

# KEYSTONE SYMPOSIA

on Molecular and Cellular Biology

## Long Noncoding RNAs: From Evolution to Function (C7)

March 15-20, 2015 • Keystone Resort • Keystone, CO, USA

Scientific Organizers: Leonard Lipovich, Jeannie T. Lee, John L. Rinn and James (Ben) Brown

Sponsored by Cell Research, Isis Pharmaceuticals, Inc., Regeneron Pharmaceuticals, Inc. and Sarepta Therapeutics

Discounted Abstract & Scholarship Deadline: November 18, 2014 / Abstract Deadline: December 16, 2014 / Discounted Registration Deadline: January 15, 2015

### SUNDAY, MARCH 15

#### Arrival and Registration

### MONDAY, MARCH 16

#### Welcome Remarks

**Leonard Lipovich**, Wayne State University, USA

**Jeannie T. Lee**, Massachusetts General Hospital / Harvard Medical School, USA

**James (Ben) Brown**, Lawrence Berkeley National Laboratory, USA

**John L. Rinn**, University of Colorado Boulder, USA

#### Keynote Session

\* **James (Ben) Brown**, Lawrence Berkeley National Laboratory, USA

**Thomas R. Cech**, HHMI/University of Colorado, USA  
*A Short History of Noncoding RNA Research*

**Lynne E. Maquat**, University of Rochester Medical Center, USA  
*Control of Gene Expression via lncRNAs and mRNAs that Contain SINES*

#### The Multidimensional lncRNA Landscape

\* **John L. Rinn**, University of Colorado Boulder, USA

**John S. Mattick**, University of Oxford, UK  
*The Human Genome as the Zip File Extraordinaire*

**Nenad Bartonicek**, Garvan Institute of Medical Research, Australia  
*Short Talk: Uncovering Hidden Genes in Intergenic GWAS Regions*

**Sanjida H. Rangwala**, National Institutes of Health, USA  
*Short Talk: Curation and Evidence Reporting of Eukaryotic RefSeq Long Noncoding RNA Genes and Transcripts*

#### Workshop 1

\* **Anna Roth**, German Cancer Research Center, DKFZ, Germany

**Mitchell R. O'Connell**, University of Rochester Medical Center, USA  
*Programmable RNA Targeting and Cleavage by CRISPR/Cas9*

**Guruharsha Kuthethur Gururaj**, Biogen Inc., USA  
*Mapping RNA-Protein Interaction Modules Important in Neurodegeneration*

**Hans E. Johansson**, LGC Biosearch Technologies, USA  
*Duplex Imaging of Pre-lncRNAs and Mature lncRNAs by Stellaris® RNA Fluorescence in situ Hybridization (RNA FISH)*

\* **Mathew Thayer**, Oregon Health & Science University, USA  
*Large Noncoding RNA Genes Control Chromosome-Wide Replication Timing and Stability*

**Karyn Schmidt**, Alnylam Pharmaceuticals, USA  
*Characterization of a lncRNA Contributing to Melanoma Invasion*

**Martin A. Smith**, Garvan Institute of Medical Research, Australia  
*The Modular Transcriptome: Unraveling a Network of Functional, Structured Noncoding RNA Domains*

**Per Johnsson**, Karolinska Institutet, Sweden  
*A Novel Role of PTENpg1 as RNA in Drug Response and Outcome in Melanoma*

#### lncRNA Form and Function

\* **Karissa Y. Sanbonmatsu**, Los Alamos National Laboratory, USA

**Phillip A. Sharp**, Massachusetts Institute of Technology, USA  
*Origins of Long Noncoding RNAs and New Families of Argonaute-Associated Nuclear RNAs*

**Ingrid Grummt**, German Cancer Research Center, Germany  
*DNA:RNA Triplexes Guide Chromatin Modifiers to Regulatory Gene Sequences*

**Boris Guenewig**, Garvan Institute of Medical Research, Australia  
*Short Talk: Functional Characterization of the Human Brain Transcriptome in Parkinson's Disease*

**Howard Y. Chang**, Stanford University, USA  
*Genome Regulation by Long Noncoding RNAs*

**Anindya Dutta**, University of Virginia, USA  
*Short Talk: Long Noncoding RNAs, H19 and MUNC, Promote Skeletal Muscle Differentiation by Two Different Mechanisms*

#### Poster Session 1

### TUESDAY, MARCH 17

#### lncRNA Evolution: Non-Conserved Functions and Species Uniqueness

\* **Kevin V. Morris**, Center for Gene Therapy, City of Hope, USA

**Leonard Lipovich**, Wayne State University, USA  
*The Primate-Specific lncRNAome: Roles in Species Uniqueness, Human Brain and Cancer*

**Jennifer Harrow**, Wellcome Trust Sanger Institute, UK  
*Identifying and Cataloguing Functional lncRNAs in Reference Genomes*

**Nikolaus Rajewsky**, Max Delbrück Center for Molecular Medicine, Germany  
*Circular RNAs in the Mammalian Brain*

**Piero Carninci**, RIKEN Center for Life Science Technologies/TransSINE Technologies Inc.  
*Discovery and Potential Therapeutic Applications of SINEUPs, lncRNA that Stimulate Protein Translation*

**Jonathan S. Weissman**, University of California, San Francisco, USA  
*Exploring Translation Outside of Canonical Protein Coding Region with Ribosome Profiling*

#### Workshop 2

\* **Howard Y. Chang**, Stanford University, USA

\* **Marina Barriocanal**, University of Navarra - FIMA, Spain

**Brian S. Clark**, Johns Hopkins University, USA  
*Dynamic Expression of lncRNAs and Examination of their Role in Retinal Progenitor Competence*

**Rohit Malik**, University of Michigan, USA  
*Integrative Analysis of Androgen Receptor Regulated Long Noncoding RNA in Prostate Cancer*

**Maninjay K. Atianand**, University of Massachusetts Medical School, USA  
*lincRNA-Eps Controls Immune Responses in Macrophage and Mice*

**Evan S. Forsythe**, University of Arizona, USA  
*Phylogenetic Analysis of lincRNA Origins and Evolution in the Plant Family Brassicaceae*

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**Jhumku D. Kohtz**, Feinberg School of Medicine, Northwestern University, USA  
*The Ultraconserved Evf2 lncRNA Reduces Seizure Susceptibility in Mice*

**Hazuki Takahashi**, RIKEN, Japan  
*Mapping of Functional Domains of SINEUPs, Antisense lncRNAs that Enhance Protein Translation*

**Susan A. Boackle**, University of Colorado School of Medicine, USA  
*Altered Expression of Long Noncoding RNA Is Associated with a Lupus-Associated Variant in Complement Receptor 2*

### In vivo Roles of lncRNAs: The Promises and Limitations of Animal Models

\***Leonard Lipovich**, Wayne State University, USA

**Alexandra Henrion-Caude**, Necker Hospital – Imagine Foundation, France  
*Learning about Human lncRNA by Repetition and Reduction*

**Kevin G. Nyberg**, Northwestern University, USA  
*Short Talk: Comparative Transcriptomics of Long Intergenic Noncoding RNAs in Drosophila*

**Ciro Bonetti**, Regeneron Pharmaceuticals, USA  
*Short Talk: Mouse Models to Dissect Oncogenic and Tumor-Suppressive Functions of lincRNAs*

**Sven Diederichs**, University of Freiburg & German Cancer Research Center, Germany  
*Long Noncoding RNA Function in Cancer*

**Caio F. Damski**, University of New South Wales, Australia  
*Short Talk: Saving the Devil; lncRNA Directed Epigenetic Changes in a Contagious Cancer*

**Matthew G. Schwartz**, Harvard Medical School, USA  
*Short Talk: The Role of Long Noncoding RNAs in Regulating Chicken Limb Development*

### Poster Session 2

#### WEDNESDAY, MARCH 18

##### lncRNA Mechanisms: Diversity and Heterogeneity

\***Jhumku D. Kohtz**, Feinberg School of Medicine, Northwestern University, USA

**Ramin Shiekhhattar**, University of Miami, USA  
*Biogenesis and Mechanism of Action of Enhancer RNA*

**Kevin V. Morris**, Center for Gene Therapy, City of Hope, USA  
*RNA-Directed Modulation of Phenotypic Plasticity in Human Cells*

**Nicholas Lister**, University of New South Wales, Australia  
*Short Talk: Promoter-Associated Transcripts Are Required for PTENpg1 Antisense RNA-Directed Epigenetic Regulation of PTEN*

**Jeannie T. Lee**, Massachusetts General Hospital / Harvard Medical School, USA  
*RNA-Protein Interactions in Epigenetic Regulation*

**Richard G. Jenner**, University College London, UK  
*Short Talk: Polycomb Repressive Complex 2 Directly Interacts with RNA through Suz12 and Is Independent of Chromatin Association*

**Reini F. Luco**, Centre National de la Recherche Scientifique, France  
*Short Talk: A Long Noncoding RNA Regulates Chromatin-Mediated Modulation of Alternative Splicing*

### Workshop 3

\***Ranjan J. Perera**, Sanford Burnham Prebys Medical Discovery Institute, USA

\***Emily R. Feldman**, University of Florida, USA

**Zhuo Zhou**, NIDDK, National Institutes of Health, USA  
*RNA-Dependent Triplex Formation Regulates Expression of Erythroid Genes*

**Valerie Brid O'Leary**, Helmholtz Zentrum Muenchen, Germany  
*PARTICLE – A Long Noncoding RNA Modulator of Cellular Methylation in Response to Low Dose Irradiation*

**Fabien Dachet**, University of Illinois at Chicago School of Medicine, USA

*Epigenetic Organization of Protein Coding and Large Noncoding Transcripts in Electrically Active Human Brain*

**Yuya Ogawa**, Cincinnati Children's Hospital Medical Center, USA  
*Xist Exon 7 Contributes to the Stable Localization of Xist RNA on the Inactive X-Chromosome*

**Karissa Y. Sanbonmatsu**, Los Alamos National Laboratory, USA  
*Structural Studies of Long Noncoding RNAs*

**Luis Arnes**, Columbia University, USA  
*Examining the Role of Novel Long Noncoding RNAs in beta Cell Biology*

### Conserved lncRNA Functions

\***Alexandra Henrion-Caude**, Necker Hospital – Imagine Foundation, France

**James (Ben) Brown**, Lawrence Berkeley National Laboratory, USA  
*Long Noncoding RNAs and Adaptive Responses to Environmental Stressors*

**Mridula (Millie) K. Ray**, Harvard University, Massachusetts General Hospital, USA

*Short Talk: lncRNAs Interact with PRC1 to Impact Development in Human and Zebrafish*

**John L. Rinn**, University of Colorado Boulder, USA  
*Linking RNA from Mouse to Mechanism*

**David J. Waxman**, Boston University, USA  
*Short Talk: Mouse Liver lincRNAs: Gene Structures, Chromatin States, Conservation and Regulation of Sex-Specific Transcription by Pituitary Growth Hormone (GH)*

**Colleen A. McHugh**, California Institute of Technology, USA  
*Short Talk: Uncovering Mechanisms of lncRNA Function through Comprehensive Identification of Direct lncRNA-Interacting Proteins in vivo*

### Poster Session 3

#### THURSDAY, MARCH 19

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### Transcription Factors and lncRNAs: Direct Endogenous Riboregulation

\***Jeannie T. Lee**, Massachusetts General Hospital / Harvard Medical School, USA

**David R. Corey**, University of Texas Southwestern Medical Center, USA

*Nuclear RNAi: Connecting lncRNAs with Sequence-Specific Regulation of Transcription and Splicing*

**Vladimir Bajic**, King Abdullah University of Science and Technology, Saudi Arabia

*Protein-Coding and lncRNA Genes Are Regulated Differently: Feedback Loops with lncRNA-Interacting Transcription Factors*

**Michael G. Rosenfeld**, University of California, San Diego, USA  
*Enhancer Signatures eRNAs and Nuclear Architecture in Regulated Gene Transcription*

**Veronica Peschansky**, University of Miami, USA  
*Short Talk: Fragile X-Associated lncRNA FMR4 Is Trans-Active, Involved in Neural Development and Localized to Chromatin*

**Katelin R. Haynes**, University of Queensland Diamantina Institute, Australia  
*Short Talk: Identification of Monocyte-Specific eRNAs at an Intergenic GWAS Locus Associated with Ankylosing Spondylitis Reveals Potential Mechanism in Disease*

**Jennifer F. Kugel**, University of Colorado Boulder, USA  
*Regulation of RNA Polymerase II by SINE-Encoded ncRNAs*

**Jesse M. Engreitz**, Harvard University and Broad Institute, USA  
*Short Talk: Many Nuclear-Localized lincRNAs Regulate Gene Expression in cis*

### Workshop 4

\***Saba Valadkhan**, Case Western Reserve University, USA

\***Ashley R. Hoover**, University of Texas Southwestern Medical Center, USA

**Fan Lai**, University of Miami, USA  
*Integrator Mediates the Biogenesis of Enhancer RNAs*

**Shrikanth S. Gadad**, Texas Tech University Health Sciences Center, USA

*Functional Characterization of an Estrogen-Regulated Long Noncoding RNA that Controls the Growth of Breast Cancer Cells*

**Maren M. Gross**, Dharmacon, a Horizon Discovery Group Company, USA

*Knockdown of Long Noncoding RNAs in Breast Cancer*

**Musa M. Mhlanga**, University of Cape Town, South Africa  
*HIV-1 Targets MAP2K1/ERK2 to Evade lincRNA-p21-Mediated Apoptosis*

**Margaret D. Ballantyne**, University of Glasgow, UK  
*Cytokine and Growth Factor Induction of lncRNA in Vascular Smooth Muscle Cells*

**Damien Hermand**, University of Namur, Belgium  
*Timely Entry into Gametogenesis Regulated by a Modified cis-Acting LINC-RNA in Fission Yeast*

**Felipe Beckedorff**, Universidade de São Paulo, Brazil  
*lincRNAs Enriched for Enhancer Histone Signatures Are Involved in the Activation of Genes Regulated by Androgen*

### lncRNAs in Human Disease: Toward Rational Ribo-Therapeutics

\***Luis Arnes**, Columbia University, USA

**Frank Rigo**, Ionis Pharmaceuticals, USA  
*Towards a Therapy for Angelman Syndrome by Targeting a Long Noncoding RNA to Active UBE3A*

**James Barsoum**, Arrakis Therapeutics, USA  
*Selective Activation of Gene Expression by Targeting Long Noncoding RNA*

**Saba Valadkhan**, Case Western Reserve University, USA  
*A Bi-Functional Long Noncoding RNA Links Neuronal Differentiation to Survival after Stress*

**Eleonora Leucci**, KU Leuven, Belgium  
*Short Talk: Targeting the Melanoma-Specific Long Noncoding RNA LINC01212 as an Effective Antimelanoma Strategy*

**Claes Wahlestedt**, University of Miami/CURNA-OPKO  
*Long Noncoding RNAs: Therapeutic Opportunities*

### Concluding Remarks

**Leonard Lipovich**, Wayne State University, USA

**Jeannie T. Lee**, Massachusetts General Hospital / Harvard Medical School, USA

**James (Ben) Brown**, Lawrence Berkeley National Laboratory, USA

**John L. Rinn**, University of Colorado Boulder, USA

### FRIDAY, MARCH 20

#### Departure