# Jon R. Lorsch, Ph.D.

## Current Appointment

Director, National Institute of General Medical Sciences

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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

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|---|---|
| 1989-1990 | Honors Thesis, Swarthmore College<br>Advisors: Judith Voet, Ph.D. and Nancy Hamlett, Ph.D.<br>Thesis: Enzymology of mercuric reductase from a novel bacterium, *C. iridescens* |
| 1990-1995 | Ph.D., Harvard University<br>Department of Molecular and Cellular Biology Advisor:<br>Jack W. Szostak, Ph.D.<br>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<br>Department of Biochemistry Advisor:<br>Daniel Herschlag, Ph.D. |
| 1999-2005 | Assistant Professor |
| 2005-2009 | Associate Professor |
| 2009-2013 | Professor<br>Department of Biophysics and Biophysical Chemistry<br>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 ionpair 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.

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.** "$P_i$ 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-$tRNA_i^{Met}$ 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.**‡ and Hinnebusch, A.G.‡ "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.**‡ and Ramakrishnan, V.‡ "The eukaryotic translation initiation factors eIF1 and eIF1A induce an open conformation of the 40S ribosome." *Mol. Cell* (2007) **26**:41-50.

‡Co-corresponding authors.

*Equal contribution.

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.**‡ and Hinnebusch, A.G.‡ "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.

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 $tRNA^{Met}$ 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.

‡Co-corresponding authors.

36. Shin, B.S., Kim, J.R., Walker, S.E., Dong, J., **Lorsch, J.R.** and Dever, T.E. “Initiation factor eIF2γ promotes eIF2-GTP-Met-tRNAi(Met) ternary complex binding to the 40S ribosome.” *Nat. Struct. Mol. Biol.* (2011) **18**:1227-34.

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**:2030112.

38. Luna R.E., Arthanari H., Hiraishi H., Nanda J., Martin-Marcos P., Markus M.A., Akabayo 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 eIF2β.” *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.‡ and **Lorsch, J.R.**‡ “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**.‡ and Hinnebusch A.G.‡ “β 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.**‡, Ramakrishnan V.‡ and Scheres S.H.‡ “Molecular architecture of a eukaryotic translational initiation complex.” *Science* (2013) **342**:1240585.

45. Zhou F.*, Walker S.E.*, Mitchell S.F., **Lorsch J.R.**‡ and Hinnebusch A.G.‡ “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.

‡Co-corresponding authors.
*Equal contribution.

46. Martin-Marcos P., Nanda J.S., Luna R.E., Zhang F., Saini A.K., Cherkasova V.A., Wagner G., **Lorsch J.R.**‡ and Hinnebusch A.G.‡ "Enhanced eIF1 binding to the 40S ribosome impedes conformational rearrangements of the preinitiation complex and elevates initiation accuracy." *RNA* (2014) **20**:150-67.

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

48. Hussain T., Llàcer J.L., Fernández I.S., Munoz A., Martin-Marcos P., Savva C.G., **Lorsch J.R.**, Hinnebusch A.G. and Ramakrishnan V. "Structural changes enable start codon recognition by the eukaryotic translation initiation complex." *Cell* (2014) **159**:597-607.

49. Saini A.K.‡, Nanda J.S., Martin-Marcos P., Dong J., Zhang F., Bhardwaj M., **Lorsch J.R.** and Hinnebusch A.G.‡ "Eukaryotic translation initiation factor eIF5 promotes the accuracy of start codon recognition by regulating Pi release and conformational transitions of the preinitiation complex." *Nucleic Acids Res*. (2014) **42**:9623-40.

50. Llàcer J.L., Hussain T., Marier L., Aitken C.E., Thakur A., **Lorsch J.R.**, Hinnebusch A.G. and Ramakrishnan V. "Conformational Differences between Open and Closed States of the Eukaryotic Translation initiation Complex." *Mol Cell*. (2015) **59**:399-412.

51. Saini A.K., Nanda J.S., Martin-Marcos P., Dong J., Zhang F., Bhardwaj M., **Lorsch J.R.** and Hinnebusch A.G. "Eukaryotic translation initiation factor eIF5 promotes the accuracy of start codon recognition by regulating Pi release and conformational transitions of the preinitiation complex." *Nucleic Acids Res*. (2015) **43**:5673-4.

‡Co-corresponding authors.
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52. Aitken E.E., Beznosková P., Vlčkova V., Chiu W.L., Zhou F., Valàšek L.S.‡, Hinnebusch A.G.‡ and **Lorsch J.R**.‡ "Eukaryotic translation initiation factor 3 plays distinct roles at the mRNA entry and exit channels of the ribosomal preinitiation complex." *Elife* (2016) **5**:e20934.

53. Munoz A.M., Yourik P., Rajagopal V., Nanda J.S., **Lorsch J.R.** and Walker S.E. "Active yeast ribosome preparation using monolithic anion exchange chromatography." *RNA Biol*. (2017) **14**:188-196.

54. Dong J., Aitken C.E., Thakur A., Shin B.S., **Lorsch J.R.**‡ and Hinnebusch A.G.‡ "Rps3/uS3 promotes mRNA binding at the 40S ribosome entry channel and stabilizes preinitiation complexes at start condons." *Proc Natl Acad Sci USA*. (2017) **114**:E2126-E2135.

55. Yourik P., Aitken C.E., Zhou F., Gupta N., Hinnebusch A.G.‡ **Lorsch J.R**.‡ "Yeast eIF4A enhances recruitment of mRNAs regardless of their structural complexity." *Elife* (2017) **6**: e31476

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*Equal contribution.

56. Martin-Marcos P., Zhou F., Karunasiri C., Zhang F., Dong J., Nanda J., Kulkarni S.D., Sen N.D., Tamame M., Zeschnigk M., **Lorsch J.R.**‡ and Hinnebusch AG.‡ "eIF1A residues implicated in cancer stabilize translation preinitiation complexes and favor suboptimal initiation sites in yeast." *Elife* (2017) **6**: e31250.

57. Gupta N., **Lorsch J.R.**‡ and Hinnebusch A.G.‡ "Yeast Ded1 promotes 48S translation pre-initiation complex assembly in an mRNA-specific and eIF4F-dependent manner." *Elife* (2018) **7**:e38892.

58. Llácer J.L.,* Hussain T.,* Saini A.K.,* Nanda J.S.,* Kaur S., Gordiyenko Y., Kumar R., Hinnebusch A.G.,‡ **Lorsch J.R.**‡ and Ramakrishnan V.‡ "Translation initiation factor eIF5 replaces eIF1 on the 40S ribosomal subunit to promote start-codon recognition." *Elife* (2018) **7**:e39273.

59. Sen N.D., Gupta N., Archer S.K., Preiss T., **Lorsch J.R.** and Hinnebusch A.G. "Functional interplay between DEAD-box RNA helicases Ded1 and Dbp1 in preinitiation complex attachment and scanning on structured mRNAs in vivo." *Nucleic Acids Res.* (2019) **47**:8785-8806.

60. Kulkarni S.D., Zhou F., Sen N.D., Zhang H., Hinnebusch A.G. and **Lorsch J.R**. "Temperature-dependent regulation of upstream open reading frame translation in *S. cerevisiae*." *BMC Biol*. (2019) **17**:101.

61. Zhou F., Zhang H., Sulkarni S.D., **Lorsch J.R.**‡ and Hinnebusch A.G.‡ "eIF1 discriminates against suboptimal initiation sites to prevent excessive uORF translation genome-wide." *RNA* (2020) **26**:419-438.

62. Gulay S., Gupta N., **Lorsch J.R.** and Hinnebusch A.G. "Distinct interactions of eIF4A and eIF4E with RNA helicase Ded1 stimulate translation *in vivo*." *Elife* (2020) **9**:358243.

**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.

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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**:197205.

25. **Lorsch J.R**. “Preface. Laboratory Methods in Enzymology: Protein Part D.” *Methods Enzymol*. (2015) **559**:xi.

26. Mitchell S.F. and **Lorsch J.R**. “Protein Affinity Purification using Intein/Chitin Binding Protein Tags.” *Methods Enzymol*. (2015) **559**:111-25.

**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.**, Barrett K., Pollock D. and Barman S. “APS leadership meets with NIGMS.” *Physiologist* (2014) **57**:157, 191-2.

5. **Lorsch, J.R.** “Maximizing the return on taxpayers' investments in fundamental biomedical research.” *Mol Biol Cell* (2015) **26(9)**:1578-82.

6. Bourne PE, **Lorsch J.R.**, Green ED. “Perspective: Sustaining the big-data ecosystem.” *Nature*. (2015) **527(7576)**:S16-7.

7. Collins F.S., Anderson J.M., Austin C.P., Battey J.F., Birnbaum L.S., Briggs J.P., Clayton J.A., Cuthbert B., Eisinger R.W., Fauci A.S., Gallin J.I., Gibbons G.H., Glass R.I., Gottesman M.M., Gray P.A., Green E.D., Greider F.B., Hodes R., Hudson K.L., Humphreys B., Katz S.I., Koob G.F., Koroshetz W.J., Lauer M.S., **Lorsch J.R.**, Lowy D.R., McGowan J., Murray D.M., Nakamura R., Norris A., Perez-Stable E.J., Pettigrew R.I., Riley W.T., Rodgers G.P., Sieving P.A., Somerman J.J., Spong C.Y., Tabak L.A., Volkow N.D. and Wilder E.L. “Basic science: Bedrock of progress.” *Science* (2016) **351**:1405.

**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

**Previous Extramural Sponsorship**

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)

2009-2013 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**

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 lecturer, SUNY Plattsburgh)
2001-2006 Mikkel Algire (Ph.D.; BCMB student; currently oncology assay lab head, Abbvie)
2001-2006 David Maag (Ph.D.; BCMB student; NSF pre-doctoral fellow; 2005; currently associate scientific director, oncology discovery, Abbvie)
2002-2008 Michael Acker (Ph.D.; BCMB student; currently senior investigator, Novartis)
2004-2010 Sarah Kolitz (Ph.D., PMB student; currently vice president, translational medicine, immuneering)
2004-2010 Sarah Mitchell (Ph.D., PMB student; currently assistant professor, Loyola Marymount University)
2005-2011 Julie Takacs (Ph.D., BCMB student; currently instructor, Anne Arundel Community College)
2010-2015 Antonio Muñoz (Ph.D., PMB student; currently consultant, Accenture))
2012-2017 Paul Yourik (Ph.D., BCMB student; currently postdoctoral fellow, New England Biolabs)

Post-doctoral Fellows

2006-2012 Jagpreet Nanda (Ph.D., 2005, IMTECH, Jawaharlal Nehru University, New Delhi; currently Lorsch lab staff scientist)
2008-2015 Sarah Walker (Ph.D., 2008, Ohio State University; American Heart Association Fellow; currently assistant professor, University of Buffalo)
2009-2013 Vaishnavi Rajagopal (Ph.D., 2009, Rutgers University; currently senior scientist, Ra Pharmaceuticals)
2010-present Colin Aitken (Ph.D., 2010, Stanford University; Leukemia and Lymphoma Society Fellow; currently assistant professor, Vassar College)
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*
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 (Selected)

2013-present NIH Steering Committee
2013-present Scientific Data Council (SDC) – Co-Chair, 2016-Present
Joint DSPC and SDC, co-chair
2019-present SDC Co-Chairs/ODSS
2013-2016 BD2K Multi-Council Working Group

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| 2014-present | Extramural Activities Working Group (EAWG) – Co-Chair |
| 2014-2021 | Administrative Data Council (ADC) |
| 2015-present | Diversity Program Consortium – Co-Chair |
| 2015-2016 | Cell Line Authentication Working Group – Co-Chair |
| 2016-present | Executive Leadership Program Advisory Group (ExLP) |
| 2016-2017 | Developing Efficient and Sustainable Funding Policies Working Group of EAWG/EPMC – Chair |
| 2016-2019 | Extramural Program Management Committee (EPMC) Agenda Subcommittee |
| 2016-present | National Center for Biotechnology Information (NCBI) Resource Board |
| 2016-2017 | Grant Support Index (GSI) Implementation Subcommittee |
| 2017-2018 | SDC Data Resource Ecosystem "Blue Sky" Working Group – Chair |
| 2017-2018 | Advisory Committee to the Director (ACD) Next Generation Researchers Initiative Working Group |
| 2017 | Headquarters Building Planning Committee |
| 2017 | 21st Century Cures Implementation Working Group |
| 2020 | Congressional Liaison, request to Connect on the NIH M*DAS Network for Data Modeling and COVID-19* |
| 2020-present | NIH Liaison to NSF |
| 2020 | EAWG Working Group: Locus of Review |
| 2020-present | RADx-UP Governance Committee |
| 2020-present | UNITE Full Committee |
| 2020-present | UNITE E Committee, Co-Chair |
| 2021-present | ARPA-H (Advanced Research Projects Agency for Health)2 |
| 2022-present | EAWG Work Group on Simplifying Peer Review |

**NIH Search Committees**

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|---|---|
| 2014 | Director, Division of Biomedical Research Workforce, Office of Extramural Research (OER), NIH (Chair) |
| 2014 | Division Directors (2), Center for Scientific Review (CSR), NIH |
| 2015 | Director, National Library of Medicine (NLM) (Co-Chair) |
| 2015 | Director, National Institute of Neurological Disorders and Stroke (NINDS) |
| 2018 | Associate Deputy Director, OD |
| 2018 | Director, Center for Scientific Review (CSR) (Co-chair) |
| 2021-2022 | NIA Deputy Director |
| 2021-2022 | OER Deputy Director (Chair) |
| 2021-2022 | NCBI Director (Co-chair) |

**External Administrative Appointments**

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

**Professional Societies**

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|---|---|
| 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

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| 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

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| 2006 | RNA Society Meeting |
| 2007 | FASEB Summer Research Conference on Helicases & NTP-Driven Nucleic Acid Motors: Structure, Function, Mechanisms & Roles in Human Disease |
| 2007 | 22nd 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) |
| 8/18/2021 | BMSF DCTCDP Review Committee |

# 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<br>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) |

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| 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) |
| 2019 | Honorary Doctor of Philosophy (Swarthmore College) |
| 2020 | Special Acknowledgement and Deputy Secretary Coin, presented by Deputy Secretary Hargan for significant contributions to ReImagine HHS initiatives |
| 2020 | Johns Hopkins University Alumni Award |

**INVITED TALKS** (since 2000)

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|---|---|
| 2/9/2000 | Institute for Biophysical Research, Johns Hopkins University: Invited speaker |
| 2/21/2001 | Johns Hopkins University School of Medicine, Department of Pharmacology: Invited speaker |
| 7/20/2010 | Message Pharmaceuticals: Invited speaker |
| 7/24/2001 | LGRD, NICHD, National Institutes of Health: Invited speaker |
| 10/14-16/2001 | West Coast Translation and mRNA Stability Meeting, Washington: Selected speaker (from submitted abstracts) |
| 2/28/2002 | Trinity College, Department of Biology: Invited speaker |
| 3/12/2002 | Pennsylvania State University, Department of Chemistry: Invited speaker |
| 7/10/2002 | Bryn Mawr College, Department of Chemistry: Invited speaker |
| 10/24/2002 | Swarthmore College, Department of Chemistry: Invited speaker |
| 6/28-7/3/2003 | FASEB Summer Research Conference "Helicases: Structure, Function, and Roles in Human Disease," Vermont: Invited speaker |
| 10/17/2003 | Institute for Biophysical Research, Johns Hopkins University, Annual Retreat: Keynote speaker (selected by Program in Molecular and Computational Biophysics graduate students) |
| 10/31/2003 | LGRD, NICHD, National Institutes of Health: Invited speaker |
| 11/18/2003 | Johns Hopkins University School of Medicine, Department of Biological Chemistry: Invited speaker |
| 11/4-6/2004 | National Academy of Sciences, Beckman Frontiers of Science Symposium, California: Invited participant |
| 11/19/2004 | Meyerhoff Scholars Program, University of Maryland, Baltimore County: Invited speaker |
| 12/2-4/2004 | Workshop on "Quantitative mathematical modeling of gene regulatory networks," Mathematical Biosciences Institute, Ohio State University: Invited speaker |
| 4/21/2005 | Louisiana State University Health Sciences Center, Department of Biochemistry and Molecular Biology: Invited speaker |
| 10/26/2005 | Washington University in St. Louis, Department of Biochemistry and Molecular Biophysics: Invited speaker |

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| 12/8/2005 | SUNY Downstate Medical Center, Department of Molecular Biology and Immunology: Invited speaker |
| 2/13/2006 | University of Delaware, Department of Chemistry and Biochemistry: Invited speaker |
| 3/2/2006 | Rutgers University, DIMACS/DARPA Workshop on State-Dependent Delays in Gene Regulatory Networks: Co-organizer and speaker |
| 5/1-5/2006 | American Society for Biochemistry and Molecular Biology 100th Anniversary Meeting, Symposium on Protein Synthesis, Post-translational Modification and Degradation, San Francisco, CA: Invited speaker |
| 6/10-12/2006 | FASEB Summer Research Conference on Nucleic Acid Enzymes, Saxtons River, VT: Invited speaker |
| 6/20-25/2006 | RNA Society Meeting, Seattle, WA: Session chair |
| 10/25/2006 | University of Rochester Medical Center, Department of Biochemistry and Biophysics; Invited speaker |
| 11/10/2006 | Columbia University, Department of Biochemistry and Molecular Biophysics; Invited speaker |
| 12/12/2006 | Uniformed Services University of the Health Sciences, Department of Biochemistry and Molecular Biology; Invited speaker |
| 3/14/2007 | Institute for Biophysical Research, Johns Hopkins University: Invited speaker |
| 4/12/2007 | Laboratory of Molecular Biology, Medical Research Council, Cambridge, UK: Invited speaker |
| 6/3-7/2007 | Ribosome Meeting, Cape Cod, MA: Invited speaker |
| 6/24-28/2007 | 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 |
| 7/21-25/2007 | Protein Society Meeting, Boston, MA: Invited speaker |
| 10/18/2007 | McGill University Cancer Centre: Invited speaker |
| 11/1-6/2007 | 22nd tRNA Workshop, Uppsala, Sweden (Sponsored by the Royal Swedish Academy of Sciences): Invited speaker and session chair |
| 12/11/2007 | University of Maryland, College Park, Department of Chemistry and Biochemistry: Invited speaker |
| 1/15/2008 | University of California, San Francisco, Department of Biochemistry and Biophysics: Invited speaker |
| 1/16/2008 | Stanford University School of Medicine, Department of Biochemistry: Invited speaker |
| 1/28-2/2/2008 | Keystone Symposium on Translational Regulatory Mechanisms, Coeur d'Alene, ID: Invited speaker |
| 2/25/2008 | University of Maryland Medical Center, Department of Biochemistry and Molecular Biology: Invited speaker |
| 3/26-3/28/2008 | The UK Biochemical Society's Meeting on 'Gene Expression and Analysis,' Manchester, UK: Invited speaker |
| 4/11/2008 | University of Michigan, Department of Chemistry: Invited speaker |
| 4/28/2008 | Yale University, Department of Molecular Biophysics and Biochemistry: Invited speaker |
| 5/28/2008 | Albert Einstein College of Medicine of Yeshiva University, Department of Developmental and Molecular Biology: Invited speaker |

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| 6/8-13/2008 | FASEB Summer Research Conference on Nucleic Acid Enzymes, Saxtons River, VT: Invited speaker |
| 10/22/2008 | Undergraduate Biochemistry Majors Association, Case Western Reserve University: Invited speaker |
| 10/23/2008 | Department of Biochemistry, Case Western Reserve University School of Medicine: Invited speaker |
| 1/26-27/2009 | Roy Parker Lab Retreat, University of Arizona: Invited speaker and advisor |
| 4/29/2009 | Department of Biochemistry and Molecular Biology, University of Chicago: Invited speaker |
| 5/21-26/2009 | RNA Society Meeting, Madison, WI: Session chair |
| 6/26/2009 | Genes to Society Curriculum Retreat, Faculty Development Session on Lecturing: Invited speaker |
| 9/9-13/2009 | EMBO Protein Synthesis and Translational Control Meeting, Heidelberg, Germany: Session chair and invited speaker |
| 4/20/2010 | Department of Microbiology, Ohio State University: Invited speaker |
| 5/3-7/2010 | Ribosome Meeting, Orvieto, Italy: Invited speaker and session chair |
| 6/23/2010 | RNA Society Meeting: Invited speaker |
| 8/30/2010 | PTC Therapeutics: Invited speaker and consultant |
| 10/30/2010 | American College of Veterinary Pathologists Annual Meeting–Pre-meeting workshop on Principles of Educational Theory in Practice: Invited speaker |
| 11/18/2010 | Department of Chemistry, Swarthmore College: Invited speaker |
| 3/2/2011 | National Academy of Sciences Workshop: Towards a New Taxonomy of Disease: Panelist |
| 4/21/2011 | Department of Chemistry and Biochemistry, University of Texas at Austin: Invited speaker |
| 6/17/2011 | Workshop on Leading Small Group Discussions, Genes to Society Curriculum Retreat, Johns Hopkins University School of Medicine: Co-leader |
| 9/8/2011 | EMBL Proteins Synthesis and Translational Control Meeting, Heidelberg, Germany: Organizer |
| 11/3/2011 | University of Illinois, Urbana-Champaign, Department of Biochemistry: Invited speaker |
| 12/7/2011 | Washington University School of Medicine, Department of Biochemistry and Molecular Biophysics: Invited speaker |
| 1/20/2012 | Gateway Sciences Initiative Symposium on Teaching Excellence: Organizer |
| 2/20/2012 | 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) |
| 3/14/2012 | University of Massachusetts School of Medicine: Invited speaker |
| 3/23/2012 | Education Retreat, Johns Hopkins University School of Medicine: Workshop leader (teaching and mentoring in a laboratory setting) |
| 4/22/2012 | ASBMB Meeting, San Diego, CA: Invited speaker and session chair |
| 5/2/2012 | Department of Cell and Molecular Biology, Uppsala University, Sweden: Invited speaker and thesis examiner |
| 2/11/2013 | Department of Biology, University of Richmond: Invited speaker |
| 4/11/2013 | Division of Chemistry and Chemical Engineering, Biochemistry subgroup, California Institute of Technology: Invited speaker |

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| 5/6/2013 | Department of Biochemistry and Molecular Genetics, University of Colorado School of Medicine: Invited speaker |
| 5/24/2013 | Johns Hopkins University School of Medicine Convocation: Keynote speaker |
| 7/9-12/2013 | Ribosome Meeting, Sonoma, CA: Invited speaker |
| 9/16-17/2013 | National Academies' Committee on Key Challege Areas for Convergence and Health, Washington D.C.: Invited speaker |
| 9/30/2013 | National Academies' Board on Mathematical Sciences and their Applications Board Meeting, Washington D.C.: Invited speaker |
| 11/15-16/2013 | Southeast Regional IDeA Meeting, Little Rock, AK: Plenary speaker |
| 12/14-16/2013 | 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 |
| 7/29-8/3/2014 | 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 |
| 9/16/2014 | FASEB Roundtable, Bethesda, MD: Panelist |
| 10/21/2014 | 16th Annual NIH SBIR/STTR Conference: "Land of Achievement: Extending the Reach of Science with the SBIR/STTR Programs," Albuquerque, NM: Keynote speaker |
| 12/8/2014 | ASCB Annual Meeting, Philadelphia, PA: Panelist Leader |
| 2/10/2015 | Biophysical Society Annual Meeting, Baltimore, MD: Invited speaker |
| 2/24/2015 | The American Academy of Arts and Sciences and Duke University, Durham, NC: Panelist |
| 3/5/2015 | ASCPT Annual Meeting (attended via videoconference): Invited speaker |
| 3/17/2015 | Grand Rounds Lecture Series at the Johns Hopkins Institute of Excellence in Education, Baltimore, MD: Invited speaker |
| 3/27/2015 | 2015 GRAND Spring Conference at the American Association of Medical Colleges Learning Center, Washington D.C.: Invited speaker |
| 4/14/2015 | National Diversity Equity Workshop, Open Chemistry Collborative in Diversity Equity, Arlington, VA: Invited speaker |
| 4/19-21/2015 | Molecular Biophysics and Biochemistry Departmental Seminar Series, Yale University, New Haven, CT: Invited speaker |
| 4/30/2015 | National Organization of Research Development Professionals 7th Annual Research Development Conference, Bethesda, MD: Invited speaker |
| 5/6-7/2015 | Joint Seminars in Molecular Biology seminar series; University of California, San Francisco and University of California, Davis: Invited speaker |
| 5/31/2015 | FASEB Science Policy Symposium on Reproducibility of Biological Research, Arlington, VA: Invited speaker |
| 9/9/2015 | 2015 Drug Information Association/FDA Oligonucleotide-Based Therapeutic Conference, Washington D.C.: Invited speaker |
| 9/25/2015 | Northeast Regional IDeA Meeting, Bar Harbor, ME: Invited speaker |
| 10/23/2015 | Harvard Medical School Program in Graduate Education Symposium, Cambridge, MA: Invited speaker |
| 10/29/2015 | 2015 SACNAS National Conference, Washington D.C.: Keynote speaker |
| 11/12/2015 | ABRCMS 2015, Seattle, WA: Invited speaker |

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| 11/13/2015 | Oregon Health and Science University Research Week, Portland, OR: Invited speaker |
| 11/16/2015 | Genetics Society of America Board Meeting, Bethesda, MD: Invited speaker |
| 1/15/2016 | Association of Medical and Graduate Departments of Biochemistry Meeting, Skype meeting: Invited participant |
| 2/4-5/2016 | ASBMB, Sustaining the Biomedical Research Enterprise, Washington, DC: Invited speaker |
| 2/2016-17/2016 | Howard Hughes Medical Institute, Accelerating Science and Publication in Biology, Washington, DC: Invited speaker |
| 2/29/2016 | EPSCoR/IDeA Annual Conference, Washington, DC: Keynote address |
| 3/2/2016 | FASEB Public Service Award Ceremony, Washington, DC: Invited speaker |
| 3/7/2016 | University of Maryland-Baltimore MARC Scholars Seminar: Invited speaker |
| 3/2016/2016 | Research!America's Advocacy Award Ceremony, Washington, DC: Invited speaker |
| 5/4/2016 | USUHS 2016 Research Days (Wu Award Ceremony, Washington, DC: Invited speaker |
| 5/9/2016 | NIH SciEd Annual Conference, Washington, DC: Keynote address |
| 5/2016/2016 | American Society for Cell Biology Council, Training Grant Support, Bethesda, MD: Invited speaker |
| 5/23-24/2016 | MIDAS PI Network Meeting, Reston, VA: Invited speaker |
| 5/25/2016 | Tri-Institutional Collaboration Network (TCN), New York: Plenary speaker |
| 5/26/2016 | Hunter College, Developing a More Productive, Efficient and Sustainable Biomedical Research Enterprise, New York: Invited speaker |
| 6/20-21/2016 | 2016 Select USA Summit, US Department of Commerce, Washington, DC: Invited speaker |
| 6/27/2016 | National IDeA Symposium of Biomedical Research Excellence, Washington, DC: Invited speaker |
| 7/8-11/2016 | Gordon Research Conference—Post-Transcriptional Control, Burlington, VT: Keynote speaker |
| 9/9/2016 | US-German Science Leadership Breakfast, Washington, DC: NIH representative |
| 9/29/2016 | Kenyon College, Developing a More Productive, Efficient and Sustainable Biomedical Research Enterprise, Ohio: Invited speaker |
| 10/13/2016 | Kansas University COBRE Center Visit: Invited speaker |
| 10/26/2016 | University of North Carolina, Chapel Hill, speak to SACNAS students |
| 10/27/2016 | Duke University Seminar, Durham, NC: Invited speaker |
| 2/1/2017 | ISPCTN Steering Committee Meeting, Bethesda, MD: Invited speaker |
| 3/24-25/2017 | AAMC Council of Deans, Ongoing Developments in Mechanisms for Funding Research at the NIH, New York City: Invited speaker |
| 5/15/2017 | American Society for Cell Biology Council, MIRA, Bethesda, MD: Invited speaker |
| 5/21/2017 | University of Virginia-Charlottesville, VA: Commencement Address |
| 5/31/2017 | NIH SciEd (SEPA) Conference, "NIGMS Education and Training Programs": Washington, DC: Invited speaker |
| 6/7-9/2017 | IDeA Central Regional Meeting, Sioux Falls, SD: Invited speaker |

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| 7/20/2017 | Association of American Medical Colleges, Great Group MD-Ph.D. Section Meeting, Rockville, MD: Invited speaker |
| 8/20/2017 | American Chemical Society, Advancing Graduate Education in the Sciences, Washington, DC: Plenary speaker |
| 9/25/2017 | 2017 Annual INBRE PI/PC Meeting, Bethesda, MD: Invited speaker |
| 10/2/2017 | Association of Independent Research Institutes, NIH's current and future research initiatives and priorities, Washington, DC: Invited speaker |
| 11/13/2017 | Vermont Research Day, Burlington, VT: Invited speaker |
| 4/22/2018 | NISBRE Conference, News from NIGMS |
| 5/4/2018 | NLM Blue Ribbon Panel #3 |
| 5/21/2018 | NHGRI Advisory Council: NIH's Strategic Plan for Data Science |
| 5/23/2018 | NIBIB National Advisory Council, NIH Strategic Plan for Data Science |
| 5/29-6/1/2018 | SEPA PI Meeting/NIH SciEd |
| 6/12/2018 | Marshall University State of the University Address, Huntington, WVA |
| 7/2/2018 | Rescue Biomedical Research Project Annual Meeting, Washington, DC |
| 7/9/2018 | Update on the Status of the Strategic Plan for Data Science |
| 8/8/2018 | Big Data Working Group, NASA |
| 9/7/2018 | NACMHD Council, NIGMS Workforce Development and Research Capacity Building Program |
| 9/24/2018 | IDeA Networks of Biomedical Research Excellence (INBRE) |
| 9/17/2018 | AAMC Council of Deans and NIH |
| 10/23/2018 | AAMC-NIMHD Diversity in Workforce |
| 10/31/2018 | NIH Data Science Activities, A Presentation of the AMIA Public Policy Committee (Webinar) |
| 10/2018 | Clinical Research Forum IT Round Table |
| 11/29-30/2018 | AAHC Research Meeting |
| 6/2019 | Briefing on Data Science Strategic Plan |
| 6/4/2019 | NIH-NSF Collaborative Workshop, NIH SDC Co-Chair |
| 6/27/2019 | Annual ORWH/ICO Directors' Meeting |
| 8/26/2019 | Presentation at EO Lunch Meeting |
| 9/2019 | Big Data Briefing |
| 9/12/2019 | Research Organism Landscape – Choosing the Best Organism |
| 9/24/2019 | INBRE PI/PC Meeting |
| 10/2/2019 | Inclusion Governance Committee, Disadvantaged Populations |
| 10/7-9/2019 | IDeA Western Regional Meeting, Nevada |
| 10/11/2019 | Coalition for the Life Sciences |
| 10/22/2019 | DORA/HHMI Assessment meeting: Wednesday discussion leader |
| 11/4/2019 | NIH-DOE/ORNL, Dr. Lorsch: Pharma Data, Combining and Preserving and Discussion Moderator |
| 11/7/2019 | Delaware IDeA Symposium |
| 12/7-11/2019 | Joint Meeting of the American Society for Cell Biology/European Molecular Biology Organization Meeting (ASCB/EMBO), Washington, DC |
| 12/25/2019 | NCAI/REACH Panel (NIGMS hubs and related entrepreneurial and product development support programs) |
| 2020 | NIGMS / VA Collaboration on Sepsis Research |

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| 1/12/2020 | All About Grants Podcast on the Diversity Statement, Definition and Supplements |
| 1/24/2020 | Ad Hoc Group for Medical Research |
| 1/23/2020 | NIGMS Meeting with Elizabeth Henry re: IDeA |
| 1/31/2020 | Whitehouse Workshop on the Responsible Liberation of Federal Data |
| 2/3/2020 | ACD Working Group on Enhancing Reproducibility and Rigor in Animal Research |
| 4/6/2020 | Biomedical Research and the NIH in the Age of COVID-19, Swarthmore College Swat Talk |
| 5/2020 | Data Access for Infectious Disease Modeling Researchers (Veterans Affairs/NIH) |
| 6/19/2020 | Vanderbilt IGP Curriculum Review Committee Meeting |
| Jun-20 | American Chemical Society – Researchers' needs |
| 6/22/2020 | NISBRE Conference |
| 6/24/2020 | HHS Protect Demo with Jose Arrieta |
| 7/2020 | Joint NSF-NIGMS Technology Development Initiative |
| 8/2020 | BCBSA/NIGMS Access to Data |
| 9/22/2020 | INBRE PI/PC Meeting |
| 10/24/2020 | Rustbelt RNA Meeting, Solutions for Promoting Diversity, Equity, and Inclusion |
| 10/29/2020 | Guest Speaker, High School Biology Class (Berger Lab), Upper School Science Department, Chapin School |
| 11/5/2020 | Developing a Culture of Safety in Biomedical Research Training -Webinar |
| 11/20/2020 | Fall SIAM CSP Meeting |
| 12/7/2020 | Research!America Alliance Member Meeting (presentation and panelist) |
| 12/11/2020 | NARCH PI Meeting, NIGMS Updates and Engaging Students in Biomedical Research |
| 2021 | Initiative to Address Publication Bias |
| 7/1/2021 | NIH Cement Extramural Leadership Institute (Celi) |
| 2021 | SciEd Conference (Keynote address) |
| 1/19/2021 | BMSF & NMF Diversity in Clinical Trials Career Development Program Stakeholder Group |
| 1/27/2021 | Wednesday Morning Group Community Presentation |
| 2/2/2021 | FASEB Data Sharing Project |
| 2/8/2021 | Council on Undergraduate Research (CUR) |
| 2/19/2021 | NIGMS/ODSS Workshop on IDeA Cloud Platform and Sandbox |
| 2/26/2021 | Scholastic/NIGMS Meeting to Discuss the Next Pathway Issue |
| 3/2021 | ACD Working Group Meeting on Enhancing Rigor, Transparency and Translatability |
| 3/5/2021 | Trans-NIH Group for High Value Data Asset Sustainability |
| 3/12-13/2021 | Common Fund Cryo-EM PI Meeting |
| 3/19/2021 | Ad Hoc Working Group – Using AI/ML to Render Electronic Medical Records Usable for Research Purposes |
| 3/25/2021 | AI/ML Initiative Related to Health Disparities, Health Inequities, and Minority Health |
| 3/31/2021 | Ad Hoc Group for Medical Research |

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| 4/6/2021 | ACD Working Group on Enhancing Rigor, Transparency, and Translatability in Animal Research |
| 4/12/2021 | Racial Equity Institute Training for ICD |
| 4/30/2021 | BioKansas – Speak on Government, Academia and Industry's Roles in Driving R&D (Burroughs Wellcome Fund to help biomedical graduate students successfully transition into private sector careers |
| 5/5/2021 | Research Updates from IDeA State Scientists using N3C |
| 5/11/2021 | MIDAS Annual Meeting |
| 5/12/2021 | NIH Common Fund Transformative High Resolution Cryo-Electron Microscopy |
| 5/19/2021 | All of Us Research Program Update |
| 5/26/2021 | Presentation, NIDCR Council Meeting |
| 5/26/2021 | NIGMS' Diversity and Capacity Building Programs |
| 6/17/2021 | FASEB Shared Research Resources Virtual Roundtable |
| 7/20/2021 | EAWG Working Group Presentation to MBW |
| 7/8/2021 | Protein Data Bank Cloud Strategy—NIGMS, NSF, and DOE |
| 7/14/2021 | NIGMS – AACOM Connection |
| 7/26/2021 | IDeA Central Region Conference |
| 7/22/2021 | Q3 EAWG Update, Steering Committee Update |
| 7/26/2021 | IDeA Central Region (Zoom) Conference |
| 8/2021 | NIH COSWD Office Strategic Priorities |
| 8/9/2021 | RADx-UP Return to School Virtual Workshop |
| 8/10/2021 | Meeting in Twelve Parts of the Mid Atlantic Directors and Staff of Scientific Cores |
| 8/11/2021 | ORWH Pearls of Wisdom Virtual Interview |
| 8/16/2021 | Rhode Island-INBRE North East Regional IDeA Conference/Rhode Island IDeA Network of Biomedical Research Excellence |
| 8/25/2021 | Western Regional IDeA Webinar Presentation |
| Sep-21 | Cloud Computing Workshop |
| 10/18/2021 | UNITE Co-Chairs presentation at ACD Workgroup on Diversity in the Biomedical Research Workforce |
| 10/27/2021 | NIH Tribal Advisory Committee:  Native American Research Centers for Health (NARCH) Outcomes |
| 11/5/2021 | Southeast Regional IDeA Conference (recorded) |
| 11/17/2021 | SARS-COV-2 Surveillance Mini Symposium |
| 11/29/2021 | Next Steps:  Quantum Information Technology Applications in Biomedical Sciences, NIH-DOE-NIST-NSF-DAPRA |
| 12/7/2021 | Keynote Address:  Proof of Concept Network Annual Meeting, 2021 |
| 12/7/2021 | HHS Stakeholder Meeting |
| 2/9/2022 | Cloud Computing Workshop and RFI Report |
| 2/9/2022 | Training Advisory Committee – Presentation on UNITE E Committee |
| 2/23-24/2022 | Fostering Cohort Recruitment Forum |
| 4/21/2022 | Frank Low Research Day, University of North Dakota School of Medicine |