

D. Eisenhower when the antarctic portion of the International Geophysical Year was developing. The papers contain material related to this office and augment records held by the National Archives and Records Administration in Washington, D.C.

#### The future of the collection

Ohio State University plans to establish a memorial to Byrd at the Institute of Polar Studies. The new collection will be

the memorial's centerpiece. Temporarily the papers is housed in the Ohio State University Libraries. Cataloging is expected to take at least a year, but once the collection is inventoried and cataloged, the documents will be available for research.

—Peter J. Anderson, Institute of Polar Studies, Ohio State University, Columbus, Ohio 43210.

## Geology of the northern Chilean Canals: Hero cruise 84-6

*Editor's note:* Hero cruises in Chile's 200-nautical-mile zone were conducted with the assistance and permission of the Chilean government. In June 1983 representatives of the U.S. and Chilean governments signed an agreement that outlines a cooperative plan for research conducted aboard the *Hero*. To fulfill one requirement of this agreement, NSF publishes the final reports of these cruises in the *Antarctic Journal*. *Hero* was the National Science Foundation's antarctic research ship from 1968 through 1984. During the austral winters, when ice prevented work in the far south, *Hero* operated in the Subantarctic and along the southern coasts of South America.

Between 27 August and 22 September 1984, U.S. and Chilean geologists used the research ship *Hero* to study the geology of the islands along the northern half of the Chilean Canals. By using a small ship like *Hero* we were able to reach otherwise inaccessible islands. Our objective was to study in greater detail areas that had been surveyed during a 1983 reconnaissance investigation. Specifically, we collected samples in areas that contained diverse and abundant assemblages, visited those areas that were not reached during the 1983 cruise, and determined the stratigraphic relationships of deposits.

During the 1983 *Hero* cruise U.S. and Chilean geologists surveyed the islands along the Chonos Archipelago south to the Peninsula Tres Montes region (DeVries, Stott, and Zinsmeister, 1984). The cruise objectives were to determine the nature and extent of the Cenozoic deposits, which occur along this part of the Chilean Canals, and to obtain a representative collection of fossils from these deposits. Because this area is difficult to reach, geologists know very little about the geologic record of this part of the Chilean coast and South America. Before this cruise, the only available paleontologic data were collected by Charles Darwin during the voyage of HMS *Beagle* in the 1830s.

Results from the 1983 cruise clearly indicated that deposits in this region were more extensive than we had thought and that many of them were richly fossiliferous.

Preliminary analysis of these collections indicated that deposits ranged in age from Early Miocene to Pleistocene (about 20 million to 5 million years old). The presence of a number of subtropical taxa in the fauna suggested that the marine environment along this part of South America was warmer during the early Neogene than today. Because of these findings, a more extensive investigation was planned for the 1984 austral winter. With data from both cruises we hope to gain new insights into the climatic and oceanic histories of the southeastern Pacific and to increase our understanding of the tectonic history of the southern Andes.

#### Geology of the northern Chilean Canals

During the early part of the Cenozoic a shallow seaway existed between 45°S and 50°S—across the present-day Andes. This seaway allowed fauna to move between the southeastern Pacific and the southern Atlantic oceans. Sometime between the late Oligocene and the middle Miocene, this segment of the Andes underwent tectonic changes and was lifted above sea level. Changes in marine faunas from deposits in the Chilean Canal region record the closing of the seaway and the isolation of southwestern Atlantic shallow-water shelf areas from the southeastern Pacific Ocean. The record of changes in marine fauna between Patagonia and the Chilean Canals provide data on the beginning of tectonic activity and the early Neogene uplift of this segment of the Andes.

Because of its extreme southern location, the southwest coast of the South America should have been affected by southern hemisphere climatic and oceanic changes earlier than other southern continents. By studying the biogeographic histories of faunas and floras from this region, we hope to develop a precise chronology for antarctic glacial history and its effects on climate and ocean patterns in the Southern Hemisphere.

We know from our work on Seymour Island (near the eastern coast of the Antarctic Peninsula) that the high southern latitudes were important to the development of shallow- and deep-marine communities in the middle and low latitudes of the Pacific basin. Data obtained in the Chilean Canal region, when compared with the Seymour Island data, will help us to determine the timing and extent of the northward migration of antarctic marine faunas during the Late Cenozoic as well as the role that cooler ocean water has had in the development of modern marine faunas in the Pacific basin.

#### Preliminary observations from the 1984 cruise

*Huafo Island.* We collected data from the Plio-Pleistocene sequence along the southeast coast of the island from Estero Tres Calles to Caleta Samuel. A comparison of Darwin's field notes and the collections he made with our observations clearly indicates that Darwin collected his samples from this part of Huafo Island.

Because of calm sea conditions during the afternoon of 28 August, we were able to land several times along the south coast Huafo Island between Playas Buenas to Punta Sur. A small collection of fossils from fine deep-water siltstone facies was obtained from Playas Buenas. Between Punta Sur and Playas Buenas we discovered a thick sequence, possibly several 1,000 feet thick; we believe that we were the first geologists to visit this sequence. Although we found no megafossils, we collected microfossils samples at several sites.

As we began our transit to Ipu Island, we stopped briefly at Punta Norte. The sequence at Punta Norte consisted of well bedded, fine-grained deep-water sandstones. Microfossils samples were collected here. As in the case of the south coast of Huafo Island, there are no published reports on the geology of Punta Norte.

Our last stop on Huafo Island was at Punta Weather. The sequence at the point consisted of a massive bedded conglomerate with large angular blocks. Although we have no paleontologic evidence, this conglomerate appears to be considerably older than any of the other sedimentary deposits at the southeast end of the island. We found no fossil material, and the coarse nature of the sediments limited our ability

to obtain any age data based on microfossils. Additional field work at Punta Weather may enable us to determine where within the conglomeratic sequence fossiliferous material might be found.

*Stokes, Lemo, and Ipun islands.* Large collections of fossils were made from a number of sites visited during the 1983 cruise on the east coast of Stokes and Lemo islands. On Ipun Island we discovered several new sites. On the west side of the island we found an exceptionally well exposed sequence, but the cruise schedule prevented us from making a detailed survey. Near the northeast tip of Ipun Island, we found a thick sequence of glacial marine sediments. These sediments consisted of fine-grained gray siltstones with a number of large dropstones. Dropstones are rocks that an iceberg transported to sea. When the iceberg melts, the stones drop to the ocean bottom and are incorporated in the sediments. These stones are important for the recognition of glacial deposits. We also observed the contact of the glacial marine sediments with the underlying Tertiary siltstones on the beach at low tide.

*Guamblin Island.* During the 1983 cruise, hazardous sea conditions prevented us from landing on Guamblin Island. During the 1984 cruise relatively calm seas enabled us to land on the east coast of the island for half a day. Although Chilean geologic maps show only Tertiary deposits on Guamblin Island, the sequence along the coast where we landed consisted of Quaternary glacial marine sediments. The lithology varied from massive silty sandstone to silty sandstones with numerous dropstones. A number of horizons within this sequence contained well preserved molluscs. Preliminary analysis of these fossils indicate that they are probably of late Pleistocene age. Along the east coast of Guamblin we found clear evidence of recent uplift. Many outcrops were covered with Recent shells and barnacles, many still in the living position. The occurrence of these Recent shells suggest Guamblin region is tectonically active with uplift currently taking place.

*Peninsula Tres Montes.* We spent most of our time during the 1984 cruise in the Peninsula Tres Montes region. During the previous season, only 5 days were devoted to this large area. Because we had more time, during the 1984 expedition we visited nearly all the exposures of Tertiary sediments along the coasts of the numerous islands in the region. Smith, Crosslet, and Hereford islands were particularly productive. The Tertiary sequence exposed on these islands gradually changes in southeasterly direction from a coarse basal sandy facies, which rest on the metamorphic basement, to medium- to fine-grained sandstones with abundant marine fossils. We

have tentatively dated these deposits as early Miocene.

The sediments along the south coast of Seno Hoppner consisted of dark to medium brown sandstone with thin resistant debris flows that averaged 30 to 70 centimeters thick. Many of the large angular clasts in these flows were as wide as the flow. The discovery of several gastropods, which commonly occur in late Pliocene and Pleistocene deposits in central Chile, indicates that these sediments along the southern coast of Seno Hoppner Island are considerably younger than the deposits of Crosslet and Hereford islands. The absence of dropstones or any other glacial deposits suggests that these rocks were deposited during an interglacial period.

We investigated a thick fossiliferous sequence along the coasts of Seno San Pablo and Seno Newman islands. Because of a regional strike that is almost perpendicular to the coast, we were able to collect a nearly complete section through this sequence. The presence of certain fossils indicates that the Seno San Pablo and Seno Newman sequence is no younger than Miocene. Based on a very preliminary comparison of the faunas from this area with those from Crosslet and Hereford islands, we believe that the fauna from Seno San Pablo and Seno Newman islands are slightly younger. Although the deposits in the two areas appear to be of different ages, the faunal variation may reflect slightly different facies and not age.

Participating in the cruise were

- William J. Zinsmeister (chief scientist), Purdue University
- Lowell Stott, Institute of Polar Studies, Ohio State University
- Jennifer Chambers, Institute of Polar Studies, Ohio State University
- Vladimir Covacevich, Servicio Nacional de Geología y Minería, Chile
- Daniel Frassinetti, Museo Nacional de Historia Natural, Santiago, Chile
- Philip Granchi, Purdue University

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## Reference

- DeVries, Thomas J., Lowell Stott, and William J. Zinsmeister. 1984. Neogene fossiliferous deposits in southern Chile. *Antarctic Journal of the U.S.* 19(2), 12-13.

*Hero*, the National Science Foundation's research ship, supported science in the Antarctic Peninsula region from 1968 to 1984. In the photograph below the ship is anchored near the Peninsula in early 1970s.

NSF photo by William Curtsinger.

