

Project Summary

Intellectual Merit: Antarctica holds tremendous potential for cosmology and astrophysics that can be best realized if the scientists involved understand and participate in the management, planning and oversight of the shared resources and logistical support. We propose an intellectual partnership comprised of and directed by these scientists to ensure that the highest quality astrophysics is conducted at the South Pole. Specifically we propose the Science Coordination Office for Astrophysical Research in Antarctica (SCOARA), a consortium of the investigators conducting cosmology and astrophysics projects at the Amundsen-Scott South Pole station. SCOARA is structured to enable the scientists to work together to coordinate and maintain shared resources, to communicate lessons learned and new knowledge, and to provide a valuable advisory resource to the NSF/OPP Polar Research Support Section (PRSS) and its Antarctic support contractor. Funds are requested to facilitate this coordination, to maintain shared scientific equipment and to operate the South Pole Dark Sector model shop. No funds are requested for activities that are covered by the individual investigator grants.

Over the last decade the infrastructure for conducting astrophysics projects at the South Pole station has evolved from crude, makeshift laboratories with severely limited resources to modern, well-equipped laboratories. Concurrently the characteristics of the atmosphere above, and of the ice below, the station have been studied extensively. Due to the combination of low temperature, low water vapor content and high stability of its atmosphere, the South Pole has been demonstrated to be the best developed site on Earth for conducting millimeter through infrared wavelength observations, especially large area survey observations. Due to its exceptionally clear and thick ice, the South Pole is also the best site available for deploying a large Cherenkov high energy neutrino detector. The Center for Astrophysics Research in Antarctica (CARA) and the Antarctic Muon and Neutrino Detector Array project (AMANDA) pioneered the development of these fields at the South Pole and ushered in an era in which complex, state-of-the-art instruments designed to take full advantage of the exceptional site conditions can be deployed and operated successfully. World-class cosmological and astrophysical research has resulted. To ensure the best return on the U.S. investment in South Pole astrophysics requires that the participating scientists play an active role in the coordination of the shared and limited resources at the South Pole, and in the operation and maintenance of the scientific equipment and facilities that are critical to their research. The scientists must also work together to provide coherent and well-researched advice to OPP on issues critical to the success of the NSF South Pole astrophysics program, for example, issues related to the cryogen supply and information technology. Most importantly, especially for new projects, are having communication mechanisms among the scientists and support staff to ensure that all projects benefit from the many lessons learned during the development of South Pole astrophysics over the last decade, and to ensure the best solutions to new challenges are found. While ad hoc measures have been used since CARA ended over two years ago to provide this science coordination, they have been insufficient. SCOARA is structured to officially provide this mechanism.

Broader Impacts: An important broader impact of the proposed activities is to help researchers, especially those without previous Antarctic experience, to successfully deploy instrumentation to the South Pole station. This is particularly important for small research efforts, such as those often led by young investigators. SCOARA will also help ensure our considerable national investment in the infrastructure of the Dark Sector of the South Pole station is best used for conducting world-class astrophysical research. We recognize that the whole can be much more than the sum of its parts. By working together to coordinate the shared resources and to address critical science support issues, the combined expertise of the SCOARA consortium scientists can be brought to bear on the matter at hand and to the education of all participants. The extensive communication channels opened up and maintained by SCOARA will further benefit all of the Antarctic projects, including education and outreach activities. The environment provided by SCOARA will be particularly beneficial for the career development of young investigators. Lastly, SCOARA will have a positive impact on the quality and timeliness of the astrophysical research conducted at the South Pole.