



Millimeter- to submillimeter-scale laminations and massive clay-rich beds of olive silty clay (lithological Subunit 1C) from Section 146-893A-6H-6, 0–45 cm (left), and Section 146-893A-7H-2, 0–45 cm (right).

PROCEEDINGS OF THE OCEAN DRILLING PROGRAM

VOLUME 146 SCIENTIFIC RESULTS PART 2: SANTA BARBARA BASIN

Covering Leg 146 of the cruises of the Drilling Vessel *JOIDES Resolution*,
Santa Barbara Channel, California, Site 893,
20 September–22 November 1992

James P. Kennett, Jack G. Baldauf, Richard Behl, William R. Bryant, Michael Fuller,
Kurt Grimm, Linda Heusser, Alan Kemp, Carina Lange, Steven P. Lund,
Russell B. Merrill, Fabrice Olivier, Evelyn Polgreen, Lisa Pratt, Frank R. Rack,
Arndt Schimmelmann, Martha Schwartz, Ruediger Stein, and Jürgen Thurow
Shore-based Scientists

Robert J. Musgrave
Shipboard Staff Scientist

Editorial Review Board:
James P. Kennett, Jack G. Baldauf, Mitchell Lyle

Prepared by the
OCEAN DRILLING PROGRAM
TEXAS A&M UNIVERSITY

Lona Haskins Dearmont
Volume Editor

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

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:

Canada/Australia Consortium for the Ocean Drilling Program, Department of Energy, Mines and Resources (Canada), and Department of Primary Industries and Energy (Australia)
Deutsche Forschungsgemeinschaft (Federal Republic of Germany)
European Science Foundation Consortium for Ocean Drilling (Belgium, Denmark, Finland, Greece, Iceland, Italy, The Netherlands, Norway, 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.

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

Print citation:

Kennett, J.P., Baldauf, J.G., and Lyle, M. (Eds.), 1995. *Proc. ODP, Sci. Results*, 146 (Pt. 2): College Station, TX (Ocean Drilling Program).

Merrill, R.B., and Beck, J.W., 1995. The ODP color digital imaging system: color logs of Quaternary sediments from the Santa Barbara Basin, Site 893. *In* Kennett, J.P., Baldauf, J.G., and Lyle, M. (Eds.), *Proc. ODP, Sci. Results*, 146 (Pt. 2): College Station, TX (Ocean Drilling Program), 45–59.

Electronic citation:

Kennett, J.P., Baldauf, J.G., and Lyle, M. (Eds.), 1995. *Proc. ODP, Sci. Results* [CD-ROM], 146 (Pt. 2). Available: Ocean Drilling Program, Texas A&M University, College Station, TX, 77845-9547, U.S.A.

Merrill, R.B., and Beck, J.W., 1995. The ODP color digital imaging system: color logs of Quaternary sediments from the Santa Barbara Basin, Site 893. *In* Kennett, J.P., Baldauf, J.G., and Lyle, M. (Eds.), *Proc. ODP, Sci. Results* [CD-ROM], 146 (Pt. 2), 45–59. Available: Ocean Drilling Program, Texas A&M University, College Station, TX, 77845-9547, U.S.A.

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 correct.

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

Volume 154 (*Initial Reports*): May 1995
Volume 155 (*Initial Reports*): July 1995
Volume 156 (*Initial Reports*): September 1995
Volume 137/140 (*Scientific Results*): June 1995
Volume 138 (*Scientific Results*): August 1995
Volume 141 (*Scientific Results*): September 1995

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 October 1995

ISSN 0884-5891
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* (Sedco/BP 471), 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 borehole televiewer is available for 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. 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 Planning Committee (PCOM), with its advisory structure, is made up of working scientists and provides scientific advice and detailed planning. PCOM has a network of panels and working groups that screen drilling proposals, evaluate instrumentation and measurement techniques, and assess geophysical-survey data and other safety and siting information. PCOM 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.

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 PCOM 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. 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 addition, ODP is cooperating closely with other geological and geophysical programs; for example, in 1991 the first hole was drilled by ODP for emplacement of a seismometer near Hawaii for the Ocean Seismic Network. 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 results to come.



D. James Baker
President
Joint Oceanographic Institutions, Inc.

Washington, D.C.

Preface

The *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* contain specialty papers presenting the results of up to one and one-half years of research in various aspects of scientific ocean drilling. I acknowledge with thanks the authors of the papers published in this volume, who thereby have enabled future investigators to gain ready access to the results of their research.

Each of the papers submitted to a *Scientific Results* volume undergoes rigorous peer review by at least two specialists in the author's research field. A paper typically goes through one or more revision cycles before being accepted for publication. Our goal is to maintain a peer-review system comparable to those of the most highly regarded journals in the geological sciences.

The Editorial Review Board for a *Scientific Results* volume 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 area investigated. In addition, the ODP staff editor assigned to the volume helps with any manuscripts that require special attention, such as those by authors who need assistance with English expression.

Scientific Results volumes may also contain short reports consisting of good data that are not ready for final interpretation. Papers in this category are segregated in a section in the back of the volume called Data Reports. Although no interpretation is permitted, these papers ordinarily contain a section on methodology or procedures. Data Report papers are read carefully by at least one specialist to make sure they are well organized, comprehensive, and discuss the techniques thoroughly.

In acknowledgment of the contributions made by this volume's Editorial Review Board, the members of the Board are designated Editors of the volume and are listed on the title page as well. Reviewers of manuscripts for this volume, whose efforts are so essential to the success of the publication, are listed in the front portion of the book, without attribution to a particular manuscript.

On behalf of the Ocean Drilling Program, I extend sincere appreciation to members of the Editorial Review Boards and to the reviewers for giving so generously of their time and efforts in ensuring that only papers of high scientific quality are published in the *Proceedings*.



Philip D. Rabinowitz
Director
Ocean Drilling Program
Texas A&M University

College Station, Texas

REVIEWERS FOR THIS VOLUME

David Balkwill
Tim Baumgartner
Jan Bloemendal
James R. Boles
Edward Boyle
Wallace S. Broecker
James M. Brooks
Elisabeth Brouwers
William Busch
Roger Byrne
Robert Christian
John S. Compton
Thomas M. Cronin
Kathleen C. Dadey
Owen K. Davis

Walter E. Dean
Benjamin Flower
William C. Ghiorse
Gary H. Girty
D.S. Gorsline
Sarah Gray
Teresa K. Hagelberg
Douglas E. Hammond
Raymond V. Ingersoll
Julie Kennedy
James P. Kennett
Carina Lange
Steven P. Lund
Daniel C. McCorkle
Audrey Wright Meyer

Philip A. Meyers
Alan Mix
T.C. Moore, Jr.
Joseph D. Ortiz
Charles Paull
Fred Prahl
Connie Sancetta
Charles E. Savrda
Michael Schaaf
Hans Schrader
Bernd R.T. Simoneit
Rainer Stax
Ellen Thomas
Scott E. Thornton

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 and Maritime Studies
University of Texas at Austin, Institute for Geophysics
University of Washington, College of Ocean and Fishery Sciences
Woods Hole Oceanographic Institution
Canada/Australia Consortium for the Ocean Drilling Program, Department of Energy, Mines and Resources (Canada) and Department of Primary Industries and Energy (Australia)
European Science Foundation Consortium for Ocean Drilling (Belgium, Denmark, Finland, Greece, Iceland, Italy, The Netherlands, Norway, 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
United Kingdom, Natural Environment Research Council

PRIME CONTRACTOR

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

David A. Falvey
Director, Ocean Drilling Programs

OPERATING INSTITUTION

College of Geosciences and Maritime Studies
Texas A&M University
College Station, Texas

Robert A. Duce
Dean

OCEAN DRILLING PROGRAM

Paul J. Fox
Director

Timothy J.G. Francis
Deputy Director

Richard G. McPherson
Administrator

Jack G. Baldauf, Manager
Science Operations

Barry W. Harding, Manager
Engineering and Drilling Operations

Russell B. Merrill, Curator and Manager
Science Services

Robert E. Olivas, Manager
Technical and Logistics Support

Russell B. Merrill, Manager
Information Services

LOGGING OPERATOR

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

David Goldberg, Head

SHORE-BASED PARTICIPANTS FOR LEG 146*

James P. Kennett

Scientific Coordinator
*Marine Science Institute
Department of Geological Sciences
University of California, Santa Barbara
Santa Barbara, California 93106
U.S.A.*

Jack G. Baldauf

Scientific Coordinator
*Ocean Drilling Program
Texas A&M University Research Park
1000 Discovery Drive
College Station, Texas 77845-9547
U.S.A.*

Richard Behl

*Marine Science Institute
University of California, Santa Barbara
Santa Barbara, California 93106
U.S.A.*

William R. Bryant

*Department of Oceanography
Texas A&M University
College Station, Texas 77843-3146
U.S.A.*

Michael Fuller

*Department of Geological Sciences
University of California, Santa Barbara
Santa Barbara, California 93106
U.S.A.*

Kurt Grimm

*Department of Geological Sciences
University of British Columbia
Vancouver, British Columbia V6T 1Z4
Canada*

Linda Heusser

*Clinton Road
Tuxedo, New York 10987
U.S.A.*

Alan Kemp

*Department of Oceanography
University of Southampton
Southampton SO9 5NH
United Kingdom*

Carina Lange

*Geological Research Division
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, California 92093-0215
U.S.A.*

Steven P. Lund

*Department of Geological Sciences
University of Southern California
3651 University Avenue
Los Angeles, California 90089-0740
U.S.A.*

Russell B. Merrill

*Ocean Drilling Program
Texas A&M University Research Park
1000 Discovery Drive
College Station, Texas 77845-9547
U.S.A.*

Fabrice Olivier

*Department of Geological Sciences
University of California, Santa Barbara
Santa Barbara, California 93106
U.S.A.*

Evelyn Polgreen

*Department of Oceanography
Texas A&M University
College Station, Texas 77843-3146
U.S.A.*

Lisa Pratt

*Department of Geological Sciences
Indiana University, Bloomington
Bloomington, Indiana 47405
U.S.A.*

Frank R. Rack

*Department of Surveying Engineering
Ocean Mapping Group
University of New Brunswick
P.O. Box 4400
Fredericton, New Brunswick E3B 5A3
Canada*

Arndt Schimmelmann

*Geological Research Division
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, California 92093-0215
U.S.A.*

Martha Schwartz

*Department of Geological Sciences
University of Southern California
3651 University Avenue
Los Angeles, California 90089-0740
U.S.A.*

Ruediger Stein

*Alfred-Wegener Institut für Polar und Meeresforschung
Columbusstrasse
D-2850 Bremerhaven
Federal Republic of Germany*

Jürgen Thurow

*Ruhr-Universität Bochum
Postfach 102148
D-44780 Bochum 1
Federal Republic of Germany*

* Addresses at time of cruise.

Ocean Drilling Program Publications Staff*

Publications Supervisor
William D. Rose

Chief Editor
Ann Klaus

Editors
Lona Haskins Dearmont
Eva M. Maddox
Jennifer A. Marin
Ruth N. Riegel

Chief Production Editor
Jennifer Pattison Hall

Production Editors
Karen O. Benson
Jaime A. Gracia
Christine M. Miller
William J. Moran (this volume)

Senior Publications Coordinator
Gudelia ("Gigi") Delgado

Publications Coordinator
Shelley René Cormier

Publications Distribution Specialist
Alexandra F. Moreno

Data Entry/Copier Operator
Ann Yeager

Senior Photographer
John W. Beck

Photographer
Bradley James Cook

Chief Illustrator
Deborah L. Partain

Illustrators
Melany R. Borsack
L. Michelle Briggs
Katherine C. Irwin
Monica E. Rul

Production Assistants
Angeline T. Miller
Mary Elizabeth Mitchell

Student Assistants

Pamela Ivette Baires, Jamee J. Boutell, Rebecca Kapes, Amy Knapp, Lisa Larson, Ivy E. Oliver, M. Kathleen Phillips, Yvonne C. Zissa

Publisher's Notes

Current policy requires that artwork published in *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* be furnished by authors in final camera-ready form.

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).

* At time of publication.

TABLE OF CONTENTS

VOLUME 146—SCIENTIFIC RESULTS PART 2: SANTA BARBARA BASIN

SECTION 1: ISOTOPIC STRATIGRAPHY AND CHRONOLOGY

1. Latest Quaternary benthic oxygen and carbon isotope stratigraphy: Hole 893A, Santa Barbara Basin, California 3
J.P. Kennett
2. Radiocarbon chronology and planktonic-benthic foraminiferal ¹⁴C age differences in Santa Barbara Basin sediments, Hole 893A 19
B.L. Ingram and J.P. Kennett

SECTION 2: SEDIMENTS AND PHYSICAL PROPERTIES

3. Late Pleistocene–Holocene climatic cycles recorded in Santa Barbara Basin sediments: interpretation of color density logs from Site 893 31
M. Schaaf and J. Thurow
4. The ODP color digital imaging system: color logs of Quaternary sediments from the Santa Barbara Basin, Site 893 45
R.B. Merrill and J.W. Beck
5. Provenance of sand deposited in the Santa Barbara Basin at Site 893 during the last 155,000 years 61
K.M. Marsaglia, K.C. Rimkus, and R.J. Behl
6. Composition and origins of laminae in late Quaternary and Holocene sediments from the Santa Barbara Basin 77
D. Bull and A.E.S. Kemp
7. Clay and bulk mineralogy of late Quaternary sediments at Site 893, Santa Barbara Basin 89
R. Stein
8. Centennial-scale late Quaternary stratigraphies of carbonate and organic carbon from Santa Barbara Basin, Hole 893A, and their paleoceanographic significance 103
J.V. Gardner and P. Dartnell
9. A 160,000-year high-resolution record of quantity and composition of organic carbon in the Santa Barbara Basin (Site 893) 125
R. Stein and F.R. Rack
10. Bacterial profiles in deep sediments of the Santa Barbara Basin, Site 893 139
B.A. Cragg, R.J. Parkes, J.C. Fry, A.J. Weightman, J.R. Maxwell, M. Kastner, M. Hovland, M.J. Whiticar, J.C. Sample, and R. Stein
11. Magnetic susceptibility and physical properties of sediment cores from Site 893, Santa Barbara Basin: records of sediment diagenesis or of paleoclimatic and paleoceanographic change? 145
F.R. Rack, E.A. Heise, and R. Stein
12. Interhole correlations at Site 893, Santa Barbara Basin: construction of a 16,000-year composite record using magnetic susceptibility and digital color imaging data 169
F.R. Rack and R.B. Merrill

13. Effects of gas and core handling on measurements of compressional wave velocity in Site 893 cores.	193
N.C. Slowey and W.R. Bryant	

SECTION 3: ORGANIC GEOCHEMISTRY

14. Preliminary assessment of organic geochemical signals in sediments from Hole 893A, Santa Barbara Basin, offshore California.	201
K.-U. Hinrichs, J. Rullkötter, and R. Stein	
15. Episodically strong recycling of methane recorded by ¹³ C/ ¹² C, N/C, and H/C ratios for kerogens from the last 160,000 years in the Santa Barbara Basin at Hole 893A.	213
L.M. Pratt, A.M. Carmo, V. Brüchert, S.M. Monk, and J.M. Hayes	
16. Abundance and isotopic composition of organic and inorganic sulfur species in laminated and bioturbated sediments from Hole 893A, Santa Barbara Basin.	219
V. Brüchert, L.M. Pratt, T.F. Anderson, and S.R. Hoffmann	

SECTION 4: PALEOCEANOGRAPHY AND PALEONTOLOGY

17. A diatom record spanning 114,000 years from Site 893, Santa Barbara Basin.	233
E. Hemphill-Haley and E. Fourtanier	
18. Autochthonous and allochthonous Quaternary Ostracoda from Site 893, Santa Barbara Basin.	251
R. Whatley and I. Boomer	
19. Glacial-interglacial sea-surface temperature record inferred from alkenone unsaturation indices, Site 893, Santa Barbara Basin.	257
T.D. Herbert, M. Yasuda, and C. Burnett	
20. Pollen stratigraphy and paleoecologic interpretation of the 160-k.y. record from Santa Barbara Basin, Hole 893A.	265
L.E. Heusser	
21. Late Quaternary climatically related planktonic foraminiferal assemblage changes: Hole 893A, Santa Barbara Basin, California.	281
J.P. Kennett and K. Venz	
22. Sedimentary facies and sedimentology of the late Quaternary Santa Barbara Basin, Site 893.	295
R.J. Behl	
23. Paleoclimatic evolution of Santa Barbara Basin during the last 20 k.y.: marine evidence from Hole 893A.	309
J.P. Kennett and B.L. Ingram	

SECTION 5: DATA REPORTS

24. <i>Data Report: Calcareous nannofossils of Hole 893A in the Santa Barbara Basin.</i>	329
W. Wei and A. Peleo-Alampay	
25. <i>Data Report: Chemistry of pore fluids in sediments of Hole 893B, Santa Barbara Basin.</i>	331
M. Kastner	
26. <i>Data Report: X-radiography of selected, predominantly varved intervals at Hole 893A.</i>	333
C.B. Lange and A. Schimmelmann	

27. <i>Data Report: Detailed lithostratigraphy of Hole 893A, Santa Barbara Basin, Southern California Continental Borderland</i>	347
R.J. Behl	

SECTION 6: INDEX

Index	355
-------------	-----

(For JOIDES Advisory Groups and ODP Sample Distribution Policy, please see *ODP Proceedings, Scientific Results*, Volume 143, pp. 601–608.)

BACK-POCKET MATERIALS

Oversized Table

Chapter 17: Table 1. Relative abundance (%) of diatoms from Hole 893A, Santa Barbara Basin.

CD-ROM

This volume contains a CD-ROM that includes an electronic version of the volume in Adobe Acrobat. The Acrobat Reader is included for installation on a personal computer (386-based or higher) running Windows 3.1 or a Macintosh computer (68020 or later processor). Also on this CD is a data directory with ASCII copies of data appendixes and tables too large to print in the volume.

Refer to the README file for more information.

Scientific Results, Vol. 146 (Pt. 2), Directory Structure:

Acrobat:

- Mac
 - Copy of Acrobat Reader for Macintosh
- Win
 - Copy of Acrobat Reader for Windows

Book (Acrobat viewing files linked for viewing):

- Chapters
 - Chapters.PDF
- Figures
 - Chapter number_figure number.PDF
- Index
 - Volume index
- Intro_pg
 - Intro.PDF
- Plates
 - Chapter number_plate number.PDF

Data (ASCII data files of appendixes and tables within the volume):

- Chapter 4:
 - Appendix. Color data sets for Holes 893A and 893B.
- Chapter 8:
 - Appendix. Analytical CaCO₃ and C_{org} data from Santa Barbara Basin, Hole 893A.
- Chapter 9:
 - Table 1. Summary table of Hole 893A data.
- Chapter 11:
 - Appendix A. Magnetic susceptibility measurements, Hole 893A.
 - Appendix B. Magnetic susceptibility measurements, Hole 893B.
- Chapter 27:
 - Appendix. Detailed lithostratigraphic log of sediment facies.