



## **PROCEEDINGS OF THE OCEAN DRILLING PROGRAM**

Prepared by the  
OCEAN DRILLING PROGRAM,  
TEXAS A&M UNIVERSITY,  
in cooperation with the  
NATIONAL SCIENCE FOUNDATION and JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

# PROCEEDINGS OF THE OCEAN DRILLING PROGRAM

## Volume 185 Scientific Results Izu-Mariana Margin

Covering Leg 185 of the cruises of the Drilling Vessel *JOIDES Resolution*  
Hong Kong, People's Republic of China, to Yokohama, Japan  
Sites 801 and 1149  
12 April–14 June 1999

### SHIPBOARD SCIENTISTS

John N. Ludden, Terry Plank, Carlota Escutia,  
Lewis Abrams, Jeffrey C. Alt, Robin N. Armstrong, Samantha Barr, Annachiara Bartolini,  
Graeme Cairns, Martin R. Fisk, Gilles Guérin, Shelley A. Haveman, Tetsuro Hirono, José Honnorez,  
Katherine A. Kelley, Roger L. Larson, Francesca M. Lozar, Richard W. Murray, Thomas K. Pletsch,  
Robert A. Pockalny, Olivier Rouxel, Angelika Schmidt, David C. Smith, Arthur J. Spivack, Hubert Staudigel,  
Maureen B. Steiner, Robert B. Valentine

### SHIPBOARD STAFF SCIENTIST

Carlota Escutia

### EDITORIAL REVIEW BOARD

John N. Ludden, Terry Plank, Carlota Escutia

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

### Print citation for synthesis chapter:

Ludden, J.N., Plank, T., Larson, R., and Escutia, C., 2006. Leg 185 synthesis: Sampling the oldest crust in the ocean basins to understand Earth's geodynamic and geochemical fluxes. *In* Ludden, J.N., Plank, T., and Escutia, C. (Eds.), *Proc. ODP, Sci. Results*, 185: College Station TX (Ocean Drilling Program), 1–35.

### CD-ROM volume citation:

Ludden, J.N., Plank, T., and Escutia, C. (Eds.), 2006. *Proc. ODP, Sci. Results*, 185 [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station TX 77845-9547, USA.

### CD-ROM chapter citation:

Olschesky, K.S., and Laws, R.A., 2006. Data report: Pliocene–late Pleistocene diatom biostratigraphic data from ODP Leg 185, Hole 1149A. *In* Ludden, J.N., Plank, T., and Escutia, C. (Eds.), *Proc. ODP, Sci. Results*, 185, 1–31 [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station TX 77845-9547, USA.

### WWW volume citation:

Ludden, J.N., Plank, T., and Escutia, C. (Eds.), 2006. *Proc. ODP, Sci. Results*, 185 [Online]. Available from World Wide Web: <[http://www-odp.tamu.edu/publications/185\\_SR/185sr.htm](http://www-odp.tamu.edu/publications/185_SR/185sr.htm)>. [Cited YYYY-MM-DD]

### WWW PDF chapter citation:

Olschesky, K.S., and Laws, R.A., 2002. Data report: Pliocene–late Pleistocene diatom biostratigraphic data from ODP Leg 185, Hole 1149A. *In* Ludden, J.N., Plank, T., and Escutia, C. (Eds.), *Proc. ODP, Sci. Results*, 185, 1–31 [Online]. Available from World Wide Web: <[http://www-odp.tamu.edu/publications/185\\_SR/VOLUME/CHAPTERS/007.PDF](http://www-odp.tamu.edu/publications/185_SR/VOLUME/CHAPTERS/007.PDF)>. [Cited YYYY-MM-DD]

### WWW HTML chapter citation:

Olschesky, K.S., and Laws, R.A., 2002. Data report: Pliocene–late Pleistocene diatom biostratigraphic data from ODP Leg 185, Hole 1149A. *In* Ludden, J.N., Plank, T., and Escutia, C. (Eds.), *Proc. ODP, Sci. Results*, 185 [Online]. Available from World Wide Web: <[http://www-odp.tamu.edu/publications/185\\_SR/007/007.htm](http://www-odp.tamu.edu/publications/185_SR/007/007.htm)>. [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 printing date*, is the correct one.

The printing date of this volume: May 2006

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

Volume 208 (*Initial Reports*): May 2004

Volume 209 (*Initial Reports*): June 2004

Volume 210 (*Initial Reports*): October 2004

Volume 190/196 (*Scientific Results*): September 2005

Volume 191 (*Scientific Results*): September 2005

Volume 192 (*Scientific Results*): November 2004

Copies of this publication may be obtained from Publications Distribution Center, Integrated Ocean Drilling Program, Texas A&M University, 1000 Discovery Drive, College Station TX 77845-9547, USA. See the ODP publication list at [www-odp.tamu.edu/publications](http://www-odp.tamu.edu/publications) or contact IODP for prices and ordering information. Orders for copies require advance payment.

### ISSN

Book: 0884-5891; CD-ROM: 1096-2514; World Wide Web: 1096-7451

Library of Congress 87-642-462

## PUBLISHER'S NOTES

This volume also appears on the World Wide Web. Any scientific corrections, revisions, or additions will be noted in the chapter (see "Chapter Notes") at [www-odp.tamu.edu/publications](http://www-odp.tamu.edu/publications).

This publication was prepared by the Integrated 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, 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, and Switzerland)

Institut National des Sciences de l'Univers–Centre National de la Recherche Scientifique (INSU-CNRS) (France)

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

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.

Current policy requires that all figures published in *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* be provided by the authors.

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).

This volume includes a site map showing the drilling locations for this leg and maps showing the drilling locations of all Ocean Drilling Program (ODP) and Deep Sea Drilling Project (DSDP) drilling sites in PDF. These maps were produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.R. Smith ([gmt.soest.hawaii.edu](http://gmt.soest.hawaii.edu)).

Cover photograph is from Leg 185, the derrick of the *JOIDES Resolution* at dawn by ODP Photographer Roy Davis.

# FOREWORD

## BY JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

This volume presents scientific and engineering results from the Ocean Drilling Program (ODP). These results address the scientific and technical goals of the program, which are focused on the study of the dynamics of Earth's interior and environment, the evolution of oceanic crust, the fluctuations of climate, and the study of the Earth's deep biosphere.

Although ODP ended operations in 2003, science results from ODP's expeditions on the *JOIDES Resolution* continue to emerge. The results represent the contributions of scientists and research institutions from 22 ODP member countries. International oversight and coordination of the program was provided by the ODP Council, which was made up of representatives from the member countries. Scientific and management guidance was provided by representatives from the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES).

Joint Oceanographic Institutions, Inc. (JOI), a nonprofit consortium of 20 U.S. oceanographic institutions, serves as the National Science Foundation's prime contractor for ODP. JOI implemented scientific objectives, plans, and recommendations of the JOIDES committees through subcontracts to Texas A&M University (TAMU) for science operations and to Lamont-Doherty Earth Observatory (LDEO) of Columbia University for geochemical and geophysical well-logging services.

JOI, TAMU, and LDEO worked together successfully for many years to manage the Ocean Drilling Program. We look forward to many exciting discoveries and continued international collaboration on the Integrated Ocean Drilling Program as we further our scientific mission.

Steven R. Bohlen

President of the Joint Oceanographic Institutions and Executive Director of the Ocean Drilling Programs  
Washington, D.C.

# PREFACE

## THE VOYAGES OF DISCOVERY

The *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* are about Earth and her oceans.

These volumes contain contributions to a better understanding of the history of our planet through time. This exploration of Earth's past is based on scientific analyses of layers of strata sampled by the *JOIDES Resolution* at key locations throughout the global ocean. These volumes are a tribute to the scientific exploration carried out by the men and women who contributed to these voyages of discovery. Like the pioneering exploration and research of Captain Cook aboard the first *Resolution*, these volumes are a credit to the human spirit, which sees no boundaries.

The papers in this volume are published in a new online format that will be archived on CD-ROM. The *Proceedings* contents are available to students, scientists, and the public throughout the world. Volumes, once housed in the libraries of the member nations of the Ocean Drilling Program (ODP), are now published on the Internet for a worldwide audience and are also available in CD-ROM format. This electronic publication enables future investigators to gain easier access to the results of ocean drilling research. I acknowledge and thank the authors for their contributions and willingness to participate in this new venture in our successful transition to electronic publications.

Each *Scientific Results* volume has an Editorial Review Board that is responsible for obtaining peer reviews of papers submitted to the volume. This board usually is made up of the two co-chief scientists for the cruise, the ODP staff scientist for the cruise, and one external specialist who is familiar with the geology of the investigated area. ODP staff coordinate the peer-review process and also edit and produce each paper.

Each *Scientific Results* volume contains one leg synthesis paper and other peer-reviewed papers that present the results of extensive research in various aspects of scientific ocean drilling related to each leg. Each paper submitted to a *Scientific Results* volume undergoes rigorous peer review by at least two specialists in the author's research field. Volumes may also contain short reports of useful data. These Data Reports do not include interpretation of results and are peer-reviewed by at least one specialist. We seek to maintain a peer-review system comparable to those of the most highly regarded journals in the geological sciences.

To acknowledge the contributions made by this volume's Editorial Review Board, the Board members are designated Editors of the volume. Reviewers of manuscripts for this volume, whose efforts are so essential to the success of the publication, are listed without attribution to any particular manuscript.

On behalf of ODP and now the Integrated Ocean Drilling Program, the successor to ODP, I extend sincere appreciation to the members of the Editorial Review Board and to the reviewers for generously contributing their time and effort. This process ensures that only papers of high scientific quality are published in the *Scientific Results* volumes.

Paul J. Fox  
 Director, Science Services, TAMU  
 Integrated Ocean Drilling Program  
 Texas A&M University  
 College Station, Texas



## REVIEWERS FOR THIS VOLUME

Gary D. Acton  
Timothy J. Bralower  
Lloyd H. Burckle  
Elisabetta Erba  
Yohan Guyodo  
Richard Jarrard

Kevin W. Mandernack  
Francine M.G. McCarthy  
Ralph Moberly  
Gregory F. Moore  
James G. Ogg  
Philippe A. Pezard

Isabella Raffi  
William W. Sager  
Kohtaro Ujiie  
A. Aristedes Yayanos

# OCEAN DRILLING PROGRAM\*

National Science Foundation  
4201 Wilson Boulevard  
Arlington VA 22230, USA  
Tel: (703) 306-1581; Fax: (703) 306-0390  
Web site: [www.nsf.gov](http://www.nsf.gov)

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

Columbia University, Lamont-Doherty Earth Observatory

Florida State University

Oregon State University, College of Oceanic and Atmospheric Sciences

Pennsylvania State University, College of Earth and Mineral Sciences

Rutgers, The State University of New Jersey, Institute of Marine and Coastal Sciences and Faculty of Arts and Sciences

Stanford University, School of Earth Sciences

Texas A&M University, College of Geosciences

University of California at San Diego, Scripps Institution of Oceanography

University of California, Santa Cruz

University of Florida

University of Hawaii, School of Ocean and Earth Science and Technology

University of Miami, Rosenstiel School of Marine and Atmospheric Science

University of Michigan, College of Literature, Science, and the Arts

University of Rhode Island, Graduate School of Oceanography

University of South Florida, College of Marine Science

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, National Taiwan University in Taipei, and Korean Institute for Geology, Mining and Minerals

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

\*At time of completion of ODP cruises in September 2003. See [Publisher's Notes](#), p. 5, for list of funding agencies at time of cruise.

Federal Republic of Germany, Bundesanstalt für  
Geowissenschaften und Rohstoffe

France, Institut National des Sciences de  
l'Univers–Centre National de la Recherche  
Scientifique (INSU-CNRS)

Japan, University of Tokyo, Ocean Research  
Institute

### **ODP PROGRAM MANAGER**

Joint Oceanographic Institutions, Inc.  
1201 New York Avenue, NW, Suite 400  
Washington DC 20005, USA  
Tel: (202) 232-3900; Fax: (202) 462-8754  
E-mail: [info@joiscience.org](mailto:info@joiscience.org)  
Web site: [www.joiscience.org](http://www.joiscience.org)

### **ODP SCIENCE OPERATOR**

Integrated Ocean Drilling Program  
Texas A&M University  
1000 Discovery Drive  
College Station TX 77845-9547, USA  
Tel: (979) 845-2673; Fax: (979) 845-4857  
E-mail: [information@iodp.tamu.edu](mailto:information@iodp.tamu.edu)  
Web site: [iodp.tamu.edu](http://iodp.tamu.edu)

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

### **ODP LOGGING SERVICES OPERATOR**

Borehole Research Group  
Lamont-Doherty Earth Observatory  
of Columbia University  
PO Box 1000, 61 Route 9W  
Palisades NY 10964, USA  
Tel: (845) 365-8341; Fax: (845) 365-3182  
E-mail: [borehole@ldeo.columbia.edu](mailto:borehole@ldeo.columbia.edu)  
Web site: [www.ldeo.columbia.edu/BRG/ODP](http://www.ldeo.columbia.edu/BRG/ODP)

### **ODP SITE SURVEY DATA BANK**

Lamont-Doherty Earth Observatory  
of Columbia University  
PO Box 1000, 61 Route 9W  
Palisades NY 10964, USA  
Tel: (845) 365-8542; Fax: (845) 365-8159  
E-mail: [odp@ldeo.columbia.edu](mailto:odp@ldeo.columbia.edu)  
Web site: [ssdb.ldeo.columbia.edu](http://ssdb.ldeo.columbia.edu)

# LEG 185 PARTICIPANTS\*

## SHIPBOARD SCIENTIFIC PARTY

**John N. Ludden**

**Co-Chief Scientist**

CRPG-CNRS

15 rue Notre-Dame des Pauvres

BP 20

54501 Vandoeuvre-lès-Nancy Cedex

France

[ludden@crpg.cnrs-nancy.fr](mailto:ludden@crpg.cnrs-nancy.fr)

**Terry Plank**

**Co-Chief Scientist**

Department of Earth Sciences

Boston University

685 Commonwealth Avenue

Boston MA 02215

USA

[tplank@bu.edu](mailto:tplank@bu.edu)

**Carlota Escutia**

**Staff Scientist**

Ocean Drilling Program

Texas A&M University

1000 Discovery Drive

College Station TX 77845-9547

USA

Present address (1 August 2002):

Instituto Andaluz de Ciencias de la Tierra

CSIC/Universidad de Granada Facultad de

Ciencias

Campus de Fuentenueva s/n

18002 Granada

Spain

[cescutia@ugr.es](mailto:cescutia@ugr.es)

**Lewis Abrams**

**Physical Properties Specialist**

Department of Earth Sciences

University of North Carolina

601 South College Road

Wilmington NC 28403-3297

USA

[abramsl@uncwil.edu](mailto:abramsl@uncwil.edu)

**Jeffrey C. Alt**

**Igneous Petrologist**

Department of Geological Sciences

University of Michigan

2534 C.C. Little Building

425 East University

Ann Arbor MI 48109-1063

USA

[jalt@umich.edu](mailto:jalt@umich.edu)

**Robin N. Armstrong**

**Inorganic Geochemist**

Southampton Oceanography Centre

University of Southampton

Empress Dock, European Way

Southampton SO14 3ZH

United Kingdom

[rxs@soc.soton.ac.uk](mailto:rxs@soc.soton.ac.uk)

**Samantha Barr**

**Igneous Petrologist**

Department of Geology

University of Leicester

University Road

Leicester LE1 7RH

United Kingdom

[srb7@leicester.ac.uk](mailto:srb7@leicester.ac.uk)

\*Addresses at time of cruise, except where updated by the leg participants before publication.

**Annachiara Bartolini****Paleontologist (radiolarians)**

Institut de Geologie et Paleontologie  
 Universite de Lausanne  
 BFSH-2 UNIL  
 1015 Lausanne  
 Switzerland

Present address (12 June 2002):  
 Laboratoire de Micropaleontologie, case 104  
 Université Pierre et Marie Curie  
 4 Place Jussieu  
 75252 Paris 05  
 France  
[chiara@ccr.jussieu.fr](mailto:chiara@ccr.jussieu.fr)

**Graeme Cairns****LDEO Logging Trainee**

Laboratoire de Mesures en Forage  
 ODP/Naturalia et Biologia (NEB)  
 BP 72  
 13545 Aix-en-Provence Cedex 4  
 France

Present address (19 February 2003):  
 PO Box 692  
 Elora ON N0B 1S0  
 Canada  
[graeme.cairns@sympatico.ca](mailto:graeme.cairns@sympatico.ca)

**Martin R. Fisk**

Microbiologist/  
 Igneous Petrologist  
 College of Oceanic and Atmospheric Sciences  
 Oregon State University  
 104 Ocean Administration Building  
 Corvallis OR 97331-5503  
 USA  
[mfisk@oce.orst.edu](mailto:mfisk@oce.orst.edu)

**Gilles Guérin****LDEO Logging Scientist**

Borehole Research Group  
 Lamont-Doherty Earth Observatory  
 Columbia University  
 PO Box 1000, 61 Route 9W  
 Palisades NY 10964  
 USA

[guerin@ldeo.columbia.edu](mailto:guerin@ldeo.columbia.edu)

**Shelley A. Haveman****Microbiologist**

Institute for Cell and Molecular Biology,  
 Microbiology  
 Göteborgs Universitet  
 Box 462  
 405 30 Göteborg  
 Sweden

Present address (12 June 2002):  
 University of Calgary  
 2500 University Drive Northwest  
 Calgary AB T2N 1N4  
 Canada  
[haveman@ucalgary.ca](mailto:haveman@ucalgary.ca)

**Tetsuro Hirono****Physical Properties Specialist**

Department of Earth and Planetary Sciences  
 Tokyo Institute of Technology  
 Okayama 2-12-1, Meguro-ku  
 Tokyo 152-8551  
 Japan  
[t-hirono@spa.att.ne.jp](mailto:t-hirono@spa.att.ne.jp)

**José Honnorez**

**Metamorphic Petrologist**

Institut de Géologie  
Université Louis Pasteur  
1 rue Blessig  
67084 Strasbourg Cedex  
France

[honnorez@illite.u-strasbg.fr](mailto:honnorez@illite.u-strasbg.fr)

**Katherine A. Kelley**

**Igneous Petrologist**

Department of Geology  
University of Kansas  
120 Lindley Hall  
Lawrence KS 66045  
USA

[kelley@eagle.cc.ukans.edu](mailto:kelley@eagle.cc.ukans.edu)

**Roger L. Larson**

**JOIDES Logging Scientist**

Graduate School of Oceanography  
University of Rhode Island  
Narragansett RI 02882-1197  
USA

[rlar@gsosun1.gso.uri.edu](mailto:rlar@gsosun1.gso.uri.edu)

**Francesca M. Lozar**

**Paleontologist (nannofossils)**

Centro di Studi Sulla Geodinamica delle Catene  
Collisionali  
Consiglio Nazionale delle Ricerche via  
Accademia delle Scienze 5  
10123 Torino  
Italy

Present address (12 June 2002):  
Dipartimento di Scienze della Terra  
Universita di Torino and Istituto di Geoscienze e  
Georisorse  
Consiglio Nazionale delle Ricerche  
via Accademia delle Scienze 5  
10123 Torino  
Italy  
[lozar@dst.unito.it](mailto:lozar@dst.unito.it)

**Richard W. Murray**

**Inorganic Geochemist**

Department of Earth Sciences  
Boston University  
685 Commonwealth Avenue  
Boston MA 02215  
USA

[rickm@bu.edu](mailto:rickm@bu.edu)

**Thomas K. Pletsch**

**Sedimentologist**

Geologisch-Paläontologisches Institut  
Christian-Albrechts-Universität zu Kiel  
Olshausenstrasse 40-60  
24118 Kiel  
Germany

Present address (12 June 2002):  
Federal Institute for Geosciences and Natural  
Resources (BGR)  
Technical Mineralogy and Sedimentology  
Section  
Stilleweg 2  
30655 Hannover  
Germany  
[t.pletsch@bgr.de](mailto:t.pletsch@bgr.de)

**Robert A. Pockalny**

**JOIDES Logging Scientist**

Graduate School of Oceanography  
University of Rhode Island  
Narragansett RI 02882-1197  
USA

[robp@bobbyorr.gso.uri.edu](mailto:robp@bobbyorr.gso.uri.edu)

**Olivier Rouxel**

**Igneous Petrologist**

Centre de Recherches  
Pétrographiques et Géochimiques  
15 rue Notre-Dame des Pauvres  
BP 20  
54501 Vandoeuvre-lès-Nancy Cedex  
France  
[rouxel@crpg.cnrs-nancy.fr](mailto:rouxel@crpg.cnrs-nancy.fr)

**Angelika Schmidt****Igneous Petrologist**

GEOMAR  
 Department of Volcanology and Petrology  
 Christian-Albrechts-Universität zu Kiel  
 Wischhofstrasse 1-3  
 24148 Kiel  
 Germany  
[aschmidt@geomar.de](mailto:aschmidt@geomar.de)

**David C. Smith****Microbiologist**

Graduate School of Oceanography  
 University of Rhode Island  
 South Ferry Road  
 Narragansett RI 02881-1197  
 USA  
[dcsmith@gso.uri.edu](mailto:dcsmith@gso.uri.edu)

**Arthur J. Spivack****Inorganic Geochemist**

Department of Earth Sciences  
 University of North Carolina  
 601 South College Road  
 Wilmington NC 28403-3297  
 USA

Present address (24 June 2002):  
 Graduate School of Oceanography  
 University of Rhode Island  
 Narragansett RI 02882  
 USA  
[spivack@gso.uri.edu](mailto:spivack@gso.uri.edu)

**SEDCO OFFICIALS****Tom Ribbens****Master of the Drilling Vessel**

Overseas Drilling Ltd.  
 707 Texas Avenue South, Suite 213D  
 College Station TX 77840-1917  
 USA

**Hubert Staudigel****Igneous Petrologist**

Scripps Institute of Oceanography  
 University of California, San Diego  
 La Jolla CA 92093-0225  
 USA  
[hstaudigel@ucsd.edu](mailto:hstaudigel@ucsd.edu)

**Maureen B. Steiner****Paleomagnetist**

Department of Geology and Geophysics  
 University of Wyoming  
 PO Box 3006, University Station  
 Laramie WY 82071  
 USA  
[magnetic@uwyo.edu](mailto:magnetic@uwyo.edu)

**Robert B. Valentine****Sedimentologist**

Department of Earth and Planetary Sciences  
 Washington University  
 One Brookings Drive  
 Campus Box 1169  
 St. Louis MO 63130  
 USA  
[rbvalent@artsci.wustl.edu](mailto:rbvalent@artsci.wustl.edu)

**Scott Pederson****Drilling Superintendent**

Overseas Drilling Ltd.  
 707 Texas Avenue South, Suite 213D  
 College Station TX 77840-1917  
 USA

**ODP SHIPBOARD PERSONNEL****Pablo Cervantes**

Marine Laboratory Specialist

**Roy Davis**

Marine Laboratory Specialist (Photography)

**Sandy Dillard**

Marine Laboratory Specialist (Downhole Measurements, Thin Sections)

**John Dyke**

Marine Logistics Specialist

**Glen Foss**

Operations Manager

**Burney Hamlin**

Laboratory Officer

**Margaret Hastedt**

Marine Computer Specialist

**Dwight Hornbacker**

Information Services Programmer

**Steve Kittredge**

Schlumberger Engineer

**Jacque Ledbetter**

Marine Laboratory Specialist (X-Ray)

**Erinn McCarty**

Marine Laboratory Specialist (Curator)

**Erik Moortgat**

Marine Laboratory Specialist (Chemistry)

**Matthew O'Regan**

Marine Laboratory Specialist (Paleomagnetism)

**Anne Pimmel**

Marine Laboratory Specialist (Chemistry)

**John Pretorius**

Marine Electronics Specialist

**Pieter Pretorius**

Marine Electronics Specialist

**Steve Prinz**

Marine Laboratory Specialist  
(Underway Geophysics)

**Jo Ribbens**

Marine Laboratory Specialist (Yeoperson)

**Patrick Riley**

Marine Laboratory Specialist (Physical Properties)

**Chris Stephens**

Marine Computer Specialist

**Johanna Suhonen**

Marine Laboratory Specialist (X-Ray)

**Eddie Wright**

ODP Drilling Engineer



## PUBLICATION SERVICES STAFF\*

**Karen Benson**  
Production Specialist II

**Anthony Tyler Caviness**  
Student Assistant

**Gudelia ("Gigi") Delgado**  
Senior Publications  
Coordinator

**Patrick H. Edwards**  
Production Specialist II

**Jaime A. Gracia**  
Supervisor of Production

**Jennie L. Lamb**  
Graphics Specialist II

**Shana C. Lewis**  
Editor

**Ginny Lowe**  
Reports Coordinator

**Nancy H. Luedke**  
Graphics Specialist II

**Amy McWilliams**  
Editor

**Angeline T. Miller**  
Manager of Publication  
Services

**Mary Elizabeth Mitchell**  
Publications Coordinator  
Assistant

**Linda Orsi**  
Graphics Specialist II

**Deborah L. Partain**  
Supervisor of Graphics

**Brooke Perry**  
Student Assistant

**Lorri L. Peters**  
Interim Supervisor of Editing

**M. Kathleen Phillips**  
Publications Specialist

**Barbara Riggs-Turner**  
Administrative Assistant

**Jennifer Pattison Rumford**  
Electronic Publications  
Specialist

**Kenneth Sherar**  
Production Specialist II

**Katherine W. Steuer**  
Assistant Editor

**Ann Yeager**  
Distribution Specialist

\*At time of publication.

# CD-ROM CONTENTS: INTRODUCTION AND CHAPTERS

## SYNTHESIS

### **1. Leg 185 Synthesis: Sampling the Oldest Crust in the Ocean Basins to Understand Earth's Geodynamic and Geochemical Fluxes**

John N. Ludden, Terry Plank, Roger L. Larson, and Carlota Escutia  
Manuscript number: 185SR-014

## CHAPTERS

### BIOSTRATIGRAPHY

### **2. Data Report: Pliocene–Late Pleistocene Diatom Biostratigraphic Data from ODP Leg 185, Hole 1149A**

Karyn S. Olschesky and Richard A. Laws  
Manuscript number: 185SR-007

### **3. Bacterial Populations in Deepwater Low-Sedimentation-Rate Marine Sediments and Evidence for Subsurface Bacterial Manganese Reduction (ODP Site 1149, Izu-Bonin Trench)**

Barry A. Cragg, Peter Wellsbury, Richard W. Murray, and R. John Parkes  
Manuscript number: 185SR-008

### **4. Silicoflagellate Biostratigraphy, Hole 1149A (ODP Leg 185, Nadezhda Basin, Northwestern Pacific)**

Francesca Lozar and Massimo Mussa  
Manuscript number: 185SR-009

### **5. Calcareous Nannofossil Biostratigraphy of Cretaceous Sediments Recovered at ODP Site 1149 (Leg 185, Nadezhda Basin, Western Pacific)**

Francesca Lozar and Fabrizio Tremolada  
Manuscript number: 185SR-010

### **6. Cretaceous Radiolarian Biochronology and Carbon Isotope Stratigraphy of ODP Site 1149 (Northwestern Pacific, Nadezhda Basin)**

Annachiara Bartolini  
Manuscript number: 185SR-011

## SEDIMENTOLOGY, STRATIGRAPHY, AND PHYSICAL PROPERTIES

### **7. Pleistocene Deep-Sea Sediment in ODP Hole 1149A, Nadezhda Basin: Sources, Alteration, and Age Controls (0–800 ka)**

Michael Urrbat and Thomas Pletsch  
Manuscript number: 185SR-012

### **8. Correlation between Core, Logging, and Seismic Data at Site 1149 in the Nadezhda Basin**

Lewis J. Abrams  
Manuscript number: 185SR-001

### **9. Progressive Microfabric Changes in Unconsolidated Pelagic and Hemipelagic Sediments Down to 180 mbsf, Northwest Pacific, ODP Leg 185, Site 1149**

Kiichiro Kawamura and Yujiro Ogawa  
Manuscript number: 185SR-003

### **10. Data Report: Silica Mineral Crystallization with Textural Change of Cretaceous Siliceous/Calcareous Pelagic Sedimentary Rocks Recovered from the Northwest Pacific, ODP Leg 185**

Chihiro Tanaka and Yujiro Ogawa  
Manuscript number: 185SR-004

### **11. Data Report: Measurement of Mass Transfer Property with Subducted Oceanic Plate**

Tetsuro Hirono  
Manuscript number: 185SR-002

### **12. Data Report: Electrical Resistivity and X-Ray Computed Tomography Measurements of Sedimentary and Igneous Units from Hole 801C and Site 1149**

Tetsuro Hirono and Lewis J. Abrams  
Manuscript number: 185SR-005

### **13. Data Report: $^{40}\text{Ar}/^{39}\text{Ar}$ Chronology of Discrete Ash Layers in the Northwestern Pacific: ODP Sites 1149 and 1179**

C. Escutia, M. Canon, and J. Gutierrez-Pastor  
Manuscript number: 185SR-015

## CD-ROM CONTENTS: DRILLING LOCATION MAPS

A site map showing the drilling locations for this leg and maps showing the drilling locations of all Ocean Drilling Program (ODP) and Deep Sea Drilling Project (DSDP) drilling sites are available in PDF format.

[ODP Leg 185 Site Map](#)

[ODP Map](#) (Legs 100–210)

[DSDP Map](#) (Legs 1–96)

## CD-ROM CONTENTS: INDEX TO LEG 185 *INITIAL REPORTS AND SCIENTIFIC RESULTS VOLUMES*

The index covers both the *Initial Reports* and *Scientific Results* portions of Volume 185 of the *Proceedings of the Ocean Drilling Program*. The index contains a subject and taxonomic index.

[Index to Leg 185](#)

## CD-ROM CONTENTS: COMPILED ELECTRONIC INDEX

The Compiled Electronic Index of the *Proceedings of the Ocean Drilling Program* contains the indexes of Volumes 101–178, 180–192, and 196. The indexes are contained in the directory titled ODPINDEX and are named ###NDX.PDF (### = the leg number). These indexes can be searched individually or collectively. For information on using the Acrobat search function, see the Help function in Adobe Reader.

# CD-ROM DIRECTORY STRUCTURE

<b>185SR.PDF</b> (Preliminary pages and table of contents)		
<b>README.TXT</b> (ASCII version of information about the volume CD-ROM)		
<b>ACROREAD</b> (Acrobat Reader installation software and instructions for different platforms)	<b>MAC</b>	
	<b>WINDOWS</b>	
	<b>UNIX</b>	
	<b>README.TXT</b>	
<b>MAPS</b> (Drilling location maps)	<b>185_MAP.PDF</b>	(Leg 185 site map)
	<b>ODPMAP.PDF</b>	(ODP map, Legs 100 through 210)
	<b>DSDPMAP.PDF</b>	(DSDP map, Legs 1 through 96)
<b>VOLUME</b> (Leg 185 <i>Scientific Results</i> volume)	<b>SYNTH</b> (Overview chapter)	<b>SYNTH.PDF</b> (Chapter 1: Leg 185 Synthesis)
	<b>CHAPTERS</b> (Volume chapters)	<b>007.PDF</b> (Chapter 2: Data Report: Pliocene–Late Pleistocene Diatom Biostratigraphy)
		<b>008.PDF</b> (Chapter 3: Bacterial Populations and Manganese Reduction)
		<b>009.PDF</b> (Chapter 4: Silicoflagellate Biostratigraphy)
		<b>010.PDF</b> (Chapter 5: Site 1149 Calcareous Nannofossil Biostratigraphy)
		<b>011.PDF</b> (Chapter 6: Cretaceous Radiolarian Biochronology and Carbon Isotope Stratigraphy)
		<b>012.PDF</b> (Chapter 7: Pleistocene Deep-Sea Sediment, Nadezhda Basin)
		<b>001.PDF</b> (Chapter 8: Correlation between Core, Logging, and Seismic Data)
		<b>003.PDF</b> (Chapter 9: Progressive Changes of Microfabric)
		<b>004.PDF</b> (Chapter 10: Silica Mineral Crystallization)
		<b>002.PDF</b> (Chapter 11: Data Report: Mass Transfer Property)
		<b>005.PDF</b> (Chapter 12: Data Report: Electrical Resistivity and X-Ray CT)
		<b>015.PDF</b> (Chapter 13: Data Report: $^{40}\text{Ar}/^{39}\text{Ar}$ Chronology)
	<b>185NDX.PDF</b> (185 <i>Proceedings</i> volume index)	
	<b>INDEX.PDX</b> (Acrobat file used to enable Acrobat Search of the 185 <i>Scientific Results</i> )	

## CD-ROM DIRECTORY STRUCTURE (CONTINUED)

### **SUPP\_MAT**

(Supplementary Material)

#### **SR185015**

(Leg 185 and 191 isotope results  
in Microsoft Excel 97/98 format)

**OSU\_185** (Chapter 13 files)

**OSU\_191** (Chapter 13 files)

#### **README.TXT**

### **ODPINDEX**

(Compiled Electronic Index of the  
*Proceedings of the Ocean Drilling  
Program*)

#### **101NDX.PDF through 178NDX.PDF and 180NDX.PDF through 192NDX.PDF**

(Index files)

#### **NDX.PDX**

(Acrobat file used to enable Acrobat Search of the  
Compiled Electronic Index)