

PROCEEDINGS OF THE OCEAN DRILLING PROGRAM

VOLUME 174A
INITIAL REPORTS
CONTINUING THE NEW JERSEY MID-ATLANTIC SEA-LEVEL TRANSECT

Covering Leg 174A of the cruises of the Drilling Vessel *JOIDES Resolution*,
Halifax, Nova Scotia, to New York, New York, Sites 1071–1073,
15 June–19 July 1997

James A. Austin, Jr., Nicholas Christie-Blick, Mitchell J. Malone,
Serge Berné, Mai Kirstine Borre, George Claypool, John (Jed) Damuth, Heike Delius,
Gerald Dickens, Peter Flemings, Craig Fulthorpe, Stephen Hesselbo, Koichi Hoyanagi,
Miriam (Mimi) Katz, Hanne Krawinkel, Candace Major, Francine McCarthy, Cecilia McHugh,
Gregory Mountain, Hiro Oda, Hilary Olson, Carlos Pirmez, Charles (Chuck) Savrda,
Christopher Smart, Linda Sohl, Patricia Vanderaveroet, Wuchang Wei, Brian Whiting
Shipboard Scientists

Mitchell J. Malone
Shipboard Staff Scientist

Prepared by the
OCEAN DRILLING PROGRAM
TEXAS A&M UNIVERSITY

Christine M. Miller, Jennifer A. Marin, and Katerina E. Petronotis
Volume Editors

in cooperation with the
NATIONAL SCIENCE FOUNDATION
and
JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

Reference to the whole or to part of this volume should be made as follows:

Print citation:

Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., 1998. *Proc. ODP, Init. Repts.*, 174A: College Station, TX (Ocean Drilling Program).

Shipboard Scientific Party, 1998. Site 1071. In Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., *Proc. ODP, Init. Repts.*, 174A: College Station, TX (Ocean Drilling Program), 37–97.

CD-ROM citation:

Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., 1998. *Proc. ODP, Init. Repts.*, 174A [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station, TX 77845–9547, U.S.A.

Shipboard Scientific Party, 1998. Site 1071. In Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., *Proc. ODP, Init. Repts.*, 174A, 37–97 [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station, TX 77845–9547, U.S.A.

WWW citation:

Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., 1998. *Proc. ODP, Init. Repts.*, 174A [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/174A_IR/174ATOC.HTM>. [Cited YYYY-MM-DD]

Shipboard Scientific Party, 1998. Site 1071. In Austin, J.A., Jr., Christie-Blick, N., Malone, M.J., et al., *Proc. ODP, Init. Repts.*, 174A, 37–97 [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/174A_IR/CHAPTERS/CHAP_03.PDF>. [Cited YYYY-MM-DD]

Effective Publication Dates of ODP *Proceedings*

According to the International Code of Zoological Nomenclature, the date of publication of a work and of a contained name or statement affecting nomenclature is the date on which the publication was mailed to subscribers, placed on sale, or when the whole edition is distributed free of charge, mailed to institutions and individuals to whom free copies are distributed. The mailing date, *not the printed date*, is the correct one.

The mailing dates of recent *Proceedings of the Ocean Drilling Program* are as follows:

Volumes 171A/171B (*Initial Reports*): April 1998
Volume 172 (*Initial Reports*): June 1998
Volume 173 (*Initial Reports*): July 1998
Volume 152 (*Scientific Results*): May 1998
Volume 157 (*Scientific Results*): June 1998
Volume 158 (*Scientific Results*): February 1998

Distribution

Copies of this publication may be obtained from Publications Distribution Center, Ocean Drilling Program, 1000 Discovery Drive, College Station, Texas 77845-9547, U.S.A. Orders for copies will require advance payment. See current ODP publication list for price and availability of this publication.

Printed November 1998

ISSN

Printed volume: 0884-5883; CD-ROM volume: 1096-2522; WWW volume: 1096-2158
Library of Congress 87-642-462

Printed in Canada by Friesens

Foreword

By the National Science Foundation

The National Science Foundation is proud to play a leading role in partnership with the U.S. oceanographic community in the operation and management of the Ocean Drilling Program (ODP). We are equally proud of the cooperation and commitment of our international partners, who contribute both financial and intellectual resources required to maintain the high quality of this unique program. The Ocean Drilling Program, like its predecessor, the Deep Sea Drilling Project (DSDP), is a model for the organization and planning of research to address global scientific problems that are of high priority internationally and of long-term interest to the scientific community and general public.

Major scientific themes guiding the development of specific drilling cruises range from determining the causes and effects of oceanic and climatic variability to understanding the circulation of fluids in the ocean crust and the resultant formation of mineral deposits. Although such studies are at the forefront of basic scientific inquiry into the processes that control and modify the global environment, they are equally important in providing the background for assessing man's impact on the global environment or for projecting resource availability for future generations.

The transition from the DSDP to the ODP was marked by a number of changes. The 471-foot *JOIDES Resolution*, which replaced the *Glomar Challenger*, has allowed larger scientific parties and the participation of more graduate students, a larger laboratory and technical capability, and operations in more hostile ocean regions. The *JOIDES Resolution* has drilled in all of the world's oceans, from the marginal ice regions of the Arctic to within sight of the Antarctic continent. Over 1,200 scientists and students from 26 nations have participated on project cruises. Cores recovered from the cruises and stored in ODP repositories in the United States and Europe have provided samples to an additional 1,000 scientists for longer term post-cruise research investigations. The downhole geochemical and geophysical logging program, unsurpassed in either academia or industry, is providing remarkable new data with which to study the Earth.

In 1994, NSF and our international partners renewed our commitment to the program for its final phase. Of the 20 countries that supported ODP initially, only one, Russia, has been unable to continue for financial reasons. As the reputation and scientific impact of the program continue to grow internationally, we hope to add additional members and new scientific constituencies. This global scientific participation continues to assure the program's scientific excellence by focusing and integrating the combined scientific knowledge and capabilities of its member nations.

We wish the program smooth sailing and good drilling!

Neal Lane
Director
National Science Foundation
Arlington, Virginia

Foreword

By Joint Oceanographic Institutions, Inc.

This volume presents scientific and engineering results from the Ocean Drilling Program (ODP). The papers presented here address the scientific and technical goals of the program, which include providing a global description of geological and geophysical structures including passive and active margins and sediment history, and studying in detail areas of major geophysical activity such as mid-ocean ridges and the associated hydrothermal circulations.

The Ocean Drilling Program, an international activity, operates a specially equipped deep-sea drilling ship, the *JOIDES Resolution*, which contains state-of-the-art laboratories, equipment, and computers. The ship is 471 feet (144 meters) long, is 70 feet (21 meters) wide, and has a displacement of 18,600 short tons. Her derrick towers 211 feet (64 meters) above the waterline, and a computer-controlled dynamic-positioning system stabilizes the ship over a specific location while drilling in water depths up to 27,000 feet (8230 meters). The drilling system collects cores from beneath the seafloor with a derrick and drawworks that can handle 30,000 feet (9144 meters) of drill pipe. More than 12,000 square feet (1115 square meters) of space distributed throughout the ship is devoted to scientific laboratories and equipment. The ship sails with a scientific and technical crew of 51 and a ship's crew (including the drill crew) of 62. The size and ice-strengthening of the ship allow drilling in high seas and ice-infested areas as well as permit a large group of multidisciplinary scientists to interact as part of the scientific party.

Logging, or measurements in the drilled holes, is an important part of the program. ODP provides a full suite of geochemical and geophysical measurements for every hole deeper than 1300 feet (400 meters). For each such hole, there are lowerings of basic oil-industry tools: nuclear, sonic, and electrical. In addition, a Formation MicroScanner is available for high-resolution imaging the wall of the hole, a 12-channel logging tool provides accurate velocity and elastic property measurements as well as sonic waveforms for spectral analysis of energy propagation near the wall of the hole, and a vertical seismic profiler can record reflectors from below the total depth of the hole.

The management of the Ocean Drilling Program involves a partnership of scientists and governments. International oversight and coordination are provided by the ODP Council, a governmental consultative body of the partner countries, which is chaired by a representative from the United States National Science Foundation (NSF). The ODP Council periodically reviews the general progress of the program and discusses financial plans and other management issues. Overall scientific and management guidance is provided to the operators of the program by representatives from the group of institutions involved in the program, called the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES).

The Executive Committee (EXCOM), made up of the administrative heads of the JOIDES institutions, provides general oversight for ODP. The Science Committee (SCICOM), with its advisory structure, is made up of working scientists and provides scientific advice and detailed planning for the Ocean Drilling Program. SCICOM has a network of panels and committees that screen drilling proposals, evaluate instrumentation and measurement techniques, and assess geophysical survey data and other safety and siting information. SCICOM uses the recommendations of the panels and committees to select drilling targets, to specify the location and major scientific objectives of each two-month drilling segment or leg, and to provide the science operator with nominations for co-chief scientists.

Joint Oceanographic Institutions, Inc. (JOI), a nonprofit consortium of U.S. oceanographic institutions, serves as the National Science Foundation's prime contractor for ODP. JOI is responsible for seeing that the scientific objectives, plans, and recommendations of the JOIDES committees are translated into scientific operations consistent with scientific advice and budgetary constraints. JOI subcontracts the operations of the program to two universities: Texas A&M University and Lamont-Doherty Earth Observatory

of Columbia University. JOI is also responsible for managing the U.S. contribution to ODP under a separate cooperative agreement with NSF.

Texas A&M University (TAMU) serves as science operator for ODP. In this capacity, TAMU is responsible for planning the specific ship operations, actual drilling schedules, and final scientific rosters, which are developed in close cooperation with SCICOM and the relevant panels. The science operator also ensures that adequate scientific analyses are performed on the cores by maintaining the shipboard scientific laboratories and computers and by providing logistical and technical support for shipboard scientific teams. Onshore, TAMU manages scientific activities after each leg, is curator for the cores, distributes samples, and coordinates the editing and publication of scientific results.

Lamont-Doherty Earth Observatory (LDEO) of Columbia University is responsible for the program's logging operation, including processing the data and providing assistance to scientists for data analysis. The ODP Data Bank, a repository for geophysical data, is also managed by LDEO.

Core samples from ODP and the previous Deep Sea Drilling Project are stored for future investigation at four sites: ODP Pacific and Indian Ocean cores at TAMU, DSDP Pacific and Indian Ocean cores at the Scripps Institution of Oceanography, ODP and DSDP Atlantic and Antarctic cores through Leg 150 at LDEO, and ODP Atlantic and Antarctic cores since Leg 151 at the University of Bremen, Federal Republic of Germany.

Scientific achievements of ODP include new information on early seafloor spreading and how continents separate and the margins evolve. The oldest Pacific crust has been drilled and sampled. We have new insights into glacial cycles and the fluctuations of ocean currents throughout geological time. ODP has also provided valuable data that shed light on fluid pathways through the lithosphere, global climate change both in the Arctic and near the equator, past sea-level change, seafloor mineralization, the complex tectonic evolution of oceanic crust, and the evolution of passive continental margins.

Many of the scientific goals can be met only with new technology; thus the program has focused on engineering as well as science. To date, ODP engineers have demonstrated the capability to drill on bare rock at mid-ocean-ridge sites and have developed techniques for drilling in high-temperature and corrosive regions typical of hydrothermal vent areas. A new diamond coring system promises better core recovery in difficult areas. In a close collaborative effort between ODP engineers and scientists, a system has been developed that seals selected boreholes ("CORKs") and monitors downhole temperature, pressure, and fluid composition for up to three years. When possible, ODP is also taking advantage of industry techniques such as logging while drilling, to obtain continuous downhole information in difficult-to-drill formations.

JOI is pleased to have been able to play a facilitating role in the Ocean Drilling Program and its cooperative activities, and we are looking forward to many new, exciting results in the future.

James D. Watkins
Admiral, U.S. Navy (Retired)
President
Joint Oceanographic Institutions, Inc.
Washington, D.C.

OCEAN DRILLING PROGRAM*

MEMBER ORGANIZATIONS OF THE JOINT OCEANOGRAPHIC INSTITUTIONS FOR DEEP EARTH SAMPLING (JOIDES)

University of California at San Diego, Scripps Institution of Oceanography

Columbia University, Lamont-Doherty Earth Observatory
University of Hawaii, School of Ocean and Earth Science and Technology

University of Miami, Rosenstiel School of Marine and Atmospheric Science

Oregon State University, College of Oceanic and Atmospheric Sciences

University of Rhode Island, Graduate School of Oceanography

Texas A&M University, College of Geosciences

University of Texas at Austin, Institute for Geophysics

University of Washington, College of Ocean and Fishery Sciences

Woods Hole Oceanographic Institution

Australia/Canada/Chinese Taipei/Korea Consortium for Ocean Drilling, Department of Primary Industries and Energy (Australia), Natural Resources Canada (Canada), National Taiwan University in Taipei, and Korean Institute for Geology, Mining and Minerals

European Science Foundation Consortium for Ocean Drilling (Belgium, Denmark, Finland, Iceland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and Turkey)

Federal Republic of Germany, Bundesanstalt für Geowissenschaften und Rohstoffe

France, Institut Français de Recherche pour l'Exploitation de la Mer

Japan, University of Tokyo, Ocean Research Institute

People's Republic of China, Marine High-Technology Bureau of the State Science and Technology Commission of the People's Republic of China

United Kingdom, Natural Environment Research Council

PRIME CONTRACTOR

Joint Oceanographic Institutions, Inc.
Washington, D.C.

Kathryn Moran
Director, Ocean Drilling Programs

OPERATING INSTITUTION

College of Geosciences
Texas A&M University
College Station, Texas

David B. Prior
Dean

OCEAN DRILLING PROGRAM

Paul J. Fox
Director

Jack G. Baldauf
Deputy Director

Richard G. McPherson
Administrator

Brian Jonasson, Manager
Drilling Services

Ann Klaus, Manager
Publication Services

Thomas A. Davies, Manager
Science Services

LOGGING OPERATOR

Borehole Research Group
Lamont-Doherty Earth Observatory
Columbia University
Palisades, New York

David Goldberg, Head

*At time of publication.

PARTICIPANTS ABOARD THE *JOIDES RESOLUTION* FOR LEG 174A*

James A. Austin, Jr.

Co-Chief Scientist

University of Texas Institute for Geophysics
4412 Spicewood Springs Road
Building 600
Austin, TX 78759
U.S.A.
jamie@utig.ig.utexas.edu

Nicholas Christie-Blick

Co-Chief Scientist

Department of Earth and Environmental Sciences and
Lamont-Doherty Earth Observatory
Columbia University
Palisades, NY 10964
U.S.A.
ncb@ldeo.columbia.edu

Mitchell J. Malone

Staff Scientist/Inorganic Geochemist

Ocean Drilling Program
Texas A&M University Research Park
1000 Discovery Drive
College Station, TX 77845
U.S.A.
Mitchell_Malone@odp.tamu.edu

Serge Berné

Sedimentologist

Département Géosciences Marines
IFREMER
BP 70, 29280 Plouzané
France
sberne@ifremer.fr

Mai Kirstine Borre

Physical Properties Specialist

Department of Geology and Geotechnical Engineering
Bygn. 204
DTU, DK-2800 Lyngby
Denmark
maib@ipt.ntnu.no

George Claypool

Organic Geochemist

8910 W. 2nd Ave.
Lakewood, CO 80226
U.S.A.
geclaypool@aol.com

John (Jed) Damuth

Sedimentologist

Department of Geology
University of Texas at Arlington
P.O. Box 19049
Arlington, TX 76019
U.S.A.
damuth@uta.edu

Heike Delius

LDEO Logging Trainee

Angewandte Geophysik
RWTH Aachen
Lochnerstr. 4-20
D-52056 Aachen
Federal Republic of Germany
heike@sun.geophac.rwth-aachen.de

Gerald Dickens

Organic Geochemist

Department of Earth Sciences
James Cook University
Townsville, Q4811
Australia
jerry.dickens@jcu.edu.au

Peter Flemings

JOIDES Logging Scientist

Department of Geosciences
Pennsylvania State University
442 Deike Building
University Park, PA 16802-2714
U.S.A.
flemings@geosc.psu.edu

Craig Fulthorpe

Physical Properties Specialist

University of Texas Institute for Geophysics
4412 Spicewood Springs Road
Building 600
Austin, TX 78759-8500
U.S.A.
craig@utig.ig.utexas.edu

Stephen Hesselbo

Sedimentologist

Department of Earth Sciences
University of Oxford
Parks Road
Oxford OX1 3PR
United Kingdom
stephen.hesselbo@earth.ox.ac.uk

Koichi Hoyanagi

Sedimentologist

Department of Geology
Shinshu University
3-1-1 Asahi, Matsumoto, 390
Japan
hoya101@gipac.shinshu-u.ac.jp

Miriam (Mimi) Katz

Paleontologist (benthic foraminifers)

Lamont-Doherty Earth Observatory
Columbia University
Palisades, NY 10964
U.S.A.
mkatz@ldeo.columbia.edu

* Addresses at time of cruise.

Hanne Krawinkel
Sedimentologist
*Institut für Geowissenschaften
Johannes Gutenberg Universität Mainz
Becherweg 21, Mainz 55099
Federal Republic of Germany
hannelore.krawinkel@po.uni-stuttgart.de*

Candace Major
LDEO Logging Scientist
*Borehole Research Group
Lamont-Doherty Earth Observatory
Columbia University
Palisades, NY 10964
U.S.A.
major@ldeo.columbia.edu*

Francine McCarthy
Paleontologist (dinoflagellates)
*Department of Earth Sciences
Brock University
St. Catherines, ON L2S 3A1
Canada
francine@craton.geol.brocku.ca*

Cecilia McHugh
Sedimentologist
*Department of Geology
Queens College (CUNY)
65-30 Kissena Blvd.
Flushing, NY 11367
U.S.A.
cmmqc@qcvara.acc.qc.edu*

Gregory Mountain
JOIDES Logging Scientist
*Lamont-Doherty Earth Observatory
Columbia University
Palisades, NY 10964
U.S.A.
mountain@ldeo.columbia.edu*

Hiro Oda
Paleomagnetist
*Marine Geology Department
Geological Survey of Japan
1-1-3 Hiashi, Tsukuba
Ibaraki 305
Japan
hoda@gsj.go.jp*

Hilary Olson
Paleontologist (planktonic foraminifers)
*University of Texas Institute for Geophysics
4412 Spicewood Springs Road
Building 600
Austin, TX 78759-8500
olson@utig.ig.utexas.edu*

Carlos Pirmez
LDEO Logging Scientist
*Borehole Research Group
Lamont-Doherty Earth Observatory
Columbia University
Palisades, NY 10964
U.S.A.
pirmez@ldeo.columbia.edu*

Charles (Chuck) Savrda
Sedimentologist
*Department of Geology
Auburn University
210 Petrie Hall
Auburn, AL 36849-5305
U.S.A.
savrce@mail.auburn.edu*

Christopher Smart
Paleontologist (planktonic foraminifers)
*Department of Geological Sciences
University of Plymouth
Drake Circus
Plymouth, Devon PL4 8AA
United Kingdom
csmart@plymouth.ac.uk*

Linda Sohl
Sedimentologist
*Lamont-Doherty Earth Observatory
Columbia University
P.O. Box 1000
Palisades, NY 10964
U.S.A.
sohl@lamont.ldeo.columbia.edu*

Patricia Vanderaveret
Sedimentologist
*Laboratoire de Sédimentologie et Géodynamique-SN5
Université de Lille I
59655 Villeneuve d'Ascq Cedex
France
Patricia.Vanderaveret@univ-lille1.fr*

Wuchang Wei
Paleontologist (nannofossils)
*Scripps Institute of Oceanography
University of California at San Diego
La Jolla, CA 92093-0215
U.S.A.
wwei@ucsd.edu*

Brian Whiting
Physical Properties Specialist
*Geology Department
Central Washington University
Lind Hall
Ellensburg, WA 98926
U.S.A.
bmw@gis.cwu.edu*

SEDCO OFFICIALS

Captain Anthony Ribbens
Master of the Drilling Vessel
*Overseas Drilling Ltd.
707 Texas Avenue South, Suite 213D
College Station, TX 77840-1917
U.S.A.*

Robert C. Caldow
Drilling Superintendent
*Overseas Drilling Ltd.
707 Texas Avenue South, Suite 213D
College Station, TX 77840-1917
U.S.A.*

ENGINEERING AND OPERATIONS PERSONNEL

Gene Pollard	Operations Manager
Steve Kittredge	Schlumberger Engineer
Thomas Horton III	Schlumberger Logging-While-Drilling Engineer

ODP TECHNICAL AND LOGISTICS PERSONNEL

Tim Bronk	Marine Lab Specialist (Chemistry)
Roy Davis	Marine Lab Specialist (Photographer)
Sandy Dillard	Marine Lab Specialist (Storekeeper)
John Eastlund	Marine Computer Specialist
Burney Hamlin	Laboratory Officer
Margaret Hastedt	Marine Lab Specialist (Paleomagnetism)
Kuro Kuroki	Assistant Lab Officer/Marine Lab Specialist (X-ray)
Brian Jonasson	Development Engineer
Jaque Ledbetter	Marine Lab Specialist (X-ray)
Erinn McCarty	Marine Lab Specialist (Curator)
Matt Mefferd	Marine Computer Specialist
Erik Moortgat	Marine Lab Specialist (Physical Properties)
Chris Nugent	Marine Lab Specialist (Downhole Tools/Thin Sections)
Matt O'Regan	Marine Laboratory Specialist
Anne Pimmel	Marine Lab Specialist (Chemistry)
Jo Ribbens	Marine Lab Specialist (Yeoman)
Bill Stevens	Marine Electronics Specialist
Mark Watson	Marine Electronics Specialist

Ocean Drilling Program Publication Services Staff*

Publication Services Manager

Ann Klaus

Editorial Supervisor/Publications Specialist

M. Kathleen Phillips

Senior Editor

Angeline T. Miller

Editors

Phyllis M. Garman
Ginny Peachey Jackson
Susan Nessler
Ruth N. Riegel
John M. Scroggs

Chief Production Editor

Jennifer Pattison Rumford

Production Editors

Amy Brundeen
Patrick H. Edwards (this volume)
Jaime A. Gracia
Lea Elaine Green

Senior Publications Coordinator

Gudelia ("Gigi") Delgado

Copier/Distribution Specialist

Ann Yeager

Chief Illustrator

Deborah L. Partain

Illustrators

Coleena Burt
Scott Elfstrom
Nancy H. Luedke (this volume)
Karen E. Wagner
Cheng Wei

WWW Administrator

Katerina E. Petronotis

Production Assistants

Marianne Gorecki
Mary Elizabeth Mitchell

Student Assistants

Jaime Cawthron, Theresa Elam, Caressa Inman, Sonya Medina

*At time of publication.

PUBLISHER'S NOTES

This publication was prepared by the Ocean Drilling Program, Texas A&M University, as an account of work performed under the international Ocean Drilling Program, which is managed by Joint Oceanographic Institutions, Inc., under contract with the National Science Foundation. Funding for the program was provided by the following agencies at the time of this cruise:

Australia/Canada/Chinese Taipei/Korea Consortium for Ocean Drilling, Department of Primary Industries and Energy (Australia), Natural Resources Canada (Canada), National Taiwan University in Taipei, and Korean Institute for Geology, Mining and Minerals
Deutsche Forschungsgemeinschaft (Federal Republic of Germany)
European Science Foundation Consortium for Ocean Drilling (Belgium, Denmark, Finland, Iceland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and Turkey)
Institut Français de Recherche pour l'Exploitation de la Mer (France)
National Science Foundation (United States)
Natural Environment Research Council (United Kingdom)
University of Tokyo, Ocean Research Institute (Japan)

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation, the participating agencies, Joint Oceanographic Institutions, Inc., Texas A&M University, or Texas A&M Research Foundation.

The bulk of the shipboard-collected data from this leg is available on the World Wide Web and is accessible at <<http://www-odp.tamu.edu/database>>. If you cannot access this site or need additional data, please contact the ODP Data Librarian, Ocean Drilling Program, Texas A&M University, College Station, TX 77845, U.S.A. (e-mail: database@odp.tamu.edu).

Abbreviations for names of organizations and publications in ODP reference lists follow the style given in *Chemical Abstracts Service Source Index* (published by American Chemical Society).

The printed version of the *Proceedings of the Ocean Drilling Program* series will end with *Initial Reports* volume 175 and *Scientific Results* volume 169S. Beginning with *Initial Reports* volume 176 and *Scientific Results* volume 169, all *Proceedings* volumes will be published on CD-ROM and the World Wide Web <<http://www-odp.tamu.edu/publications/>>.

Initial Reports—CD-ROM format: ISSN 1096-2522

WWW format: ISSN 1096-2158

Scientific Results—CD-ROM format: ISSN 1096-2514

WWW format: ISSN 1096-7451