

Hands-On Ablation

**Amin
Al-Ahmad**

**David J.
Callans**

**Henry H.
Hsia**

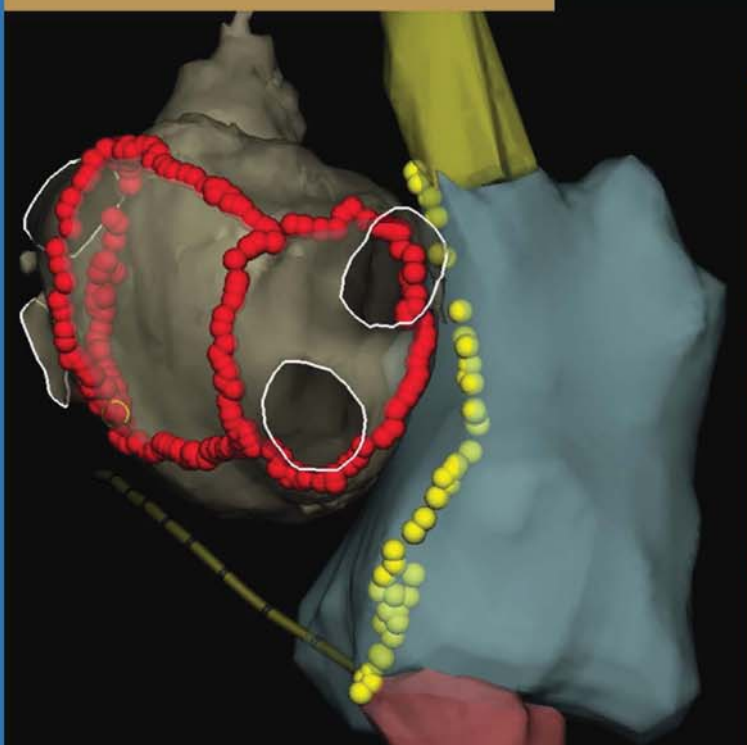
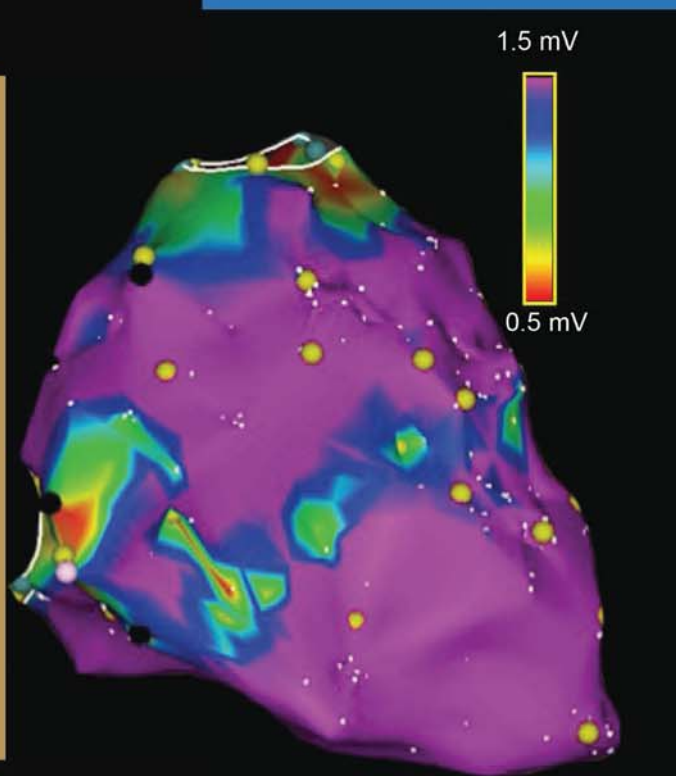
**Andrea
Natale**

**Oscar
Oseroff**

**Paul J.
Wang**

Editors

**The
Experts'
Approach**



Online Access



The purchase of a new copy of this book (with shrink-wrap) entitles the first retail purchaser to free personal online access to a digital version of this edition that includes full text and videos.

To access, use the code below and register at:

www.ablation.cardiotextpublishing.com

This book cannot be returned once access is activated.

For institutional licensing, please check with your librarian or contact Cardiotext Publishing at info@cardiotextpublishing.com.

Hands-On Ablation: The Experts' Approach

Hands-On Ablation: The Experts' Approach

EDITORS

Amin Al-Ahmad MD, FACC, FHRS
Stanford University, Stanford, California

David J. Callans MD
University of Pennsylvania, Philadelphia, Pennsylvania

Henry H. Hsia MD, FACC, FHRS
Stanford University, Stanford, California

Andrea Natale MD, FACC, FHRS, FESC
Texas Cardiac Arrhythmia Institute at St. David's Medical Center, Austin, Texas

Oscar Oseroff MD, FHRS
Bazterrica Clinic, Buenos Aires, Argentina

Paul J. Wang MD, FACC, FHRS
Stanford University, Stanford, California

© 2013 Amin Al-Ahmad, David J. Callans, Henry H. Hsia, Andrea Natale, Oscar Oseroff, Paul J. Wang

Cardiotext Publishing, LLC
3405 W. 44th Street
Minneapolis, Minnesota 55410
USA

www.cardiotextpublishing.com

Any updates to this book may be found at: www.cardiotextpublishing.com/titles/detail/9781935395249

Comments, inquiries, and requests for bulk sales can be directed to the publisher at: info@cardiotextpublishing.com.

All rights reserved. No part of this book may be reproduced in any form or by any means without the prior permission of the publisher.

All trademarks, service marks, and trade names used herein are the property of their respective owners and are used only to identify the products or services of those owners.

This book is intended for educational purposes and to further general scientific and medical knowledge, research, and understanding of the conditions and associated treatments discussed herein. This book is not intended to serve as and should not be relied upon as recommending or promoting any specific diagnosis or method of treatment for a particular condition or a particular patient. It is the reader's responsibility to determine the proper steps for diagnosis and the proper course of treatment for any condition or patient, including suitable and appropriate tests, medications, or medical devices to be used for or in conjunction with any diagnosis or treatment.

Due to ongoing research, discoveries, modifications to medicines, equipment and devices, and changes in government regulations, the information contained in this book may not reflect the latest standards, developments, guidelines, regulations, products, or devices in the field. Readers are responsible for keeping up to date with the latest developments and are urged to review the latest instructions and warnings for any medicine, equipment, or medical device. Readers should consult with a specialist or contact the vendor of any medicine or medical device where appropriate.

Except for the publisher's website associated with this work, the publisher is not affiliated with and does not sponsor or endorse any websites, organizations, or other sources of information referred to herein.

The publisher and the authors specifically disclaim any damage, liability, or loss incurred, directly or indirectly, from the use or application of any of the contents of this book.

Unless otherwise stated, all figures and tables in this book are used courtesy of the authors.

Library of Congress Control Number: 2012949102

ISBN: 978-1-935395-24-9

Printed in the United States of America

CONTENTS

Contributors	xi
Foreword	xix
Preface	xxi
Abbreviations	xxiii

SECTION I: Ablation of Supraventricular Tachycardia..... 1

Chapter 1: How to Rapidly Diagnose Supraventricular Tachycardia (SVT) in the Electrophysiology Lab	3
<i>Luis F. Couchonnal, Bradley P. Knight</i>	
Chapter 2: How to Ablate Typical and Reverse Atrial Flutter	11
<i>John C. Evans, Donald D. Hoang, Mintu P. Turakhia</i>	
Chapter 3: How to Ablate Atrial Flutter Postsurgery	23
<i>George F. Van Hare</i>	
Chapter 4: The Ablation of Atrial Tachycardia	33
<i>Patrick M. Heck, Peter M. Kistler, Andrew W. Teh, Jonathan M. Kalman</i>	
Chapter 5: How to Ablate Atrial Tachycardias in Patients with Congenital Heart Disease	39
<i>John K. Triedman</i>	
Chapter 6: How to Perform Radiofrequency and Cryoablation Ablation for AV Nodal Reentrant Tachycardia	51
<i>Paul J. Wang, Zhongwei Cheng</i>	
Chapter 7: Ablation of Left-Lateral Accessory Pathways	59
<i>Abram Mozes, Mark S. Link, Ann C. Garlitski, Jonathan Weinstock, Munther Homoud, N. A. Mark Estes III</i>	
Chapter 8: Catheter Ablation of Accessory Pathways	64
<i>Hiroshi Nakagawa, Warren M. Jackman</i>	

Chapter 9: Right-Sided Accessory Pathways	72
<i>Anne M. Dubin</i>	
Chapter 10: How to Diagnose, Map, and Ablate AVRT Due to Atriofascicular Conduction Fibers	81
<i>Melvin M. Scheinman, David S. Kwon</i>	
Chapter 11: How to Ablate Accessory Pathways in Patients with Ebstein's Syndrome	85
<i>Christina Y. Miyake</i>	
SECTION II: Ablation of Atrial Fibrillation	95
Chapter 12: How to Perform a Transseptal Puncture	97
<i>Gregory E. Supple, David J. Callans</i>	
Chapter 13: How to Utilize ICE for Optimal Safety and Efficacy with AF Ablation	107
<i>Mathew D. Hutchinson</i>	
Chapter 14: How to Perform Pulmonary Vein Antrum Isolation for Atrial Fibrillation	120
<i>Marco V. Perez, Amin Al-Ahmad, Andrea Natale</i>	
Chapter 15: How to Perform Circumferential Ablation for Atrial Fibrillation	129
<i>Carlo Pappone, Vincenzo Santinelli</i>	
Chapter 16: How to Perform Ablation of Atrial Fibrillation by Targeting Complex Fractionated Atrial Electrograms	139
<i>Koonlawee Nademane, Montawatt Amnuaypol</i>	
Chapter 17: How to Ablate Long-Standing Persistent Atrial Fibrillation Using a Stepwise Approach (The Bordeaux Approach)	147
<i>Daniel Scherr, Michala Pedersen, Ashok J. Shah, Sébastien Knecht, Pierre Jaïs</i>	
Chapter 18: How to Ablate Long-Standing Persistent Atrial Fibrillation Using a Stepwise Approach (The Natale Approach)	159
<i>Luigi Di Biase, Pasquale Santangeli, Andrea Natale</i>	
Chapter 19: How to Use Balloon Cryoablation for Ablation of Atrial Fibrillation	167
<i>Pipin Kojodjojo, D. Wyn Davies</i>	
Chapter 20: How to Perform Pulmonary Vein Isolation Using Laser Catheter Ablation	175
<i>Edward P. Gerstenfeld</i>	
Chapter 21: The Combined Surgical/Endocardial Ablation Procedure for Atrial Fibrillation	182
<i>Rodney P. Horton, Luigi Di Biase, Andrew T. Hume, James R. Edgerton, Javier E. Sánchez, Andrea Natale</i>	
Chapter 22: How to Perform a Hybrid Surgical Epicardial and Catheter Endocardial Ablation for Atrial Fibrillation	189
<i>Srijoy Mahapatra, Gorav Ailawadi</i>	
Chapter 23: How to Ablate the Vein of Marshall	202
<i>Seongwook Han, Peng-Sheng Chen, Chun Hwang</i>	
Chapter 24: Diagnosis and Ablation of Atrial Tachycardias Arising in the Context of Atrial Fibrillation Ablation	210
<i>Amir S. Jadidi, Ashok J. Shah, Mèlèze Hocini, Michel Haïssaguerre, Pierre Jaïs</i>	

Chapter 25: How to Perform 3-Dimensional Entrainment Mapping to Treat Post-AF Ablation Atrial Tachycardia/AFL.	220
<i>Philipp Sommer, Christopher Piorkowski, Gerhard Hindricks</i>	
Chapter 26: Catheter Ablation of Autonomic Ganglionated Plexi in Patients with Atrial Fibrillation	227
<i>Hiroshi Nakagawa, Benjamin J. Scherlag, Warren M. Jackman</i>	
Chapter 27: How to Use Electroanatomic Mapping to Rapidly Diagnose and Treat Post-AF Ablation Atrial Tachycardia and Flutter	234
<i>Aman Chugh</i>	
Chapter 28: How to Utilize Frequency Analysis to Aid in Atrial Fibrillation Ablation.	248
<i>Yenn-Jiang Lin, Li-Wei Lo, Shib-Ann Chen</i>	
Chapter 29: Utilization of the Hansen Robotic Catheter Navigation System: The Austin Approach.	259
<i>G. Joseph Gallinghouse, Luigi Di Biase, Andrea Natale</i>	
Chapter 30: How to Perform Atrial Fibrillation Ablation Using Remote Magnetic Navigation	267
<i>J. David Burkhardt, Matthew Dare, Luigi Di Biase, Pasquale Santangeli, Andrea Natale</i>	
Chapter 31: How to Perform Accurate Image Registration with Electroanatomic Mapping Systems	275
<i>Francesco Perna, Moussa Mansour</i>	
Section III: Ablation of Ventricular Tachycardia.	281
Chapter 32: How to Localize Ventricular Tachycardia Using a 12-Lead ECG	283
<i>Hicham El Masry, John M. Miller</i>	
Chapter 33: How to Diagnose and Ablate Ventricular Tachycardia from the Outflow Tract and Aortic Cusps.	292
<i>Takumi Yamada, G. Neal Kay</i>	
Chapter 34: How to Diagnose and Ablate Fascicular Ventricular Tachycardia	302
<i>Frederick T. Han, Nitish Badhwar</i>	
Chapter 35: How to Map and Ablate Hemodynamically Tolerated Ventricular Tachycardias	313
<i>Kojiro Tanimoto, Henry H. Hsia</i>	
Chapter 36: How to Map and Ablate Unstable Ventricular Tachycardia: The University of Pennsylvania Approach	331
<i>Wendy S. Tzou, Francis E. Marchlinski</i>	
Chapter 37: How to Map and Ablate Unstable Ventricular Tachycardia: The Brigham Approach	341
<i>Usha B. Tedrow, William G. Stevenson</i>	
Chapter 38: How to Map and Ablate Ventricular Tachycardia Using Delayed Potential in Sinus Rhythm.	350
<i>Eduardo Castellanos, Jesús Almendral, Carlos De Diego</i>	

Chapter 39: How to Utilize Electroanatomical Mapping to Identify Critical Channels for Ventricular Tachycardia Ablation	360
<i>Henry H. Hsia, Kojiro Tanimoto</i>	
Chapter 40: How to Use Noncontact Mapping for Catheter Ablation of Ventricular Tachycardia	373
<i>Jason T. Jacobson</i>	
Chapter 41: How to Use ICE to Aid in Catheter Ablation of Ventricular Tachycardia	385
<i>Marc W. Deyell, Mathew D. Hutchinson, David J. Callans</i>	
Chapter 42: How to Perform an Epicardial Access	399
<i>Mauricio I. Scanavacca, Sissy Lara Melo, Carina A. Hardy, Cristiano Pisani, Eduardo Sosa</i>	
Chapter 43: Transcoronary Ethanol Ablation for Ventricular Tachycardia.	407
<i>Karin K. M. Chia, Paul C. Zei</i>	
Chapter 44: How to Perform Epicardial Ablation in Postcardiac Surgery Patients	414
<i>Sheldon M. Singh, James O. Coffey, Andre d'Avila</i>	
Chapter 45: How to Perform Endocardial/Epicardial Ventricular Tachycardia Ablation.	419
<i>J. David Burkhardt, Luigi Di Biase, Matthew Dare, Pasquale Santangeli, Andrea Natale</i>	
Chapter 46: How to Ablate Ventricular Fibrillation Arising from the Structurally Normal Heart	428
<i>Shinsuke Miyazaki, Ashok J. Shah, Michel Haïssaguerre, Mélèze Hocini</i>	
Chapter 47: How to Ablate Ventricular Tachycardia in Patients with Congenital Heart Disease	435
<i>Katja Zeppenfeld</i>	
Chapter 48: Catheter Ablation of Ventricular Tachycardia in Sarcoidosis / Hypertrophic Cardiomyopathy.	450
<i>Kyoko Soejima, Akiko Ueda, Masaomi Chinushi</i>	
Chapter 49: How to Ablate Ventricular Tachycardia in Patients with Arrhythmogenic Right Ventricular Cardiomyopathy/Dysplasia.	462
<i>Fermin C. Garcia, Victor Bazan</i>	
Chapter 50: How to Perform Hybrid VT Ablation in the Operating Room	471
<i>Paolo Della Bella, Giuseppe Maccabelli, Francesco Alamanni</i>	
Index	487

To Rola, Maya, Dana, and Mohammad, for the constant love and support.

—Amin Al-Ahmad

This book is dedicated to my lovely wife Linda, who loves me despite all the time I invest in projects such as this, and to all students and teachers of cardiac electrophysiology.

—Dave Callans

To my family, for their continuous support and guidance; to my parents, for their encouragement and illumination.

—Henry H. Hsia

To my lovely wife Marina and our beautiful daughters Veronica and Eleonora.

—Andrea Natale

To my loving wife Solange, my sons Pablo and Martin, my parents, and my brother, for their endless understanding and support.

—Oscar Oseroff

To my lovely wife Gloria, my wonderful daughters Margaret and Katie, and the memory of my parents, Samuel and Lillian.

—Paul Wang

CONTRIBUTORS

Editors

Amin Al-Ahmad, MD, FACC, FHRS
Assistant Professor, Department of Medicine,
Stanford University School of Medicine; Associate
Director of the Cardiac Arrhythmia Service and
Director of the Cardiac Electrophysiology
Laboratory, Stanford University, Stanford, California

David J. Callans, MD
Professor of Medicine, University of Pennsylvania
School of Medicine, Department of Medicine,
Division of Cardiovascular Medicine, Philadelphia,
Pennsylvania

Henry H. Hsia, MD, FACC, FHRS
Associate Professor of Medicine, Stanford University
School of Medicine; Cardiac Electrophysiology and
Arrhythmia Service, Stanford University, Stanford,
California

Andrea Natale, MD, FACC, FHRS, FESC
Executive Medical Director, Texas Cardiac
Arrhythmia Institute, St. David's Medical Center,
Austin, Texas; Consulting Professor, Division of
Cardiology, Stanford University, Palo Alto,
California; Clinical Professor of Medicine, Case
Western Reserve University, Cleveland, Ohio;
Director, Interventional Electrophysiology, Scripps
Clinic, San Diego, California; Senior Clinical
Director, EP Services, California Pacific Medical
Center, San Francisco, California

Oscar Oseroff, MD, FHRS
Chief of Pacing and Electrophysiology,
Electrophysiology Department, Bazterrica Clinic,
Buenos Aires, Argentina

Paul J. Wang, MD, FACC, FHRS
Professor, Department of Medicine, Stanford
University School of Medicine; Director of the
Cardiac Arrhythmia Service, Stanford University,
Stanford, California

Contributors

Gorav Ailawadi, MD
Associate Professor, TCV Surgery, University of
Virginia; Biomedical Engineering, University of
Virginia, Charlottesville, Virginia

Francesco Alamanni, MD
Department of Cardiac Surgery, University of
Milan, Centro Cardiologico, Monzino, Italy

Jesús Almendral, MD, PhD, FESC
Unidad de Electrofisiología Cardíaca y Arritmología
Clínica, Grupo Hospital de Madrid, Universidad
CEU-San Pablo, Madrid, Spain

Montawatt Amnueypol, MD
Pacific Rim Research Institute at White Memorial
Hospital, Los Angeles, California; Bangkok Medical
Center, Bangkok, Thailand

Nitish Badhwar, MBBS, FACC, FHRS
Director, Cardiac Electrophysiology Training
Program; Associate Chief, Cardiac
Electrophysiology, Medicine/Cardiology, University
of California, San Francisco, California

Victor Bazan, MD, PhD
Attending Physician, Electrophysiology Unit,
Cardiology Department, Hospital del Mar,
Barcelona, UAB, Barcelona, Spain

J. David Burkhardt, MD, FACC, FHRS
Director of Research, Texas Cardiac Arrhythmia
Institute, Austin, Texas; Director of Complex
Arrhythmia Ablation, Scripps Clinic, La Jolla,
California

Eduardo Castellanos, MD, PhD
Unidad de Electrofisiología Cardíaca y Arritmología
Clínica, Grupo Hospital de Madrid, Universidad
CEU-San Pablo, Madrid, Spain

Peng-Sheng Chen, MD, FHRS
Medtronic Zipes Chair in Cardiology; Director,
Krannert Institute of Cardiology; Chief, Division of
Cardiology, Department of Medicine, Indiana
University School of Medicine, Indianapolis,
Indiana

Shih-Ann Chen, MD, FHRS
Professor, Institute of Clinical Medicine, and
Cardiovascular Research Center, National Yang-
Ming University, Taipei, Taiwan; Division of
Cardiology, Department of Medicine, Taipei
Veterans General Hospital, Taipei, Taiwan

Zhongwei Cheng, MD
Cardiologist, Department of Cardiology, Peking
Union Medical College Hospital, Peking Union
Medical College and Chinese Academy of Medical
Sciences, Beijing, China

Karin K. M. Chia, MBBS, FRACP
Staff Specialist Cardiac Electrophysiologist, Senior
Lecturer, Royal Brisbane and Women's Hospital,
The University of Queensland, Herston,
Queensland, Australia

Masaomi Chinushi, MD, PhD
Associate Professor, School of Health Science,
Niigata University School of Medicine, Niigata,
Japan

Aman Chugh, MD, FACC
Associate Professor of Medicine, Section of
Electrophysiology, Division of Cardiology,
University of Michigan Medical School/University
of Michigan Hospital, Ann Arbor, Michigan

James O. Coffey, MD
Assistant Professor of Medicine, Department of
Cardiac Electrophysiology, Miller School of
Medicine, University of Miami, Miami, Florida

Luis F. Couchonnal, MD
Electrophysiologist, Alegent Creighton Health
Omaha, Nebraska

Andre d'Avila, MD, PhD
Associate Professor of Medicine; Co-Director
Cardiac Arrhythmia Service, Helmsley Cardiac
Arrhythmia Service, Mount Sinai School of
Medicine, New York, New York

Matthew Dare, CEPS
Research, Technology, and Education Coordinator,
Texas Cardiac Arrhythmia Institute, St. David's
Medical Center, Austin, Texas

D. Wyn Davies, MD, FRCP, FHRS
Consultant Cardiologist, Department of Cardiology,
St. Mary's Hospital, Imperial College Healthcare
NHS Trust, London, United Kingdom

Carlos De Diego, MD

Unidad de Electrofisiología Cardíaca y Arritmología
Clínica, Grupo Hospital de Madrid, Universidad
CEU-San Pablo, Madrid, Spain

Paolo Della Bella, MD, FESC

Arrhythmia Unit and Electrophysiology
Laboratories, Department of Cardiology and
Cardiothoracic Surgery, San Raffaele Hospital,
Milan, Italy

Marc W. Deyell, MD, MSc

Electrophysiology Fellow, Department of Medicine,
Division of Cardiovascular Diseases, University of
Pennsylvania School of Medicine, Philadelphia,
Pennsylvania

Luigi Di Biase, MD, PhD, FHRS

Cardiologist, Electrophysiologist, Senior Researcher,
Texas Cardiac Arrhythmia Institute at St. David's
Medical Center, Austin, Texas; Adjunct Associate
Professor, Department of Biomedical Engineering,
University of Texas at Austin, Austin, Texas; Clinical
Assistant Professor, Department of Cardiology,
University of Foggia, Foggia, Italy

Anne M. Dubin, MD

Associate Professor of Pediatrics; Director, Pediatric
Arrhythmia Center, Department of Pediatrics,
Lucile Packard Children's Hospital, Stanford
University, Palo Alto, California

James R. Edgerton, MD, FACS, FACC, FHRS

Co-Director, Arrhythmia Center of Innovation;
Director of Research, Education, and Training, The
Heart Hospital, Plano, Texas

Hicham El Masry, MD

Director of Cardiac Electrophysiology, Marion
General Hospital, Marion, Indiana

N. A. Mark Estes III, MD, FACC, FHRS, FAHA, FESC

Professor of Medicine, Tufts University School of
Medicine, New England Cardiac Arrhythmia
Center, Tufts Medical Center, Boston,
Massachusetts

John C. Evans, MD

Clinical Cardiac Electrophysiologist, Renown
Institute for Heart and Vascular Health, Reno,
Nevada

G. Joseph Gallinghouse, MD

Cardiac Electrophysiologist, Texas Cardiac
Arrhythmia Institute, St. David's Medical Center,
Austin, Texas

Fermin C. Garcia, MD

Cardiac Electrophysiologist, Hospital of the
University of Pennsylvania, University of
Pennsylvania, Perelman School of Medicine,
Philadelphia, Pennsylvania

Ann C. Garlitski, MD, FACC, FHRS

Assistant Professor of Medicine, Tufts University
School of Medicine, New England Cardiac
Arrhythmia Center, Tufts Medical Center, Boston,
Massachusetts

Edward P. Gerstenfeld, MD, FACC, FHRS

Associate Professor of Medicine; Chief, Cardiac
Electrophysiology, Section of Cardiac
Electrophysiology, Department of Medicine,
University of California, San Francisco, California

Michel Haïssaguerre, MD

Hôpital Cardiologique du Haut-Lévêque and the
Université Victor Segalen Bordeaux II, Bordeaux,
France

Frederick T. Han, MD

Medicine/Cardiology, University of California,
San Francisco, California

Seongwook Han, MD, PhD, FHRS

Central Utah Clinic—Cardiology, Provo, Utah

Carina A. Hardy, MD

Medical Staff of Cardiac Arrhythmia Unit, Instituto
do Coração (InCor), Faculdade de Medicina da
Universidade de São Paulo (Heart Institute,
University of São Paulo Medical School), São Paulo,
Brazil

Patrick M. Heck, BM, BCh, DM
Consultant Cardiologist, Department of Cardiology,
Papworth Hospital, Cambridge, United Kingdom

Gerhard Hindricks, MD, PhD
Head of Department, Department of
Electrophysiology, Heart Center, University of
Leipzig, Leipzig, Germany

Donald D. Hoang, BA
Research Associate, Department of Cardiology,
Cardiac Electrophysiology Section, Veterans Affairs
Palo Alto Health Care System, Palo Alto, California

Mélèze Hocini, MD
Hôpital Cardiologique du Haut-Lévêque and the
Université Victor Segalen Bordeaux II, Bordeaux,
France

Munther Homoud, MD, FACC, FHRS
Director, CCEP Fellowship Program; Associate
Professor of Medicine, New England Cardiac
Arrhythmia Center, Tufts University School of
Medicine, Tufts Medical Center, Boston,
Massachusetts

Rodney P. Horton, MD
Texas Cardiac Arrhythmia Institute, Adjunct
Professor, Department of Biomedical Engineering,
Cockrell School of Engineering, University of Texas,
Austin; Adjunct Assistant Professor, Division of
Cardiology, Department of Medicine, University of
Texas Health Sciences Center, San Antonio, Texas

Andrew T. Hume, MD
Director of Surgical Arrhythmias, St. David's
Medical Center, Austin, Texas

Mathew D. Hutchinson, MD, FACC, FHRS
Assistant Professor of Medicine, Cardiovascular
Division, Department of Medicine, University of
Pennsylvania, Perelman School of Medicine
Philadelphia, Pennsylvania

Chun Hwang, MD, FACC, FHRS
Director of Electrophysiology, Utah Valley Regional
Medical Center, Central Utah Clinic—Cardiology,
Provo, Utah

Warren M. Jackman, MD, FACC, FHRS
Professor of Medicine; George Lynn Cross Research
Professor, University of Oklahoma Health Sciences
Center, Oklahoma City, Oklahoma

Jason T. Jacobson, MD, FACC
Assistant Professor; Director, Cardiac
Electrophysiology, Columbia University Division of
Cardiology at Mount Sinai Medical Center, Miami
Beach, Florida

Amir S. Jadidi, MD
Department of Cardiac Arrhythmias, Hôpital
Cardiologique du Haut-Lévêque, CHU de
Bordeaux, Pessac-Bordeaux, France; Department of
Cardiac Arrhythmias, University Heart Centre
Freiburg—Bad Krozingen, Bad Krozingen,
Germany

Pierre Jaïs, MD
Arrhythmia Department, Hôpital Haut-Lévêque,
University of Bordeaux, Bordeaux, France

Jonathan M. Kalman, MBBS, PhD
Professor, Department of Cardiology, Royal
Melbourne Hospital, Melbourne, Australia

G. Neal Kay, MD, FACC, FAHA
Professor of Medicine, Division of Cardiovascular
Disease, University of Alabama at Birmingham,
Birmingham, Alabama

Peter M. Kistler, MBBS, PhD
Associate Professor, Department of Cardiology,
Alfred Hospital and Baker IDI, Melbourne,
Australia

Sébastien Knecht, MD, PhD
Professor, Electrophysiology, CHU Brugmann,
Brussels, Belgium

Bradley P. Knight, MD, FACC, FHRS
Medical Director, Center for Heart Rhythm
Disorders, Bluhm Cardiovascular Institute,
Northwestern Memorial Hospital; Cooley Professor
of Medicine, Northwestern University, Feinberg
School of Medicine, Chicago, Illinois

Pipin Kojodjojo, MRCP, PhD
Clinical Senior Lecturer in Cardiac
Electrophysiology, Department of Cardiology, St.
Mary's Hospital, Imperial College Healthcare NHS
Trust, London, United Kingdom

David S. Kwon, MD, PhD
Associate Director Clinical Research, Cardiovascular
Therapeutic Area, Gilead Sciences, Foster City,
California

Yenn-Jiang Lin, MD, PhD
Assistant Professor, School of Medicine, National
Yang-Ming University, Taipei, Taiwan; Division of
Cardiology, Department of Medicine, Taipei
Veterans General Hospital, Taipei, Taiwan

Mark S. Link, MD, FACC, FHRS
Professor of Medicine, Tufts University School of
Medicine, New England Cardiac Arrhythmia
Center, Tufts Medical Center, Boston,
Massachusetts

Li-Wei Lo, MD
Assistant Professor, School of Medicine, National
Yang-Ming University, Taipei, Taiwan; Division of
Cardiology, Department of Medicine, Taipei
Veterans General Hospital, Taipei, Taiwan

Giuseppe Maccabelli, MD
Arrhythmia Unit and Electrophysiology
Laboratories, Department of Cardiology and
Cardiothoracic Surgery, San Raffaele Hospital,
Milan, Italy

Srijoy Mahapatra, MD, FHRS
Medical Director and Vice President of Clinical and
Therapy Development, AF Division, St. Jude
Medical, St. Paul, Minnesota

Moussa Mansour, MD
Director, Cardiac Electrophysiology Laboratory,
Massachusetts General Hospital, Harvard Medical
School, Boston, Massachusetts

Francis E. Marchlinski, MD, FACC
Director, Cardiac Electrophysiology, Department of
Medicine, Division of Cardiovascular Medicine,
Hospital of the University of Pennsylvania,
Philadelphia, Pennsylvania

Sissy Lara Melo, MD, PhD
Assistant Professor, Arrhythmia Unit, Instituto do
Coração (InCor), Faculdade de Medicina da
Universidade de São Paulo (Heart Institute,
University of São Paulo Medical School), Sao Paulo,
Brazil

John M. Miller, MD
Director of Cardiac Electrophysiology, Indiana
University Health; Director, Electrophysiology
Training Program, Indiana University School of
Medicine, Indianapolis, Indiana

Christina Y. Miyake, MD
Instructor of Pediatrics, Department of Pediatrics,
Division of Pediatric Cardiology, Lucile Packard
Children's Hospital, Stanford University, Palo Alto,
California

Shinsuke Miyazaki, MD
Hôpital Cardiologique du Haut-Lévêque and the
Université Victor Segalen Bordeaux II, Bordeaux,
France

Abram Mozes, MD
Clinical Fellow in Cardiac Electrophysiology, New
England Cardiac Arrhythmia Center, Tufts Medical
Center, Boston, Massachusetts

Koonlawee Nademanee, MD, FACC, FAHA, FHRS
Pacific Rim Research Institute at White Memorial
Hospital, Los Angeles, California; Bangkok Medical
Center, Bangkok, Thailand

Hiroshi Nakagawa, MD, PhD
Professor of Medicine; Director, Clinical Catheter
Ablation Program; Director, Translational
Electrophysiology, Heart Rhythm Institute,
University of Oklahoma Health Sciences Center,
Oklahoma City, Oklahoma

Carlo Pappone, MD, PhD, FACC
Department of Arrhythmology, Maria Cecilia
Hospital, Cotignola, Ravenna, Italy

Michala Pedersen, MD, DPhil
Hôpital-Haut-Lévêque, Service Rhythmologie;
Hôpital-Haut-Lévêque & Université Victor
Segalen, Bordeaux II, Bordeaux-Pessac, France

Marco V. Perez, MD
Clinical Instructor, Cardiac Arrhythmia Service,
Division of Cardiovascular Medicine, Stanford
University, Stanford, California

Francesco Perna, MD, PhD
Cardiology Department, Agostino Gemelli
Hospital, Catholic University of the Sacred Heart,
Rome, Italy

Christopher Piorkowski, MD
EP Consultant, Department of Electrophysiology,
Heart Center, University of Leipzig, Leipzig,
Germany

Cristiano Pisani, MD
Assistant Professor, Arrhythmia Unit, Instituto do
Coração (InCor), Faculdade de Medicina da
Universidade de São Paulo (Heart Institute,
University of São Paulo Medical School), São Paulo,
Brazil

Javier E. Sánchez, MD
Cardiac Electrophysiologist, Texas Cardiac
Arrhythmia Institute, St. David's Medical Center,
Austin, Texas

Pasquale Santangeli, MD
Texas Cardiac Arrhythmia Institute, St. David's
Medical Center, Austin, Texas

Vincenzo Santinelli, MD
Department of Arrhythmology, Maria Cecilia
Hospital Cotignola, Ravenna, Italy

Mauricio I. Scanavacca, MD, PhD
Director of Cardiac Arrhythmia Unit, Instituto do
Coração (InCor), Faculdade de Medicina da
Universidade de São Paulo (Heart Institute,
University of São Paulo Medical School), São Paulo,
Brazil

Melvin M. Scheinman, MD
Professor of Medicine; Walter H. Shorenstein
Endowed Chair of Cardiology, Cardiac
Electrophysiology, University of California,
San Francisco, California

Benjamin J. Scherlag, PhD, FHRS
Professor of Medicine, Division of Cardiology,
Heart Rhythm Institute, University of Oklahoma
Health Sciences Center, Oklahoma City, Oklahoma

Daniel Scherr, MD, PD
Assistant Professor of Medicine, Division of
Cardiology, Department of Medicine, Medical
University of Graz, Graz, Austria

Ashok J. Shah, MD
Hôpital Cardiologique du Haut-Lévêque and the
Université Victor Segalen Bordeaux II, Bordeaux,
France

Sheldon M. Singh, MD, FRCPC, FACC
Assistant Professor of Medicine, Schulich Heart
Program, Sunnybrook Health Sciences Center,
Faculty of Medicine, University of Toronto, Toronto,
Ontario, Canada

Kyoko Soejima, MD
Associate Professor, Cardiovascular Division, Kyorin
University School of Medicine, Tokyo, Japan

Philipp Sommer, MD
EP Consultant, Department of Electrophysiology,
Heart Center, University of Leipzig, Leipzig,
Germany

Eduardo Sosa, MD, PhD
Clinic Arrhythmia and Pacemaker Unit, Instituto do
Coração (InCor), Heart Institute, University of São
Paulo Medical School, São Paulo, Brazil

William G. Stevenson, MD
Professor of Medicine, Harvard Medical School,
Cardiovascular Division, Department of Medicine,
Brigham and Women's Hospital, Boston,
Massachusetts

Gregory E. Supple, MD

Assistant Professor of Medicine, University of Pennsylvania School of Medicine, Department of Medicine, Division of Cardiovascular Medicine, Philadelphia, Pennsylvania

Kojiro Tanimoto, MD

Instructor, Cardiology Division, Keio University School of Medicine, Tokyo, Japan

Usha B. Tedrow, MD, MSc

Assistant Professor of Medicine, Harvard Medical School; Director, Clinical Cardiac Electrophysiology Program, Cardiovascular Division, Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts

Andrew W. Teh, MBBS, PhD

Physician, Department of Cardiology, Royal Melbourne Hospital, Melbourne, Australia

John K. Triedman, MD, FACC, FHRS

Professor of Pediatrics, Harvard Medical School, Arrhythmia Service, Department of Cardiology, Boston Children's Hospital, Boston, Massachusetts

Mintu P. Turakhia, MD, MAS

Acting Assistant Professor of Medicine; Director of Cardiac Electrophysiology, Veterans Affairs Palo Alto Healthcare System, Stanford University School of Medicine, Stanford, California

Wendy S. Tzou, MD, FHRS

Assistant Professor of Medicine, Cardiology Division, Electrophysiology Section, University of Colorado Anschutz Medical Campus, Aurora, Colorado

Akiko Ueda, MD

Doctor, Department of Cardiology, Tokyo Metropolitan Hiroo Hospital, Tokyo, Japan

George F. Van Hare, MD

Director, Pediatric Cardiology; Louis Larrick Ward Professor of Pediatrics; Co-Director, St. Louis Children's and Washington University Heart Center, Washington University School of Medicine, St. Louis, Missouri

Jonathan Weinstock, MD, FACC, FHRS

Assistant Professor of Medicine, Tufts University School of Medicine, New England Cardiac Arrhythmia Center, Tufts Medical Center, Boston, Massachusetts

Takumi Yamada, MD, PhD

Assistant Professor of Medicine, Division of Cardiovascular Disease, University of Alabama at Birmingham, Birmingham, Alabama

Paul C. Zei, MD, PhD, FHRS

Clinical Associate Professor, Cardiac Electrophysiology; Chief, Cardiovascular Clinics; Director, Electrophysiology, Stanford University, Stanford, California

Katja Zeppenfeld, MD, PhD, FESC

Professor of Cardiology, Electrophysiology, Department of Cardiology, Leiden University Medical Centre, Leiden, The Netherlands

