



OFFICERS

PRESIDENT, 2019–20

Patrick Griffis
Dolby Labs

PAST PRESIDENT, 2019–20

Matthew Goldman
MediaKind

EXECUTIVE VICE PRESIDENT, 2019–20

Hans Hoffmann
EBU

STANDARDS VICE PRESIDENT, 2018–19

Bruce Devlin
Mr MXF Ltd.

FINANCE VICE PRESIDENT, 2018–19

Patricia Keighley
Imax Corporation

EDUCATION VICE PRESIDENT, 2019–20

Sara Kudrle
Imagine Communications

MEMBERSHIP VICE PRESIDENT, 2018–19

Peter Wharton
SECRETARY/TREASURER, 2019–20,

John Ferder
Multidyne Video and
Fiber Optic Systems

EXECUTIVE DIRECTOR

Barbara H. Lange
SMPTE Headquarters

DIRECTORS

STANDARDS
Chris Lennon
Medianswers
Dave Schnuelle
Dolby

Paul Treleven

EDUCATION

David Long
Rochester Institute of Technology
Jaclyn Pytlarz
Dolby

Peter Putman
ROAM Consulting

Yvonne Thomas

MediaPortal

MEMBERSHIP

Francois Abbe
Consultant
John Shike
VMI Inc.
Maciej Ochman
Corp. for Public Broadcasting
Karl Kuhn
Tektronix

GOVERNORS

GOVERNORS-AT-LARGE, 2019

Brian Claypool
Christie Digital Systems
Seth Hallen
Pixelogic Media Partners, LLC

ASIA/PACIFIC REGION

Ward Hansford, 2018–19
Grass Valley
Masayuki Sugawara, 2019–20
NEC Corporation

CANADIAN REGION

Sylvain Marcotte, 2019–20
Miranda Technologies Inc.
Paul Briscoe, 2018–19
Televisionary Consulting

CENTRAL REGION

William T. Hayes, 2019–20
Iowa Public Television

EASTERN REGION

Renard Jenkins, 2018–19
PBS
James Burger, 2019–20
Thompson Coburn

HOLLYWOOD REGION

Paul Chapman, 2018–19
SIM Group
Michael DeValue, 2019–20
Walt Disney Studios
Christopher Fetner, 2019–20
Netflix

EMEA, CENTRAL & SOUTH AMERICA REGION

Siegfried Foessel, 2019–20
Fraunhofer IIS
Francois Abbe, 2019–20
Qvest Media

NEW YORK REGION

Rosemarie Lockwood, 2019–20
Consultant
Thomas Mauro, 2018–19
Arvato Systems North America

SOUTHERN REGION

Merrick Ackermans, 2018–19
MVA Broadcast Consulting
Michael Koetter, 2019–20
Turner Broadcasting

U.K. REGION

Mark Harrison, 2018–19
Digital Production Partnership
(DPP)

Marina Kalkanis 2019–20
M2a Media

WESTERN REGION

Gary Mandle, 2019–20
Ben Waggoner, 2018–19
Amazon

SECTION CHAIRS

ATLANTA
Bob Baker
Turner Broadcasting

AUSTRALIA

Paul Broderick
Telstra

CENTRAL TEXAS

Rick Ackermans (Governor)

CHICAGO

Brian Claypool (Governor)

DALLAS/FORT WORTH

Michael Koetter (Governor)

DETROIT

Frank J. Maynard
CBS Television Stations

FLORIDA

Ken Botelho
Principle Engineering Consultant

GERMANY

Siegfried Foessel (Governor)
Fraunhofer IIS

HOLLYWOOD

Jim DeFilippis
TMS Consulting

HONG KONG

Tony Ngai
Salon Films (H.K.) Ltd.

INDIA

Ujwal Nirgudkar
KPMG India

ITALY

Alfredo Bartelletti
BLT Italia srl

MONTREAL/QUEBEC

Daniel Guevin
Radio Canada

NASHVILLE

Michael Koetter (Governor)

NEW ENGLAND

Martin P. Feldman
The Camera Co., Inc.

NEW YORK

Jeff Cohen
IMT-Vislink

NORDIC

Francois Abbe (Governor)

PHILADELPHIA

James Lien
ACV Video Solutions

OHIO

John R. Owen
Q Communications, LLC

PACIFIC/NORTHWEST

Mark Siegel
Advanced Broadcast

PITTSBURGH

Daniel Turk
NEP Group

POLAND

Kamil Rutkowski
Di Factory

ROCHESTER

Ricardo R. Figueroa
Rochester Institute of Technology

ROCKY MOUNTAIN

Tom Craig
Rocky Mountain PBS

RUSSIA

Oleg Berezin
Nevafilm Co.

SACRAMENTO

Tim Walker
Grass Valley, A Belden Brand

SAN FRANCISCO

Keith Ian Graham
Graham Associates

TORONTO

Leigh Whitcomb
Imagine Communications

UNITED KINGDOM

Simon Gauntlett
Dolby

WASHINGTON, D.C.

Tom Hackett
Diversified

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
Pasadena City College
Pasadena, CA
Media Arts Collaborative
Charter School
Albuquerque, NM
USC University of Southern
California
Los Angeles, CA

HONG KONG

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

NEW ENGLAND

Stonehill College
Easton, MA
Fitchburg State University
Fitchburg, MA

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
Rowan University
Glassboro, NJ
William Patterson University
Wayne, NJ

PHILADELPHIA

Millersville University
Millersville, PA

ROCHESTER

Rochester Institute
of Technology
Rochester, NY

UNITED KINGDOM

Birmingham City University
Birmingham, U.K.
Ravensbourne
London, U.K.
Southampton Solent University
Southampton, Hampshire, U.K.
University of Salford
Manchester, U.K.
University of Surrey
Guildford, U.K.

WASHINGTON, DC

George Mason University
Fairfax, VA
Loyola University
Baltimore, MD

BOARD OF EDITORS

John Belton, *Chairman*
Ioan Allen
Harvey Arnold
David Bancroft
Al Barton
Steve Bilow
V. Michael Bove
Wayne Brett
John Brooks
Angela Bünger
Patrick Candry
Dominic Case
Curtis Chan
Philip Cianci
Andres C. Colpa

Greg Coppa

Don Craig
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
Paul Hearty
Hans Hoffmann
Randall Hoffman
Tomlinson Holman
Fred Huffman
Kim Iannone
Kees Schouhamer Immk
Stephen Jensen
Louis Kerofsky
Al Kovalick
Sara Kudrle
W. J. Kumeling
Vicki Lau
Michael Liebman
Peter Ludé
Ian MacSpadden
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
Glen Pensinger
Felix Poulin
Charles Poynton
Pete Putman
Ed Reuss
Adam Schadle
Mark Schublin
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
Aleksandar Todorovic
Upasna Vishnoi
Reinhard E. Wagnerr
Evans Wetmore
Jerry Whitaker
Jim Wilkinson
William Y. Zou

SMPTE Motion Imaging Journal (ISSN: 1545-0279) published 10 times per year by the Society of Motion Picture and Television Engineers, Inc., 445 Hamilton Ave., Suite 601, White Plains, NY 10601. Periodicals postage paid at White Plains, NY, and at additional mailing office. Copyright © 2019 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.smpete.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: \$1,000 (shipping included); 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, 445 Hamilton Ave., Suite 601, White Plains, NY 10601. All rights reserved.

PRINTED IN THE USA