



**OFFICERS**

**PRESIDENT, 2015-16**

Robert P. Seidel  
CBS Television Network

**PAST PRESIDENT, 2015-16**

Wendy Aylsworth  
Warner Bros.

**EXECUTIVE VICE PRESIDENT, 2015-16**

Matthew Goldman  
Ericsson

**STANDARDS VICE PRESIDENT, 2016-17**

Alan Lambshead  
Retired

**FINANCE VICE PRESIDENT, 2016-17**

Paul Stechly  
Applied Electronics Ltd.

**EDUCATION VICE PRESIDENT, 2015-16**

Patrick Griffith  
Dolby Laboratories Inc.

**MEMBERSHIP VICE PRESIDENT, 2016-17**

William C. Miller  
Miltag Media Technology, LLC

**SECRETARY/TREASURER, 2015-16**

Peter Wharton  
BroadStream Solutions, Inc.

**EXECUTIVE DIRECTOR**

Barbara H. Lange  
SMPTE Headquarters

**DIRECTORS**

**STANDARDS DIRECTORS**

Bob Edge  
Bob Edge TV Consulting

Paul Treleven  
IABM

Dave Schnuelle  
Dolby Laboratories

**EDUCATION DIRECTORS**

Al Kovalick  
Media Systems Consulting

Michael DeValue  
The Walt Disney Studios

V. Michael Bove  
MIT Media Laboratory

Peter Putman  
ROAM Consulting, LLC

**MEMBERSHIP DIRECTORS**

Karl Kuhn  
Tektronix, Inc.

Peter Weitzel  
Weitzel.tv

Bruce Follmer  
Retired

**GOVERNORS**

**GOVERNOR-AT-LARGE**

Leon Silverman, 2016  
The Walt Disney Studios

Christopher Fetner, 2016  
Netflix

**ASIA/PACIFIC REGION**

John Maizels, 2016-17  
Entropy Enterprises

Kwok-Luen Lam, 2015-16  
Hong Kong Cable TV Ltd. (Retired)

**CANADIAN REGION**

Pierre Marion, 2015-16  
Retired

Randy Conrod, 2016-17  
Imagine Communications

**CENTRAL REGION**

William T. Hayes, 2015-16  
Iowa Public Television

**EASTERN REGION**

John Luff, 2016-17  
HD Consulting

John McCoskey, 2015-16  
Eagle Hill Consulting

**HOLLYWOOD REGION**

Stephen Beres, 2015-16  
HBO

Patricia Keighley, 2016-17  
IMAX Corporation

Andrew Setos, 2015-16  
BLACKSTAR Engineering Inc.

**INTERNATIONAL REGION**

Siegfried Foessel, 2016-17  
Fraunhofer IIS

Angelo D'Alessio, 2015-16  
Cam-Center for Accessible Media

**NEW YORK REGION**

Douglas I. Sheer, 2015-16  
DIS Consulting Corp.

John Ferder, 2016-17  
CBS, Inc.

**SOUTHERN REGION**

Dan Burnett, 2016-17  
Ericsson Television, Inc.

Merrick Ackermans, 2015-16  
MVA Media Consulting

**U.K. REGION**

Bruce Devlin, 2016-17  
Dalet

**WESTERN REGION**

Sara J. Kudrle, 2015-16  
Grass Valley, a Belden Brand

Mark Narveson, 2016-17  
Artegis Law Group, LLP

**SECTION CHAIRS**

**ATLANTA**

Jack Linder  
Jack Linder Consulting

**AUSTRALIA**

Paul Broderick  
Telstra

**CENTRAL TEXAS**

Merrick Ackermans (Governor)

**CHICAGO**

William Hayes (Governor)

**DALLAS/FORT WORTH**

Dan Burnett (Governor)

**DETROIT**

Louis Johnson IV  
Auxexecutive/Arrington-Johnson, LLC

**FLORIDA**

Ken Botelho  
Golf Channel

**GERMANY**

Siegfried Foessel (Governor)  
Fraunhofer IIS

**HOLLYWOOD**

Marty Meyer  
Division Camera

**HONG KONG**

Wicky Man-Hoi Law  
The Hong Kong Jockey Club

**INDIA**

Ujwal Nirgudkar  
Filmlab India

**ITALY**

Alfredo Bartelletti  
BLT Italia srl

**MONTREAL/QUEBEC**

Daniel Guevin  
Radio Canada

**NASHVILLE**

Merrick Ackermans (Governor)

**NEW ENGLAND**

Martin P. Feldman  
The Camera Co., Inc.

**NEW YORK**

Jeff Cohen  
TVU Networks

**NORDIC**

Angelo D'Alessio (Governor)

**OHIO**

John R. Owen  
Q Communications, LLC

**PACIFIC/NORTHWEST**

Mark Narveson (Governor)

**PHILADELPHIA**

Dover Mundt  
Canon USA, Inc.

**PITTSBURGH**

Ed Fraticelli  
PMI

**ROCHESTER**

Ricardo R. Figueroa  
Rochester Institute of Technology

**ROCKY MOUNTAIN**

Tom Craig  
Rocky Mountain PBS

**RUSSIA**

Oleg Berezin  
Nevafilm Co.

**SACRAMENTO**

Bob Hudelson  
AJA Video Systems

**SAN FRANCISCO**

Keith Ian Graham  
Graham Associates

**TORONTO**

Tony Meerakker  
Meer Tech Systems

**UNITED KINGDOM**

Simon Gauntlett  
Digital TV Group

**WASHINGTON, D.C.**

Tom Hackett  
Communications Engineering, Inc.

**STUDENT CHAPTERS BY SECTION**

**AUSTRALIA**

Charles Sturt University  
Wagga Wagga, NSW,  
Australia

Sydney Student Section  
Sydney, Australia

**DALLAS**

Baylor University  
Waco, TX

**CHICAGO**

Purdue University  
West Lafayette, IN

**FLORIDA**

Full Sail University  
Winterpark, FL

**HOLLYWOOD**

Los Angeles City College  
Los Angeles, CA

Marymount  
Rancho Palos Verdes, CA

Pasadena City College  
Pasadena, CA

USC Los Angeles, CA

**HONG KONG**

Hong Kong Design Institute  
(HKDI)

Hong Kong

Hong Kong Institute of  
Vocational Education (IVE)  
New Territories, Hong Kong

**NEW ENGLAND**

Stonehill College  
Easton, MA

Fitchburg State University  
Fitchburg, MA

**NEW JERSEY**

Rowan University  
Glassboro, NJ

Stevens Institute of Technology  
Hoboken, NJ

William Patterson University  
Wayne, NJ

**NEW YORK**

Borough of Manhattan  
Community College

New York, NY

Bronx Community College  
Bronx, NY

New York City College  
of Technology

Brooklyn, NY

Kingsborough Community College  
Brooklyn, NY

**ROCHESTER**

Rochester Institute  
of Technology

Rochester, NY

**UNITED KINGDOM**

Southampton Solent University  
Southampton, Hampshire, U.K.

University of Salford  
Manchester, U.K.

**WASHINGTON, DC**

Loyola University  
Baltimore, MD

**BOARD OF EDITORS**

Glen Pensinger, *Chairman*

Grant Allan

Ioan Allen

Bobby Andishmand

Harvey Arnold

David Bancroft

Al Barton

Sherwin H. Becker

John Belton

V. Michael Bove

Wayne Bretl

John Brooks

Angela Bünger

Patrick Candry

Dominic Case

Paul Thurston

Philip Cianci

Andres C. Colpa

Greg Coppa

Don Craig

Angelo D'Alessio

Michael DeValue

Michael A. Dolan

Thomas Edwards

John Emmett

Lincoln L. Endelman

John Ferder

Nuno Fonseca

John Footen

Norbert Gerfelder

Brad Gilmer

Paul R. Goldberg

Keith Graham

Eric Gsell

Scott Hamilton

John Hartwell

Hans Hoffmann

Randall Hoffner

Tomlinson Holman

Fred Huffman

Kim Iannone

Kees Schouhamer Immink

Stephen Jensen

Al Kovalick

Sara Kudrle

W. J. Kumeling

Vicki Lau

Michael Liebman

Peter Ludé

John Luff

Andrew H. Maltz

Tets Maniwa

Richard Marcus

Donald C. McCroskey

William C. Miller

Natalie Morningstar

Neil Neubert

James E. O'Neal

Pirkko Oittinen

Karl Paulsen

Felix Poulin

Charles Poynton

Pete Putman

Ed Reuss

Adam Schadle

Mark Schubert

Edgar A. Schuller

Gavin Schutz

Thomas A. Scott

Neil Shaw

Wes Simpson

Akash Singh

Michael Smith

James Snyder

Kevin Stec

Steve Storozum

Stephen A. Stough

Peter D. Symes

Paul Thurston

Jay Wack

Reinhard E. Wagner

Evans Wetmore

Jerry Whitaker

Jim Wilkinson

William Y. Zou

SMPTE Motion Imaging Journal (ISSN: 1545-0279) published 8 times per year by the Society of Motion Picture and Television Engineers, Inc., 3 Barker Ave., White Plains, NY 10601. Periodicals postage paid at White Plains, NY, and at additional mailing office. Copyright © 2016 by the Society of Motion Picture and Television Engineers, Inc. No part of this issue may be reproduced without written permission of the publisher. Statements and opinions expressed in articles or editorials in the SMPTE Motion Imaging Journal are expressions of contributors and do not necessarily represent the policies or opinions of the Society. A complete list of SMPTE membership types and benefits is available at www.smpte.org. Advertisements appearing in this publication are the sole responsibility of the advertiser. Subscription rates: SMPTE Members, \$35 USD, included in membership dues; straight subscription: U.S./Canada, \$185.00; Non-U.S./Canada, \$200.00 (shipping included); Single copy, \$20.00, plus shipping. SMPTE owns the copyrights to all published material, unless otherwise stated. SMPTE Motion Imaging Journal is registered with Canada Post: CPM # 41003019. POSTMASTER: Send change of address to SMPTE Motion Imaging Journal, 3 Barker Avenue, White Plains, NY 10601. All rights reserved. PRINTED IN THE USA