



RNA

A PUBLICATION OF THE RNA SOCIETY

SENIOR EDITOR

Javier F. Caceres
MRC Human Genetics Unit

REVIEWS EDITOR

Thomas R. Cech
Howard Hughes Medical Institute

SENIOR EDITOR

Eric M. Phizicky
University of Rochester

SPECIAL ISSUES EDITOR

Timothy W. Nilsen
Case Western Reserve University

RNA THERAPEUTICS EDITOR ISSN 1355-8382

Michelle L. Hastings
University of Michigan

EDITORS

Benjamin Blencowe
University of Toronto

Maria Carmo-Fonseca
Instituto de Medicina Molecular,
University of Lisbon

Ling-Ling Chen
Chinese Academy of Sciences

Adrian R. Ferré-D'Amaré
National Heart, Lung and Blood Institute

Fátima Gebauer
Centre for Genomic Regulation (CRG)

Britt Glaunsinger
University of California, Berkeley

Marina V. Rodnina
Max Planck Institute for Biophysical Chemistry

Mikiko C. Siomi
The University of Tokyo

Erik Sontheimer
University of Massachusetts Medical School

Peter F. Stadler
Leipzig University

Jörg Vogel
University of Würzburg

Eric Westhof
CNRS, Strasbourg

John Woolford
Carnegie Mellon University

Mihaela Zavolan
Biozentrum, University of Basel

EDITORIAL BOARD

Manuel Ares
University of California, Santa Cruz

David P. Bartel
Massachusetts Institute of Technology

Brenda L. Bass
University of Utah

Philip C. Bevilacqua
Pennsylvania State University

Douglas L. Black
University of California, Los Angeles

Ronald R. Breaker
Yale University

Chris Burge
Massachusetts Institute of Technology

Witold Filipowicz
Friedrich Miescher Institute

Kurt Fredrick
The Ohio State University

Mariano A. Garcia-Blanco
Duke University

Wendy Gilbert
Yale University

Matthias W. Hentze
EMBL, Heidelberg

Daniel Herschlag
Stanford University

Jane E. Jackman
The Ohio State University

Allan Jacobson
University of Massachusetts Medical School

Martin Jinek
University of Zurich

Katrin Karbstein
Scripps Research

Magda Konarska
Warsaw University

Andrei Korostelev
University of Massachusetts
Medical School

Adrian R. Krainer
Cold Spring Harbor Laboratory

Alain Laederach
UNC Chapel Hill

David M.J. Lilley
University of Dundee

Reinhard Lührmann
Max Planck Institute for Biophysical Chemistry,
Göttingen

Kristen W. Lynch
University of Pennsylvania School
of Medicine

James Manley
Columbia University

Lynne E. Maquat
University of Rochester

Gunter Meister
University of Regensburg

Harry F. Noller
University of California, Santa Cruz

Tao Pan
University of Chicago

Roy Parker
University of Colorado, Boulder

Lori Passmore
MRC Laboratory of Molecular Biology

Ramesh Pillai
University of Geneva

Anna Marie Pyle
Yale University

Frank Rigo
Ionis Pharmaceuticals

Donald Rio
University of California, Berkeley

Michael Rosbash
Brandeis University

Guido Sanguinetti
University of Edinburgh

Schraga Schwartz
Weizmann Institute of Science

Geraldine Seydoux
Johns Hopkins University

Phillip A. Sharp
Massachusetts Institute
of Technology

Stewart Shuman
Memorial Sloan Kettering Cancer Center

Haruhiko Siomi
Keio University School of Medicine

Jonathan Staley
University of Chicago

Joan A. Steitz
Yale University

Gisela Storz
National Institute of Child Health
and Human Development

David Tollervey
University of Edinburgh

Yukihide Tomari
The University of Tokyo

Jernej Ule
UCL Institute of Neurology

Juan Valcárcel
ICREA and Centre de Regulació Genòmica

Yanli Wang
Institute of Biophysics, Chinese Academy
of Sciences

Marvin Wickens
University of Wisconsin, Madison

Sandra L. Wolin
National Cancer Institute

Sarah A. Woodson
Johns Hopkins University

Gene Yeo
University of California, San Diego

PRODUCTION MANAGER

Denise Weiss
Cold Spring Harbor
Laboratory Press

PRODUCTION EDITOR

Marie Cotter
Cold Spring Harbor
Laboratory Press

ONLINE CONTENT COORDINATOR

Mary Mulligan
Cold Spring Harbor
Laboratory Press

EDITORIAL COORDINATOR

Ann Marie Micenmacher
Case Western Reserve University

MANAGER, DIGITAL CONTENT DISTRIBUTION

Kevin-John Black
Cold Spring Harbor
Laboratory Press

Editorial Office: RNA, Center for RNA Molecular Biology, Room W127, School of Medicine, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106-4973, USA. Telephone: 216-368-1852; fax: 216-368-2010; e-mail: majournal@case.edu.

Publishing and Advertising Offices: Cold Spring Harbor Laboratory Press, 1 Bungtown Road, Cold Spring Harbor, New York 11724-2203. For advertising rates and data, contact Marcie Siconolfi, Advertising Manager, at 516-422-4010 (telephone) or 516-422-4092 (fax).

Instructions for Contributors: Instructions for contributors are published in each issue of RNA and are available online (<http://www.majournal.org>).

Subscriptions: Kathleen Cirone, Subscription Manager. For 2024 institutional prices, go to <http://majournal.cshlp.org/site/subscriptions/cost.dtl>. Orders may be sent to Cold Spring Harbor Laboratory Press, Fulfillment Department, 500 Sunnyside Boulevard, Woodbury, New York 11797-2924. Telephone: Continental U.S. and Canada 1-800-843-4388; all other locations 1-516-422-4100. Fax: 1-516-422-4094. Claims for missing issues must be received within four months of issue date.

Member Subscriptions: Members of the RNA Society automatically receive RNA as part of their annual membership dues.

The RNA Society: Membership information and application forms may be obtained from: The RNA Society, 1660 International Drive, Suite 600, McLean, VA 22102, USA. Telephone: 301-634-7166; fax: 703-506-3266; e-mail: ma@rnasociety.org.

COPYRIGHT INFORMATION: Authors of articles published in RNA retain copyright of the articles (except US Government employees) but grant Cold Spring Harbor Laboratory Press exclusive right to publish the articles for a period of 12 months following full-issue publication. This includes the rights to publish, reproduce, distribute, display, and store the article in all formats; to translate the article into other languages; to create adaptations, summaries, extracts, or derivations of the article; and to license others to do any or all of the above. Authors can reuse their articles in their work as long as RNA is credited as the place of original publication. Twelve months following publication, these articles are made available under a CC-BY-NC 4.0 Creative Commons license. Articles that carry the Open Access designation are available immediately under a CC-BY 4.0 or CC-BY-NC 4.0 Creative Commons license. Detailed copyright terms are online at <http://majournal.cshlp.org/site/misc/terms.xhtml>. Permission information is online at http://majournal.cshlp.org/site/misc/permissions_landing.xhtml.

RNA (ISSN 1355-8382) is published monthly by Cold Spring Harbor Laboratory Press, 500 Sunnyside Blvd., Woodbury, NY 11797-2924. Periodicals paid at Woodbury, NY, and additional mailing offices. **POSTMASTER:** Send address changes to Cold Spring Harbor Laboratory Press, Journals Fulfillment Dept., 500 Sunnyside Blvd., Woodbury, NY 11797-2924.