Andrew Pratt Goodwin

Associate Professor
Department of Chemical and
Biological Engineering
University of Colorado, Boulder

596 UCB
Boulder, CO 80303
Tel: (303) 492-3573
Email: andrew.goodwin@colorado.edu

Professional Experience

2018-present Associate Professor, Dept. of Chemical and Biological Engineering, University of Colorado, Boulder.

2012-2018 Assistant Professor, Dept. of Chemical and Biological Engineering, University of Colorado, Boulder.

2008-2012 NIH Postdoctoral Fellow, Dept. of Nanoengineering, University of California, San Diego. Advisor: Prof. Sadik Esener.

2007-2008 Postdoctoral Research Associate, Dept. of Chemistry, Stanford University. Advisor: Prof. Hongjie Dai.

2002-2007 Graduate Research Associate, Dept. of Chemistry, University of California, Berkeley. Advisor: Prof. Jean Fréchet.

Education

May 2007 Ph. D., Chemistry, University of California, Berkeley.
Dissertation advisor: Prof. Jean Fréchet.
Dissertation title: "Novel Polymeric Structures and Drug Release Mechanisms for Cancer Therapy."

May 2002 B. A., Chemistry, Columbia University. Advisor: Prof. James Leighton.

Selected Awards and Professional Memberships

- Dept. of Chem. and Biol. Eng., Outstanding Undergraduate Faculty Mentor Award, 2024
- NAE Frontiers of Engineering, US Meeting Participant, 2016
- NIH Director's New Innovator Award, 2014-2019
- NIH K99/R00 Pathway to Independence Award in Cancer Nanotechnology, 2010-2015
- DOD Breast Cancer Postdoctoral Fellowship Award, 2010-2013
- AACR Scholar-in-Training Award, 2011
- NIH T32 Postdoctoral Fellowship, 2008-2010
- NCI Alliance for Nanotechnology in Cancer, Principal Investigator, 2010-present
- American Institute for Chemical Engineers, Member, 2013-present
- American Chemical Society, Member, 2005-present

Publications at the University of Colorado (* indicates corresponding author)

1. S. D. Curry, B. M. Bower, S. A. Saemundsson, **A. P. Goodwin**,* and J. N. Cha.* "Binding Affinity and Transport Studies of Engineered Photocrosslinkable Affibody-Enzyme-Nanoparticle Constructs." *Nanoscale Adv. In Press.*

2. T. B. Alina, Sven A. Saemundsson, L. E. Mortensen, Y. Xu, J. W. Medlin, J. N. Cha,* and **A. P. Goodwin.*** "Impact of Surface Chemistry and Particle Size on Inertial Cavitation Driven Transport of Silica Nanoparticles and Microparticles**."** *Adv. Func. Mater.* **2025**, *35*, 2412344.

3. B. M. Bower, S. D. Curry, **A. P. Goodwin**,* and J. N. Cha.* "Photocrosslinkable, Low Affinity Affibodies Show Improved Transport and Retention in 3D Tumor Spheroids." *Biomacromolecules.* **2024**, *25*, 7511-7517.

4. T. R. Ausec, L. L. Carr, T. B. Alina, N. B. Day, **A. P. Goodwin,*** and C. W. Shields IV.* "Combination Chemical and Mechanical Tumor Immunomodulation Using Cavitating Mesoporous Silica Nanoparticles." *ACS Appl. Nano Mater.* **2024**, *7*, 19109-19117.

5. S. A. Saemundsson, S. D. Curry, B. M. Bower, E. J. DeBoo, **A. P. Goodwin**, and J. N. Cha.* "Controlling Cellular Packing and Hypoxia in 3D Tumor Spheroids via DNA Interactions." *Biomater. Sci.* **2024**, *12*, 4759-4769.

6. T. B. Alina, H. B. Kirkpatrick, T. R. Ausec, E. N. Mueller, C. W. Shields IV, J. N. Cha,* and **A. P. Goodwin.*** "Effect of Stabilizing Phospholipid on Acoustic Cavitation of Functionalized Mesoporous Silica Nanoparticles." *ACS Appl. Nano Mater.* **2023**, *6*, 13720-13729.

7. S. A. Saemundsson, S. Ganguly, S. D. Curry, **A. P. Goodwin**, and J. N. Cha.* Controlling Cell Organization in 3D Co-Culture Spheroids Using DNA Interactions." *ACS Biomater. Sci. Eng.* **2023**, *9*, 3185-3192.

8. E. N. Mueller,+ T. B. Alina,+ S. D. Curry, S. Ganguly, J. N. Cha,* and **A. P. Goodwin.*** "Silica-Coated Gold Nanorods with Hydrophobic Modification Show Both Enhanced Two-Photon Fluorescence and Ultrasound Drug Release." *J. Mater. Chem. B* **2022**, *10*, 9789-9793.

9. S. Roy, S. D. Curry, C. Corbella Bagot, E. N. Mueller, A. M. Mansouri, W. Park, J. N. Cha,* and **A. P. Goodwin.*** "Enzyme Prodrug Therapy with Photo-Cross-Linkable Anti-EGFR Affibodies Conjugated to Upconverting Nanoparticles." *ACS Nano* **2022**, *16*, 15873–15883.

10. S. Roy, S. D. Curry, M. G. Bibbey, D. A. Chapnick, X. Liu, **A. P. Goodwin**,* and J. N. Cha.* "Effect of covalent photoconjugation of affibodies to epidermal growth factor receptor (EGFR) on cellular quiescence." *Biotechnol. Bioeng.* **2022**, *119*, 187-198.

11. E. N. Mueller,+ M. Kuriakose,+ K. Ma, M. A. Inzunza-Ibarra, T. W. Murray,* J. N. Cha,* and **A. P. Goodwin**.* "Hydrophobically Modified Silica-Coated Gold Nanorods for Generating Nonlinear Photoacoustic Signals." *ACS Appl. Nano Mater.* **2021**, *4*, 12073-12082.

12. S. Ganguly, S. Roy, **A. P. Goodwin,** and J. N. Cha.* "Generation of 3D Cellular Spheroids using DNA Modified Cell Receptors and Programmable DNA Interactions." *Biomaterials Sci.* **2021**, *9*, 7911-7920.

13. S. Movafaghi, A. L. Daniels, M. D. Kelly, C. Calderon, T. W. Randolph,* and **A. P. Goodwin.*** "Hydrogel Coatings on Container Surfaces Reduce Protein Aggregation Caused by Mechanical Stress and Cavitation." *ACS Appl. Bio Materials.* **2021**, *4*, 6949-6953.

14. H. Wu, S. Movafaghi, I. M. Francino Urdániz, T. M. Rowe, **A. P. Goodwin**,* and T. W. Randolph.* "Insulin Fibril Formation Caused by Mechanical Shock and Cavitation." *J. Phys. Chem. B.* **2021**, *125*, 8021-8027.

15. A. V. Parameswar, K. V. Dikshit, S. Movafaghi, C. J. Bruns, and **A. P. Goodwin.*** "Mechanochemistry Activated Covalent Conjugation Reactions in Soft Hydrogels Induced by Interfacial Failure." *ACS Appl. Mater. Interfaces.* **2021**, *13*, 1486-1492.

16. A. W. Harris, S. Roy, S. Ganguly, A. V. Parameswar, F. W. d. S. Lucas, A. Holewinski, **A. P. Goodwin**, and J. N. Cha.* "Investigating the Use of Conducting Oligomers and Redox Molecules in CdS-MoFeP Biohybrids." *Nanoscale Adv.* **2021**, *3*, 1392-1396.

17. S. Roy, J. N. Cha,* and **A. P. Goodwin**.* "Non-genetic bioconjugation strategies for modifying cell membranes and membrane proteins: a review." *Bioconjugate Chem.* **2020**, *31*, 2465-2475. (Invited review)

18. S. Movafaghi, H. Wu, I. M. Francino Urdániz, D. S. Bull, M. D. Kelly, T. W. Randolph,* and **A. P. Goodwin**.* "The Effect of Container Surface Passivation on Aggregation of Intravenous Immunoglobulin Induced by Mechanical Shock." *Biotechnol. J.* **2020**, *15*, 2000096.

19. A. W. Harris, A. Harguindey, R. E. Patalano, S. Roy, O. Yehezkeli, **A. P. Goodwin**, and J. N. Cha.* "Investigating Protein-Nanocrystal Interactions for Photodriven Activity." *ACS Appl. Bio Materials.* **2020**, *3*, 1026-1035.

20. S. Roy, M. Brasino, A. Harguindey, J. N. Cha,* and **A. P. Goodwin.*** "Enzymes Photo-Cross-Linked to Live Cell Receptors Retain Activity and EGFR Inhibition after Both Internalization and Recycling." *Bioconjugate Chem.* **2020**, *31*, 104-112.

21. N. T. Blum, C. M. Gyorkos,+ S. J. Narowetz,+ E. N. Mueller, and **A. P. Goodwin.*** "Phospholipid-Coated Hydrophobic Mesoporous Silica Nanoparticles Enhance Thrombectomy by High Intensity Focused Ultrasound with Low Production of Embolism-Inducing Clot Debris." *ACS Appl. Mater. Interfaces* **2019,** *11*, 36324-36332.

22. D. S. Bull, D. F. Kienle, A. F. Chaparro-Sosa, N. Nelson, S. Roy, J. N. Cha, D. K. Schwartz, J. L. Kaar, and **A. P. Goodwin.*** "Surface-Templated Nanobubbles Protect Proteins from Surface-Mediated Denaturation." *J. Phys. Chem. Lett.* **2019**, *10*, 2641-2647.

23. G. R. Hafenstine,+ R. E. Patalano,+ A. W. Harris, G. Jiang, K. Ma, **A. P. Goodwin**,* and J. N. Cha.* "Solar Photocatalytic Phenol Polymerization and Hydrogen Generation for Flocculation of Wastewater Impurities." *ACS Appl. Polym. Mater.* **2019**, *1*, 1451-1457.

24. N. T. Blum, A. Yildirim, C. Gyorkos, D. Shi, A. Cai, R. Chattaraj, and **A. P. Goodwin.*** "Temperature-Responsive Hydrophobic Silica Nanoparticle Ultrasound Contrast Agents Directed by Phospholipid Phase Behavior." *ACS Appl. Mater. Interfaces* **2019**, *11*, 15233–15240.

25. A. Yildirim,* N. T. Blum, and **A. P. Goodwin.*** "Colloids, Nanoparticles, and Materials for Imaging, Delivery, Ablation, and Theranostics by High Intensity Focused Ultrasound (HIFU)." *Theranostics* **2019**, *9*, 2572-2594.

26. A. Harguindey, S. Roy, A. W. Harris, B. D. Fairbanks, **A. P. Goodwin**, and J. N. Cha.* "Click Nucleic Acid Mediated Loading of Prodrug Activating Enzymes in PEG-PLGA Nanoparticles for Combination Chemotherapy." *Biomacromolecules* **2019**, *20*, 1683-1690.

27. R. Chattaraj,* N. T. Blum, and **A. P. Goodwin.*** "Design and Application of Stimulus-Responsive Droplets and Bubbles Stabilized by Phospholipid Monolayers." *Curr. Opin. Coll. Interface Sci.* **2019**, *40*, 14-24.

28. A. Yildirim,* D. Shi, S. Roy, N. T. Blum, R. Chattaraj, J. N. Cha, and **A. P. Goodwin.*** "Nanoparticle-Mediated Acoustic Cavitation Enables High Intensity Focused Ultrasound Ablation Without Tissue Heating." *ACS Appl. Mater. Interfaces* **2018**, *10*, 36786-36795.

29. M. Brasino, S. Roy, A. H. Erbse, L. He, C. Mao. W. Park, J. N. Cha,* and **A. P. Goodwin.*** "Affibodies with Site-Specific Photocrosslinker Incorporation Show Both Directed Target-Specific Photoconjugation and Increased Retention in Tumors." *J. Am. Chem. Soc.* **2018**, *140*, 11820-11828.

30. L. He, C. Mao, M. Brasino, A. Harguindey, W. Park, **A. P. Goodwin**, and J. N. Cha.* "TiO2 Capped Gold Nanorods for Plasmon-Enhanced Production of Reactive Oxygen Species and Photothermal Delivery of Chemotherapeutic Agents." *ACS Appl. Mater. Interfaces* **2018**, *10*, 27965–27971.

31. A. V. Parameswar, K. R. Fitch, D. S. Bull, V. R. Duke, and **A. P. Goodwin.*** "Polyacrylamide Hydrogels Produce Hydrogen Peroxide from Osmotic Swelling in Aqueous Media." *Biomacromolecules* **2018**, *19*, 3421-3426.

32. D. S. Bull, N. Nelson, D. Konetski, C. N. Bowman, D. K. Schwartz, and **A. P. Goodwin.*** "Contact Line Pinning is Not Required for Nanobubble Stability on Copolymer Brushes." *J. Phys. Chem. Lett.* **2018**, *9*, 4239-4244.

33. G. R. Hafenstine, A. W. Harris, K. Ma, J. N. Cha,* and **A. P. Goodwin.*** "Tandem Catalysis for Converting Ethanol to 2-Ethylhexenal Under Ambient Conditions Using Biphasic Media." *ACS Sustainable Chem. Eng.* **2017**, *5*, 10483-10489

34. A. W. Harris, O. Yehezkeli,* G. R. Hafenstine, **A. P. Goodwin,*** and J. N. Cha.* "Light Driven Catalytic Upgrading in a Biohybrid Photoelectrochemical System." *ACS Sustainable Chem. Eng.* **2017**, *5*, 8199-8204.

35. A. Yildirim,* R. Chattaraj, N. T. Blum, D. Shi, K. Kumar, and **A. P. Goodwin.*** "Phospholipid Capped Mesoporous Nanoparticles for Targeted High Intensity Focused Ultrasound Ablation." *Adv. Healthcare Mater.* **2017**, *6*, 1700514.

36. L. He,* M. Brasino, C. Mao, S. Cho, W. Park, **A. P. Goodwin**, and J. N. Cha.* "DNA-Assembled Core-Satellite Upconverting-Metal Organic Framework Nanoparticle Superstructures for Efficient Photodynamic Therapy." *Small*. **2017**, *13*, 1700504.

37. N. T. Blum, A. Yildirim, R. Chattaraj, and **A. P. Goodwin.*** "Nanoparticles Formed by Acoustic Destruction of Microbubbles and Their Utilization for Imaging and Effects on Therapy by High Intensity Focused Ultrasound." *Theranostics.* **2017**, *7*, 694-702.

38. G. R. Hafenstine, K. Ma, A. W. Harris, O. Yehezkeli, E. Park, D. W. Domaille, J. N. Cha,* and **A. P. Goodwin.*** "Multicatalytic Light-Driven Upgrading of Butanol to 2-Ethylhexenal and Hydrogen at Mild Aqueous Conditions." *ACS Catalysis.* **2017**, *7*, 568-572.

39. R. Chattaraj, G. M. Goldscheitter, A. Yildirim, and **A. P. Goodwin.*** "Enhanced Acoustic Vaporization of Perfluorocarbon Nanodroplets due to Phase Behavior of Mixed Lipid Monolayers." *RSC Adv.* **2016**, ***6***, 111318–111325.

40. A. Yildirim,* R. Chattaraj,+ N. T. Blum,+ **A. P. Goodwin.*** "Understanding Acoustic Cavitation Initiation by Porous Nanoparticles: Toward Nanoscale Agents for Ultrasound Imaging and Therapy." *Chem. Mater.* **2016**, *28*, 5962–5972.

41. L. He, J. Dragavon, S. Cho, C. Mao, A. Yildirim, K. Ma, R. Chattaraj, **A. P. Goodwin**, W. Park, and J. N. Cha.* "Self-Assembled Gold Nanostar-NaYF4:Yb/Er Clusters for Multimodal Imaging, Photothermal and Photodynamic Therapy." *J. Mater. Chem. B.* **2016**, *4*, 4455-4461.

42. K. Kumar, E. J. Castano, A. R. Weidner, and **A. P. Goodwin.*** "Depolymerizable Poly(vinyl carbamate-alt-sulfones) as Customizable Macromolecular Mucosal Drug Delivery Scaffolds." *ACS Macro Lett.* **2016**, *5*, 636-640.

43. A. Yildirim, R. Chattaraj, N. T. Blum, G. M. Goldscheitter, and **A. P. Goodwin.*** "Stable Encapsulation of Air in Mesoporous Silica Nanoparticles: Fluorocarbon-Free Nanoscale Ultrasound Contrast Agents." *Adv. Healthcare Mater.* **2016**, *5*, 1290-1298.

44. D. W. Domaille,* G. R. Hafenstine, M. A. Greer, **A. P. Goodwin,*** and J. N. Cha.* "Catalytic Upgrading in Bacteria-Compatible Conditions via a Biocompatible Aldol Condensation." *ACS Sustainable Chem. Eng.* **2016**, *4*, 671-675.

45. R. Chattaraj,+ P. Mohan,+ C. R. Livingston, J. D. Besmer, K. Kumar, and **A. P. Goodwin.*** "Mutually-Reactive, Fluorogenic Reporter Molecules for In-Solution Biosensing via Droplet Association." *ACS Appl. Mater. Inter.* **2016,** *8*, 802-808.

46. K. Kumar and **A. P. Goodwin.*** "Alternating Sulfone Copolymers Depolymerize in Response to Both Chemical and Mechanical Stimuli." *ACS Macro Lett.* **2015**, *4*, 907-911.

47. R. Chattaraj, P. Mohan, J. D. Besmer, and **A. P. Goodwin.*** "Selective Vaporization of Superheated Nanodroplets for Rapid, Sensitive Acoustic Biosensing." *Adv. Healthcare Mater.* **2015**, *4*, 1790-1795.

48. **A. P. Goodwin.*** "Novel polymer-lipid assemblies for stimulus-responsive imaging contrast agents." *J. Acoust. Soc. Am.* **2015**, *137*, 2397.

49. **A. P. Goodwin,*** M. A. Nakatsuka, and R. F. Mattrey.* "Stimulus-Responsive Ultrasound Contrast Agents for Clinical Imaging: Motivations, Demonstrations, and Future Directions." *WIREs Nanomed. Nanobiotechnol.* **2015**, *7*, 111-123.

50. G. R. Hafenstine, D. W. Domaille, J. N. Cha,* and **A. P. Goodwin**.* "Self-Assembly and Reassembly of Fiber-forming Dipeptides for pH-Triggered DNA Delivery." *J. Polym. Sci. A*. **2015**, *53*, 183-187.

51. K. R. Fitch and **A. P. Goodwin.*** "A Mechanochemical Reaction Cascade for Sensitive Detection of Covalent Bond Breakage in Hydrogels." *Chem. Mater.* **2014**, *26*, 6771-6776.

52. P. Mohan, P. S. Noonan, M. A. Nakatsuka, and **A. P. Goodwin**.* "On-Demand Droplet Fusion: A Strategy for Stimulus-Responsive Biosensing in Solution." *Langmuir.* **2014**, *30*, 12321–12327.

53. P. S. Noonan, P. Mohan, **A. P. Goodwin**, and D. K. Schwartz.* "DNA Hybridization-Mediated Liposome Fusion at the Aqueous-Liquid Crystal Interface." *Adv. Func. Mater.* **2014**, *24*, 3206-3214.

54. H. Noh, S. Goodman, P. Mohan, **A. P. Goodwin**, P. Nagpal, and J. N. Cha.* "Direct conjugation of DNA to quantum dots for scalable assembly of photoactive thin films." *RSC Adv.* **2014**, *4*, 8064-8071.

55. M. A. Nakatsuka, C. V. Barback, K. R. Fitch, A. R. Farwell, R. F. Mattrey, S. C. Esener, J. N. Cha, and **A. P. Goodwin.*** "In Vivo Ultrasound Visualization of Non-Occlusive Blood Clots with Thrombin-Sensitive Contrast Agents." *Biomaterials.* **2013**, *34*, 9559-9565.

56. P. F. Xu, H. Noh, J. H. Lee, D. W. Domaille, M. A. Nakatsuka, **A. P. Goodwin,*** and J. N. Cha.* "Imparting the unique properties of DNA into complex material architectures and functions." *Mater. Today.* **2013,** *16*, 290-296.

57. S. Chapman,* M. Dobrovolskaia, K. Farahani, **A. P. Goodwin**, A. Joshi, H. Lee, T. Meade, M. Pomper, K. Ptak, J. Rao, R. Singh, S. Sridhar, S. Stern, A. Wang, J. B. Weaver, G. Woloschak,* and L. Yang. "Nanoparticles for cancer imaging: The good, the bad, and the promise." *Nano Today*. **2013**, *8*, 454-460.

58. M. A. Nakatsuka, R. F. Mattrey, S. C. Esener, J. N. Cha,* and **A. P. Goodwin.*** "Aptamer-Crosslinked Microbubbles: Smart Contrast Agents for Thrombin-Activated Ultrasound Imaging." *Adv. Mater.* **2012**, *24*, 6010-6016.

Selected Publications at Previous Institutions (* indicates corresponding author)

59. M. A. Nakatsuka, M. J. Hsu, S. C. Esener,* J. N. Cha,* and **A. P. Goodwin.*** "DNA-Coated Microbubbles with Biochemically-Tunable Ultrasound Contrast Activity." *Adv. Mater.* **2011**, *23*, 4908-4912.

60. M. A. Nakatsuka, J. H. Lee, E. Nakayama, A. M. Hung, M. J. Hsu, R. F. Mattrey, S. C. Esener,* J. N. Cha,* and **A. P. Goodwin.*** "Facile One-Pot Synthesis of Polymer-Phospholipid Composite Microbubbles with Enhanced Drug Loading Capacity for Ultrasound-Triggered Therapy." *Soft Matter.* **2011**, *7*, 1656-1659.

61. M. J. Hsu, M. Eghtedari, **A. P. Goodwin**, R. F. Mattrey, D. J. Hall, and S. C. Esener. "Characterization of individual ultrasound microbubble dynamics with a light-scattering system." *J. Biomed. Opt*. **2011**, *16*, 067002.

62. **A. P. Goodwin**, S. M. Tabakman, K. Welsher, S. P. Sherlock, G. Prencipe, and H. Dai. "Phospholipid-Dextran with a Single Coupling Point: a Useful Amphiphile for Functionalization of Nanomaterials." *J. Am. Chem. Soc.* **2009**, *131*, 289-296.

63. Z. Chen, S. M. Tabakman, **A. P. Goodwin**, M. G. Kattah, D. Daranciang, X. Wang, G. Zhang, X. Li, Z. Liu, P. J. Utz, K. L. Jiang, S. S. Fan, and H. Dai. "Protein microarrays with carbon nanotubes as multicolor Raman labels." *Nature Biotechnol.* **2008**, *26*, 1285-1292.

64. **A. P. Goodwin**, S. S. Lam, J. M. J. Fréchet. "Rapid, Efficient Synthesis of Heterobifunctional Biodegradable Dendrimers." *J. Am. Chem. Soc.* **2007**, *129*, 6994-6995.

65. J. L. Mynar, **A. P. Goodwin**, J. A. Cohen, Y-Z. Ma, G. R. Fleming, J. M. J. Fréchet. "Two-photon degradable supramolecular assemblies of linear-dendritic copolymers." *Chem. Commun.* **2007**, *20*, 2081-2082.

66. **A. P. Goodwin**, J. L. Mynar, Y-Z. Ma, G. R. Fleming, J. M. J. Fréchet. "Synthetic Micelle Sensitive to IR Light Via a Two-Photon Process." *J. Am. Chem. Soc.* **2005**, *127*, 9952-9953.

67. Y. J. Kwon, S. M. Standley, **A. P. Goodwin**, E. R. Gillies, J. M. J. Fréchet. "Directed Antigen Presentation Using Polymeric Microparticulate Carriers Degradable at Lysosomal pH for Controlled Immune Responses." *Mol. Pharm.* **2005**, *2*, 83-91.

68. E. R. Gillies, **A. P. Goodwin**, J. M. J. Fréchet. "Acetals as pH-Sensitive Linkages for Drug Delivery." *Bioconjugate Chem.* **2004**, *15*, 1254-1263.

Patents and Disclosures

1. **A. P. Goodwin,** J. N. Cha, S. Roy, and M. Brasino. "*Photoconjugation Reactions for Modification of Specific Proteins on Live Cells*." US Patent US 12,018,081 B1. June 25, 2024.

2. **A. P. Goodwin,** T. W. Randolph, and S. Movafaghi. "Containers and Methods for Reducing Cavitation of Protein Solutions." WO 2022/221275. October 20, 2022.

3. **A. P. Goodwin,** J. N. Cha, S. Roy, and M. Brasino. "Photoconjugation Reactions for Modification of Specific Proteins on Live Cells." CU Invention Disclosure No. CU5000B-PPA1. Provisional Application No. 62/892,681. August 28, 2019.

4. **A. P. Goodwin,** R. Chattaraj, and P. Mohan. "Selective Vaporization of Superheated Nanodroplets for Rapid, Sensitive Acoustic Biosensing." CU Invention Disclosure No. CU3803B-PPA1. Provisional Application No. 62/136,854. March 23, 2015.

5. **A. P. Goodwin** and P. Mohan. "Highly Specific Fusion of Colloids, Droplets, or Encapsulated Materials Initiated by Specific Chemical Stimuli." CU Disclosure: US. Provisional Pat. Appl. No. 61/765,529. February 15, 2013.

6. **A. P. Goodwin**, S. C. Esener, J. N. Cha, and M. A. Nakatsuka. "Ultrasound Contrast Agents with Tunable Activity." UCSD Disclosure: SD2011-349.

7. J. N. Cha, **A. P. Goodwin**, and Y. Shi. "Nanoparticles for Sequential Release of siRNA and Chemotheropeutic Drugs." UCSD Disclosure: SD2009-343.

8. **A. P. Goodwin**, S. C. Esener, and R. F. Mattrey. "Responsive Microbubbles for Ultrasound Contrast Enhancement." UCSD Disclosure: SD2009-326.

Selected Invited Presentations

1. ACS Colloid & Surface Science Symposium, University of Washington. June 26, 2024.
2. American Institute of Chemical Engineers National Meeting. Bionanotechnology. Orlando, FL. November 2023. *Plenary Talk.*
3. Quantitative Biosciences and Engineering Program. Colorado School of Mines. Golden, CO. September 22, 2021.
4. American Chemical Society National Meeting. Nanotheranostics for Cancer Applications. COLL. Philadelphia, PA. March 24, 2020.
5. Acoustical Society of America National Meeting. San Diego, CA. December 6, 2019.
6. Cancer Early Detection Advanced Research Center (CEDAR). Oregon Health and Science University. Portland, OR. November 1, 2019.
7. International Conference on Molecular Imaging and Minimally Invasive Therapy. Peking University. Beijing, PRC. October 19, 2019. *Keynote Presentation.*
8. Photopolymerization Fundamentals 2019. Monterey, CA. September 18, 2019.
9. Department of Gastrointestinal Oncology, University of Colorado Denver. April 29, 2019.
10. American Institute of Chemical Engineers National Meeting. Nanotechnology for Biotechnology and Pharmaceuticals. Pittsburgh, PA. October 31, 2018. *Plenary Talk.*
11. American Chemical Society National Meeting. Vitrimers & Other Covalent Adaptable Networks. POLY. Boston, MA. August 20, 2018.
12. American Chemical Society National Meeting. Nanobubbles: A Sustainable Solution for Water Treatment & Agricultural Applications. ENVR/COLL. Boston, MA. August 20, 2018.
13. American Chemical Society National Meeting. Biomaterials and Biointerfaces. COLL. New Orleans, LA. March 19, 2018.
14. American Institute of Chemical Engineers National Meeting. Topical Conference: Sensors. Minneapolis, MN. October 30, 2017. *Plenary Talk.*
15. Department of Chemical Engineering and Materials Science, University of Minnesota. October 24, 2017.
16. Department of Chemical and Biomolecular Engineering, University of Pennsylvania. September 26, 2017.
17. American Chemical Society National Meeting. Polymer Mechanochemistry. POLY/PMSE. Washington, DC. August 20, 2017.
18. American Chemical Society National Meeting. Nanotheranostics for Cancer Applications. COLL. Washington, DC. August 20, 2017.
19. American Chemical Society National Meeting. Multimodal Imaging with Colloids. COLL. Washington, DC. August 22, 2017.
20. Department of Chemical Engineering, University of California, Irvine. November 18, 2016.
21. Department of Chemical Engineering, University of Washington. November 7, 2016.
22. ACS Colloid & Surface Science Symposium. Harvard University, Cambridge, MA. June 6, 2016.
23. Center for Soft Matter Research, Department of Physics, New York University. April 20, 2016.
24. NIH Common Fund High-Risk High-Reward Symposium. Bethesda, MD. December 8, 2015. (Poster)
25. American Institute of Chemical Engineers National Meeting. Salt Lake City, UT. November 10, 2015.
26. Department of Pharmaceutical Sciences, University of Colorado Denver. October 8, 2015.

27. Department of Integrative Physiology, University of Colorado Boulder. September 28, 2015.
28. Acoustical Society of America National Meeting. Pittsburgh, PA. May 20, 2015.
29. American Chemical Society National Meeting. Denver, CO. March 22, 2015.
30. NIH Common Fund High-Risk High-Reward Symposium. Bethesda, MD. December 15, 2014. (Poster)
31. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Bethesda, MD. October 3, 2014.
32. Department of Chemical and Biological Engineering. Colorado State University. November 15, 2013.
33. Bioimaging Seminar. National Institute of Standards and Technology. Boulder, CO. November 14, 2013.
34. Chemical and Biological Engineering Research Symposium: Focus on Bioengineering. University of Colorado Boulder. Boulder, CO. October 3, 2013.
35. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Bethesda, MD. September 18, 2013.
36. Department of Chemical and Biological Engineering, Korea University. Seoul, ROK. August 20, 2013.
37. JSCBB Mini-Symposium. University of Colorado Boulder, Boulder, CO. July 29, 2013.
38. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Houston, TX. November 16, 2012.
39. Department of Mechanical Engineering, University of Colorado, Boulder. October 18, 2012.

Awarded Funding (>4M PI share at University of Colorado)

1. 2024-2026. NSF 2415714. "SBIR Phase II: Renewable Cellulosic Emulsions and Applications." Total funding: $999,523. PI: P. Ferreira. Co-PI: **A. P. Goodwin (15%)**.
2. 2023-2024. NSF 2213000. "SBIR Phase I: Renewable Cellulosic Emulsions." Total funding: $255,810. PI: P. Ferreira. Co-PI: **A. P. Goodwin (30%)**.
3. 2022-2024. NIH R21CA267608. "Macrophage-Mediated Delivery of Acoustically Propelled Nanoparticles for Sensitizing Immunologically Cold Tumors." Total funding: $384,924. PI: **A. P. Goodwin (50%)**. Co-PI: C. W. Shields IV.
4. 2022-2024. OEDIT/University of Colorado Lab Venture Challenge. "New biomass pretreatments to replace toxic petroleum additives in coatings and adhesives." Total funding: $125,000. PI: **A. P. Goodwin (80%).** Co-PIs: S. Crouse, P. Ferreira.
5. 2021-2024. Dept. of Ed. GAANN P200A210114. "Engineering Polymer Materials for Energy and Sustainability." Total funding: $1,141,425. PI: **A. P. Goodwin.** Co-PIs: C. N. Bowman, S. J. Bryant, J. N. Cha, W. Zhang.
6. 2021-2022. NIH R21AR078506. "Controllable 2- and 3D Assembly of Mechanically Robust Skin Tissue Via Long Term Expression of DNA on Cell Membranes." Total funding: $348,882. PI: J. N. Cha. Co-PI: **A. P. Goodwin (50%)**.
7. 2020-2023. NSF CBET 2025547. "Design of Nanostructures for Light-Mediated Propulsion for Molecular Delivery into Tissue." Total funding: $553,467. PI: **A. P. Goodwin (50%)**. Co-PI: J. N. Cha.
8. 2019-2021. NIH R21GM135668. "Affinity-Mediated Covalent Conjugation: A Method for Direct Modification of Specific Receptors on Cell Membranes." Total funding: $389,706. PI: **A. P. Goodwin (34%)**. Co-PIs: J. N. Cha, X. Liu.
9. 2019-2021. NIH 1R21EB027319. "Nonlinear Photoacoustic Response from Functionalized Gold and Metal Oxide Nanostructures." Total funding: $407,092. PI: **A. P. Goodwin (34%).** Co-PIs: J. N. Cha, T. W. Murray.

10. 2018-2020. NIH 1R21EB026006. "Effect of Container Surface Structure on Cavitation-Induced Protein Particulate Formation." Total funding: $524,033. PI: **A. P. Goodwin (50%).** Co-PI: T. W. Randolph.
11. 2016-2018. NIH 1R03EB021432. "Hollow Silica-Polymer Nanocomposites for Stimulus-Responsive Ultrasound Contrast." Total funding: $153,958. PI: **A. P. Goodwin.** Co-I: A. Yildirim.
12. 2015-2017. NIH 1R21EB020911. "Biomolecule-Directed Assembly for Enhancing Near IR Energy Transfer Processes in Theranostics." Total funding: $383,183. PI: J. N. Cha. Co-PI: **A. P. Goodwin (25%)**, W. Park**.**
13. 2014-2019. NIH 1DP2EB020401. "Rapid, Multiscale Sensing Using Acoustic Detection Mechanisms." Total funding: $2,192,907. PI: **A. P. Goodwin.** Co-PI: None.
14. 2014-2016. NIH 1R21EB018034-A1. "Targeted Microbubbles for Noninvasive Measurement of Tumor VEGF Levels." Total funding: $404,730. PI: **A. P. Goodwin (67%).** Co-PI: M. A. Borden (33%).
15. 2014-2015. NSF XSEDE CHE140147. "Design and Implementation of 'Mechanocatalytic' Reactions for Adaptable Polymer Materials." Supercomputer allotment: 75,000 SU. PI: **A. P. Goodwin.** Co-PI: None.
16. 2012-2015. NIH 1R00CA153935. "Enzyme-Responsive Nanoemulsions as Tumor-Specific Ultrasound Contrast Agents." Total funding: $726,864. PI: **A. P. Goodwin**. Co-PI: None.
17. 2010-2012. NIH 1K99CA153935. "Enzyme-Responsive Nanoemulsions as Tumor-Specific Ultrasound Contrast Agents." Total funding: $186,990. PI: **A. P. Goodwin**. Co-PI: None.
18. 2011-2012. DOD BC101120. "Multifunctional Polymer Microbubbles for Advanced Sentinel Lymph Node Imaging and Mapping." Total funding: $149,313. PI: **A. P. Goodwin.** Co-PI None.

External Service

- Panel reviewer.
    - NCI Transition Career Development Award and Institutional Research Training Grants. January 20, 2025.
    - NIH Director's New Innovator Award Program (DP2). December 20, 2024.
    - NIH Director's New Innovator Award Program (DP2). December 8, 2023.
    - NCI Transition Career Development Award and Institutional Research Training Grants. May 25, 2023.
    - DOD CDMRP Kidney Cancer Research Program. December 13, 2022.
    - DOD PRCRP Brain Cancer Program. October 12, 2022.
    - DOE Energy Frontiers Research Center. Ad-hoc Reviewer. June 7, 2022.
    - NIH F05 Q Cell Biology, Developmental Biology, and Bioengineering. February 24, 2022.
    - NIH Special Emphasis Panel ZRG1 SBIB-N (55). March 11, 2020.
    - NIH IMST (10) Small Business Panel. November 14-15, 2019.
    - NSF Environmental Sustainability. September 20, 2019.
    - NASA Physical Science Informatics. April 20, 2018.
    - NSF Particulate and Multiphase Processes. February 22-23, 2018.
    - NIH Special Emphasis Panel ZRG1 CVRS-L (50). July 12-13, 2017.
    - NIH Special Emphasis Panel ZRG1 SBIB-Z (03). March 2, 2017.
    - NIH Special Emphasis Panel for Innovative Research in Cancer Nanotechnology. July 21, 2016.
    - NIH Special Emphasis Panel/Scientific Review Group 2016/05 ZCA1 TCRB-Q (M3) S. April 6-8, 2016.
    - NSF CHE Chemical Measurement and Imaging. Mail Reviewer, February 12, 2016.
    - NIH NCI Centers of Cancer Nanotechnology Excellence Review Meeting. March 31-April 2, 2015.

- NIH NCI Subcommittee F, Institutional Training and Education Programs. February 23-24, 2015.
- DOD CDMRP Breast Cancer Breakthrough Award. July 29-31, 2014.
- NSF DMR Biomaterials. March 10-11, 2014.

- Journal reviewer: *Accounts of Chemical Research, ACS Applied Nanomaterials, ACS Chemical Biology, ACS Macro Letters, ACS Nano, ACS Sustainable Chemistry and Engineering, Acta Biomaterialia, Advanced Functional Materials, Advanced Materials, Advanced Science, Angewandte Chemie International Edition, Bioconjugate Chemistry, Biomacromolecules, Chemical Communications, ChemPlusChem, Colloids and Surfaces B, Current Opinion in Colloid and Interface Science, Green Chemistry, Journal of the American Chemical Society, Journal of Vacuum Science B, Langmuir, Macromolecules, Materials, Materials Horizons, Molecular Pharmaceutics, Nanomaterials, Nanotechnology Reviews, Nature, Particle and Particle Characterization, Polymer, Polymer Chemistry, RSC Advances, Small, Theranostics.*
- Conference and Symposium Chair and Co-chair.
  - "Acoustically-Active Colloids for Imaging and Therapy." American Chemical Society National Meeting. Philadelphia, PA, March 22-26, 2020.
  - Area Chair/Co-Chair. Topical Conference: Sensors. American Institute of Chemical Engineers. 2016-2018.
    - Responsible for developing new sessions, assigning symposia chairs, obtaining external funding.
  - "Topical Plenary: Advances in Biosensing." American Institute of Chemical Engineers National Meeting. Pittsburgh, PA. October 29, 2018.
  - "Biomaterials and Biointerfaces." American Chemical Society National Meeting. COLL division. Boston, MA. August 19-23, 2018.
  - "Biomaterials and Biointerfaces." American Chemical Society National Meeting. COLL division. New Orleans, LA. March 18-21, 2018.
  - "Topical Plenary: Advances in Biosensing." American Institute of Chemical Engineers National Meeting. Minneapolis, MN. October 30, 2017.
  - "Polymer Mechanochemistry." American Chemical Society National Meeting. POLY division (joint with PMSE). Washington, DC. August 20-24, 2017.
  - "Topical Plenary: Advances in Biosensing." American Institute of Chemical Engineers National Meeting. San Francisco, CA. November 14, 2016.
  - "Biosensor Devices: Platforms and Techniques." American Institute of Chemical Engineers National Meeting. Salt Lake City, UT. November 8-13, 2015.
  - "Stimulus-Responsive Materials and Assemblies." American Chemical Society National Meeting. PMSE division. Denver, CO. March 22-24, 2015.