Neal Krishna Devaraj Ph.D.
Professor of Chemistry and Biochemistry
Murray Goodman Endowed Chair in Chemistry and Biochemistry
University of California, San Diego
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Education

Massachusetts Institute of Technology	Chemistry	BS	2002
Massachusetts Institute of Technology	Biology	BS	2002
Stanford University	Chemistry	PhD	2007

Professional Appointments

Postdoctoral Fellow	Harvard Medical School	2007-2011
Assistant Professor	University of California, San Diego	2011-2016
Associate Professor	University of California, San Diego	2016-2018
Professor	University of California, San Diego	2018-
Russell F. Doolittle Faculty Scholar	University of California, San Diego	2020-2021
Murray Goodman Endowed Chair	University of California, San Diego	2021-

Selected Honors and Awards

2022 - **Vannevar Bush Faculty Fellowship**

2022 - **Bioconjugate Chemistry Lectureship Award**

2021 - **Tetrahedron Young Investigator Award**

2019 - **Leo Hendrik Baekeland Award**

2019 - **Guggenheim Fellowship**

2019 - **Eli Lilly Award in Biological Chemistry**

2018 - **Blavatnik National Laureate in Chemistry**

2018 - **Magomedov-Shcherbinina Memorial Prize**

2017 - **ACS Award in Pure Chemistry**

2016 - **National Fresenius Award**

2016 - **Camille Dreyfus Teacher-Scholar Award**

2016 - **NIH T1D Pathfinder Award**

2013 - **NSF CAREER Award**

Publications: University of California, San Diego

91. L. Liu, D. Zhang, M. Johnson N. K. Devaraj "Light-activated tetrazines enable precision live-cell bioorthogonal chemistry" ***Nat. Chem.*** 2022, DOI: 10.1038/s41557-022-00963-8.

90. J. Flores, R. J. Brea, A. Lamas, A. Fracassi, M. Salvador-Castell, C. Xu, C. R. Baiz, S. K. Sinha, N. K. Devaraj "Rapid and Sequential Dual Oxime Ligation Enables De Novo Formation of Functional Synthetic Membranes from Water Soluble Precursors," ***Angew. Chem. Int. Ed.*** 2022, In press.

89. L. Tanwar, N. K. Devaraj "Engineering materials for artificial cells," ***Curr. Opin. Solid State Mater. Sci.*** 2022, 26(4), 101004.

88. K. A. Podolsky, T. Masubuchi, G. T. Debelouchina, E. Hui, N. K. Devaraj "In Situ Assembly of Transmembrane Proteins from Expressed and Synthetic Components in Giant Unilamellar Vesicles," ***ACS Chem. Biol.*** 2022, 17, 5, 1015–1021.

87. D. Zhang, L. Liu, J. Shuaijiang, E. Tota, Z. Li, X. Pao, X. Zhang, X. Fu, N. K. Devaraj "Site-specific and enzymatic cross-linking of sgRNA enables wavelength-selectable photo-activated control of CRISPR gene editing," ***J. Am. Chem. Soc.*** 2022, https://doi.org/10.1021/jacs.1c12166.

86. C. J. Cho, H. Niederholtmeyer, H. Seo, A. Bhattacharya, N. K. Devaraj "Functionalizing lipid sponge droplets with DNA," ***ChemSystemsChem*** 2022, https://doi.org/10.1002/syst.202100045.

85. M. Moinpour, A. Fracassi, R. J. Brea, M. Salvador-Castell, S. Pandey, M. M. Edwards, S. Seifert, S. Joseph, S. K. Sinha, N. K. Devaraj "Controlling Protein Enrichment in Lipid Sponge Droplets using SNAP-tag Bioconjugation," ***ChemBioChem***, 2022, 23, e202100624.

84. J. Chen, N. K. Devaraj "Synthetic Probes and Chemical Tools in Sphingolipid Research," ***Curr. Opin. Chem. Biol.***, 2021, 65, 126-135.

83. H. S. Martin, K. A. Podolsky, N. K. Devaraj "Probing the Role of Chirality in Phospholipid Membranes," ***ChemBioChem***, 2021, 22(22), 3148-3157.

82. A. Bhattacharya, C. J. Cho, R. J. Brea, N. K. Devaraj "Expression of fatty acyl-CoA ligase drives one-pot de novo synthesis of membrane-bound vesicles in a cell free transcription-translation system," ***J. Am. Chem. Soc.***, 2021, 143, 29, 11235–11242

81. N. K. Devaraj, M. G. Finn "Introduction: Click Chemistry," ***Chem. Rev.***, 2021, 121, 12, 6697–6698.

80. K. A. Podolsky, N. K. Devaraj "Synthesis of Lipid Membranes for Artificial Cells," ***Nat. Rev. Chem.***, 2021, 5, 676-694.

79. S. Khanal, R. J. Brea, M. D. Burkart, N. K. Devaraj "Chemoenzymatic Generation of Phospholipid Membranes Mediated by Type I Fatty Acid Synthase," ***J. Am. Chem. Soc.***, 2021, 143, 23, 8533–8537.

78. J. A. Vance, N. K. Devaraj "Membrane Mimetic Chemistry for Artificial Cells," ***J. Am. Chem. Soc.***, 2021, 143, 22, 8223–8231.

77. Y. Lee, N. K. Devaraj "Lipase Mimetic Cyclodextrans," ***Chem. Sci.***, 2021, 12, 1090-1094.

76. L. Liu, Y. Zou, A. Bhattacharya, D. Zhang, S. Q. Lang, K. N. Houk, N. K. Devaraj "Enzyme-free Synthesis of Natural Phospholipids in Water," ***Nat. Chem.,*** 2020, 12, 1029-1034.

75. A. K. Rudd, N. Mittal, E. W. Lim, C. M. Metallo, N. K. Devaraj "A Small Molecule Fluorogenic Probe for the Detection of Sphingosine in Living Cells," ***J. Am. Chem. Soc.,*** 2020, 142, 42, 17887–17891.

74. K. N. Busby, A. Fulzele, D. Zhang, E. J. Bennett, N. K. Devaraj "Enzymatic RNA Biotinylation for Affinity Purification and Identification of RNA-protein Interactions," ***ACS Chem. Biol.***, 2020, 15, 8, 2247-2258.

73. H. Vora, M. Johnson, R. J. Brea, A. K. Rudd, N. K. Devaraj "Inhibition of NRAS Signaling in Melanoma through Direct Depalmitoylation Using Amphiphilic Nucleophiles," ***ACS Chem. Biol.***, 2020, 15, 8, 2079-2086.

72. A. Bhattacharya, H. Niederholtmeyer, K. A. Podolsky, R. Bhattacharya, J. Song, R. J. Brea, C. Tsai, S. K. Sinha, N. K. Devaraj "Lipid Sponge Droplets as Programmable Synthetic Organelles," ***Proc. Natl. Acad. Sci. USA,*** 2020, 117(31), 18206-18215.

71. D. Zhang, S. Jin, X. Piao, N. K. Devaraj "Multiplexed Photoactivation of mRNA with Single Cell Resolution," ***ACS Chem. Biol.,*** 2020, 15(7), 1773-1779.

70. H. Qian, X. Kang, J. Hu, D. Zhang, Z. Liang, F. Meng, X. Zhang, Y. Xue, R. Maimon, S. Dowdy, N. K. Devaraj, Z. Zhou, W. Mobley, D. Cleveland, X. Fu "Reversing Parkinson Disease Model with in situ Converted Nigral Neurons," ***Nature,*** 2020, 582 (7813), 550-556.

69. S. Jin, R. J. Brea, A. K. Rudd, S. P. Moon, M. R. Pratt, N. K. Devaraj "Traceless Native Chemical Ligation of Lipid-modified Peptide Surfactants by Mixed Micelle Formation," ***Nat. Commun.,*** 2020, 11, 2793.

68. M. Johnson, A. Bhattacharya, R. J. Brea, K. A. Podolsky, N. K. Devaraj "Temperature-Dependent Reversible Morphological Transformations in *N*-Oleoyl β-D-Galactopyranosylamine," ***J. Phys. Chem. B,*** 2020, 124, 26, 5426-5433.

67. J. Flores, B. M. White, R. J. Brea, J. M. Baskin, N. K. Devaraj "Lipids: Chemical Tools for their Synthesis, Modification, and Analysis," ***Chem. Soc. Rev.,*** 2020, 49, 4602-4614.

66. K. N. Busby, N. K. Devaraj "Enzymatic Covalent Labeling of RNA with RNA Transglycosylation at Guanosine (RNA-TAG)," ***Method Enzymol.,*** 2020, 641, 373-399.

65. A. Nakamura, C. Oki, S. Sawada, T. Yoshii, K. Kuwata, A. Rudd, N. K. Devaraj, K. Noma, S. Tsukiji "Designer Palmitoylation Motif-Based Self-Localizing Ligand for Sustained Control of Protein Localization in Living Cells and C. elegans," ***ACS Chem. Biol.,*** 2020 15(4), 837-843.

64. B. T. Cisneros, N. K. Devaraj "Laccase-mediated catalyzed fluorescent reporter deposition for live cell imaging," ***ChembioChem,*** 2020, 21(1-2), 98-102.

63. A. Bhattacharya, N. K. Devaraj, "Tailoring the Shape and Size of Artificial Cells," ***ACS Nano***, 2019, 13(7), 7396-7401.

62. A. Bhattacharya, R. J. Brea, J. Song, R. Bhattacharya, S. K. Sinha, N. K. Devaraj "Single-Chain β-d-Glycopyranosylamides of Unsaturated Fatty Acids: Self-Assembly Properties and Applications to Artificial Cell Development," ***J. Phys. Chem. B****,* 2019, 123(17), 3711-3720.

61. A. Bhattacharya, R. J. Brea, H. Niederholtmeyer, N. K. Devaraj "A Minimal Biochemical Route towards de novo Formation of Synthetic Phospholipid Membranes," ***Nat. Commun.*** 2019, 10, 300.

-Highlighted in *Chemical and Engineering News* February 9, 2019, 97, 6 "Simplified Route to Phospholipid Membranes"

60. A. K. Rudd, R. J. Brea, N. K. Devaraj "Amphiphile-Mediated Depalmitoylation of Proteins in Living Cells," ***J. Am. Chem. Soc.***, 2018, 140 (50), 17374–17378.

59. R. J. Brea, A. Bhattacharya, R. Bhattacharya, J. Song, S. Sinha, N. K. Devaraj "Highly Stable Artificial Cells from Galactopyranose-Derived Single-Chain Amphiphiles," ***J. Am. Chem. Soc.***, 2018, 140 (50), 17356–17360.

58. H. Niederholtmeyer, C. Chaggan, N. K. Devaraj "Communication and quorum sensing in non-living mimics of eukaryotic cells," ***Nat. Commun.***, 2018, 9, 5027.

-Highlighted in *Science*, 2018, 362(6417), 877 "Artificial Cells Gain Communication Skills"

57. N. K. Devaraj "The Future of Bioorthogonal Chemistry," ***ACS Cent. Sci.***, 2018, 4(8), 952-959.

56. A. K. Rudd, N. K. Devaraj "Traceless Synthesis of Ceramides in Living Cells Reveals Saturation Dependent Apoptotic Effects" ***Proc. Natl. Acad. Sci. USA***, 2018, Vol. 115, Issue 29, 7485-7490.

55. A. Seoane, R. J. Brea, A. Fuertes, K. Podolsky, N. K. Devaraj "Biomimetic Generation and Remodeling of Phospholipid Membranes by Dynamic Imine Chemistry," ***J. Am. Chem. Soc.***, 2018, 140 (27), 8388–8391.

54. H. Wu, N. K. Devaraj "Advances in Tetrazine Bioorthogonal Chemistry Driven by the Synthesis of Novel Tetrazines and Dienophiles," ***Acc. Chem. Res.***, 2018, 51(5), 1249-1259.

53. D. Zhang, C. Y. Zhou, K. N. Busby, S. C. Alexander, N. K. Devaraj "Light-activated control of translation by enzymatic covalent mRNA labeling," ***Angew. Chem. Int. Ed.***, 2018, 57, 2822.

52. X. Shi, T. Wu, C. M. Cole, N. K. Devaraj, S. Joseph "Optimization of ClpXP activity and protein synthesis in an E. coli extract-based cell-free expression system," ***Sci. Rep.***, 2018, 8 (1), 3488.

51. N. K. Devaraj, C. L. Perrin "Approach control. Stereoelectronic origin of geometric constraints on N-to-S and N-to-O acyl shifts in peptides," ***Chem. Sci.***, 2018, 9, 1789-1794.

50. T. Enomoto, R. J. Brea, A. Bhattacharya, N. K. Devaraj "In Situ Lipid Membrane Formation Triggered by an Intramolecular Photoinduced Electron Transfer," ***Langmuir***, 2018, 34, 3, 750-755.

49. A. Bhattacharya, R. J. Brea, N. K. Devaraj "De novo vesicle formation and growth: an integrative approach to artificial cells," ***Chem. Sci.***, 2017, 8, 7912-7922.

48. C. Y. Zhou, S. C. Alexander, N. K. Devaraj "Fluorescent Turn-on Probes for Wash-Free mRNA Imaging via Covalent Site-Specific Enzymatic Labeling," ***Chem. Sci.***, 2017, 8, 7169-7173.

47. R. J. Brea, N. K. Devaraj "Continual Reproduction of Self-Assembling Oligotriazole Peptide Nanomaterials," ***Nat. Commun.***, 2017, 8 (1), 730.

46. F. Ehret, C. Y. Zhou, S. C. Alexander, D. Zhang, N. K. Devaraj "Site-Specific Covalent Conjugation of Modified mRNA by tRNA Guanine Transglycosylase," ***Mol. Pharm.***, 2017, *15* (3), 737–742.

45. S. C. Alexander, N. K. Devaraj "Developing a fluorescent toolbox to shed light on the mysteries of RNA," ***Biochemistry***, 2017, 56 (39), 5185–5193.

44. N. K. Devaraj "In Situ Synthesis of Phospholipid Membranes," ***J. Org. Chem.***, 2017, 82 (12), 5997–6005.

43. R. J. Brea, C. M. Cole, B. R. Lyda, L. Ye, S. Prosser, R. K. Sunahara, N. K. Devaraj "In Situ Reconstitution of the Adenosine A_{2A} Receptor in Spontaneously Formed Synthetic Liposomes," ***J. Am. Chem. Soc.***, 2017 139 (10), 3607-3610.

-Highlighted in *Chemical & Engineering News*, 95(15), April 10, 2017 "Getting GPCRs in Liposomes" Concentrates

42. R. J. Brea, A. Bhattacharya, N. K. Devaraj "Spontaneous Phospholipid Membrane Formation by Histidine Ligation," ***Synlett***, 2017, 28(01): 108-112.

41. H. Wu, S. C. Alexander, S. Jin, N. K. Devaraj "A Bioorthogonal Near-infrared Fluorogenic Probe for mRNA Detection," ***J. Am. Chem. Soc.***, 2016, 138 (36), 11429-11432.

40. R. J. Brea, A. K. Rudd, N. K. Devaraj "Non-Enzymatic Biomimetic Remodeling of Phospholipids in Synthetic Liposomes," ***Proc. Natl. Acad. Sci. USA***, 2016, 113 (31), 8589-8594.

39. M. D. Hardy, D. Konetski, C. N. Bowman, N. K. Devaraj "Ruthenium Photoredox-Triggered Phospholipid Formation," ***Org. Biomol. Chem.***, 2016, 14, 5555-5558.

38. S. Chowdhuri, C. M. Cole, N. K. Devaraj "Encapsulation of Living Cells within Giant Phospholipid Liposomes Formed by the Inverse-Emulsion Technique" ***ChemBioChem***, 2016, 17 (10), 886-889.

37. H. Wu, N. K. Devaraj "Inverse Electron-Demand Diels–Alder Bioorthogonal Reactions," ***Top. Curr. Chem.***, 2016, 374(1), 1-22.

36. S. C. Alexander, K. N. Busby, C. M. Cole, C. Zhou, N. K. Devaraj "Site-specific Covalent Labeling of RNA by Enzymatic Transglycosylation," ***J. Am. Chem. Soc.***, 2015, 137(40), 12756-12759.

35. C. M. Cole, R. J. Brea, Y. Kim, M. D. Hardy, J. Yang, N. K. Devaraj "Spontaneous Reconstitution of Functional Transmembrane Proteins During Bioorthogonal Phospholipid Membrane Synthesis," ***Angew. Chem. Int. Ed.***, 2015, 54(43), 12738-12742.

34. F. Ehret, H. Wu, S. C. Alexander, N. K. Devaraj "Electrochemical Control of Rapid Bioorthogonal Tetrazine Ligations for Selective Functionalization of Microelectrodes," ***J. Am. Chem. Soc.***, 2015, 137 (28), 8876–8879.

33. M. D. Hardy, J. Yang, J. Selimkhanov, C. M. Cole, L. S. Tsimring, N. K. Devaraj "A Self-Reproducing Catalyst Drives Repeated Phospholipid Synthesis and Membrane Growth," ***Proc. Natl. Acad. Sci. USA***, 2015, 112(27), 8187-8192.

-Highlighted in *Nature Nanotechnology*, August 2015, "Phospholipids Grow Non-stop," vol. 10, p. 653

32. R. J. Brea, M. D. Hardy, N. K. Devaraj "Towards Self-Assembled Hybrid Artificial Cells: Novel Bottom-Up Approaches to Functional Synthetic Membranes." ***Chem. Eur. J.***, 2015, 21(36), 12564-12570.

31. C. Y. Zhou, H. Wu, N. K. Devaraj "Rapid Access to Phospholipid Analogs Using Thiol-Yne Chemistry," ***Chem. Sci.***, 2015, 6, 4365-4372.

30. A. K. Rudd, J. M. V. Cuevas, N. K. Devaraj "SNAP-tag Reactive Lipid Anchors Enable Targeted and Spatiotemporally Controlled Localization of Proteins to Phospholipid Membranes," ***J. Am. Chem. Soc.***, 2015, 137(15), 4884-4887.

-Highlighted in *Chemical & Engineering News*, 93(16), April 16, 2015 "Technique Adds Proteins to Membranes at Specific Sites and Times" News of the Week

29. H. Wu, B. T. Cisneros, C. M. Cole, N. K. Devaraj "Bioorthogonal Tetrazine-Mediated Transfer Reactions Facilitate Reaction Turnover in the Nucleic Acid-Templated Detection of microRNA," ***J. Am. Chem. Soc.***, 2014, 136(52), 17942-17945.

28. R. J. Brea, C. M. Cole, N. K. Devaraj "In situ Vesicle Formation by Native Chemical Ligation," ***Angew. Chem. Int. Ed.***, 2014, 53(51), 14102-14105.

27. H. Wu, J. Yang, J. Šečkutė, N. K. Devaraj "In-situ Synthesis of Alkenyl Tetrazines for Highly Fluorogenic Bioorthogonal Live Cell Imaging Probes," ***Angew. Chem. Int. Ed.***, 2014, 53 (23), 5805-5809.

26. B. Nichols, Z. Qin, J. Yang, D. R. Vera, N. K. Devaraj "^{68}Ga Chelating Bioorthogonal Tetrazine Polymers for the Multistep labeling of Cancer Biomarkers," ***Chem. Comm.***, 2014, 50 (40), 5215-17.

25. J. Yang, Y. Liang, J. Seckute, K. Houk, N. K. Devaraj "Synthesis and Reactivity Comparisons of 1-Methyl-3-Substituted Cyclopropene Minitags for Tetrazine Bioorthogonal Reactions," ***Chem. Eur. J.***, 2014, 20 (12), 3365-3375.

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23. J. Seckute, J. Yang, N. K. Devaraj "Rapid Oligonucleotide-Templated Fluorogenic Tetrazine Cycloadditions," ***Nucl. Acids Res.***, 2013, 41(15) e148.

22. C. M. Cole, J. Yang, J. Šečkutė, N. K. Devaraj "Fluorescent Live-Cell Imaging of Metabolically Incorporated Unnatural Cyclopropene-Mannosamine Derivatives," ***ChemBioChem***, 2013, 14(2), 205-208.

21. N. K. Devaraj "Advancing Tetrazine Bioorthogonal Reactions through the Development of New Synthetic Tools," ***Synlett.***, 2012, 23(15): 2147-2152.

20. J. Yang, J. Seckute, C. M. Cole, N. K. Devaraj "Live-Cell Imaging of Cyclopropene Tags with Fluorogenic Tetrazine Cycloadditions," ***Angew. Chem. Int. Ed.***, 2012, 51(30), 7476-7479.

19. J. Yang, M. R. Karver, W. Li, S. Sagu, N. K. Devaraj "Metal-Catalyzed One-Pot Synthesis of Tetrazines Directly from Aliphatic Nitriles and Hydrazine," ***Angew. Chem. Int. Ed.***, 2012, 51(21), 5222-5225.

-Highlighted in *Chemical & Engineering News*, 90(18), April 30, 2012 "Streamlining Tetrazine Synthesis" News of the Week

18. I. Budin, N. K. Devaraj "Membrane Assembly Driven by a Biomimetic Coupling Reaction," ***J. Am. Chem. Soc.***, 2012, 134(2), 751-753.

Graduate and Postdoctoral Publications

17. N. K. Devaraj, G. M. Thurber, E. J. Keliher, B. Marinelli, R. Weissleder, "Reactive Polymer Enables Efficient In Vivo Chemistry," ***Proc. Natl. Acad. Sci. USA***, 2012, 109 (13), 4762-4767.

16. N. K. Devaraj, R. Weissleder "Biomedical Applications of Tetrazine Cycloadditions," ***Acc. Chem. Res.***, 2011, 44(9), 816-827.

15. J. B. Haun, N. K. Devaraj, B. S. Marinelli, H. Lee, R. Weissleder "Probing Intracellular Biomarkers and Mediators of Cell Activation Using Nanosensors and Bioorthogonal Chemistry" ***ACS Nano,*** 2011, 5 (4), 3204-3213.

14. J. B. Haun, N. K. Devaraj, S. A. Hilderbrand, H. Lee, R. Weissleder "Bioorthogonal Chemistry Amplifies Nanoparticle Binding and Enhances Signal Detection" ***Nat. Nanotechnol.,*** 2010, 5(9), 660-5.

13. H. S. Han, N. K. Devaraj, J. Lee, S. A. Hilderbrand, R. Weissleder, M. G. Bawendi "Development of a Bioorthogonal and Highly Efficient Conjugation Method for Quantum Dots Using Tetrazine Norbornene Cycloaddition" ***J. Am. Chem. Soc.***, 2010, 132(23), 7838-9.

12. N. K. Devaraj, S. A. Hilderbrand, R.Upadhyay, R. Mazitschek, R. Weissleder "Bioorthogonal Turn-On Probes for Imaging Small Molecules Inside Living Cells" ***Angew. Chem. Int. Ed.***, 2010, 49(16), 2869-2872.

11. N. K. Devaraj, R. Upadhyay, J. B. Haun, S. A. Hilderbrand, R. Weissleder "Fast and Sensitive Pretargeted Labeling of Cancer Cells via Tetrazine/*Trans*-Cyclooctene Cycloaddition" ***Angew. Chem. Int. Ed.***, 2009, 48(38), 7013-7016.

10. N. K. Devaraj, E. J. Keliher, G. M. Thurber, M. Nahrendorf, R. Weissleder "^{18}F Labeled Nanoparticles for *in-vivo* PET-CT Imaging" ***Bioconjugate Chem.***, 2009, 20(2) 397-401.

9. N. K. Devaraj, R. Weissleder, S. A. Hildebrand "Tetrazine-Based Cycloadditions: Application to Pretargeted Live Cell Labeling" ***Bioconjugate Chem.***, 2008, 19(12), 2297-2299.

8. N. K. Devaraj, J. P. Collman, "Copper Catalyzed Azide-Alkyne Cycloadditions on Solid Surfaces: Applications and Future Directions" ***QSAR and Comb. Sci.***, 2007, 26(11), 1253-1260.

7. J. P. Collman; R. A. Decreau; Y. Yan; Y. Yang; N. K. Devaraj, “Synthesis of Cytochrome c Oxidase Models that can be Covalently Attached onto Electrode Surfaces” ***J. Org. Chem.***, 2007, 72(8), 2794-2802.

6. J. P. Collman, N. K. Devaraj, R. A. Decreau, Y. Yang, Y. Yan, W. Ebina, T. A. Eberspacher, C. E. D. Chidsey, “A Cytochrome c Oxidase Model Catalyzes the Four-Electron Reduction of Oxygen under Rate-Limiting Electron Flux” ***Science***, 2007, *315*, 5818, 1565-1568.

5. N. K. Devaraj, R. A. Decreau, J. P. Collman, C. E. D. Chidsey, “Rate of Interfacial Electron Transfer Through the 1,2,3-Triazole ‘Click’ Linkage,” ***J. Phys. Chem. B.***, 2006, 110(32), 15955-15962.

4. J. P. Collman, N.K. Devaraj, T. A. Eberspacher, C. E. D. Chidsey, “Mixed Azide-terminated Monolayers; A Platform for Modifying Electrode Surfaces,” ***Langmuir***, 2006, 22(6), 2457-2464.

3. N. K. Devaraj, P. H. Dinolfo, C. E. D. Chidsey, J. P. Collman, “Selective Functionalization of Independently Addressable Microelectrodes by Electrochemical Activation and Deactivation of a Coupling Catalyst,” ***J. Am. Chem. Soc.***, 2006, 128 (6), 1794 -1795.

2. N. K. Devaraj, G. P. Miller, W. Ebina, B. Kakaradov, J. P. Collman, E. T. Kool, C. E. D. Chidsey, “Chemoselective Coupling of Oligonucleotides to Self-Assembled Monolayers,” ***J. Am. Chem. Soc.***, 2005, 127(24), 8600-8601.

1. J. P. Collman, N. K. Devaraj, C. E. D. Chidsey, “Clicking Functionality onto Electrode Surfaces,” ***Langmuir***, 2004, (20), 1051-1053.

<u>Patents Granted</u>

1. C. E. D. Chidsey, A. Devadoss, N. K. Devaraj, “Preparation of Azide-Modified Carbon Surfaces for Coupling to Various Species.” U.S. Patent 8,592,565 issued Nov. 26, 2013.

2. S. A. Hilderbrand, N. K. Devaraj, R. Weissleder, “Compositions and methods for delivering a substance to a biological target.” U.S. Patent 8,900,549 issued Dec. 2, 2014.

3. N. K. Devaraj, J. Yang, “Tetrazines and method of Synthesizing the Same.” U.S. Patent 9,533,957 issued Jan. 3, 2017.

4. S. A. Hilderbrand, N. K. Devaraj, R. Weissleder, M. R. Karver, “Functionalized 1,2,4,5-tetrazine compounds for use in bioorthogonal coupling reactions.” US Patent 9,902,705 issued February 27, 2018.

5. S. A. Hilderbrand, N. K. Devaraj, R. Weissleder, M. R. Karver, “Functionalized 1,2,4,5-tetrazine compounds for use in bioorthogonal coupling reactions.” US Patent 10,611,738 issued April 7, 2020.

6. R. J. Brea, C. M. Cole, N. K. Devaraj, B. Lyda, R. Sunahara, “In situ lipid synthesis for protein reconstitution.” US Patent 11,052,044 issued July 6, 2021.

7. R. J. Brea, C. M. Cole, N. K. Devaraj, B. Lyda, R. Sunahara, “In situ lipid synthesis for protein reconstitution.” US Patent 11,052,044 issued July 6, 2021.

8. N. K. Devaraj, S. C. Alexander, "Enzymatic modification of nucleic acids." US Patent 11,267,842 issued March 8, 2022.

Professional Activities

2021-present Consultant Shasqi, Inc.
2021-present Consultant Ionis Pharmaceuticals
2021-present Member International Advisory Board *Angewandte Chemie*
2020-Panel review member NSF Centers for Chemical Innovation
2020-Panel review member Alfred P. Sloan Foundation
2020-2023 Member, Editorial Advisory Board *Bioorganic and Medicinal Chemistry Letters*
2020-2023 Member, Editorial Advisory Board *Bioorganic and Medicinal Chemistry*
2020-present Consultant Encodia Inc.
2019-present Scientific Founder, Palm Therapeutics
2019-2020 Member Site Visit Review Committee NSF STC Center for Cellular Construction
2020-present Scientific Advisory Board, Triton Algae Innovations
2018-2024 Standing Member NIH EBIT Study Section
2020- Co-Chair NIH EBIT Study Section Oct. 8-9
2021-2023 Defense Science Study Group (DSSG)
2018 Member Site Visit Review Committee NIH/NICHD
2017 Ad Hoc Member NIH EBIT study section Feb. 7-8
2016-present Member, Editorial Advisory Board *ChemBioChem*
2018-present Member, Editorial Advisory Board *Biochemistry*
2018-present Member, Editorial Advisory Board *ChemSystemsChem*
2013-2015 Scientific Advisory Board, Prolynx
2007-present Member, American Chemical Society
2016-present Member, American Association for the Advancement of Science

Current Research Funding

1. W911NF-13-1-0383, Department of Defense (Army Research Office), Multidisciplinary University Research Initiative (MURI), "Dynamic Artificial Cells Composed of Synthetic Bioorthogonal Membranes," 09/01/2013-11/30/2022, Role: PI

2. EF-1935372, National Science Foundation, "Booting Up a Mirror Cell," 09/01/2019-08/31/2023, Role: PI

3. R01GM123285, National Institutes of Health, "Enzymatic Site-Specific Labeling of RNA for Affinity Isolation," 09/20/2017-08/31/2022, Role: PI

4. Camille Dreyfus Teacher Scholar Award, The Camille and Henry Dreyfus Foundation, "Site-Specific Covalent Tagging of RNA for Live Cell Imaging and Affinity Purification," 07/1/2016-06/30/2023, Role: PI

5. CHE-1828666, National Science Foundation, "MRI: Development of a 100 kHz, Ultrafast Interfacial-Specific Two-Dimensional Vibrational Spectromicroscope," 09/01/2018-08/31/2022, Role: Co-PI

6. MCB-2031068, National Science Foundation, "RAPID: Determination of SARS-CoV-2 Spike Glycoprotein Palmitoylation and its Contribution to Virus-Cell Fusion and Surface Protein-Protein Interactions," 06/01/2020-05/31/2022, Role: PI

7. R43CA250702, National Institutes of Health, “Targeted Depalmitoylation for the Treatment of NRas-Driven Melanoma,” 09/21/2020-08/31/2022, Role: MPI

8. R35GM141939, National Institutes of Health, “Illuminating cellular dark matter through the development of novel chemical tools,” 7/1/2021-6/30/2026 Role: PI

9. R43NS122619, National Institutes of Health, “A small molecule enzyme replacement for the treatment of CLN1,” 7/1/2021-6/30/2022, Role: MPI

10. MCB-2124105, National Science Foundation, “Chemoenzymatic construction of a programmable synthetic endoplasmic reticulum,” 08/01/21-07/31/26, Role: PI

11. MCB-2136169, National Science Foundation, “EAGER: Developing a Highly Selective, Orthogonal, Enzymatic RNA Labeling Technology via Directed Evolution of an RNA Transglycosylase,” 08/15/2021-07/31/2023, Role: PI

Completed Research Funding

1. K01EB010078, National Institutes of Health, Mentored Career Development Award (K01), “Fast In Vivo Click Chemistries for PET Imaging,” 05/10/2010-04/30/2015, Role: PI

2. W911NF-15-1-0329, Department of Defense, DURIP “Observing and Controlling Dynamics in Artificial Cells” 09/01/2015-08/31/2016, Role: PI

3. W9132T-14-2-0002, Department of Defense (Army Corps of Engineers), Cooperative Agreement, “Controlling Functional Group Architecture in Artificial Cells,” 03/01/2014-09/30/2017, Role: PI

4. HR0011-18-2-0039, DARPA, “Spatiotemporal Regulation of Translation and Gene Editing,” 06/05/2018-12/04/2019, Role: PI

5. CHE-1254611, National Science Foundation, CAREER Award, “Vesicle Growth Driven by Catalytic Lipid Synthesis,” 09/01/2013-08/31/2020, Role: PI

6. CHE-1844346, National Science Foundation, “RoL:EAGER:DESYN-C3 Programmable Porous Lipid Sponges as Synthetic Cell Factories,” 09/01/2018-08/31/2020, Role: PI

7. Young Investigator Award, Human Frontier Science Program, “Fully Synthetic Self-Regulated Cytoskeleton,” 07/1/2017-06/30/2020, Role: Co-PI

8. DP2DK111801, National Institutes of Health, Type 1 Diabetes Pathfinder Award (DP2), “Amplifying PET Imaging Signals for In Vivo Detection of Pancreatic Beta-cells,” 09/25/2016-08/30/2021, Role: PI

9. Janssen Research Collaboration “Bioorthogonal Tetrazine Conjugations,” 10/01/2020-11/30/2021, Role: PI

Department and University Service

2017-2019 Academic Senate: Campus and Community Environment Committee
2017-2019 Faculty Club Board of Directors
2016-2017 Chair, Endowed Lectures Committee
2016-2020 Graduate Affairs Committee (Chemistry and Biochemistry)
2014-2016 Stanley Miller Memorial Lecture Committee (Chemistry and Biochemistry)

2013-2020 Chair Agilent Lectureship Committee (Physical Sciences)
2013-2015 Medical Science Training Program (MSTP) Admissions Committee
2013-2015 Safety Committee (Chemistry and Biochemistry)
2013-2014 Fund Manager Search Committee (Chemistry and Biochemistry)
2013-2014 MS Task Force (Chemistry and Biochemistry)
2012-2016 Graduate Admissions and Recruitment Committee (Chemistry and Biochemistry)
2012-2018 Served on 6 Faculty Recruitment Committees including junior and senior searches
2018-2019 Chair Dean's Excellence Faculty Search Committee (Biochemistry)
2019-2020 Chair Dean's Excellence Faculty Search Committee (Biochemistry)
2011-2016 Kamen Prize Selection Committee
2020-2022 Chair Space Committee
2020-2021 Research Ramp-Up Safety Department Task Force
2020-2021 Biochemistry Degree Department Task Force
2022-2022 5-year administrative review committee for Dean of Physical Sciences

Teaching

2012-2022 Chemistry 168 Drug Design and Synthesis (Undergraduate, recent enrollment ~200 students)
2012-2021 Chemistry 116/216 Chemical Biology (Undergraduate/Graduate, recent enrollment ~50 students)

Seminar and Conference Presentations 2011-2022:

	Location	**Event**	**Date**
121.	Groningen, Netherlands	University of Groningen Seminar Series	06/17/22
120.	Munster, Germany	Student Seminar Series	06/15/22
119.	Munster, Germany	Department of Chemistry Seminar Series SFB	06/13/22
118.	Les Diablerets, Switzerland	Bioinspired Materials Gordon Conference	06/07/22
117.	remote	University of Virginia Hecht Lecture	02/25/22
116.	remote	Pacifichem (Life-like systems in compartments and beyond)	12/18/21
115.	remote	UC Berkeley Organic Chemistry Seminar Series	09/14/21
114	remote	XIXth ISSOL conference	10/20/21
113.	remote	Osher Institute of UC San Diego	08/17/21
112.	remote	21st Tetrahedron Symposium	06/24/21
111.	remote	University of Groningen Membrane Enzymology Seminar Series	05/14/21
110.	remote	SynCell2021 Speaker Series	05/10/21
109.	remote	Penn State Department of Chemistry Seminar Series	04/29/21
108.	remote	ASBMB annual meeting	04/28/21
107.	remote	Harvard University Woodward Departmental Colloquium Series	04/15/21
106.	remote	ACS Spring National Meeting	04/08/21
105.	remote	The University of Sydney Molecular Innovations in Health seminar series	03/18/21
104.	remote	UMass Lowell Department of Chemistry Seminar Series	03/12/21
103.	remote	Giersch conference and summer school theoretical and experimental quantitative cell biology	02/23/21
102.	remote	Ludwig Maximilian University of Munich Organic Chemistry Seminar	02/08/21
101.	remote	Youngstown State Department of Chemistry Seminar Series	01/15/21
100.	remote	SUNY Buffalo Department of Chemistry Foster Colloquium	11/13/20
99.	remote	From Soft Matter to Protocell 2020 (Tohoku University, Japan)	10/30/20
98.	remote	SEBM: Synthetic Biology webinar series	08/04/20
97.	San Marcos, CA	Cal State San Marcos Chemistry and Biochemistry Seminar Series	03/04/20
96.	Chicago, Il	Pittconn; Novel Probes for Visualizing Biochemical Processes	03/01/20
95.	Los Angeles, CA	UCLA Organic Chemistry Seminar Series	02/06/20
94.	Geneva, Switzerland	2020 International Chem Bio Symposium	01/23/20
93.	Zurich, Switzerland	ETH Laboratory of Organic Chemistry Seminar Series	01/20/20
92.	Kaohsiung, Taiwan	National Sun Yat-sen University Chemistry Seminar	12/18/19
91.	Taipei, Taiwan	18th Asian Chemical Congress	12/09/19

90.	Tsukuba, Japan	National Institute for Materials Science Seminar	12/05/19
89.	Princeton, NJ	Princeton Chemistry Seminar Series	11/21/19
88.	New York, NY	CUNY Salzberg Chemistry seminar series	11/18/19
87.	Madison, NJ	2019 Baekeland Award Symposium	11/15/19
86.	St. Petersburg, FL	Bioactive Lipids Conference (Plenary)	10/22/19
85.	Washington D.C.	Philosophical Society of Washington Lecture Series	10/18/19
84.	Liverpool, UK	University of Liverpool Chemistry Seminar	09/25/19
83.	Glasgow, UK	University of Glasgow Chemistry Seminar	09/18/19
82.	Cambridge, UK	Medical Research Council IMB Seminar	09/16/19
81.	San Diego, CA	ACS Fall National Meeting Eli Lilly Award Symposium	08/27/19
80.	San Diego, CA	Molecular Applications of Fluorescence	08/24/19
79.	Kyoto, Japan	Kyoto University, Chemistry Seminar	07/19/19
78.	Nagoya, Japan	Nagoya University, GTR Seminar	07/16/19
77.	Tokyo, Japan	University of Tokyo, Resonance Bio Lecture	07/05/19
76.	Holderness, NH	Gordon Conference, Physical Organic Chemistry	06/26/19
75.	New York, NY	Synthetic Biology: Engineering, Evolution, and Design	06/24/19
74.	San Jose, CA	Agilent Technologies Seminar	06/13/19
73.	Bethesda, MD	DARPA Safe Genes Kickoff	05/07/19
72.	Boulder, CO	University of Colorado, Boulder, Chemical and Biological Engineering Seminar	05/03/19
71.	Denver, CO	University of Denver Chemistry Seminar	05/02/19
70.	Orlando, Fl	ACS Spring National Meeting	04/02/19
69.	La Jolla, CA	Scripps Research Chemistry Seminar	01/25/19
68.	Foster City, CA	Gilead Seminar	01/07/19
67.	Berkeley, CA	UC Berkeley Student Hosted Chemistry Seminar Series	11/13/18
66.	Ashburn, VA	Probefest 2018, Janelia Research Campus	10/14/18
65.	Evanston, Il	Northwestern Chemistry Seminar	10/12/18
64.	Chicago, Il	Loyola University Denkewalter Lecture	10/11/18
63.	New Brunswick, NJ	Rutgers Chemistry Seminar Series	10/01/18
62.	New York, NY	Blavatnik Award Lecture	09/24/18
61.	Rochester, NY	Magomedov-Shcherbinina Award Lecture, University of Rochester	09/19/18
60.	Sunday River, ME	Gordon Conference Systems Chemistry	07/30/18
59.	Boston, MA	Boston College Chemistry Seminar Series	07/27/18
58.	New York, NY	Blavatnik Science Symposium	07/16/18
57.	Seattle, WA	Meeting of the Electrochemical Society	05/17/18
56.	Zurich, Switzerland	ETH Organic Chemistry Seminar Series	05/14/18
55.	Lausanne, Switzerland	EPFL Bioengineering Seminar Series	05/07/18
54.	Atlanta, GA	Georgia State University Chemistry Seminar Series	03/27/18
53.	New Orleans, LA	ACS Spring National Meeting	03/20/18
52.	Hsinchu, Taiwan	National Tsinghua University Chemistry Seminar Series	12/27/17
51.	San Jose, CA	Agilent Technologies Seminar	11/28/17
50.	Ottawa, Canada	University of Ottawa Chemistry Seminar Series	11/01/17
49.	Worcester, MA	Worcester Polytechnic Institute Chemistry Seminar Series	10/25/17
48.	Haifa, Israel	7^{th} Chemical Protein Synthesis Meeting	09/04/17
47.	San Diego, CA	XVIIIth International Conference on the Origin of Life	07/20/17
46.	Atlanta, GA	Georgia Institute of Technology Chemistry Seminar Series	06/21/17
45.	Toronto, Canada	CSC 100^{th} Canadian Chemistry Conference	06/01/17
44.	Toronto, Canada	CSC 100^{th} Canadian Chemistry Conference	05/31/17
43.	San Diego, CA	Genomics Institute of the Novartis Research Foundation/JDRF Symposium	04/27/17
42.	Los Angeles, CA	UCLA Bioengineering Seminar Series	04/20/17
41.	Salt Lake City, UT	FNANO Conference	04/11/17
40.	San Francisco, CA	ACS Spring National Meeting	04/04/17
39.	San Francisco, CA	ACS Pure Chemistry Award Symposium	04/02/17
38.	San Francisco, CA	ACS Fresenius Award Symposium	04/02/17
37.	San Diego, CA	Vertex Pharmaceuticals	02/27/17
36.	Frederick, MD	NIH-NCI Chemical Biology Seminar Series	02/09/17
35.	San Diego, CA	Type 1 Diabetes Symposium	01/19/17
34.	Philadelphia, PA	University of Pennsylvania, Biological Chemistry Seminar Series	11/03/16
33.	North Chicago, IL	Abbvie	09/07/16
32.	Chicago, IL	University of Chicago Chemistry Seminar Series	09/06/16
31.	Berlin, Germany	Humboldt University Chemistry Seminar	05/19/16
30.	Valtice, Czech Republic	SysChem2016	05/11/16
29.	Knoxville, TN	University of Tennessee Knoxville Chemistry Seminar Series	04/14/16
28.	San Diego, CA	ACS Spring National Meeting (COLL)	03/13/16

27.	San Diego, CA	ACS Spring National Meeting	03/13/16
26.	Honolulu, HI	Pacfichem	12/19/15
25.	Honolulu, HI	Pacifichem	12/18/15
24.	Stanford, CA	Stanford Chemistry Seminar Series	10/01/15
23.	Santiago, Spain	University of Santiago, Chemistry Seminar Series	07/24/15
22.	La Coruna, Spain	Meeting of the Spanish Royal Chemical Society (RSEQ)	07/20/15
21.	San Diego, CA	18^{th} Annual MedChem Symposium	07/16/15
20.	New London, NH	Gordon Research Conference: High-Throughput Chemistry and Chemical Biology	06/17/15
19.	New York, NY	Columbia, Chemistry Seminar Series	05/22/15
18.	New York, NY	New York University Chemistry Seminar Series	05/21/15
17.	Bronx, NY	Albert Einstein Medical Institute Biochemistry Seminar Series	05/20/15
16.	New Haven, CT	Yale Chemical Biology Symposium	05/15/15
15.	Denver, CO	ACS Spring National Meeting (PMSE)	03/24/15
14.	San Diego, CA	San Diego State University Chemistry Seminar Series	03/13/15
13.	Los Angeles, CA	University of Southern California Chemistry Seminar Series	02/03/15
12.	La Jolla, CA	FB3 Fluorescent Biomolecules and their Building Blocks	08/07/14
11.	Dijon France	University of Burgundy Chemistry Seminar Series	07/04/14
10.	London UK	Tetrahedron Symposium	06/24/14
9.	Riverside, CA	UC Riverside Analytical Chemistry Seminar Series	01/23/14
8.	Los Angeles, CA	UCLA Crump Institute/CMI Seminar	01/27/14
7.	Carlsbad, CA	Ionis Pharmaceuticals Invited Seminar	11/25/13
6.	Long Beach, CA	Cal State Long Beach Seminar Series	11/13/13
5.	Kloster Seon, Germany	Transatlantic Frontiers of Chemistry	08/08/13
4.	La Jolla, CA	UCSD Bioengineering Seminar Series	04/19/13
3.	La Jolla, CA	The Scripps Research Institute Chemistry Seminar	04/17/13
2.	Irvine, CA	UC Irvine, Department of Bioengineering Seminar	04/26/13
1.	La Jolla, CA	UCSD BioCircuits Seminar Series	12/04/12