

American Journal of Physiology- Renal Physiology®

Editor-in-Chief: P. Darwin Bell
Deputy Editor-in-Chief: Anita Layton

Associate Editors:

Warren G. Hill
Robert Hoover
Thu H. Le

Janos Peti-Peterdi
Rick G. Schnellmann
Jennifer C. Sullivan

Wenhui Wang
Adam Whaley-Connell

Editorial Reviews Board:

Anupam Agarwal, Chris Baylis, Pam Carmines, Jane Reckelhoff, Eleanor Lederer, Carol Liedtke, Lee Hamm, Jeff Sands, Jeffrey Garvin, Susan Wall, Kumar Sharma, Moshe Levi *United States*
Rene Bindels, Florian Lang, Soren Nielsen, Laszlo Rosivall, Olivier Staub, Francois Verrey, *Europe*
Phil Poronnik, *Australia*
Masaomi Nangaku, *Japan*

Editorial Board:

Takaaki Abe
Rosalyn Adam
Barbara Alexander
Todd Alexander
Diego Alvarez de la Rosa
Gerard Apodaca
Serena Bagnasco
Matthew Bailey
David Basile
Michel Baum
William Beierwaltes
Vivek Bhalla
Anil Bidani
Erika Boesen
Branko Braam
Heddwen Brooks
Leslie Bruggeman
Michael Butterworth
Pablo Cabral
Hui Cai
Marcelo Carattino
Mattias Carlstrom
Hayo Castrop
Toby Chai
Guangping Chen
Jian-Kang Chen
Sheldon Chen
Inyeong Choi
David Cohen
Steven Crowley
Patrick Cunningham
William Cupples
Mark de Caestecker
Thuen de Groot
Kate Denton
Henrik Dimke
Zheng Dong
Heather Drummond
Jeremy Duffield
Kenneth Dunn

Douglas Eaton
Carolyn Ecelbarger
Aurelie Edwards
Dominique Eladari
Roger Evans
Diane Felsen
Robert Fenton
Ben Fogelgren
Agnes Fogo
Nora Franceschini
Martha Franco
Jorgen Frøkiær
Romer Gonzalez-Villalobos
Monika Gooz
Karen Griffin
Michelle Gumz
Susan Gurley
Volker Haase
Kenneth Hallows
Kirk Hamilton
Permille Hansen
Chuan-Ming Hao
Lisa Harrison-Bernard
Kathleen Hering-Smith
Marcella Herrera
Ewout Hoorn
Rebecca Hughey
John Imig
Reiko Inagi
Edgar Jaimes
Boye Jensen
Pedro Jose
Armin Just
Yashpal Kanwar
Janet Keast
Gilbert Kinsey
Bellamkonda Kishore
Janet Klein
Benjamin Ko
Donald Kohan
Lawrence Lash

H. T. Lee
Andreas Linkermann
Joshua Lipschutz
Ruisheng Liu
Youhua Liu
John Lorenz
Analia Loria
Heping Ma
Jennie Ma
Christine Maric-Bilkan
James Marrs
David Mattson
James A. McCormick
Fiona McDonald
Mariela Mendez
Jerry Morrissey
John Mullins
Rama Natarajan
Deepak Nihalani
Akira Nishiyama
Ravi Nistala
Grazyna Nowak
Paul O'Connor
Pablo Ortiz
Babu Padamilam
Fredrik Palm
Lawrence Palmer
Jenny Pan
Alan Pao
Jeanie Park
Kwon Moo Park
Nuria Pastor-Soler
David Pearce
Ji-Bin Peng
Georgi Petkov
Snezana Petrovic
Jennifer Pluznick
Oleh Pochynuk
Aaron Polichnowski
Jennifer Pollock
Helle Praetorius

S. Russ Price
Minofla Prieto
Nour-Eddine Rhaleh
Timo Rieg
Lisa Robinson
Michael Romero
Michael Ruggieri
Paul Sanders
Steven Sansom
Jennifer Sasser
David Sheikh-Hamad
Shaohu Sheng
Prablen Singh
Brian Siroky
Alexander Staruschenko
Jim Stockand
Arohan Subramanya
Caroline Sussman
Franziska Theilig
Vladimir Todorov
Volker Vallon
Chad Vezina
Margaret Vizzard
Niels-Henrick von Holstein-Rathlou
Carsten Wagner
Darren Wallace
Alan Weinstein
William Welch
Paul Welling
Jan Micheal Williams
Stephen Wright
Motoko Yanagita
Li Yang
Tianxin Yang
Alan Yu
Wei-quan Yu
Richard Zager
Roberto Zatz
Aihua Zhang

Publications Committee

C. D. Sigmund, *Chair*
H. Raff, *Vice Chair*
C. E. Carr
D. Ellison
A. Greene
P. A. Insel
A. A. McDonough
L. K. Rogers
S. M. Wall
L. Wold

Ex-Officio:

Patricia E. Molina
APS Past President
Jane F. Reckelhoff
President
Dennis Brown
President-Elect

M. Frank, Executive Director

R. Scheman
*Director of Publications
and Executive Editor*
Audra E. Cox
Editorial Manager
S. Demma
Journal Supervisor
T. Christensen
L. Kanaskie

J. Marquez

D. Udoff
Copy Editors
G. Ebner
Peer Review Manager
E. Pesanelli
Editorial Art Manager
A. McEver
Editor's Assistant

The *American Journal of Physiology-Renal Physiology* (ISSN-1931-857X) is published monthly online at www.ajprenal.org (ESSN-1522-1466). (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/>. Non-member individuals (online only): \$415.00. APS members: online is free. Print back issues when available, through December 2011: subscriber, \$45 each; nonsubscriber, \$90 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-Renal 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-Renal Physiology, 9650 Rockville Pike, Bethesda, MD 20814-3991.

Disclaimer: The statements and opinions contained in the articles of the *American Journal of Physiology-Renal 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.