. Long-term funding: 5 years
3. Conferences for PIs funded under an initiative to get together
4. Administrative support for initiatives

Clear Integrating Goal

The most successful initiatives have often been those with an integrating science goal that encompassed many fields. For example, the Freshwater Initiative had a focal question of "Is the arctic hydrologic cycle intensifying?" Such synthetic questions are powerful tools for bringing researchers together.

Long Term Funding

In the normal 3-year funding cycle, the first year is "ramping up," the second is "being up," and the third is "wrapping up." It is hard to get multiple projects to integrate into a synergistic program in 3 years. It takes time to learn from each other, integrate ideas and needs from other projects, and work together on cross-project synthesis. Five years provides time to coordinate and work together. Many successful cross-project synthesis papers were multi-year initiatives, with groups talking about connections in the first year or two, coordinating data analyses in the middle, and then developing the final synthesis in years 4 & 5, often finishing after the funding was over.

Thus, we encourage NSF to look at longer term funding on programs that require multiple, independently funded projects, coordinated to achieve the programmatic vision.

Coordinating Meetings: Early and Often

To create synergy among projects, the interval between funding announcements and the first field deployments is a critical window of opportunity. This is the time when people are thinking about their projects and what they will actually do, when there is still flexibility to make modest adjustments to coordinate among investigators. This is also the opportunity to build team spirit and to get people feeling that they aren't just the PI on a single project but a player on a larger team with a larger overall goal. Having built that sense, regular all-PI's meetings maintain and develop it. Individual groups can come together to see the whole and to develop synergy, plan joint work, and start conceiving of synthesis projects and papers.

Staff Support

Planning coordination meetings and supporting initiatives requires staff support—support that no individual group is likely to have budgeted in their initial proposal. The higher the quality of the overall program support, the more successful ultimate synthesis and integration are likely to be. That support needs to come from people who have insight into the scientific issues, but also into the organizational issues involved in managing complex programs. In addition, having a postdoc or scientist whose job it is to support integration and is a co-author on papers can also provide energy in ensuring that data sets are made compatible, that they are made available, and that they are used.

Overall, we believe that these goals greatly facilitate producing the integrative science that is necessary to substantively advance our understanding of Arctic System Science and to answer questions that society needs answered about the future state of that system. Two core approaches—effective community involvement in defining objectives and effective team building in carrying out the research—have been at the heart of many of the ARCSS program's greatest successes, and we believe that they transcend specific planning models.

NSF's ARCSS Website:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13426&org=ARC&from=home

Arctic Research Consortium of the U.S. (ARCUS)' ARCSS Website: <http://www.arcus.org/arcss/index.html>