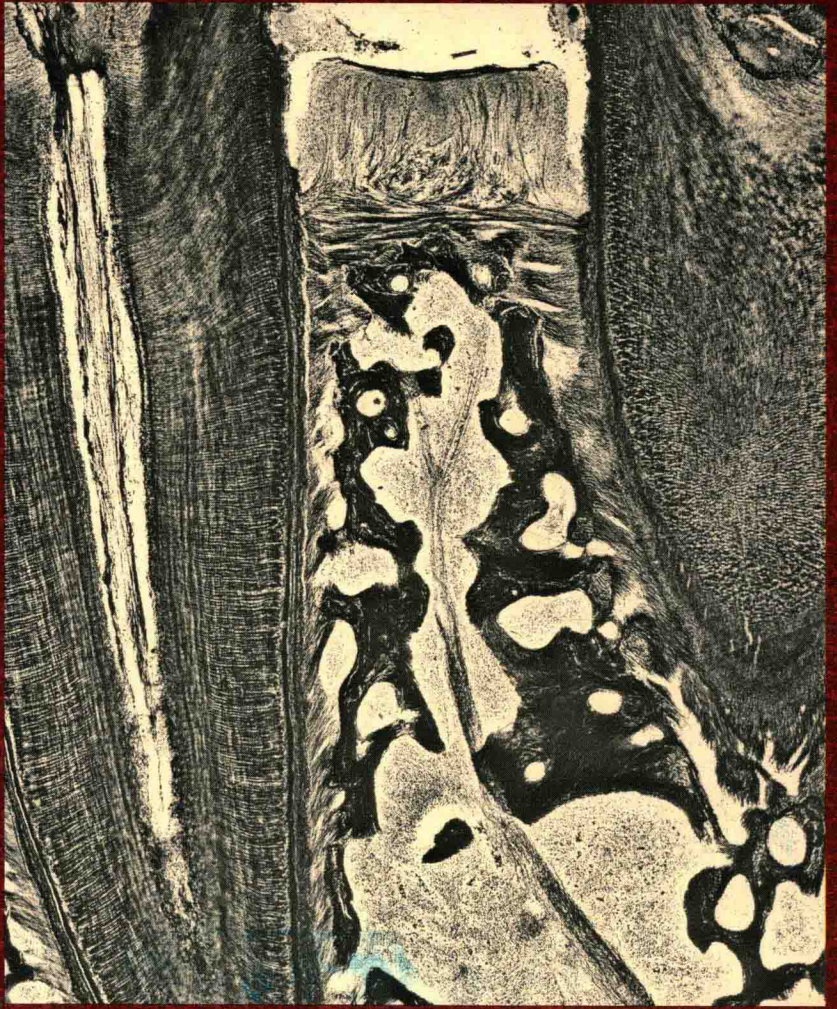


GRANT / STERN / LISTGARTEN

# PERIODONTICS

---



SIXTH EDITION

---

# PERIODONTICS

in the tradition of Gottlieb and Orban

Edited by

## **DANIEL A. GRANT, D.D.S.**

Clinical Professor, Surgical Sciences (Periodontics), University of  
Southern California School of Dentistry

Los Angeles, California;

Clinical Professor, Periodontology

Loyola University School of Dentistry

Chicago, Illinois;

Private Practice

San Diego, California

## **IRVING B. STERN, D.D.S.**

Affiliate Professor of Oral Biology,

University of Washington School of Dentistry

Seattle, Washington;

Formerly, Professor and Chairman, Department of Periodontology

Tufts University School of Dental Medicine

Boston, Massachusetts;

and Professor of Periodontics,

University of Washington School of Dentistry

Seattle, Washington;

Private Practice

Seattle, Washington

## **MAX A. LISTGARTEN, D.D.S.**

Professor and Chairman

Department of Periodontology

University of Pennsylvania

School of Dental Medicine

Philadelphia, Pennsylvania;

Private Practice

Philadelphia, Pennsylvania

SIXTH EDITION

With 1617 illustrations and 8 full-color plates

**The C. V. Mosby Company**

ST. LOUIS • WASHINGTON, D.C. • TORONTO 1988



A TRADITION OF PUBLISHING EXCELLENCE

Editor: Donna Saya Sokolowski  
Assistant editor: Melba Steube  
Production editor: Helen C. Hudlin  
Designer: Rey Umali

Sixth edition

Copyright © 1988 by The C. V. Mosby Company

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher.

Previous editions copyrighted 1958, 1963, 1968, 1972, 1979

Printed in the United States of America

The C. V. Mosby Company  
11830 Westline Industrial Drive, St. Louis, Missouri 63146

Library of Congress Cataloging-in-Publication Data  
Periodontics in the tradition of Gottlieb and Orban.

Rev. ed. of: Periodontics in the tradition of Orban and Gottlieb / Daniel A. Grant, Irving B. Stern, Frank G. Everett. 5th ed. 1979.

Includes bibliographies and index.

1. Periodontics. I. Grant, Daniel A.,  
II. Stern, Irving B. III. Listgarten, Max A. IV. Orban,  
Balint J. (Balint Joseph), 1899-1960. V. Gottlieb,  
Bernhard, 1885- . [DNLM: 1. Periodontal Diseases.  
WU 240 D44756]  
RK361.P465 1987 617.6'32 87-5815  
ISBN 0-8016-2017-1

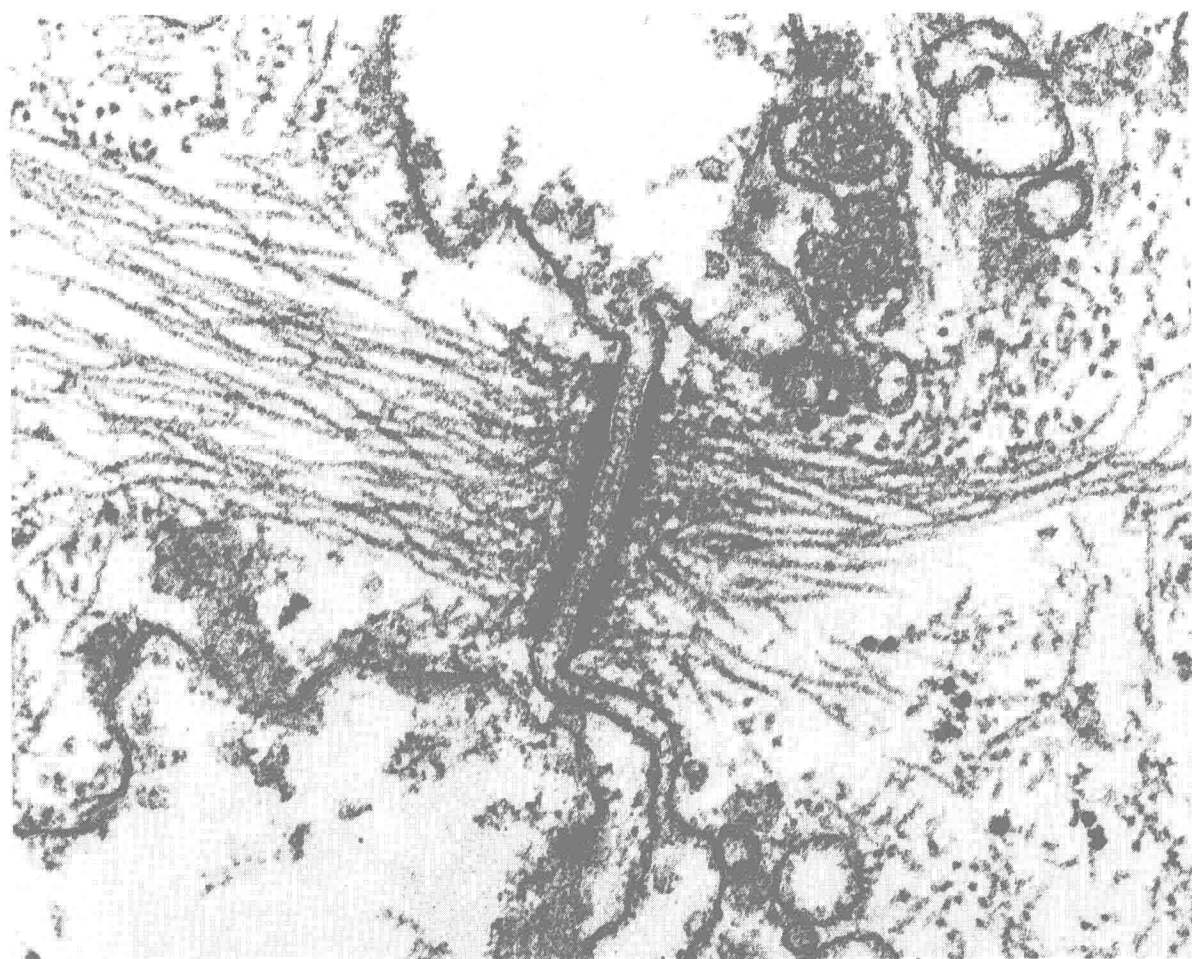
GW/MV/MV 9 8 7 6 5 4

02/D/295

**Front cover**

Periodontitis in a monkey.

A desmosome between two epidermal cells is seen in a very thin section (250 Å). Two cell membranes are separated by a zone of cementing material 300 to 400 Å thick. Within the two cells, filaments of the cytoskeletal system converge toward a dense area at the desmosome. Here they appear continuous with the internal surfaces of the cell membranes. The desmosome is a firm site of intercellular adhesion at which supportive members of the adherent cells are braced. (Courtesy D. Kelly, Los Angeles, California.)



# **PERIODONTICS**

in the tradition of Gottlieb and Orban

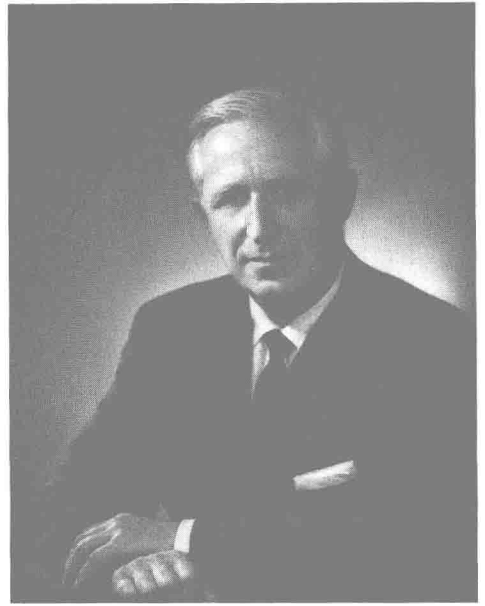
*To our families  
whose assistance and understanding  
have made this work possible*



**BERNHARD GOTTLIEB**

1885-1951

Father of the biologic concept  
of periodontics



**BALINT ORBAN**

1899-1960

A clinician of consummate skill;  
a researcher of an incomparable power  
of observation and an unprejudiced  
intellect in interpretation; a teacher of  
inspiring genius and unstinting generosity;  
a human being of empathy and humility



**FRANK G. EVERETT**

1907-1976

Clinician, researcher, educator;  
a man of intellect,  
an indefatigable worker,  
a trusted colleague

# PREFACE

---

When this book was conceived in the mid 1950s, the goals of simplicity in organization and writing and the inclusion of pertinent data were established. These goals remain. With time, additional goals were added.

*Periodontics* is a learning textbook. It is written for the undergraduate dental student, the general practitioner, and the dental hygienist. Its content and style direct it to the graduate student and the practicing specialist.

Credibility and readability are the design of this book. Clarity and simplicity in language has been our objective, and the organization of chapters is intended to provide cohesiveness of material. The marginal notes serve as a programmed guide for the reader.

The goal of *Periodontics* is to supply the reader with the knowledge necessary to treat periodontal diseases as an integral part of the practice of dentistry.

The effective treatment of periodontal ailments requires that the dentist be well grounded in basic biologic principles and that the prevention and treatment of periodontal diseases be practiced as a part of all dentistry. The dental treatment of the general patient has periodontal considerations, even when extractions and prosthetics are involved. Periodontal treatment can succeed only when needed associated restorative treatment is performed. The converse is also true: successful restorative treatment requires associated periodontal treatment. Dentitions can be preserved and the well-being of the patient promoted only when complete treatment is given. The ability to integrate all phases of dental treatment must be mastered by the general dentist, even in cases in which the cooperation of the specialist is enlisted.

Periodontics, interrelated as it is with all parts of dental practice and with obvious relationships to basic science, is the part of dentistry that can best be used to promote a unified approach to dental treatment. This concept embraces an integration of periodontics, general practice, and biologic principles in a clinical approach called *complete therapy*.

Daniel A. Grant  
Irving B. Stern  
Max A. Listgarten

## ACKNOWLEDGMENTS

---

When this book was conceived about 35 years ago, we realized that with the continuing explosion of knowledge, a persisting challenge would be present: how to weigh what is currently popular with its validity. Demonstrably, what is modish is not necessarily enduring. The recent literature is filled with therapies once popular and since discarded or shelved as unimportant, with biologic interpretations once accepted and now rejected, and with experiments once cited and since refuted. Because prominent objectives of *Periodontics* were readability, clarity, and credibility, their fulfillment has exacted a demanding discipline. The vast scope of periodontics has required help of other workers in periodontology. This text is the result of our efforts with the assistance of other workers in the areas indicated, whose contributions are gratefully acknowledged.

The orientation of this text to the dental student was pursued throughout the writing. Undergraduate students and teachers were asked to review material in an effort to make the text simple and understandable. Despite inevitable change, evidence of their efforts may be found in this sixth edition. Our gratitude is hereby expressed to Michael Alfano, D.D.S., Ph.D.; Charles R. Amen, D.D.S.; Paul Baer, D.D.S.; George Bernard, D.D.S., Ph.D.; Richard E. Bradley, D.D.S., M.S.; Richard Chace, D.D.S.; C. Kenneth Collings, D.D.S., M.A.; Mario Droppelmann, D.D.S.; Cyril Enwonwu, Sc.D., M.D.S., B.D.S.; R.D. Emslie, B.D.S., M.S., F.D.S.; Harold E. Grupe, Sr., D.D.S.; Stanley P. Hazen, D.D.S., M.S.; William Hiatt, D.D.S.; Alvin C. Hileman, D.M.D., M.S.; Leonard Hirschfeld, D.D.S.; Bennett Klavan, D.D.S.; Herbert B. Laffitte, D.D.S.; Jan Lindhe, L.D.S., Odont.D.; Bruce Mackler, Ph.D.; Irwin Mandel, D.D.S.; Nicholas R. Marfino, D.D.S., M.S.; Melvin Morris, D.D.S.; Claude L. Nabers, D.D.S., M.S.D.; John Nabers, D.D.S.; Michael G. Newman, D.D.S.; Timothy O'Leary, D.D.S.; Richard C. Oliver, D.D.S., M.S.D.; R.J. Rizzo, D.D.S.; Robert G. Schallhorn, D.D.S., M.S.D.; Hubert E. Schroeder, D.M.D.; Harry Sicher, M.D.; Richard Stallard, D.D.S., Ph.D.; Roger V. Stambaugh, D.D.S., M.S.; Stanley R. Suit, D.D.S., M.S.; Else Theilade, D.D.S.; Patrick Toto, D.D.S., M.S.; D.E. Van Scotter, D.D.S.; Frank M. Wentz, D.D.S., Ph.D., M.S.; and Helmut A. Zander, D.D.S., M.S.

# CONTRIBUTORS

---

Manuscripts for chapters or parts of chapters were submitted by the distinguished contributors listed below:

Microbiology (plaque)	Sigmund Socransky, D.D.S. A.D. Haffajee, D.D.S. Forsyth Dental Center Boston, Massachusetts
The epidemiology, etiology, and public health aspects of periodontal disease	Aubrey Sheiham, B.D.S. University College The Dental School London, England
Vesicular and bullous diseases (desquamative gingivitis)	Jose Luis Castellanos, D.D.S. Universidad de Bajio Guanajuato, Mexico
Scaling and root planing	Susan B. Wilson, R.D.H., D.Ed. University of Southern California School of Dentistry Los Angeles, California
Bone grafts and transplants	James Mellonig, D.D.S. Naval Graduate School of Dentistry Bethesda, Maryland
Interrelated endodontics-periodontics The periodontally diseased furcation	Marlin Gher, D.D.S. United States Navy San Diego, California
Implants	Daniel van Steenberghe, M.D., L.D.S., Ph.D. Catholic University of Leuven Leuven, Belgium  Charles Berman, D.D.S. Hackensack, New Jersey

Other revised sections of chapters from the 5th edition:

Calculus	Jorgen Theilade, D.D.S., B.Sc.D., M.S. Forsyth Dental Center Boston, Massachusetts
Immunology and host response	Jon Suzuki, D.D.S., Ph.D. University of Maryland College of Dentistry Baltimore, Maryland

Howard R. Creamer, Ph.D.  
The Oregon Health Sciences University  
School of Dentistry  
Portland, Oregon

Steven C. Schonfeld, D.D.S., Ph.D.  
University of Southern California  
School of Dentistry  
Los Angeles, California

Edward H. Montgomery, Ph.D.  
The University of Texas  
Health Science Center at Houston  
Dental Branch  
Houston, Texas

Pharmacology

Max Goodson, D.D.S., Ph.D.  
Forsyth Dental Center  
Boston, Massachusetts

Classification

Thomas W. Weatherford III, D.V.M., D.M.D., M.S.  
University of Alabama  
School of Dentistry  
Birmingham, Alabama

Plaque control, root sensitivity

Joyce Litch, D.D.S., R.D.H., M.S.  
University of the Pacific  
School of Dentistry  
San Francisco, California

Periodontal osseous resection

Robert E. Lamb, D.D.S., M.S.D.  
James O. Bartlett, D.D.S.  
University of the Pacific  
School of Dentistry  
San Francisco, California

Mucogingival surgery

Walter B. Hall, D.D.S., M.S.  
University of the Pacific  
School of Dentistry  
San Francisco, California

In addition, we wish to recognize the contributions of the following who reviewed and revised chapters and provided material for this edition:

Donald Adams, D.D.S., M.S.  
The Oregon Health Sciences University  
School of Dentistry  
Portland, Oregon

Oded Bahat, D.D.S., M.S.D.  
University of Southern California  
School of Dentistry  
Los Angeles, California

Sol Bernick, Ph.D.  
University of Southern California  
School of Medicine  
Los Angeles, California

Israel Speckman Borg, D.D.S.  
Mexico City, Mexico

Anthony Gargiulo, D.D.S., M.S.  
Loyola University  
School of Dentistry  
Maywood, Illinois

O.M. Gupta, B.D.S., D.M.D., M.S., M.S.D., D.P.H.  
Howard University  
College of Dentistry  
Washington, D.C.

Phillip Hoag, D.D.S.  
University of Illinois  
College of Dentistry  
Chicago, Illinois

Mansoor H. Jabro, B.D.S., M.S.D.  
Creighton University  
Boyne School of Dental Science  
Omaha, Nebraska

Charles Joseph, D.D.S., Ph.D.  
University of Southern California  
School of Dentistry  
Los Angeles, California

Katsuei Mori, D.D.S.  
Tokyo, Japan

Jon E. Peterson, D.D.S.  
San Diego, California

Gerald J. Tussing, D.D.S., M.S.D.  
University of Nebraska  
College of Dentistry  
Lincoln, Nebraska

Material on saliva was provided originally by Dr. Irwin Mandel. Dr. Michael J. Levine added material on salivary glycoproteins in plaque, and Dr. Murray Robinovitch reviewed the chapter on saliva. The chapter on nutrition was originally written by Dr. Cyril Enwonwu and revised by Dr. Michael Alfano. Dr. Stanley Hazen contributed to the chapter on calculus. The chapter on immune mechanisms contains the work of Dr. Bruce Mackler. Dr. Anthony Gargiulo contributed material on dimensions of the dentogingival junction. Marmoset specimens, microscopic slides of which appear in the text, were provided by Dr. Barnett Levy; the histologic preparation was by Dr. Sol Bernick.

Dr. William S. Lavine provided material on neutrophil function in periodontosis. Dr. Oded Bahat updated the important chapter on the periodontal flap. Dr. Phillip Hoag reviewed and modified the chapter on maintenance. Dr. Charles Joseph collaborated in the revision of the chapter on scaling and root planing.

Dr. Leonard Hirschfeld provided information for the chapters on prognosis and the treated patient. Mrs. Valerie Haynes Schwartz and Miss Danielle Grant assisted in plaque control. Material on bone grafts was contributed by Drs. Gerald Bowers, William Hiatt, Robert Schallhorn, John Nabers, Harold Meader, and Edward F. Sugarman. Histologic material on wound healing was provided by Drs. Malbern Wilderman, Mick Dragoo, Jan Egelberg, and Max Crigger. Other histologic material was contributed by Drs. Hubert Schroeder, Roy Page, and George Bernard.

Dr. Bennett Klavan and Dr. Patrick Pierre contributed to furcation involvements. Dr. Clifford Ochsenbein contributed to osseous resection. Dr. Richard Chace wrote material for the treated patient. Dr. Herman Corn and Dr. Edwin Rosenberg contributed to preprosthetic surgery. Manuel H. Marks contributed material on orthodontic therapy. Dr. Terry Tanaka reviewed the chapter on treatment of periodontal trauma. Virginia Grant struggled to keep us organized.

Assistance in illustrative material and text were provided by distinguished contributors:

Daniel Etienne, D.C.D., M.S.  
Paris, France

Alain Fontanelle, D.C.D., M.S.  
Paris, France

Hilton Israelson, D.D.S.  
Richardson, Texas

Robert Jaffin, D.D.S.  
Hackensack, New Jersey

Clifford D. Kopp, D.D.S.  
New York, New York

Michelle Lavier, D.C.D., M.S.  
Paris, France

Dan M. Loughlin, D.D.S.  
Arlington, Texas

Andre Saadoun, D.D.S.  
Los Angeles, California

We express our appreciation for the contributions that have so enhanced and added to our own work. *In all areas, we either wrote or revised contributed material, and the final wording and the concepts expressed herein are our responsibility.*

# CONTENTS

---

## **PART ONE: Introduction**

- 1 Periodontal health and disease, 3

## **PART TWO: Structure, Physiology, and Pathophysiology of the Periodontium**

- 2 Gingiva and dentogingival junction, 25
- 3 Periodontal ligament, 56
- 4 Cementum, 76
- 5 Alveolar process, 94
- 6 Periodontal structure in ageing humans, 119
- 7 Saliva, 135
- 8 Microbiology (plaque), 147
- 9 Calculus, 198
- 10 The epidemiology, etiology, and public health aspects of periodontal disease, 216
- 11 Host response: inflammation, 252
- 12 Immunology of periodontal diseases, 266
- 13 Diet and nutrition, 293
- 14 Other contributory etiologic factors, 307

## **PART THREE: Periodontal Diseases**

- 15 Gingivitis, 315
- 16 Periodontitis, 348
- 17 Early-onset periodontitis, 376
- 18 Necrotizing ulcerative gingivitis, 398
- 19 Viral infections, 413
- 20 Pericoronitis, 421
- 21 Abscesses and cysts, 425
- 22 Vesicular and bullous diseases (desquamative gingivitis), 434
- 23 Gingival recession, 460
- 24 Gingival enlargement: hyperplastic and inflammatory enlargement, 469
- 25 Role of occlusion in periodontal disease, 479

## **PART FOUR: Elements of Therapeutic Judgment**

- 26 Psychologic aspects of periodontics, 513
- 27 Doctor-patient relationship, 520
- 28 Examination and diagnosis: classification, 525
- 29 Prognosis, 573
- 30 Treatment plan, 592

## **PART FIVE: Initial Nonsurgical Therapy**

- 31 Plaque control (oral hygiene, chemical plaque control), root sensitivity, and halitosis, 611
- 32 Scaling and root planing, 650

## **PART SIX: Surgery**

- 33 Preparations for periodontal surgery, 719
- 34 Gingival and subgingival curettage: curettage of the pocket wall, 740
- 35 Gingivectomy and gingivoplasty, 761
- 36 Periodontal flap, 786
- 37 Open subgingival curettage: surgical curettage by flap, modified Widman flap procedure, new attachment-reattachment operations, and guided tissue regeneration, 823
- 38 Periodontal osseous resection, 838
- 39 Bone grafts and transplants, 860
- 40 Mucogingival surgery, 883
- 41 Interrelated endodontics-periodontics, 911
- 42 The periodontally diseased furcation, 921
- 43 Preprosthetic surgery, 950

## **PART SEVEN: Occlusal and Reconstructive Aspects of Therapy**

- 44 Treatment of periodontal trauma, 969
- 45 Orthodontic measures in periodontal therapy, 1017
- 46 Restorative and prosthetic dentistry, 1045
- 47 Splinting and stabilization, 1056
- 48 Implants, 1075

## **PART EIGHT: Maintenance**

- 49** The treated patient: maintenance and expectations; clinical trials; retrospective studies, 1095

## **COLOR PLATES**

---

- 1** Inflammation, enlargement, and recession in diseased gingival tissues, 15
- 2** Common conditions affecting the periodontal tissues, 20
- 3** Common findings affecting the periodontal tissues, 21
- 4** Clinical and microscopic tissue changes during incipient, developing, and chronic gingivitis, 338
- 5** Clinical and microscopic tissue changes in established (chronic) gingivitis, 340
- 6** Characteristic features of periodontitis, 366
- 7** Gingival responses to plaque antigens, 534
- 8** Clinical plaque experiments, 614