

Neal Krishna Devaraj Ph.D.
Professor of Chemistry and Biochemistry
Murray Goodman Endowed Chair in Chemistry and Biochemistry
Section Chair, Biochemistry and Biophysics
University of California, San Diego
Email: ndevaraj@ucsd.edu Office Phone: 858-534-9539

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-
Section Chair, Biochemistry and Biophysics	University of California, San Diego	2023-

Selected Honors and Awards

2022 - **Vannevar Bush Faculty Fellowship**

2022 - **Bioconjugate Chemistry Lectureship Award**

2022 - **Fulbright Specialist 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

106. Y. Lee, A. Fracassi, N. K. Devaraj “Control of Giant Vesicle Assemblies by Stimuli-Responsive Lipids,” *Chem. Commun.*, 2024, In press.

105. C. Knittel, S. Chadwick, C. Kuehling, N. K. Devaraj “Enzymatic activation of caged tetrazines for cell-specific bioconjugation,” *ChemRxiv*, 2024. This content is a preprint and has not been peer-reviewed.

104. C. J. Cho, T. An, Y. Lai, A. Salazar, A. Fracassi, I. A. Chen, N. K. Devaraj “Generation of Protocells by Spontaneous Reaction of Cysteine with Short Chain Thioesters,” *ChemRxiv*, 2024. This content is a preprint and has not been peer-reviewed.

103. A. Harjung, A. Fracassi, N. K. Devaraj “Encoding extracellular modification of artificial cell membranes using engineered self-translocating proteins,” *bioRxiv*, 2023. This content is a preprint and has not been peer-reviewed.

102. Y. Lee, A. Fracassi, N. K. Devaraj “Light-driven membrane assembly, shape-shifting, and tissue formation in chemically responsive synthetic cells,” *J. Am. Chem. Soc.*, 2023, 145, 47, 25815–25823.

101. J. Chen, R. J. Brea, A. Fracassi, C. J. Cho, A. M. Wong, M. Salvador-Castell, S. K. Sinha, I. Budin, N. K. Devaraj “Rapid Formation of Non-canonical Phospholipid Membranes by Chemoselective Amide-forming Ligations with Hydroxylamines” *Angew. Chem. Int. Ed.*, 2023. e202311635.

100. A. Bhattacharya, L. Tanwar, A. Fracassi, R. J. Brea, S. Khanal, M. Salvador-Castell, S. K. Sinha, N. K. Devaraj “Chemoselective Esterification of Natural and Prebiotic 1,2-amino Alcohol Amphiphiles in Water,” *J. Am. Chem. Soc.*, 2023, 145, 49, 27149–27159.

99. C. Xu, A. Fracassi, C. P. Baryiames, A. Bhattacharya, N. K. Devaraj, C. R. Baiz “Sponge-phase Lipid Droplets as Synthetic Organelles: An Ultrafast Study of Hydrogen Bonding and Interfacial Environments” *ChemPhysChem*, 2023, e202300404.

98. E.M. Tota, N. K. Devaraj “RNA-TAG Mediated Protein-RNA Conjugation” *ChemBioChem*, 2023, 24(18), e202300454.

97. F. A. Souto-Trinei, R. J. Brea, N. K. Devaraj “Biomimetic Construction of Phospholipid Membranes by Direct Aminolysis Ligations” *Interface Focus*, 2023, 1320230019.

96. E. M. Tota, N. K. Devaraj “Site-specific Labeling of DNA Substrates by an RNA Transglycosylase,” *J. Am. Chem. Soc.*, 2023, 145, 14, 8099–8106.

95. A. Fracassi, K. A. Podolsky, S. Pandey, C. Xu, J. Hutchings, S. Seifert, C. R. Baiz, S. K. Sinha, N. K. Devaraj “Characterizing the Self-Assembly Properties of Monoolein Lipid Isosteres,” *J. Phys. Chem. B.*, 2023, 127, 8, 1771–1779.

94. N. K. Devaraj, S. Tsukiji, “Editorial overview: Synthetic biomolecules for probing lipid membranes” *Curr. Opin. Chem. Biol.* 2023, 73, 102271.

93. S. Suzuki, M. Yoshikawa, S. Sawada, N. K. Devaraj, S. Tsukiji “Miniaturized Synthetic Palmitoylation Motifs for Small Molecule Localization in Living Cells,” *Bioconjugate Chem.*, 2023, 34, 1, 169–173.
92. C. Knittel N. K. Devaraj “Bioconjugation strategies for revealing the roles of lipids in living cells” *Acc. Chem. Res.* 2022, 55, 21, 3099-3109.
91. L. Liu, D. Zhang, M. Johnson N. K. Devaraj “Light-activated tetrazines enable precision live-cell bioorthogonal chemistry” *Nat. Chem.* 2022, 14, 1078–1085.
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, 61, e202200549.
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, 4, e202100045.
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. Šečkutè, 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 "⁶⁸Ga 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.
24. J. Seckute, N. K. Devaraj "Expanding Room for Tetrazine Ligations in the In Vivo Chemistry Toolbox," *Curr. Opin. Chem. Biol.*, 2013, 17(5), 761-767.

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 "¹⁸F 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.

Patents Granted

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. 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 11,208,390 issued December 28, 2021.

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

Professional Activities

2023-Member, NIH MIRA for Early Stage Investigators Study Section Mar. 14-15

2022-2024 Consultant Seawolf Therapeutics

2021-2023 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*

2020-2021 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

2018-2022 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/NICHHD

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

Guest Editor:

2021-Chemical Reviews Thematic Issue on "Click Chemistry"

2022-Current Opinion in Chemical Biology, Synthetic Biomolecules Section "Synthetic Biomolecules for probing lipid membranes"

2023-Journal of Organic Chemistry Special Issue on "Next-Generation Organic Chemistry for Labeling and Imaging"