coastal region to provide maximum information on ice dynamics.

For the last point, any core in West Antarctica is sampling the most dynamic remaining ice sheet on Earth. The ice sheet is believed capable of rapid changes affecting global sea level. Indeed, the ice sheet is changing rapidly now, possibly in response to the end of the last ice age [*Alley and Whillans*, 1991], and the ice sheet was much smaller in size than today or absent entirely at least once during the last 600,000 years [*Scherer*, 1991].

An integrated project, the West Antarctic Ice Sheet Initiative (WAIS) [*Bindschadler*, 1991], has been organized to study this ice sheet and predict its future. Key data needed from ice cores include the history of climatic forcing (temperature and accumulation) and the history of response (thickness) of the ice sheet. An inland core will reveal the forcing clearly, but response in the dynamic coastal regions is more important. A core through a local ice dome between fast-moving ice streams will reveal whether the past ice sheet was similar to the present low-profile, ice-stream configuration, or whether it was more like the thick, high-profile East Antarctic ice sheet, with inland ice flowing across the region now occupied by the local domes and ice streams. A second deep core thus can serve double duty, allowing accurate reconstruction of paleoclimates and helping us understand and predict ice-sheet and sea-level changes.

The ICWG recommends that site-selection activities begin as soon as possible. The tentative timetable calls for deep-core-analysis proposals by June 1993, depending on site-selection progress and other factors. For a copy of the science plan, or to be placed on the mailing list for future information, contact ICWG, c/o P. Grootes, Quaternary Isotope Lab, AK-60, University of Washington, Seattle, WA 98195.—*Richard B. Alley, Earth System Center and Department of Geosciences, Pennsylvania State University, University Park*

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Antarctica and Global Change Research

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The Antarctic, including the continent and Southern Ocean with the subantarctic islands, is a critical area in the global change studies under the International Geosphere-Biosphere Program (IGBP) and the World Climate Research Program (WCRP). Major scientific problems include the impacts of climate warming, the ozone hole, and sea level changes. Large-scale interactions between the atmosphere, ice, ocean, and biota in the Antarctic affect the entire global system through feedbacks, biogeochemical cycles, deep-ocean circulation, atmospheric transport of heat, moisture, and pollutants, and changes in ice mass balances. Antarctica is also a rich repository of paleoenvironmental information in its ice sheet and its ocean and land sediments.

Recognizing Antarctica's importance in global change, a Scientific Committee on Antarctic Research (SCAR) steering committee on global change research published "The Role of Antarctica in Global Change," outlining the reasons for a regional global change research effort there. On September 18–20 of last year, SCAR held a workshop in Bremerhaven, Germany, to discuss and write a framework for implementing such a regional coordinated research program on global change. About 50 scientists from the SCAR countries attended, who split into six smaller working groups, each addressing one of six "core" projects identified by SCAR. These "core" projects are analogous to the IGBP cores, but address specific regional research issues with a more limited scope.

The core projects discussed were the antarctic sea ice zone (atmosphere, ice, ocean, biota, and sediments), and interactions and feedbacks within the global geosphere-biosphere system; global paleoenvironmental records from the antarctic ice sheet and marine and land sediments; the mass balance of the antarctic ice sheet and sea level; Antarctic stratospheric ozone, tropospheric chemistry, and the effects of UV on the biosphere; the role of the antarctic in biogeochemical cycles and exchanges; and the detection and monitoring of global change in Antarctica.

Each working group addressed the following topics: background and relevance of the core program to global change (why?); research objectives (what?); current and future planned relevant international programs (where?, when?); and specific problems and recommendations (how?).

There are numerous existing and planned programs that address global change research in the Antarctic, and SCAR can play a very useful role in helping to coordinate them. The various working groups identified gaps, overlaps, and other problems associated with matching these programs to the overall global change research objectives in the Antarctic and attempted to assign priorities to the research to be conducted.

A more general plenary discussion led to recommendations on overall coordination issues and to specific recommendations on data management, synthesis, and modeling of information, logistics, and future implementation of an overall research strategy, including the establishment of regional centers, as proposed by the IGBP-START (System for Analysis, Research, and Training) initiative.

It was the consensus of the meeting that SCAR continue to plan and implement a regional antarctic research program on global change, with Antarctica representing one of the regional research networks within the IGBP-START. This will include coordinating the various existing and proposed international projects that are relevant; establishing several regional centers funded by the nations proposing them; establishing a coordinating office with a project scientist and an advisory committee, with logistics coordinated through the Council of Managers of National Antarctic Programmes (COMNAP) and its Standing Committee on Antarctic Logistics and Operations (SCALOP); training scientific personnel from developing countries; and giving attention to overall regional monitoring, modeling, and data management issues.

More detailed recommendations on how to achieve these goals and what research to emphasize will be in the workshop report, which will be published by the 22nd meeting of SCAR delegates in Bariloche, Argentina, June 15–19, 1992. Any action to be taken by SCAR will be considered by the SCAR delegates at that meeting.—*Gunter Weller, chair, University of Alaska; and Manfred Lange, cochair, Alfred Wegener Institute*

Japanese Submersible Explores the North Fiji Basin

PAGES 116–117

Since 1987, Japanese and French geologists, geophysicists, and biologists have been studying the North Fiji Basin Ridge within the framework of a joint project named STARMER (*S*cience and *T*echnology *A*gency of Japan—IF*REMER* of France). This ridge was first geologically, geophysically, and geochemically surveyed during the 1985 *SEAPSO 3* cruise of the R/V *Jean Charcot* [*Auzende et al.*, 1988]. At that time, water sampling and morphotectonic analysis indicated that the North Fiji Basin Ridge was tectonically and hydrothermally active. Within the STARMER project, four surface ship cruises have been conducted (*Kaiyo 87–88–89* and *Yokosuka 90*).

One significant result of these surveys is the complete mapping of the entire ridge between 14°S and 22°S (Figure 1), an area approximately 900 km long and more than 50 km wide (Sea Beam and Furuno multibeam swath-mapping systems were used). During the *Kaiyo 87* cruise, the presence of active hydrothermalism (sulfide deposits, chimneys expelling shimmering water, and

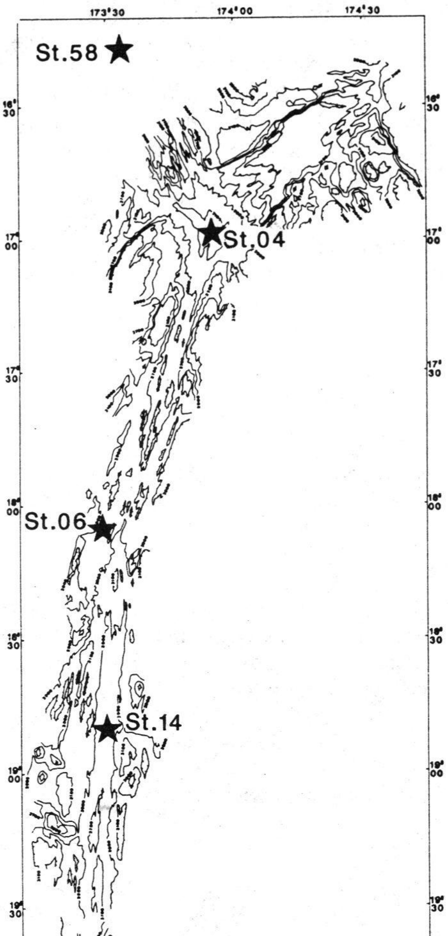

Fig. 1. Simplified multibeam map of the North Fiji Basin Ridge. The stars indicate the Shinkai 6500 *diving sites. The North Fiji Basin Ridge can be divided into four main segments, each about 200 km long. South of 20°30'S, accretion occurs on an elevated N-S ridge. Between 18°10'S and 20°30'S the ridge axis shows typical fast-spreading ridge characteristics. Active hydrothermal manifestations were observed on station 14. Between 18°10'S and the 16°50'S triple junction the spreading axis is constituted by a twin N15 trending ridge, which is 2500 m deep. North of the triple junction the present-day accretion is located in a series of grabens (deeper than 4000 m) bounded by 1000-m-high steep walls. This morphology is similar to slow-spreading ridges. The average spreading rate deduced from magnetic lineations is 5 cm/yr, increasing southward to 7.2 cm/yr.*

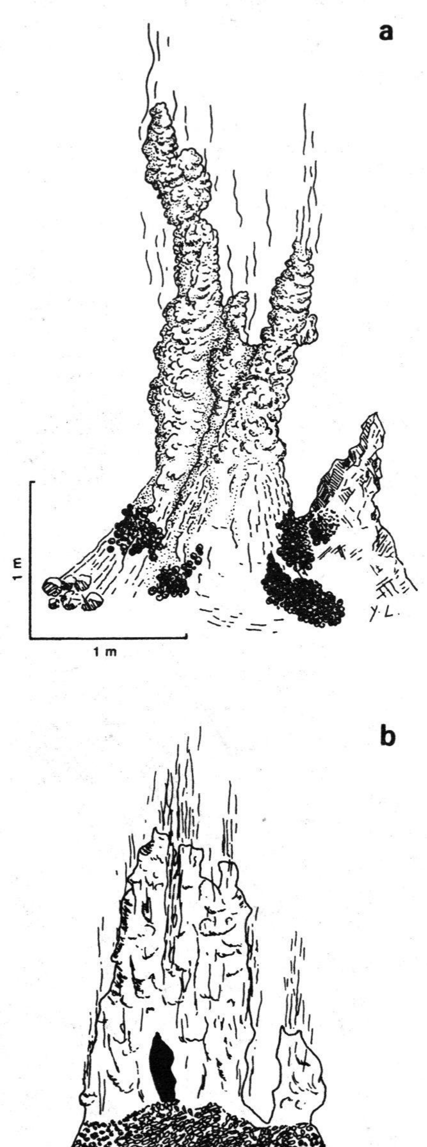

Fig. 2. (Top) The White Lady in 1989 drawn by Y. Lagabrielle. (Bottom) The new White Lady pictured in 1991 by P. Geistdoerfer.

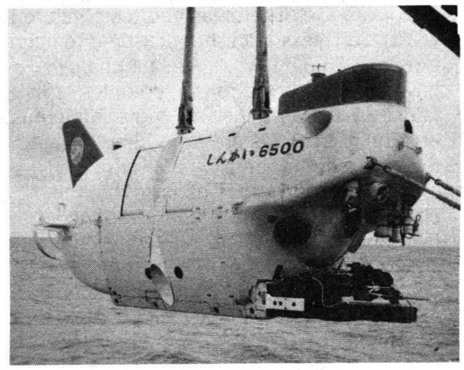

Fig. 3. The Shinkai 6500.

associated living animal colonies) was discovered through water sampling and video deep towing.

A spectacular, active site named the White Lady was discovered and explored during dives of the French submersible *Nautile* in 1989 (Figure 2a) [*Urabe et al.*, 1990; *Auzende et al.*, 1991; *Bendel et al.*, in press, 1991]. At the time of this discovery, the site was described as follows: the White Lady chimney is located on the top of a 6- to 7-m-high mound composed of sulfides and oxides, and it is approximately 30 m in diameter. The chimney is bifurcated and is composed exclusively of anhydrite. It expels shimmering 285°C water that is very poor in particulates. At the foot of the main chimney, six secondary vents expelling the same transparent water are colonized by gastropods, mussels, crabs, and cirripeds. During the *Nautile* cruise, the White Lady site was significantly remodified due to geological and biological sampling, and in one instance, one arm of the chimney was broken off by the *Nautile* during a dive. In 1990 the White Lady edifice was almost completely destroyed by the Sonne grab sampler (Halbach, personal communication).

The most recent cruise of the STARMER project returned to the White Lady site with the *Shinkai 6500*, the new Japanese submersible (Figure 3). Launched in 1989, her main characteristics are length, 9.5 m; width, 2.7 m; height, 3.2 m; weight in the air, 26 tons; operational speed, 1 knot; maximum depth, 6500 m; crew, 3 (2 pilots and 1 scientist); internal diameter, 2.1 m. The *Shinkai 6500* reached a depth of 6527 m in August 1989, during one of the numerous test cruises. The *Yokosuka 91* cruise was her first scientific cruise. *Yokosuka*, the mothership for *Shinkai 6500*, was built especially for submersible support. Also launched in 1989, she is 105 m long and 16 m wide and has a tonnage of 4439. The operational speed of *Yokosuka* is 16.7 knots. The vessel is equipped with the Furuno swath-mapping system, and the swath width is 2 times the water depth. The ship can carry up to 25 scientists.

Since the fourteen *Nautile* dives in 1989, six *Shinkai 6500* dives have been devoted to the study of the White Lady and of the surrounding active hydrothermal sites. The present-day condition of the White Lady can be summarized as follows (Figure 2b): the anhydrite chimney currently comprises a massive 2-m-high main conduit with a 2-m diameter and a 1.5-m-high secondary chimney with a diameter in the vicinity of tens of centimeters. These vents expel the same shimmering water, but the flux is about twice that of 2 years ago. The measured temperature is 265°C, 20°C less than the measured temperature in 1989. Finally, significant changes have been observed for the colonies of living fauna. In all cases they are more numerous, and their territories are expanding toward the top of the mound.

These observations confirm that the changes in morphology and in activity of a hydrothermal site occur rapidly, even for relatively mature systems. The same phenomenon has been documented on the East Pacific Rise around 13°N, where we observed (R. Hekinian, personal communication) a 40-cm increase in the height of one chimney within 1 month.

The 23 other dives of the *Yokosuka 91* cruise were devoted to the study of the along-strike variability of tectonic, magmatic, and hydrothermal activity along the axis of the North Fiji Basin Ridge. Three sites were explored: the first (ST.58, Figure 1) documents active tectonism concentrated in a deep (3900 m) axial graben; the second (ST.06, Figure 1) establishes a widespread diffuse zone of fissuring centered around a several hundred meter wide axis; and the third (ST.14, Figure 1) shows very fresh lobate, draped, and scoriated lavas, expelling 18°C water through fissures colonized by giant mussels.

The STARMER project was funded by STA and IFREMER. We thank Captain Hyodo and *Yokosuka*'s crew and the *Shinkai 6500* operation team.—*J.-M. Auzende, T. Urabe, M. Tanahashi, E. Ruellan, and the Shipboard Scientific Party, which consisted of V. Bendel, A. Fiala-Medioni, K. Fujikura, P. Geistdoerfer, E. Gracia-Mont, D. Grimaud, J. I. Ihibashi, M. Joshima, K. Kisimoto, S. Kojima, P.Maillet, T. Matsumoto, K. Mitsuzawa, M. Murai, J. Naka, P. H. Nargeolet, Y. Nojiri, S. Ohta, V. Pranal, and C. Pratt*

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Ocean Drilling Program Sets FY 1993 Schedule

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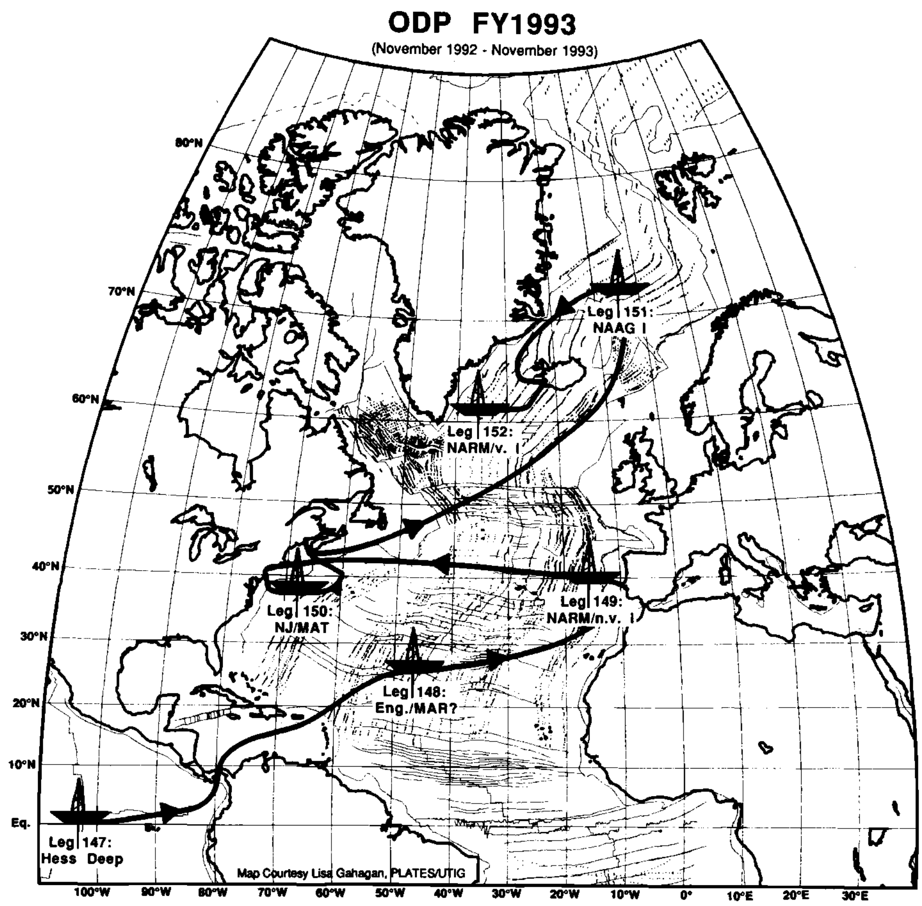
At its December 1991 meeting in Austin, Tex., the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) Planning Committee of the Ocean Drilling Program (ODP) established its plan for fiscal year 1993 in association with chairpersons of ODP's scientific advisory panel. The budget covers late November 1992 through late November 1993.

ODP, successor to the Deep Sea Drilling Project (DSDP) and the International Phase of Ocean Drilling, is a consortium of countries led by the United States with a broad mandate to conduct scientific drilling in the world's ocean basins. ODP reviews and ranks drilling programs proposed by an international community of Earth scientists according to priorities established by ODP's Long Range Plan. Using those rankings as primary input, the planning committee has placed six 56-day drilling legs on the fiscal 1993 schedule, beginning with Leg 147. ODP's Long Range Plan is available from the Joint Oceanographic Institutions, Inc., in Washington, D.C., and from JOIDES thematic panels.

The new schedule is generally consistent with long-term ODP planning, which has stipulated that operations of the ODP drill ship *JOIDES Resolution* will be concentrated north of the equator until approximately April 1994 in the Atlantic Ocean, the Gulf of Mexico, and in the Caribbean, Mediterranean, Norwegian, and Labrador seas. Each program to be held in 1993 is briefly summarized below and in Figure 1 to alert the international Earth science community to future opportunities for direct participation aboard the drill ship and to facilitate planning for necessary ancillary activities, such as geophysical and geological surveys in the vicinity of prospective drill sites.

- Leg 147 (late November 1992 to late January 1993): Scientific drilling operations at the beginning of fiscal 1993 will attempt to sample lower oceanic crust and, if possible, sample upper mantle at Hess Deep, where 1.2 m.y. East Pacific Rise (EPR) crust has been exposed in the wake of a propagating rift. Hess Deep represents an inaugural program to implement a general strategy of drilling offset sections of oceanic crust exposed at "tectonic windows." The ultimate goal is to put together composite sections that are representative of crustal generation processes at both fast- and slow-spreading mid-ocean ridges. These sections can then be compared with both ophiolites on land and with results from existing efforts to sample oceanic lithosphere in-situ, like Hole 504B (see below).

- Leg 148 (late January to late March 1993): At present, Leg 148 is scheduled as a further engineering test of ODP's evolving Diamond Coring System (DCS) capability, a follow-up to earlier tests conducted during legs 124 (Western Pacific), 132 (Western Pacific), and 142 (EPR at 9°30′ N). The DCS is ODP's adaptation of mining technology to the marine realm, with the goal of sampling



Magnetic anomaly map of the North Atlantic on which the ODP fiscal 1993 schedule has been superimposed. Designated ports-of-call are preliminary, and ship track and drilling locations are schematic. For more detailed information, contact the JOIDES Office. A key to drilling program abbreviations can be found in the accompanying text. Courtesy of L. Gahagan, Project PLATES, University of Texas Institute for Geophysics.