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The Polar Rock Repository: furthering knowledge of Antarctic ice sheet history using legacy collections

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While Antarctica offers many opportunities to study ice-sheet dynamics, its remote location provides challenges in terms of logistical accessibility and environmental impacts. Use of legacy collections from remote outcrops offers researchers the ability to study this area while eliminating their environmental impact on the continent. The Polar Rock Repository (PRR) is a National Science Foundation funded facility that provides free and online access to rock samples, unconsolidated deposits (e.g., glacial till), terrestrial bedrock cores, and dredge samples for scientific research. The use of existing legacy samples and associated metadata from remote regions offers scientists the ability to expand the scientific and geographic scope of their research with no additional environmental impact to Antarctica. Importantly, destructive techniques are allowed on loaned samples.

The PRR online database (prr.osu.edu) includes a wealth of metadata on all 66,000+ samples, including field notes, sample photos, information on logistics, stratigraphy, observed minerals, and surface features that can be useful to a broad range of climate scientists (e.g., glacial striations, weathering salts, etc.). Many samples also have orientation data that has been beneficial in cosmogenic studies. The PRR website (prr.osu.edu) provides multi-field searchable criteria, enabling researchers to filter samples relevant to their interests. The PRR has also created a media archive of over 11,000 images and videos (with some dating back over 65 years) that can provide glaciological, geological, and logistical information as well as provide a record of temporal change associated with surface features (snow cover, ponds, icebergs, streams, lichen, etc.). By making terrestrial and marine geological materials available to the cryosphere community, the PRR represents an invaluable resource to help answer key questions involving ice sheet-ocean interactions and processes affecting glacial retreat.

Antarctic Ice Sheet questions that have been addressed using PRR samples/metadata include (but are not limited to):

- Millennial-scale climate cycles in the East Antarctic ice sheet have been documented using subglacial precipitates.
- Timing of glacial reconstructions using cosmogenic nuclides and luminescence studies.
- Provenance studies suggesting sea-level oscillations in the early Neogene could be from a large West Antarctic Ice Sheet.
- Paleotemperature proxies using coral in the Ross Sea and Southern Ocean.