

# Andrew Pratt Goodwin

Assistant Professor  
Department of Chemical and  
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## Professional Experience

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| <b>2012-present</b> | Assistant Professor, Dept. of Chemical and Biological Engineering, University of Colorado, Boulder.                  |
| <b>2008-2012</b>    | NIH Postdoctoral Fellow, Dept. of Nanoengineering, University of California, San Diego. Advisor: Prof. Sadik Esener. |
| <b>2007-2008</b>    | Postdoctoral Research Associate, Dept. of Chemistry, Stanford University. Advisor: Prof. Hongjie Dai.                |
| <b>2002-2007</b>    | Graduate Research Associate, Dept. of Chemistry, University of California, Berkeley. Advisor: Prof. Jean Fréchet.    |

## Education

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| <b>May 2007</b> | Ph. D., Chemistry, University of California, Berkeley.<br>Dissertation advisor: Prof. Jean Fréchet.<br>Dissertation title: "Novel Polymeric Structures and Drug Release Mechanisms for Cancer Therapy." |
| <b>May 2002</b> | B. A., Chemistry, Columbia University. Advisor: Prof. James Leighton.   |

## Selected Awards and Professional Memberships

- Langmuir Early Career Author in Fundamental Colloid and Interface Science, 2017
- 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
- NCI Alliance for Nanotechnology in Cancer, Postdoctoral Member, 2007-2010
- American Institute for Chemical Engineers, Member, 2013-present
- Materials Research Society, Member, 2012-present
- American Association of Cancer Research, Associate Member, 2008-present
- American Chemical Society, Member, 2005-present

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

1. R. Chattaraj and **A. P. Goodwin.\*** "Interfacial Effects of Lipids, Polymers, and Proteins on Liquid Crystal Orientation in Phospholipid-Coated Nanodroplets." *Submitted*.
2. 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**, In press.
3. 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**, In press.
4. 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.* In press.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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-NaYF<sub>4</sub>:Yb/Er Clusters for Multimodal Imaging, Photothermal and Photodynamic Therapy." *J. Mater. Chem. B.* **2016**, *4*, 4455-4461.
11. 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.
12. 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.

13. 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.
14. 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.
15. 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.
16. 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.
17. **A. P. Goodwin.\*** "Novel polymer-lipid assemblies for stimulus-responsive imaging contrast agents." *J. Acoust. Soc. Am.* **2015**, *137*, 2397.
18. **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.
19. 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.
20. 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.
21. 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.
22. 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.
23. 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.
24. 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.
25. 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.

26. 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.
27. 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)**

28. 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.
29. 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.
30. 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.
31. L. F. Forbes, **A. P. Goodwin**, and J. N. Cha. "Tunable Size and Shape Control of Platinum Nanocrystals from a Single Peptide Sequence." *Chem. Mater.* **2010**, *22*, 6524-6528.
32. **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.
33. Z. Chen, S. M. Tabakman, **A. P. Goodwin**, M. G. Kattah, D. Darancioglu, 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.
34. **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.
35. 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.
36. **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.
37. 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.

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

### Selected Invited Presentations

1. American Institute of Chemical Engineers National Meeting. Minneapolis, MN. October 30, 2017. Plenary Talk.
2. Department of Chemical Engineering and Materials Science, University of Minnesota. October 24, 2017.
3. Department of Chemical and Biomolecular Engineering, University of Pennsylvania. September 26, 2017.
4. American Chemical Society National Meeting. Polymer Mechanochemistry. POLY/PMSE. Washington, DC. August 20, 2017.
5. American Chemical Society National Meeting. Nanotheranostics for Cancer Applications. COLL. Washington, DC. August 20, 2017.
6. American Chemical Society National Meeting. Multimodal Imaging with Colloids. COLL. Washington, DC. August 20, 2017.
7. Department of Chemical Engineering, University of California, Irvine. November 18, 2016.
8. Department of Chemical Engineering, University of Washington. November 7, 2016.
9. ACS Colloid & Surface Science Symposium, Harvard University. June 6, 2016.
10. Center for Soft Matter Research, Department of Physics, New York University. April 20, 2016.
11. NIH Common Fund High-Risk High-Reward Symposium. Bethesda, MD. December 8, 2015. (Poster)
12. American Institute of Chemical Engineers National Meeting. Salt Lake City, UT. November 10, 2015.
13. Department of Pharmaceutical Sciences, University of Colorado Denver. October 8, 2015.
14. Department of Integrative Physiology, University of Colorado Boulder. September 28, 2015.
15. Acoustical Society of America National Meeting. Pittsburgh, PA. May 20, 2015.
16. American Chemical Society National Meeting. Denver, CO. March 22, 2015.
17. NIH Common Fund High-Risk High-Reward Symposium. Bethesda, MD. December 15, 2014. (Poster)
18. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Bethesda, MD. October 3, 2014.
19. Department of Chemical and Biological Engineering. Colorado State University. November 15, 2013.
20. Bioimaging Seminar. National Institute of Standards and Technology. Boulder, CO. November 14, 2013.
21. Chemical and Biological Engineering Research Symposium: Focus on Bioengineering. University of Colorado Boulder. Boulder, CO. October 3, 2013.
22. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Bethesda, MD. September 18, 2013.
23. Department of Chemical and Biological Engineering, Korea University. Seoul, ROK. August 20, 2013.
24. JSCBB Mini-Symposium. University of Colorado Boulder, Boulder, CO. July 29, 2013.
25. NCI Alliance for Nanotechnology in Cancer, Annual Principal Investigators' Meeting. Houston, TX. November 16, 2012.
26. Department of Mechanical Engineering, University of Colorado, Boulder. October 18, 2012.
27. American Chemical Society National Meeting. San Diego, CA. March 25, 2012.

28. UC Biophotonics Alliance Biotechnology Industry Forum. San Francisco, CA. January 20, 2012.
29. American Chemical Society National Meeting. Anaheim, CA. March 29, 2011.
30. Department of Nanoengineering, University of California, San Diego. La Jolla, CA. July 28, 2008.

### Awarded Funding (total >\$3.4M since 2012)

1. 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.
2. 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.
3. 2014-2019. NIH 1DP2EB020401. "Rapid, Multiscale Sensing Using Acoustic Detection Mechanisms." Total funding: \$2,192,907. PI: **A. P. Goodwin**. Co-PI: None.
4. 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%).
5. 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.
6. 2012-2015. NIH 1R00CA153935. "Enzyme-Responsive Nanoemulsions as Tumor-Specific Ultrasound Contrast Agents." Total funding: \$726,864. PI: **A. P. Goodwin**. Co-PI: None.
7. 2010-2012. NIH 1K99CA153935. "Enzyme-Responsive Nanoemulsions as Tumor-Specific Ultrasound Contrast Agents." Total funding: \$186,990. PI: **A. P. Goodwin**. Co-PI: None.
8. 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.

### Service

#### External:

- Conference and Symposium Co-organization.
  - Area Co-Chair. Topical Conference: Sensors. American Institute of Chemical Engineers. 2017-2018.
  - "Topical Plenary: Advances in Biosensing." American Institute of Chemical Engineers National Meeting. Minneapolis, MN. October 29 - November 3, 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.
- Panel reviewer.
  - 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. 2014.
- NSF DMR Biomaterials. March 10-11, 2014.
- Journal reviewer: *ACS Macro Letters*, *ACS Nano*, *Advanced Functional Materials*, *Advanced Materials*, *Angewandte Chemie International Edition*, *Bioconjugate Chemistry*, *Biomacromolecules*, *Chemical Communications*, *ChemPlusChem*, *Colloids and Surfaces B*, *Green Chemistry*, *Journal of the American Chemical Society*, *Journal of Vacuum Science B*, *Materials*, *Macromolecules*, *Molecular Pharmaceutics*, *Nanomaterials*, *Nanotechnology Reviews*, *Polymer Chemistry*, *RSC Advances*, *Theranostics*.

College/University:

- Member of Bioengineering Search Committee, Department of Electrical, Computer, and Energy Engineering. 2013-2014.

Departmental:

- Faculty Committee. 2016-present.
- Departmental Leadership Committee. 2016-present.
- Department of Chemical and Biological Engineering Faculty Search Committee. Chair of Biomedical Subcommittee. 2016-present.
- Chair, Departmental Seminar Committee. 2015-present.
- Graduate Committee. 2012-2016.
- Chair, Graduate and Postdoctoral Awards Committee. 2012-2015.