

American Journal of Physiology- Heart and Circulatory Physiology®

Editor: Irving H. Zucker

Deputy Editor: Merry Lindsey

Associate Editors:

Mario Delmar
Leon J. De Windt
Christine Des Rosiers
Debra I. Diz
Robert L. Hester

Steven P. Jones
Nancy L. Kanagy
Masafumi Kitakaze
Ronglih Liao
Gary D. Lopaschuk

Kaushik P. Patel
Fabio A. Recchia
Junichi Sadoshima
Ajay M. Shah
Zoltan Ungvari

Consulting Editors:

Ivor J. Benjamin
Mordecai P. Blaustein
Nisha Charkoudian

Igor R. Efimov
David Guttermann
David A. Kass

Yulin Liao
Donal O'Leary

Crystal Ripplinger
Michael S. Wolin

Editorial Board:

Ellen Aasum
Jun-Ichi Abe
Tetsuro Ago
Fadi Akar
Barbara Alexander
Nicole Ashpole
Zsolt Bagi
Christopher Baines
Yasuko Bando
Susan Barman
Jill Barnes
Daniel Beard
Shawn Bender
Luc Bertrand
Burns Blaxall
Ralf Brandes
Joseph Brayden
Paul Brookes
David Busija
Candido Cabo
Hua Cai
John Calvert
John Canty
Adam Case
Julie Chan
Jiang Chang
John Chatham
William Chilian
Anna Csizsar
Deborah Damon
Roger Dampney
Sandra Davidge
Buddhadeb Dawn
Lisandra de Castro Bras
Pieter de Tombe
Dominic Del Re
Lea Delbridge
Kristine DeLeon-Pennell
Kevin Dellsperger
Isabelle Deschenes
Thomas Dick
Sergey Dikalov
Anne Dorrance
Dirk Duncker
Walter Duran

Jason Dyck
Scott Earley
Philip Eaton
Satoru Eguchi
M. Faadiel Essop
Paul Fadel
Frank Faraci
Vadim Fedorov
Gregory Fink
Steven Fisher
Ingrid Fleming
Michael John Flister
Yasushi Fujio
Tohru Fukai
Feng Gao
Lie Gao
Jason D. Gardner
A. Martin Gerdes
Alexey Glukhov
D. Neil Granger
Kathy Griendling
Mahesh Gupta
Sachin Gupta
Asa Gustafsson
Ganesh Halade
Milton Hamblin
Geoffrey Head
Gerd Heusch
Joseph Hill
Brian Hoit
John Hollander
Patrick Hsieh
Thomas Hund
Yunlong Huo
John Imig
William Jackson
Michael Joyner
Atsunori Kamiya
Michael Kamiloff
Zamaneh Kassiri
Prasad Katakam
Zvonimir Katusic
Marc Kaufman
Christopher Kevil
Lorrie Kirshenbaum

Takuya Kishi
Walter Koch
Ronald Korthuis
Rakesh Kukreja
Kathryn Lamping
Kenneth Laurita
Jonathan Ledoux
David Lefler
Charles Lefler
De-Pei Li
Pin-Lan Li
Bruce Liang
Vincenzo Lionetti
Yanping Liu
John Lorenz
Vaughan Macefield
Yasuhiro Maejima
Takashi Matsui
Kathleen McDonough
Raymond Migrino
Virginia Miller
Tetsuo Minamino
Paras Mishra
Brett Mitchell
Tetsuji Miura
Shigeki Miyamoto
Judy Muller-Delp
Timothy Musch
Jay Naik
Carlos Negro
Mark Nelson
Jeanne Nerbonne
Kinya Otsu
Pal Pacher
Patrick Pagano
Nazareno Paolucci
Hemal Patel
William Pearce
Shane Phillips
Paul Pilowsky
Steven Poelzing
David Pollock
David Poole
Michael Portman
Ravichandran Ramasamy

Russell Richardson
Petra Rocić
Brian Rodrigues
Nancy Rusch
Hredya Sapru
Deborah Scheuer
Richard Schuessler
Harold Schultz
Steven Segal
Farah Sheikh
Hiroaki Shimokawa
Maria Siebes
Dinender Singla
Lawrence Sinoway
Eric Sobie
Francis Spinale
David Stepp
Mark Sussman
Eric Thorin
Thomas Thum
Peter Toth
Johnathan Tune
Osamu Tsukamoto
Suresh Tyagi
John Tyberg
John Ussher
Thomas Vondriska
Jessica Wagenseil
Mary Walker
Han-Jun Wang
Xuejun Wang
Stephanie Watts
R. Clinton Webb
Nico Westerhof
Margaret Westfall
Michael Widlansky
Loren Wold
Andriy Yabluchanskiy
Huang-Tian Yang
Martin Young
Xin Yu
Matthew Zimmerman
Wolfram Zimmermann

Publications Committee

Curt D. Sigmund, *Chair*
Catherine E. Carr
David Ellison
Andrew Greene
Paul A. Insel
Lynette K. Rogers
Loren Wold

Ex officio

Jane F. Reckelhoff, *President*
Dennis Brown, *President Elect*
Patricia E. Molina, *Past President*
Martin Frank
Executive Director
Rita Scheman
*Director of Publications
and Executive Editor*

Audra E. Cox

Editorial Manager
Joseph Girouard
Senior Journal Supervisor
Gil Ebner
Peer Review Manager

Eric Pesanelli

Editorial Art Manager
Kara Hansell Keehan
Executive Editor
Michelle Gaffney
Editorial Consultant

The *American Journal of Physiology-Heart and Circulatory Physiology* (ISSN-0363-6135) is published monthly online at www.ajpheart.org (ISSN 1522-1539) (two volumes a year) by the American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991. *Subscription Prices (postpaid):* For institutional print and online pricing, please see <http://www.the-aps.org/publications/subs/>. Nonmember individual (online only): \$810.00. APS members: online is free. Print back issues when available, through December 2011: Subscriber, \$75 each; nonsubscriber, \$150 each. Subscriptions from outside the United States are payable in US currency or full equivalent. Subscriptions are accepted on a calendar-year basis only. Periodicals postage paid at Be-

thesda, MD, and at additional mailing offices.

The *American Journal of Physiology-Heart and Circulatory Physiology*® is a registered trademark of the American Physiological Society.

Copyright © 2017 by the American Physiological Society. Printed in the United States of America by Cadmus Communications—Lancaster Division, Lancaster, PA 17601. The code at the bottom of the first page of an article indicates the copyright owner's consent that copies of that article may be made beyond that permitted by sections 107 and 108 of the US Copyright Law—unless the copies are for general distribution, for advertising, for creating new works, or for resale—provided the per-copy fee is paid through the Copyright Clearance Center, Inc., 222 Rosewood Dr., Danvers, MA 01923.

Editorial and Business Correspondence: AJP-Heart and Circulatory Physiology, 9650 Rockville Pike, Bethesda, MD 20814-3991.

Disclaimer: The statements and opinions contained in the articles of the *American Journal of Physiology-Heart and Circulatory Physiology* are solely those of the individual authors and contributors and not of the American Physiological Society. The appearance of advertisements in the journal is not a warranty, endorsement, or approval of the products or their safety. The American Physiological Society disclaims responsibility for any injury to persons or property resulting from any ideas or products referred to in any article or advertisement.