

# Jon R. Lorsch, Ph.D.

## DEMOGRAPHIC INFORMATION

### Current Appointment

Director National Institute of General Medical Sciences

### Personal Data

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### Education and Training

#### 1990 B.A. Swarthmore College (Chemistry with Honors)

1995 Ph.D. Harvard University (Biochemistry)  
1995-1999 Fellowship Stanford University (Biochemistry)

### Professional Experience

1989-1990 Honors Thesis, Swarthmore College  
Advisors: Judith Voet, Ph.D. and Nancy Hamlett, Ph.D.  
Thesis: Enzymology of mercuric reductase from a novel bacterium,  
*C. iridescens*

1990-1995 Ph.D., Harvard University  
Department of Molecular and Cellular Biology  
Advisor: Jack W. Szostak, Ph.D.  
Thesis: *In vitro* selection of novel functional RNAs

1993 Graduate Teaching Fellow, Harvard University  
1994 Head Graduate Teaching Fellow, Harvard University  
1995-1999 Post-doctoral Fellow, Stanford University  
Department of Biochemistry  
Advisor: Daniel Herschlag, Ph.D.

1999-2005 Assistant Professor  
2005-2009 Associate Professor  
2009-2013 Professor  
Department of Biophysics and Biophysical Chemistry  
Johns Hopkins University School of Medicine

2013-2014 Adjunct Investigator, *Eunice Kennedy Shriver* National Institute of Child Health  
and Human Development

2013-present Director, National Institute of General Medical Sciences  
2014-present Senior Investigator, *Eunice Kennedy Shriver* National Institute of Child Health  
and Human Development

## RESEARCH ACTIVITIES

### Peer-Reviewed Original Research Articles

1. Ruprecht, R.M., **Lorsch, J.R.** and Trites, D.H. "Analysis of suramin plasma levels by ion-pair high-performance liquid chromatography under isocratic conditions." *Journal of Chromatography* (1986) **378**:498-502.
2. **Lorsch, J.R.** and Szostak, J.W. "*In vitro* selection of RNA aptamers specific for cyanocobalamin." *Biochemistry* (1994) **33**:973-82.
3. **Lorsch, J.R.** and Szostak, J.W. "*In vitro* evolution of new ribozymes with polynucleotide kinase activity." *Nature* (1994) **371**:31-6.
4. **Lorsch, J.R.**, Bartel, D.P. and Szostak, J.W. "Reverse transcriptase reads through a 2'-5' linkage and a 2'-thiophosphate in a template." *Nucleic Acids Research* (1995) **23**:2811-14.
5. **Lorsch, J.R.** and Szostak, J.W. "Kinetic and thermodynamic characterization of the reaction catalyzed by a polynucleotide kinase ribozyme." *Biochemistry* (1995) **34**:15315-27.
6. **Lorsch, J.R.** and Herschlag, D. "The DEAD Box Protein eIF4A. 1. A minimal kinetic and thermodynamic framework reveals coupled binding of RNA and nucleotide." *Biochemistry* (1998) **37**:2180-93.
7. **Lorsch, J.R.** and Herschlag, D. "The DEAD box protein eIF4A. 2. A cycle of nucleotide and RNA-dependent conformational changes." *Biochemistry* (1998) **37**:2194-2206.
8. **Lorsch, J.R.** and Herschlag, D. "Kinetic dissection of fundamental processes of eukaryotic translation initiation *in vitro*." *EMBO J.* (1999) **18**:6705-17.
9. Algire, M.A., Maag, D., Savio, P., Acker, M.G., Tarun, S.Z., Sachs, A.B., Asano, K., Nielsen, K.H., Olsen, D.S., Phan, L., Hinnebusch, A.G. and **Lorsch, J.R.** "Development and characterization of a reconstituted yeast translation initiation system." *RNA* (2002) **8**:382-97.
10. Carriere, M., Vijayabaskar, V., Applefield, D., Harvey, I., Garneau, P., **Lorsch, J.**, Lapidot, A. and Pelletier, J. "Inhibition of protein synthesis by aminoglycoside-arginine conjugates." *RNA* (2002) **8**:1267-79.
11. Shin, B.-S., Maag, D., Roll-Mecak, A., Arefin, M.S., Burley, S.K., **Lorsch, J.R.** and Dever, T.E. "Uncoupling of initiation factor eIF5B/IF2 GTPase and translational activities by mutations that lower ribosome affinity." *Cell* (2002) **111**:1015-25.
12. Maag, D. and **Lorsch, J.R.** "Communication between eukaryotic translation initiation factors 1 and 1A on the yeast small ribosomal subunit." *J. Mol. Biol.* (2003) **330**:917-24.
13. Kapp, L.D. and **Lorsch, J.R.** "GTP-dependent recognition of the methionine moiety on initiator tRNA by translation factor eIF2." *J. Mol. Biol.* (2004) **335**:923-36.

‡Co-corresponding authors.

\*Equal contribution.

14. Maag, D., Fekete, C.A., Gryczynski, Z. and **Lorsch, J.R.** "A conformational change in the eukaryotic translation pre-initiation complex and release of eIF1 signal recognition of the start codon." *Mol. Cell* (2005) **17**:265-75.
15. Fekete, C.A., Applefield, D.J., Blakely, S.A., Shirokikh, N., Pestova, T., **Lorsch, J.R.**, and Hinnebusch, A.G. "The eIF1A C-terminal domain promotes initiation complex assembly, scanning and AUG selection *in vivo*." *EMBO J.* (2005) **24**:3588-601.
16. Algire, M.A., Maag, D. and **Lorsch, J.R.** "P<sub>i</sub> release from eIF2, not GTP hydrolysis, is the step controlled by start-site selection during eukaryotic translation initiation." *Mol. Cell* (2005) **20**:251-62.
17. Maag, D., Algire, M.A. and **Lorsch, J.R.** "Communication between eukaryotic translation initiation factors 5 and 1A within the ribosomal pre-initiation complex plays a role in start site selection." *J. Mol. Biol.* (2006) **356**:724-37.
18. Acker, M.G., Shin, B.-S., Dever, T.E. and **Lorsch, J.R.** "Interaction between eukaryotic initiation factors 1A and 5B is required for efficient ribosomal subunit joining." *J. Biol. Chem.* (2006) **281**:8469-75.
19. Kapp, L.D., Kolitz, S.E. and **Lorsch, J.R.** "Yeast initiator tRNA identity elements cooperate to influence multiple steps of translation initiation." *RNA* (2006) **12**:751-64.
20. Robert, F., Kapp, L.D., Khan, S.N., Acker, M.G., Kolitz, S.E., Kazemi, S., Kaufman, R.J., Merrick, W.C., Koromilas, A.E., **Lorsch, J.R.** and Pelletier, J. "Initiation of protein synthesis by hepatitis C virus is refractory to reduced eIF2•GTP•Met-tRNA<sub>i</sub><sup>Met</sup> ternary complex availability." *Mol. Biol. Cell* (2006) **17**:4632-44.
21. Shin, B.-S., Acker, M.G., Maag, D., Kim, J.R., **Lorsch, J.R.** and Dever, T.E. "Intragenic suppressor mutations restore GTPase and translation functions of eIF5B switch II mutant." *Mol. Cell. Biol.* (2007) **27**:1677-85.
22. Fringer, J.M., Acker, M.G., Fekete, C.A., **Lorsch, J.R.** and Dever, T.E. "Coupled release of factors eIF5B and eIF1A from 80S ribosomes following subunit joining." *Mol. Cell. Biol.* (2007) **27**:2384-97.
23. Fekete, C.A.\* , Mitchell, S.F.\* , Cherkasova, V.A., Applefield, D.J., Algire, M.A., Maag, D., Saini, A., **Lorsch, J.R.**<sup>‡</sup> and Hinnebusch, A.G.<sup>‡</sup> "N- and C-terminal residues of eIF1A have opposing effects on the fidelity of start codon selection." *EMBO J.* (2007) **26**:1602-14.
24. Passmore, L.A., Schmeing, T.M., Maag, D., Applefield, D.J., Acker, M.G., Algire, M.A., **Lorsch, J.R.**<sup>‡</sup> and Ramakrishnan, V.<sup>‡</sup> "The eukaryotic translation initiation factors eIF1 and eIF1A induce an open conformation of the 40S ribosome." *Mol. Cell* (2007) **26**:41-50.
25. Cheung, Y.-N., Maag, D., Mitchell, S.F., Fekete, C.A., Algire, M.A., Takacs, J.E., Shirokikh, N., Pestova, T.V., **Lorsch, J.R.**<sup>‡</sup> and Hinnebusch, A.G.<sup>‡</sup> "Dissociation of eIF1 from the 40S ribosomal subunit is a key step in start codon selection *in vivo*." *Genes and Dev.* (2007) **21**:1217-30.

<sup>‡</sup>Co-corresponding authors.

\*Equal contribution.

26. Dong, J., Nanda, J.S., Rahman, H., Pruitt, M.R., Shin, B.-S., Wong, C.-M., **Lorsch, J.R.** and Hinnebusch, A.G. "Genetic identification of yeast 18S rRNA residues required for efficient recruitment of initiator tRNA<sup>Met</sup> and AUG selection." *Genes and Dev.* (2008) **22**:2242-55.
27. Acker, M.G., Shin, B.-S., Saini, A.K., Dever, T.E. and **Lorsch, J.R.** "Kinetic analysis of late steps of eukaryotic translation initiation." *J. Mol. Biol.* (2009) **385**:491-506.
28. Kolitz, S.E., Takacs, J.E. and **Lorsch, J.R.** "Kinetic and thermodynamic analysis of the role of start codon/anticodon base pairing during eukaryotic translation initiation." *RNA* (2009) **15**:138-52.
29. Shin, B.S., Kim, J.R., Acker, M.G., Maher, K.N., **Lorsch, J.R.** and Dever, T.E. "rRNA suppressor of an eIF5B/IF2 mutant reveals a binding site for translational GTPases on the small ribosomal subunit." *Mol. Cell Biol.* (2009) **29**:808-21.
30. Saini, A.K., Nanda, J.S., **Lorsch, J.R.** and Hinnebusch, A.G. "Regulatory elements in eIF1A control the fidelity of start codon selection by modulating tRNA(i)(Met) binding to the ribosome." *Genes Dev.* (2010) **24(1)**:97-110.
31. Kurata, D., Nielsen, K.H., Mitchell, S.F., **Lorsch, J.R.**, Kaji, A. and Kaji, H. "Ribosome recycling step in yeast cytoplasmic protein synthesis is catalyzed by eEF3 and ATP." *Proc. Natl. Acad. Sci. U.S.A.* (2010) **107(24)**:10854-9.
32. Mitchell, S.F., Walker, S.E., Algire, M.A., Park, E.H., Hinnebusch, A.G. and **Lorsch, J.R.** "The 5'-7-methylguanosine cap on eukaryotic mRNAs serves both to stimulate canonical translation initiation and to block an alternative pathway." *Mol. Cell* (2010) **39(6)**:950-62.
33. Park, E.H., Walker, S.E., Lee, J.M., Rothenberg, S., **Lorsch, J.R.** and Hinnebusch, A.G. "Multiple elements in the eIF4G1 N-terminus promote assembly of eIF4G1 PABP mRNPs *in vivo*." *EMBO J.* (2011) **30(2)**:302-16.
34. Takacs, J.E., Neary, T.B., Ingolia, N.T., Saini, A.K., Martin-Marcos, P., Pelletier, J., Hinnebusch, A.G. and **Lorsch, J.R.** "Identification of compounds that decrease the fidelity of start codon recognition by the eukaryotic translational machinery." *RNA* (2011) **17(3)**:439-52.
35. Shin, B.S., Acker, M.G., Kim, J.R., Maher, K.N., Arefin, S.M., **Lorsch, J.R.** and Dever, T.E. "Structural integrity of {alpha}-helix H12 in translation initiation factor eIF5B is critical for 80S complex stability." *RNA* (2011) **17**:687-96.
36. Shin, B.S., Kim, J.R., Walker, S.E., Dong, J., **Lorsch, J.R.** and Dever, T.E. "Initiation factor eIF2y promotes eIF2-GTP-Met-tRNA<sup>i</sup>(Met) ternary complex binding to the 40S ribosome." *Nat. Struct. Mol. Biol.* (2011) **18**:1227-34.

‡Co-corresponding authors.

\*Equal contribution.

37. Rajagopal, V., Park, E.H., Hinnebusch, A.G. and **Lorsch, J.R.** “Specific domains in yeast translation initiation factor eIF4G strongly bias the RNA unwinding activity of the eIF4F complex towards duplexes with 5'-overhangs.” *J. Biol. Chem.* (2012) **287**:20301-12.
38. Luna R.E., Arthanari H., Hiraishi H., Nanda J., Martin-Marcos P., Markus M.A., Akabayov B., Milbradt A.G., Luna L.E., Seo H.C., Hyberts S.G., Fahmy A., Reibarkh M., Miles D., Hagner P.R., O'Day E.M., Yi T., Marintchev A., Hinnebusch A.G., **Lorsch J.R.**, Asano K. and Wagner G. “The C-Terminal Domain of Eukaryotic Initiation Factor 5 Promotes Start Codon Recognition by Its Dynamic Interplay with eIF1 and eIF2 $\beta$ .” *Cell Rep.* (2012) **1**:689-702.
39. Allen R.C., Tu Y.K., Nevarez M.J., Bobbs A.S., Friesen J.W., **Lorsch J.R.**, McCauley J.A., Voet J.G. and Hamlett N.V. “The mercury resistance (*mer*) operon in a marine gliding flavobacterium, *Tenacibaculum discolor* 9A5.” *FEMS Microbiol. Ecol.* (2013) **83**:135-48.
40. Park, E.-H., Walker, S.E., Zhou, F., Lee, J.M., Rajagopal, V., **Lorsch, J.R.** and Hinnebusch A.G. “Yeast eIF4B enhances eIF4G·eIF4A complex assembly *in vivo*.” *J. Biol. Chem.* **288**:2340-54.
41. Walker, S.E.\* , Zhou, F.\* , Mitchell, S.F., Larson, V.S., Valasek, L., Hinnebusch, A.G.<sup>‡</sup> and **Lorsch, J.R.**<sup>‡</sup> “Yeast eIF4B binds to the head of the 40S ribosomal subunit and promotes mRNA recruitment through its N-terminal and internal repeat domains.” *RNA* (2013) **19**:191-207.
42. Nanda, J.S., Saini A.K., Muñoz A.M., Hinnebusch, A.G. and **Lorsch, J.R.** “Coordinated movements of eukaryotic translation initiation factors eIF1, eIF1A and eIF5 trigger phosphate release from eIF2 in response to start codon recognition by the ribosomal pre-initiation complex.” *J. Biol. Chem.* (2013) **288**:5316-29.
43. Martin-Marcos P., Nanda J., Luna R.E., Wagner G., **Lorsch J.R.**<sup>‡</sup> and Hinnebusch A.G.<sup>‡</sup> “ $\beta$  Hairpin loop of eukaryotic initiation factor 1 (eIF1) mediates 40 S ribosome binding to regulate initiator tRNA(Met) recruitment and accuracy of AUG selection *in vivo*.” *J. Biol. Chem.* (2013) **288**:27546-62.
44. Fernández I.S.\* , Bai X.C.\* , Hussain T., Kelley A.C., **Lorsch J.R.**<sup>‡</sup>, Ramakrishnan V.<sup>‡</sup> and Scheres S.H.<sup>‡</sup> “Molecular architecture of a eukaryotic translational initiation complex.” *Science* (2013) **342**:1240585.
45. Zhou F.\* , Walker S.E.\* , Mitchell S.F., **Lorsch J.R.**<sup>‡</sup> and Hinnebusch A.G.<sup>‡</sup> “Identification and characterization of functionally critical, conserved motifs in the internal repeats and N-terminal domain of yeast translation initiation factor 4B (yeIF4B).” *J. Biol. Chem.* (2014) **289**:1704-22.
46. Martin-Marcos P., Nanda J.S., Luna R.E., Zhang F., Saini A.K., Cherkasova V.A., Wagner G., **Lorsch J.R.**<sup>‡</sup> and Hinnebusch A.G.<sup>‡</sup> “Enhanced eIF1 binding to the 40S ribosome impedes conformational rearrangements of the preinitiation complex and elevates initiation accuracy.” *RNA* (2014) **20**:150-67.

<sup>‡</sup>Co-corresponding authors.

\*Equal contribution.

47. Dong J.\* , Munoz A.\* , Kolitz S.E., Saini A.K., Chiu W., Rahman H., **Lorsch J.R.**<sup>‡</sup> and Hinnebusch A.G.<sup>‡</sup> "Conserved residues in yeast initiator tRNA calibrate initiation accuracy by regulating preinitiation complex stability at the start codon." *Genes Dev.* (2014) **28**:502-20.

<sup>‡</sup>Co-corresponding authors.

\*Equal contribution.

## **Review Articles**

1. **Lorsch, J.R.** and Szostak, J.W. "Chance and necessity in the selection of nucleic acid catalysts." *Accounts of Chemical Research* (1996) **29**:103-10.
2. **Lorsch, J.R.** "RNA chaperones exist and DEAD box proteins get a life." *Cell* (2002) **109**:797-800.
3. Green, R. and **Lorsch, J.R.** "The path to perdition is paved with protons." *Cell* (2002) **110**:665-8.
4. Kapp, L.D. and **Lorsch, J.R.** "The molecular mechanics of eukaryotic translation." *Ann. Rev. Biochem.* (2004) **73**:657-704.
5. Doudna, J.A. and **Lorsch, J.R.** "Ribozyme catalysis: Not different, just worse." *Nat. Struct. Mol. Biol.* (2005) **12**:395-402.
6. Algire, M.A. and **Lorsch, J.R.** "Where to begin? The mechanism of translation initiation codon selection in eukaryotes." *Curr. Opin. Chem. Biol.* (2006) **10**:480-6.
7. Acker, M.G., Kolitz, S.E., Mitchell, S.F., Nanda, J.S. and **Lorsch, J.R.** "Reconstitution of yeast translation initiation." *Methods in Enzymol.* (2007) **430**:111-45.
8. Acker, M.G. and **Lorsch, J.R.** "Mechanism of ribosomal subunit joining during eukaryotic translation initiation." *Biochem. Soc. Trans.* (2008) **36(Pt 4)**:653-7.
9. Mitchell, S.F. and **Lorsch, J.R.** "Should I stay or should I go? Eukaryotic translation initiation factors 1 and 1A control start codon recognition." *J. Biol. Chem.* (2008) **283**:27345-9.
10. Kolitz, S.E. and **Lorsch, J.R.** "Eukaryotic initiator tRNA: finely tuned and ready for action." *FEBS Lett.* (2010) **584(2)**:396-404.
11. **Lorsch, J.R.** and Dever, T.E. "Molecular view of 43 S complex formation and start site selection in eukaryotic translation initiation." *J Biol Chem.* (2010) **285(28)**:21203-7.
12. Aitken, C.E. and **Lorsch, J.R.** "A mechanistic overview of translation initiation in eukaryotes." *Nat Struct Mol Biol.* (2012) **19**:568-76.
13. Hinnebusch, A.G and **Lorsch, J.R.** "The mechanism of eukaryotic translation initiation: New insights and challenges." *Cold Spring Harb Perspect Biol.* (2012) **4**:pii:a011544.

14. Walker, S.E. and **Lorsch, J.R.** "Sanger dideoxy sequencing of DNA." *Methods Enzymol.* (2013) **529**:171-84.
15. Kolitz, S. and **Lorsch, J.R.** "Explanatory chapter: nucleic acid concentration determination." *Methods Enzymol.* (2013) **530**:331-6.
16. Walker, S.E. and **Lorsch, J.R.** "RNA purification--precipitation methods." *Methods Enzymol.* (2013) **530**:337-43.
17. Walker, S.E. and **Lorsch, J.R.** "Reverse transcriptase dideoxy sequencing of RNA." *Methods Enzymol.* (2013) **530**:347-59.
18. Rajagopal, V. and **Lorsch, J.R.** "ATP and GTP hydrolysis assays (TLC)." *Methods Enzymol.* (2013) **533**:325-34.
19. **Lorsch, J.R.** "Practical steady-state enzyme kinetics." *Methods Enzymol.* (2014) **536**:3-15.
20. Nanda, J.S. and **Lorsch, J.R.** "Labeling of a protein with fluorophores using maleimide derivitization." *Methods Enzymol.* (2014) **536**:79-86.
21. Nanda, J.S. and **Lorsch, J.R.** "Labeling a protein with fluorophores using NHS ester derivitization." *Methods Enzymol.* (2014) **536**:87-94.
22. Mitchell, S.F. and **Lorsch, J.R.** "Protein derivitization-expressed protein ligation." *Methods Enzymol.* (2014) **536**:95-108.
23. Mitchell, S.F. and **Lorsch, J.R.** "Standard in vitro assays for protein-nucleic acid interactions—gel shift assays for RNA and DNA binding." *Methods Enzymol.* (2014) **541**:179-96.
24. Kolitz, S. and **Lorsch, J.R.** "Protein filter binding." *Methods Enzymol.* (2014) **541**:197-205.

### **Commentaries and Perspectives**

1. **Lorsch, J.R.** and Nichols, D.G. "Organizing graduate life sciences education around nodes and connections." *Cell* (2011) **146**:506-9.
2. **Lorsch, J.R.** "Good outcomes." *ASBMB Today*, August 2012.
3. **Lorsch, J.R.**, Collins F.S. and Lippincott-Schwartz, J.L. "Fixing problems with cell lines." *Science* (2014) **346**:1452-3.
4. **Lorsch, J.R.** "Maximizing the return on taxpayers' investments in fundamental biomedical research." *Mol Biol Cell* (2015) **26(9)**:1578-82.
5. Bourne PE, **Lorsch JR**, Green ED. "Perspective: Sustaining the big-data ecosystem." *Nature.* (2015) **527(7576)**:S16-7.

### **Letter (technical comment)**

1. **Lorsch, J.R.** and Berg, J.M. "Mechanism of ribosomal peptide bond formation." *Science* (2001) **291**:203.

## **Book Chapters**

1. **Lorsch, J.R.** and Szostak, J.W. “*In vitro* selection of nucleic acid sequences that bind small molecules” in Combinatorial Libraries: Synthesis, Screening and Application Potential (1995; ed. R. Cortese) Walter de Gruyter & Co., Berlin.
2. Pestova, T.V., **Lorsch, J.R.** and Hellen, C.U.T. “The mechanism of translation initiation in eukaryotes” in Translational Control in Biology and Medicine (2007; eds. M.B. Mathews, N. Sonenberg and J.W.B. Hershey), Cold Spring Harbor Laboratory Press, Cold Spring Harbor.
3. Mitchell, S.F., Walker, S.E., Rajagopal, V., Aitken, C.E. and **Lorsch, J.R.** “Recruiting knotty partners: The roles of translation initiation factors in mRNA recruitment to the eukaryotic ribosome” in Ribosomes: Structure, Function and Dynamics (2011; eds. M.V. Rodnina, W. Wintermeyer and R. Green) Springer, Vienna.

## **Books Edited**

1. *Methods in Enzymology*, Vol. 429, Translation Initiation: Extract Systems and Molecular Genetics (2007; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
2. *Methods in Enzymology*, Vol. 430, Translation Initiation: Reconstituted Systems and Biophysical Methods (2007; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
3. *Methods in Enzymology*, Vol. 431, Translation Initiation: Cell Biology, High-Throughput and Chemical-Based Approaches (2007; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
4. *Methods in Enzymology*, Vol. 529, Laboratory Methods in Enzymology: DNA (2013; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
5. *Methods in Enzymology*, Vol. 530, Laboratory Methods in Enzymology: RNA (2013; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
6. *Methods in Enzymology*, Vol. 533, Laboratory Methods in Enzymology: Cell, Lipid and Carbohydrate (2013; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.
7. *Methods in Enzymology*, Vol. 536, Laboratory Methods in Enzymology: Protein Part A (2014; ed. **J.R. Lorsch**), Elsevier, San Diego, CA.

## **Patents**

United States Patent 5,688,670 (November 18, 1997)  
“Self-modifying RNA molecules and methods of making them”  
Inventors: Szostak, Jack W.; **Lorsch, Jon R.**; Wilson, Charles  
Assignee: The General Hospital Corporation (Boston, MA)

United States Patent 8,828,976 (September 9, 2014)  
“Identification and use of compounds that affect the fidelity of eukaryotic translation initiation codon selection”  
Inventors: **Lorsch, Jon R.**; Takacs, Julie Ellen; Neary, Timothy Brian  
Assignee: The Johns Hopkins University

## **Extramural Sponsorship**

## Previous

- 09/1/2000-08/01/2013 Kinetic Dissection of Eukaryotic Translation Initiation  
R01 GM62128  
NIH/NIGMS  
\$1,924,241  
PI, 20%  
The major goal of this project was to dissect the molecular mechanics of the steps involved in 43S pre-initiation complex formation and start codon recognition in eukaryotic translation initiation using a reconstituted yeast system.
- 12/01/2009-11/31/2012 Structural Studies of Yeast Translation Initiation  
RGP0028/2009-C  
Human Frontier Science Program  
\$750,000  
PI, 10%; co-PIs: A. Hinnebusch and V. Ramakrishnan  
The goal of this project was to determine three-dimensional structures of yeast translation initiation complexes.
- 09/10/2011-08/31/2013 Modulators of the Fidelity of Start Codon Recognition in Eukaryotes  
1R03 MH095520-01  
NIH  
\$25,000 (Yr 1 Direct Cost)  
The major goal of this project was to perform a high-throughput screen for additional compounds that modulate the fidelity of start codon recognition.
- 07/01/1998-06/30/2001 Kinetic and Thermodynamic Analysis of Eukaryotic Translation Initiation  
Career Development Award #3762-99  
Leukemia Society of America  
\$183,000  
PI, 50%  
The goal of this project was to develop a fully reconstituted translation system using yeast components and to use this system to begin to analyze yeast translation initiation.
- 07/01/2003-06/30/2005 Elucidation of the Molecular Mechanisms Employed by a Central Eukaryotic Translation Initiation Factor, eIF1.  
Grant-in-Aid  
American Heart Association  
\$120,000  
PI, 30%  
The goal of this project was to probe the molecular mechanisms used by the eukaryotic translation initiation factor eIF1 in ensuring the fidelity of initiation codon selection.
- 07/01/2003-12/31/2007 Mechanism of Action of a Central Translation Factor, eIF5B  
RSG GMC-105934  
American Cancer Society  
\$600,000

PI, 30%  
The goal of this project was to elucidate the molecular mechanisms employed by the translation initiation factor eIF5B, a GTPase that facilitates the joining of the ribosomal subunits at the end of translation initiation.

07/01/2005-06/30/2007      The Molecular Mechanics of the Penultimate Steps in Eukaryotic Translation Initiation  
Grant-in-Aid  
American Heart Association  
\$120,000  
PI, 20%  
The goal of this project was to elucidate the molecular mechanics of the steps following the first committed step in eukaryotic translation initiation, GTP hydrolysis by the factor eIF2, and preceding the final step, joining of the two ribosomal subunits. These penultimate steps may play an important role in proofreading the selection of the translational start site in the mRNA.

06/01/2007-05/31/2009      Small Molecule Effectors of Eukaryotic Translation Initiation Site Selection  
R21 DK078633  
NIH/NIDDK  
\$275,000  
PI, 20%  
The goal of this project was to find and begin to characterize small molecules that can modulate the fidelity of start codon recognition in eukaryotes.

06/2007-08/2007      Supplement to Kinetic Dissection of Eukaryotic Translation Initiation  
3R01GM062128-07S1  
NIH/NIGMS  
\$4,800  
PI, 20%  
This award provided support under the Research Supplements to Promote Diversity in Health-Related Research Program for Jasmine Hope's summer research.

06/2008-08/2008      Supplement to Kinetic Dissection of Eukaryotic Translation Initiation  
3R01GM062128-08S1  
NIH/NIGMS  
\$7,800  
PI, 20%  
This award provided support under the Research Supplements to Promote Diversity in Health-Related Research Program for Jasmine Hope's summer research.

07/2009-03/2010      Supplement to Kinetic Dissection of Eukaryotic Translation Initiation  
3R01GM062128-09S1  
NIH/NIGMS  
\$67,841  
This was an ARRA supplement to the parent grant to provide funds to purchase a new FPLC.

- 07/2010-06/2012 Supplement to Kinetic Dissection of Eukaryotic Translation Initiation  
3R01GM062128-10S1  
NIH/NIGMS  
\$178,886  
This award provided support under the Research Supplements to Promote Diversity in Health-Related Research Program for Colin Echeverria Aitken's research.
- 07/2010-06/2012 Supplement to Kinetic Dissection of Eukaryotic Translation Initiation  
3R01GM062128-10S2  
NIH/NIGMS  
\$101,702  
This award provided support under the Research Supplements to Promote Diversity in Health-Related Research Program for Antonio Muñoz's research.

## **EDUCATIONAL ACTIVITIES**

### **Teaching**

- 2000 Molecules and Cells, Macromolecules block (Section Leader)  
2001-2003 Molecules and Cells, Macromolecules block (Lecturer, Section Leader)  
2004-2009 Molecules and Cells, Macromolecules block (Director, Lecturer, Section Leader)  
2009-present Scientific Foundations of Medicine (Director, Lecturer, Section Leader)  
2000-2005 Topics in Macromolecular Structure and Function (Course Director, Lecturer)  
2001-2002 Biochemistry and Cell Biology (Lecturer)  
2001-2004 Bioorganic Chemistry (Lecturer)  
2003-2007 Method and Logic (Section Leader)  
2003-2013 Biochemical and Biophysical Principles (Lecturer)  
2009-2013 Basic Science Scholarly Concentration (Course Director)  
2011-2013 Medical Education Elective (Lecturer, Discussion Leader)  
2012-2013 Infectious Diseases Translational Intersession (co-leader of the Antibiotics section, with Khalil Ghanem, M.D.)

### **Mentoring**

#### **Advisees**

##### **Graduate Students**

- 2000-2006 Drew Applefield (Ph.D.; BCMB student; currently business and technology development associate, North Carolina Biotechnology Center)  
2000-2005 Lee Kapp (Ph.D.; BCMB student; currently post-doctoral fellow, U. Penn., with Dr. Mary Mullins)  
2001-2006 Mikkel Algire (Ph.D.; BCMB student; currently assistant professor, J. Craig Venter Institute)  
2001-2006 David Maag (Ph.D.; BCMB student; NSF pre-doctoral fellow, 2005; currently senior scientist, Abbott Labs)  
2002-2008 Michael Acker (Ph.D.; BCMB student; currently senior scientist, Novartis)  
2004-2010 Sarah Kolitz (Ph.D., PMB student; currently post-doctoral fellow, MIT)  
2004-2010 Sarah Mitchell (Ph.D., PMB student; currently post-doctoral fellow, HHMI/University of Colorado)

2005-2011 Julie Takacs (Ph.D., BCMB student; currently corps member, Teach for America)  
2010-2015 Antonio Muñoz (Ph.D., PMB student)  
2012-present Paul Yourik (Ph.D., BCMB student)

#### Post-doctoral Fellows

2006-2012 Jagpreet Nanda (Ph.D., 2005, IMTECH, Jawaharlal Nehru University, New Delhi)  
2008-2015 Sarah Walker (Ph.D., 2008, Ohio State University; American Heart Association Fellow)  
2009-2013 Vaishnavi Rajagopal (Ph.D., 2009, Rutgers University)  
2010-present Colin Aitken (Ph.D., 2010, Stanford University; Leukemia and Lymphoma Society Fellow)  
2011-2012 Aleksander Todorovic (Ph.D., 2006, University of Florida)  
2013-present Shardul Kulkarni

#### Research Associate/Senior Scientist

2012-present Jagpreet Nanda (Ph.D., 2005, IMTECH, Jawaharlal Nehru University, New Delhi)

#### Medical, Undergraduate, Post-baccalaureate and High School Students

2000-2003 Clarence Lin (JHU undergraduate; attended NYU Medical School)  
2006-2009 Jasmine Hope (Baltimore Polytechnic High School student; Baltimore Scholar, JHU; Teach for America; worked in lab senior year, 2006-2007; Summers 2007, 2008)  
2006-2008 Alex Herrera (B.A., UMBC; post-baccalaureate PREP student)  
2007-2008 Amy Dusto (JHU undergraduate)  
2011-2012 Nirvan Sengupta (JHU undergraduate)  
2012-2013 Candice Jennings (Carver Vocational Technical High School student; Biophysics Research for Baltimore Teens program, summers of 2012, 2013)  
2012-2013 Nikhil Jiwrajka (medical student)

#### Thesis Committees and Graduate Board Oral Examinations

2000-2013 Served on 39 thesis committees and over 50 oral examination committees

#### **Training Grant Participation**

1999-2013 Member, Biochemistry, Cell and Molecular Biology (BCMB) Graduate Program  
1999-2013 Member and Chair of Admissions Committee, Program in Molecular Biophysics (PMB)

#### **Educational Program Building/Leadership**

2002-2013 Chair, Admissions Committee, Graduate Program in Molecular Biophysics  
2002-2013 Member, Steering Committee, Graduate Program in Molecular Biophysics  
2005-2006 Member, Medical Curriculum Reform Committee  
2005-2006 Member, "Scientific Foundations of Medicine" Subcommittee, Medical Curriculum Reform Committee  
2006-2013 Member, Genes to Society (GtS) Integration Committee  
2008-2009 Member, Committee on Graduate Education  
2008-2013 Director, Scientific Foundations of Medicine course (GtS curriculum)  
2008-2013 Director, Basic Sciences Scholarly Concentration course (GtS curriculum)  
2010-2013 Member, Managing Board of the Johns Hopkins Institute for Excellence in

- Education
- 2011-2013 Chair, MA/PhD Committee (oversees and coordinates graduate education at the School of Medicine)
- 2011-2013 Member, Gateway Science Initiative Steering Committee (Provost's Office)
- 2011-2012 Chair, Gateway Science Initiative Symposium Planning Committee
- 2012-2013 Director, Biophysics Research for Baltimore Teens Program
- 2012-2013 Chair, Committee on the Future of Ph.D. Education (Provost's Office)

## **EDITORIAL ACTIVITIES**

- 2006 Member, *Ad hoc* advisory panel for *Nature Structural and Molecular Biology*
- 2007 Editor of three volumes of *Methods in Enzymology* (Vols. 429-431)
- 2009-2011 Editor, Methods Navigator Protocols for Biomedical Research (Elsevier) (Subsequently turned into multiple volumes of *Methods in Enzymology*)
- 2013- Member, Editorial Advisory Board, *ASBMB Today*
- Current Reviewer for *Biochemistry, Cell, EMBO Journal, Journal of Biological Chemistry, Journal of Molecular Biology, Molecular Cell, Molecular & Cellular Biology, Nature Structural and Molecular Biology, Proceedings of the National Academy of Sciences, PLOS Biology, RNA, Science, Virology*

## **ORGANIZATIONAL ACTIVITIES**

### **Institutional Administrative Appointments**

#### Johns Hopkins

- 2000-2001 Co-chair, *Ad hoc* Committee to Reevaluate Oral Examination Procedures, Graduate Program in Biochemistry, Cellular and Molecular Biology
- 2000-2005 Course director, Topics in Macromolecular Structure and Function
- 2001-2005 Member, Admissions Committee, Graduate Program in Biochemistry, Cellular and Molecular Biology
- 2002-2013 Chair, Admissions Committee, Graduate Program in Molecular Biophysics
- 2002-2013 Member, Steering Committee, Graduate Program in Molecular Biophysics
- 2002-2004 Chair, Student Seminar Evaluation Committee, Program in Molecular Biophysics
- 2003, 2012 Member, Curriculum Committee, Program in Molecular Biophysics
- 2003-2006 Member, Medical School Council
- 2004-2013 Member, Professors' Awards Committee
- 2004-2013 Course Director, Macromolecules block of Molecules and Cells
- 2005-2006 Member, Medical Curriculum Reform Committee
- 2005-2006 Member, "Scientific Foundations of Medicine" Subcommittee, Medical Curriculum Reform Committee
- 2005-2006 Participant, Leadership Development Program, Johns Hopkins University School of Medicine
- 2006-2009 Chair, Year 1 Medical Curriculum Committee
- 2006-2013 Member, Educational Policy and Curriculum Committee (EPCC)
- 2006-2013 Member, EPCC Agenda/Executive Committee
- 2006-2013 Member, Student Assessment and Program Evaluation Committee (SAPE)
- 2006-2013 Member, Genes to Society Integration Committee
- 2006-2012 Member, Instructor and Assistant Professor Reappointment Committee
- 2008-2009 Member, Committee on Graduate Education
- 2009-2013 Chair, Foundations of Medicine Curriculum Committee
- 2011-2013 Chair, MA/PhD Committee

2011-2013 Member, Gateway Science Initiative Steering Committee (Provost's Office)  
2011-2012 Chair, Gateway Science Initiative Symposium Planning Committee  
2012-2013 Co-chair, Committee on the Future of PhD Education (Provost's Office)  
2012-2013 Provost's Fellow on Graduate Education

## NIH

2013- Scientific Data Council  
2013- National Advisory General Medical Sciences Council (Chair)  
2013- Intramural Research Program Long-term Planning Committee  
2014- Administrative Data Council  
2014- Extramural Activities Working Group (Co-Chair)

## **External Administrative Appointments**

2012- Member, Mentoring Committee, ASBMB  
2013 Board of Directors, RNA Society

## **Professional Societies**

1990-2008 Member, American Chemical Society  
1998-2013 Member, RNA Society  
2001-2005 Member, Faculty of 1000, RNA Structural Biology Section  
2006-2013 Member, American Society for Biochemistry and Molecular Biology

## **Conference Organizer**

2004 Co-organizer, Baltimore-Washington Protein Synthesis Meeting  
2006 Co-organizer, DIMACS/DARPA Workshop on State-Dependent Delays in Gene Regulatory Networks  
2011 Co-organizer, EMBL Conference on Protein Synthesis and Translational Control  
2012 Chair, Organizing Committee, Johns Hopkins University Gateway Sciences Initiative Symposium on Teaching Excellence in the Sciences

## **Session Chair**

2006 RNA Society Meeting  
2007 FASEB Summer Research Conference on Helicases & NTP-Driven Nucleic Acid Motors: Structure, Function, Mechanisms & Roles in Human Disease  
2007 22<sup>nd</sup> tRNA Workshop  
2009 RNA Society Meeting  
2009 EMBO Protein Synthesis and Translational Control Meeting, Heidelberg, Germany  
2010 Ribosome Meeting  
2010 Cold Spring Harbor Translational Control Meeting  
2012 ASBMB Meeting: RNA Dynamics

## **Review Groups**

2001-2002 Ad Hoc Reviewer for NSF grant applications  
2005 Ad hoc member, NIH special program project study section  
2006-2008 Ad hoc member, NIH Molecular Genetics A Study Section (three times)  
2007 Member, American Heart Association Mid-Atlantic Division Peer Review Committee 6A (Basic Cell and Molecular Biology)

- 2008 Member, NIH Special Emphasis Panel on Enzyme and Gene Evolution  
 2008 Co-chair, American Heart Association Region II Basic Cell and Molecular Biology Study Group  
 2008-2012 Member, NIH Molecular Genetics A Study Section  
 2010 Acting Chair, NIH Molecular Genetics A Study Section (February meeting)

## RECOGNITION

### Honors and Awards

- 1989 Adamson Prize in Chemistry (Swarthmore College)  
 1990 American Chemical Society Award for Academic Achievement  
 1990 Phi Beta Kappa  
 1995-1998 Damon Runyon-Walter Winchell Post-doctoral Fellowship  
 1998-2001 Leukemia Society of America Special Fellowship  
 2001-2005 Member, Faculty of 1000, RNA Structural Biology Section  
 2002 Graduate Student Association Teacher of the Year (Johns Hopkins School of Medicine)  
 2003-2007 American Cancer Society Research Scholar  
 2005 Dean's Marshall (Commencement)  
 2006 Barry Wood Teaching Award (first year medical students)  
 2007 Professors Award for Excellence in Pre-clinical Teaching  
 2008 Graduate Student Association Teacher of the Year  
 2008 Students' Marshall (Commencement)  
 2009 "Last Lecture" (Selected by Nathans College Students)  
 2012 Barry Wood Teaching Award  
 2012 Graduate Student Association Teacher of the Year  
 2012 Dean's Lecture (Johns Hopkins School of Medicine)  
 2013 Convocation Speaker (Johns Hopkins School of Medicine) (<http://www.youtube.com/watch?v=ITHDKfCWvOg>)

### Invited Talks (since 2000)

- 2/9/00 Institute for Biophysical Research, Johns Hopkins University: *Invited speaker*  
 2/21/01 Johns Hopkins University School of Medicine, Department of Pharmacology: *Invited speaker*  
 7/20/01 Message Pharmaceuticals: *Invited speaker*  
 7/24/01 LGRD, NICHD, National Institutes of Health: *Invited speaker*  
 10/14-16/01 West Coast Translation and mRNA Stability Meeting, Washington: *Selected speaker (from submitted abstracts)*  
 2/28/02 Trinity College, Department of Biology: *Invited speaker*  
 3/12/02 Pennsylvania State University, Department of Chemistry: *Invited speaker*  
 7/10/02 Bryn Mawr College, Department of Chemistry: *Invited speaker*  
 10/24/02 Swarthmore College, Department of Chemistry: *Invited speaker*  
 6/28-7/3/03 FASEB Summer Research Conference "Helicases: Structure, Function, and Roles in Human Disease," Vermont: *Invited speaker*  
 10/17/03 Institute for Biophysical Research, Johns Hopkins University, Annual Retreat: *Keynote speaker (selected by Program in Molecular and Computational Biophysics graduate students)*  
 10/31/03 LGRD, NICHD, National Institutes of Health: *Invited speaker*  
 11/18/03 Johns Hopkins University School of Medicine, Department of Biological Chemistry: *Invited speaker*  
 11/4-11/6/04 National Academy of Sciences, Beckman Frontiers of Science Symposium, California: *Invited participant*

11/19/04 Meyerhoff Scholars Program, University of Maryland, Baltimore County: *Invited speaker*

12/2-12/4/04 Workshop on “Quantitative mathematical modeling of gene regulatory networks,” Mathematical Biosciences Institute, Ohio State University: *Invited speaker*

4/21/05 Louisiana State University Health Sciences Center, Department of Biochemistry and Molecular Biology: *Invited speaker*

10/26/05 Washington University in St. Louis, Department of Biochemistry and Molecular Biophysics: *Invited speaker*

12/8/05 SUNY Downstate Medical Center, Department of Molecular Biology and Immunology: *Invited speaker*

2/13/06 University of Delaware, Department of Chemistry and Biochemistry: *Invited speaker*

3/2/06 Rutgers University, DIMACS/DARPA Workshop on State-Dependent Delays in Gene Regulatory Networks: *Co-organizer and speaker*

5/1-5/5/06 American Society for Biochemistry and Molecular Biology 100<sup>th</sup> Anniversary Meeting, Symposium on Protein Synthesis, Post-translational Modification and Degradation, San Francisco, CA: *Invited speaker*

6/10-6/12/06 FASEB Summer Research Conference on Nucleic Acid Enzymes, Saxtons River, VT: *Invited speaker*

6/20-6/25/06 RNA Society Meeting, Seattle, WA: *Session chair*

10/25/06 University of Rochester Medical Center, Department of Biochemistry and Biophysics; *Invited speaker*

11/10/06 Columbia University, Department of Biochemistry and Molecular Biophysics; *Invited speaker*

12/12/06 Uniformed Services University of the Health Sciences, Department of Biochemistry and Molecular Biology; *Invited speaker*

3/14/07 Institute for Biophysical Research, Johns Hopkins University: *Invited speaker*

4/12/07 Laboratory of Molecular Biology, Medical Research Council, Cambridge, UK: *Invited speaker*

6/3-6/7/07 Ribosome Meeting, Cape Cod, MA: *Invited speaker*

6/24-6/28/07 FASEB Summer Research Conference on Helicases & NTP-Driven Nucleic Acid Motors: Structure, Function, Mechanisms & Roles in Human Disease, Indian Wells, CA: *Invited speaker and session chair*

7/21-7/25/07 Protein Society Meeting, Boston, MA: *Invited speaker*

10/18/07 McGill University Cancer Centre: *Invited speaker*

11/1-11/6/07 22<sup>nd</sup> tRNA Workshop, Uppsala, Sweden (Sponsored by the Royal Swedish Academy of Sciences): *Invited speaker and session chair*

12/11/07 University of Maryland, College Park, Department of Chemistry and Biochemistry: *Invited speaker*

1/15/08 University of California, San Francisco, Department of Biochemistry and Biophysics: *Invited speaker*

1/16/08 Stanford University School of Medicine, Department of Biochemistry: *Invited speaker*

1/28-2/2/08 Keystone Symposium on Translational Regulatory Mechanisms, Coeur d’Alene, ID: *Invited speaker*

2/25/08 University of Maryland Medical Center, Department of Biochemistry and Molecular Biology: *Invited speaker*

3/26-3/28/08 The UK Biochemical Society’s Meeting on ‘Gene Expression and Analysis,’ Manchester, UK: *Invited speaker*

4/11/08 University of Michigan, Department of Chemistry: *Invited speaker*

4/28/08 Yale University, Department of Molecular Biophysics and Biochemistry: *Invited speaker*

5/28/08 Albert Einstein College of Medicine of Yeshiva University, Department of Developmental and Molecular Biology: *Invited speaker*

6/8-6/13/08 FASEB Summer Research Conference on Nucleic Acid Enzymes, Saxtons River, VT: *Invited speaker*

10/22/08 Undergraduate Biochemistry Majors Association, Case Western Reserve University: *Invited speaker*

10/23/08 Department of Biochemistry, Case Western Reserve University School of Medicine: *Invited speaker*

1/26-1/27/09 Roy Parker Lab Retreat, University of Arizona: *Invited speaker and advisor*

4/29/09 Department of Biochemistry and Molecular Biology, University of Chicago: *Invited speaker*

5/21-26/09 RNA Society Meeting, Madison, WI: *Session chair*

6/26/09 Genes to Society Curriculum Retreat, Faculty Development Session on Lecturing: *Invited speaker*

9/9-13/09 EMBO Protein Synthesis and Translational Control Meeting, Heidelberg, Germany: *Session chair and invited speaker*

4/20/10 Department of Microbiology, Ohio State University: *Invited speaker*

5/3-7/10 Ribosome Meeting, Orvieto, Italy: *Invited speaker and session chair*

6/23/10 RNA Society Meeting: *Invited speaker*

8/30/10 PTC Therapeutics: *Invited speaker and consultant*

10/30/10 American College of Veterinary Pathologists Annual Meeting—Pre-meeting workshop on Principles of Educational Theory in Practice: *Invited speaker*

11/18/10 Department of Chemistry, Swarthmore College: *Invited speaker*

3/2/11 National Academy of Sciences Workshop: Towards a New Taxonomy of Disease: *Panelist*

4/21/11 Department of Chemistry and Biochemistry, University of Texas at Austin: *Invited speaker*

6/17/11 Workshop on Leading Small Group Discussions, Genes to Society Curriculum Retreat, Johns Hopkins University School of Medicine: *Co-leader*

9/8/11 EMBL Proteins Synthesis and Translational Control Meeting, Heidelberg, Germany: *Organizer*

11/3/11 University of Illinois, Urbana-Champaign, Department of Biochemistry: *Invited speaker*

12/7/11 Washington University School of Medicine, Department of Biochemistry and Molecular Biophysics: *Invited speaker*

1/20/12 Gateway Sciences Initiative Symposium on Teaching Excellence: *Organizer*

2/20/12 Dean's Lecture, "The Widening Gyre: Biomedical Education in the Age of Information Overload." Johns Hopkins University School of Medicine: *Invited speaker (four senior faculty selected by the Dean per year)*

3/14/12 University of Massachusetts School of Medicine: *Invited speaker*

3/23/12 Education Retreat, Johns Hopkins University School of Medicine: *Workshop leader (teaching and mentoring in a laboratory setting)*

4/22/12 ASBMB Meeting, San Diego, CA: *Invited speaker and session chair*

5/2/12 Department of Cell and Molecular Biology, Uppsala University, Sweden: *Invited speaker and thesis examiner*

2/11/13 Department of Biology, University of Richmond: *Invited speaker*

4/11/13 Division of Chemistry and Chemical Engineering, Biochemistry subgroup, California Institute of Technology: *Invited speaker*

5/6/13 Department of Biochemistry and Molecular Genetics, University of Colorado School of Medicine: *Invited speaker*

5/24/13 Johns Hopkins University School of Medicine Convocation: *Keynote speaker*

7/9-12/13 Ribosome Meeting, Sonoma, CA: *Invited speaker*

9/16-17/13 National Academies' Committee on Key Challenge Areas for Convergence and Health, Washington D.C.: *Invited speaker*

9/30/13 National Academies' Board on Mathematical Sciences and their Applications Board Meeting, Washington D.C.: *Invited speaker*

11/15-16/13 Southeast Regional IDeA Meeting, Little Rock, AK: *Plenary speaker*

12/14-16/13 ASCB Annual Meeting, New Orleans, LA: *Invited speaker*

3/8/2014 Mid-Atlantic American Medical Association, Medical Student Section Regional Meeting, Washington D.C.: *Keynote speaker*

7/29-8/3/14 Genetics Society of America 2014 Yeast Genetics Meeting, Seattle, WA: *Invited speaker*

9/2-6/14 Cold Spring Harbor Translational Control Meeting, Cold Spring Harbor, NY: *Keynote speaker*

9/16/14 FASEB Roundtable, Bethesda, MD: *Panelist*

10/21/14 16th Annual NIH SBIR/STTR Conference: "Land of Achievement: Extending the Reach of Science with the SBIR/STTR Programs," Albuquerque, NM: *Keynote speaker*

12/08/14 ASCB Annual Meeting, Philadelphia, PA: *Panelist Leader*

2/10/15 Biophysical Society Annual Meeting, Baltimore, MD: *Invited speaker*

2/24/15 The American Academy of Arts and Sciences and Duke University, Durham, NC: *Panelist*

3/5/15 ASCPT Annual Meeting (attended via videoconference): *Invited speaker*

3/17/15 Grand Rounds Lecture Series at the Johns Hopkins Institute of Excellence in Education, Baltimore, MD: *Invited speaker*

3/27/15 2015 GRAND Spring Conference at the American Association of Medical Colleges Learning Center, Washington D.C.: *Invited speaker*

4/14/15 National Diversity Equity Workshop, Open Chemistry Collaborative in Diversity Equity, Arlington, VA: *Invited speaker*

4/21-22/15 Molecular Biophysics and Biochemistry Departmental Seminar Series, Yale University, New Haven, CT: *Invited speaker*

4/30/15 National Organization of Research Development Professionals 7th Annual Research Development Conference, Bethesda, MD: *Invited speaker*

5/6-7/15 Joint Seminars in Molecular Biology seminar series; University of California, San Francisco and University of California, Davis: *Invited speaker*

5/31/15 FASEB Science Policy Symposium on Reproducibility of Biological Research, Arlington, VA: *Invited speaker*

9/9/15 2015 Drug Information Association/FDA Oligonucleotide-Based Therapeutic Conference, Washington D.C.: *Invited speaker*

9/25/15 Northeast Regional IDeA Meeting, Bar Harbor, ME: *Invited speaker*

10/23/15 Harvard Medical School Program in Graduate Education Symposium, Cambridge, MA: *Invited speaker*

10/29/15 2015 SACNAS National Conference, Washington D.C.: *Keynote speaker*

11/12/15 ABRCMS 2015, Seattle, WA: *Invited speaker*

11/13/15 Oregon Health and Science University Research Week, Portland, OR: *Invited speaker*