

JOEL L. KAAR

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EDUCATION

Ph.D. Chemical Engineering, University of Pittsburgh, 09/2007

Dissertation title: Using enzyme structure-environment-activity relationships to enhance biocatalyst utility

Advisor: Prof. Alan J. Russell

B.S. Chemical Engineering, University of Pittsburgh, 12/2001

PROFESSIONAL EXPERIENCE

Associate Chair (Graduate Program Director), University of Colorado Boulder, Department of Chemical and Biological Engineering, 07/2018 – present

Associate Professor, University of Colorado Boulder, Department of Chemical and Biological Engineering, 08/2017 – present

Assistant Professor, University of Colorado Boulder, Department of Chemical and Biological Engineering, 08/2010 – 07/2017

Postdoctoral Research Fellow, UK Medical Research Council Centre for Protein Engineering, University of Cambridge, 01/2008 – 07/2010

Advisor: Prof. Sir Alan R. Fersht, F.R.S.

Bayer Corporation, Leverkusen, Germany, 05/2000 – 08/2000

Bayer Corporation, Baytown, TX, 08/1999 – 12/1999

Bayer Corporation, Pittsburgh, PA, 01/1999 – 04/1999

HONORS AND AWARDS

University of Colorado Department of Chemical & Biological Engineering Distinguished Performance Award, 2019

University of Colorado Provost's Faculty Achievement Award, 2016

University of Colorado Department of Chemical & Biological Engineering Outstanding Junior Faculty Award, 2016

NSF CAREER Award, 2015

University of Colorado College of Engineering Dean's Faculty Fellowship, 2013

US Army Research Office Young Investigator Award, 2012

UK Medical Research Council Career Development Fellowship, 2008

Tissue Engineering and Regenerative Medicine International Society Poster Session "Second Place Award for Best Paper", 2007

American Institute of Chemical Engineers Annual Student Poster Competition "First Place Award for Best Paper", 2001

PEER-REVIEWED PUBLICATIONS

(* denotes corresponding author, # denotes equal contribution)

From University of Colorado

1. Plaks JG, Brewer JA, Jacobsen NK, Mckenna M, Uzarski JR, Lawton TJ, Filocamo SF, **Kaar JL***. Rosetta-enabled structural prediction of permissive loop insertion sites in proteins. *Biochemistry* 2020;59(41):3993-4002.
2. Chaparro Sosa AF, de Oliveira da Silva SM, Morgan GP, Schwartz DK*, **Kaar JL***. Mixed phospholipid vesicles catalytically inhibit and reverse amyloid fibril formation. *J Phys Chem Lett* 2020;11(17):7417-7422
3. Summers SR, Kraft C, Alamdari S, Pfaendtner J, **Kaar JL***. Enhanced activity and stability of *Acidothermus cellulolyticus* endoglucanase 1 in ionic liquids via engineering active site residues and non-native disulfide bridges. *ACS Sustainable Chem Eng* 2020;8(30):11299-11307.
4. Chaparro Sosa AF, Black KJ, Kienle DF, **Kaar JL***, Schwartz DK*. Engineering the composition of heterogeneous lipid bilayers to stabilize tethered enzymes. *Adv Mater Interfaces* 2020;7(17):2000533.
5. Kienle DF, Chaparro Sosa AF, **Kaar JL**, Schwartz DK*. Polyelectrolyte multilayers enhance the dry storage and pH stability of physically entrapped enzymes. *ACS Appl Mater Interfaces* 2020;12(20):22640-22649.
6. Choudhury A, Fankhauser RG, Freed EF, Morgenthaler AB, Bassalo MC, Oh EJ, Copley SD, **Kaar JL**, Gill RT*. Determinants for efficient editing with Cas9-mediated recombineering in *Escherichia coli*. *ACS Synth Biol* 2020;9(5):1083-1099.
7. Choudhury A, Fenster JA, Frankhauser RG, **Kaar JL**, Tenaillon O, Gill RT*. CRISPR/Cas9 recombineering-mediated targeted deep mutational scanning of essential genes in *Escherichia coli*. *Mol Syst Biol* 2020;16(3):e9265.
8. Weltz JS, Kienle DF, Schwartz DK*, **Kaar JL***. Reduced enzyme dynamics upon multipoint covalent immobilization leads to stability-activity tradeoff. *J Am Chem Soc* 2020;142(7):3463-3471.
9. Hedayati M, Faulón Marruecos D, Krapf D, **Kaar JL**, Kipper MJ*. Protein adsorption measurements on low fouling and ultralow fouling surfaces: a critical comparison of surface characterization techniques. *Acta Biomater* 2020;102:169-180.
10. Faulón Marruecos D, Saleh LS, Kim HH, Bryant SJ, Schwartz DK*, **Kaar JL***. Stabilization of fibronectin by random copolymer brushes inhibits macrophage activation. *ACS Appl Bio Mater* 2019;2:4698-4702.
11. Bull DS., Kienle DF, Chaparro Sosa AF, Nelson N, Roy S, Cha JN, Schwartz DK, **Kaar JL**, Goodwin AP*. Surface-templated nanobubbles protect proteins from surface-mediated denaturation. *J Phys Chem Lett* 2019;10(11):2641-2647.
12. Weltz JS, Kienle DF, Schwartz DK*, **Kaar JL***. Dramatic increase in catalytic performance of immobilized lipases by their stabilization on polymer brush supports. *ACS Catal* 2019;9:4992-5001.
13. Plaks JG, **Kaar JL***. Lipoic acid ligase-promoted bioorthogonal protein modification and immobilization. *Methods Mol Biol* 2019; 2012:279-297.
14. Chado GR, Holland EN, Tice AK, Stoykovich MP*, **Kaar JL***. Exploiting the benefits of homogeneous and heterogeneous biocatalysis: tuning the molecular interaction of enzymes with solvents via polymer modification. *ACS Catal* 2018;8(12):11679-11588.
15. Faulón Marruecos D, Schwartz DK*, **Kaar JL***. Impact of surface interactions on protein conformation. *Curr Opin Colloid Interface Sci* 2018;38:45-55.
16. Kienle DF, Falatach RM, **Kaar JL***, Schwartz DK*. Correlating structural and functional heterogeneity of immobilized enzymes. *ACS Nano* 2018;12(8):8091-8103.
17. Russell AJ*, Baker SL, Colina CM, Figg CA, **Kaar JL**, Matyjaszewski K, Simakova A, Summerlin BS. Next generation protein-polymer conjugates. *AIChE J* 2018;64(8):3230-3246.

18. Chado GR, Holland EN, Tice AK, Stoykovich MP*, **Kaar JL***. Modification of lipase with the poly(4-acryloylmorpholine) for enhanced solubility and transesterification activity in anhydrous ionic liquids. *Biomacromolecules* 2018;19(4):1324-1332.
19. Chaparro Sosa AF, Kienle DF, Falatach RM, Flanagan J, **Kaar JL***, Schwartz DK*. Stabilization of immobilized enzymes via the chaperone-like activity of mixed lipid bilayers. *ACS Appl Mater Interfaces* 2018;10(23):19504-19513.
20. Faulón Marruecos D, Kienle DF, **Kaar JL***, Schwartz DK*. Grafting density impacts local nanoscale hydrophobicity in poly(ethylene glycol) brushes. *ACS Macro Lett* 2018;7(4):498-503.
21. Summers SR, Sprenger KG, Pfaendtner J, Marchant J, Summers MF, **Kaar JL***. Mechanism of competitive inhibition and destabilization of *Acidothermus Cellulolyticus* Endoglucanase 1 by ionic liquids. *J Phys Chem B* 2017;121(48):10793-10803.
22. Sprenger KG, Plaks JG, **Kaar JL**, Pfaendtner J*. Elucidating sequence and solvent specific design targets to protect and stabilize enzymes for biocatalysis in ionic liquids. *Phys Chem Chem Phys* 2017;19(26):17426-17433.
23. Jung S, **Kaar JL***, Stoykovich MP*. Enhanced optical sensitivity in thermo-responsive photonic crystal hydrogels by operating near the phase transition. *ACS Appl Mater Interfaces* 2017;9(33):27927-27935.
24. Kastantin M#, Faulón Marruecos D #, Grover N, McLoughlin SY, Schwartz DK*, **Kaar JL***. Connecting protein conformation and dynamics with ligand-receptor binding using three-color FRET tracking. *J Am Chem Soc* 2017;139(29):9937-9948.
25. **Kaar JL***. Lipase activation and stabilization in room temperature ionic liquids. *Methods Mol Biol* 2017;1504:25-35. This edition is an updated version of the previously published version of this manuscript.
26. Jung S, **Kaar JL***, Stoykovich MP*. Design and functionalization of photonic crystal-containing hydrogels for biosensing. *Mol Sys Des Eng* 2016;1(3):225-241.
27. Grover N, Plaks JG, Summers SR, Chado GR, Schurr MJ, **Kaar JL***. Acylase-containing polyurethane coatings with anti-biofilm activity. *Biotechnol Bioeng* 2016;113(12):2535-2543.
28. Chado GR, Stoykovich MP*, **Kaar JL***. Role of dimension and spatial arrangement on the activity of biocatalytic cascade reactions on scaffolds. *ACS Catal* 2016;6:5161-5169. (selected for cover image)
29. Sprenger KG, Choudhury A, **Kaar JL**, Pfaendtner J*. The lytic polysaccharide monooxygenases ScLPMO10B and ScLPMO10C are stable in ionic liquids as determined by molecular simulations. *J Phys Chem B* 2016;120(16):3863-3872.
30. Faulón Marruecos D, Kastantin M, Schwartz DK*, **Kaar JL***. Dense poly(ethylene glycol) brushes reduce adsorption and stabilize the unfolded conformation of fibronectin. *Biomacromolecules* 2016;17(3):1017-1025.
31. Weltz JS, Schwartz DK*, **Kaar JL***. Surface-mediated protein unfolding as a search process for denaturing sites. *ACS Nano* 2016; 10(1):730-738.
32. Nordwald EM#, Plaks JG#, Snell JR, Sousa MC, **Kaar JL***. Crystallographic investigation of imidazolium ionic liquid effects on enzyme structure. *ChemBioChem* 2015;16(17):2456-2459.
33. MacConaghy KI, Chadly DM, Stoykovich MP*, **Kaar JL***. Label-free detection of missense mutations and methylation differences in the p53 gene using optically diffracting hydrogels. *Analyst* 2015;140(18):6354-6362.
34. Plaks JG, Falatach R, Kastantin M, Berberich JA, **Kaar JL***. Multi-site clickable modification of proteins using lipoic acid ligase. *Bioconjug Chem* 2015;26(6):1104-1112.

35. MacConaghy KI, Chadly DM, Stoykovich MP*, **Kaar JL***. Optically diffracting hydrogels for screening kinase activity: impact of material and solution properties. *Anal Chem* 2015;87(6):3467-3475.
36. Burney PR, Nordwald EM, Hickman K, **Kaar JL**, Pfaendtner J*. Molecular dynamics investigation of the ionic liquid/enzyme interface: application to engineering enzyme surface charge. *Proteins: Struct Funct Bioinf* 2015;83(4):670-680.
37. Swartzlander MD, Barnes CA, Blakney AK, **Kaar JL**, Kyriakides TR, Bryant SJ*. Linking the foreign body response and protein adsorption to PEG-based hydrogels using proteomics. *Biomaterials* 2015;41:26-36.
38. Nordwald EM, Armstrong GS, **Kaar JL***. NMR-guided rational engineering of an ionic liquid tolerant lipase. *ACS Catal* 2014;4(11):4057-4064.
39. MacConaghy KI, Geary CI, **Kaar JL***, Stoykovich MP*. Photonic crystal kinase biosensor. *J Am Chem Soc* 2014;136(19):6896-6899.
40. Nordwald EM, Brunecky R, Himmel ME, Beckham GT, **Kaar JL***. Charge engineering of cellulases improves ionic liquid tolerance and reduces lignin inhibition. *Biotechnol Bioeng* 2014;111(8):1541-1549.
41. McLoughlin SY#, Kastantin M#, Schwartz DK, **Kaar JL***. Single Molecule resolution of protein structure and interfacial dynamics on biomaterial surfaces. *Proc Natl Acad Sci U S A* 2013;110(48):19396-19401.
42. Nordwald EM, **Kaar JL***. Mediating electrostatic binding of 1-butyl-3-methylimidazolium chloride to enzyme surfaces improves conformational stability. *J Phys Chem B* 2013;117(30):8977-8986.
43. Nordwald EM, **Kaar JL***. Stabilization of enzymes in ionic liquids via modification of enzyme charge. *Biotechnol Bioeng* 2013;110(9):2352-2360.
44. Nordwald EM, Garst A, Gill, RT, **Kaar JL***. Accelerated protein engineering for chemical biotechnology via homologous recombination. *Curr Opin Biotechnol* 2013;24(6):1017-1022.

Prior to University of Colorado

45. Brandt T, **Kaar JL**, Fersht AR, Veprintsev DB*. Stability of p53 homologs. *PLoS One* 2012;7(10):e47889.
46. **Kaar JL***. Lipase activation and stabilization in room temperature ionic liquids. *Methods Mol Biol* 2011;679:25-35.
47. **Kaar JL**, Basse N, Joerger AC, Stephens E, Rutherford TJ, Fersht AR*. Stabilization of mutant p53 via alkylation of cysteines and effects on DNA binding. *Protein Sci* 2010;19(12):2267-2278.
48. Basse N#, **Kaar JL**#, Joerger AC, Rutherford TJ, Fersht AR*. Towards the rational design of p53 stabilizing drugs: probing the surface of the oncogenic Y220C mutant. *Chem Biol* 2010;17(1):46-56.
49. Chen CZC, Peng YX, Wang ZB, Fish PV, **Kaar JL**, Koepsel RR, Russell AJ, Lareu RR, Raghunath M*. The scar-in-a-jar: studying antifibrotic lead compounds from the epigenetic to extracellular level in a single well. *Br J Pharmacol* 2009;158(5):1196-1209.
50. **Kaar JL**, Li Y, Blair HC, Asche G, Koepsel RR, Huard J, Russell AJ*. Matrix metalloproteinase-1 treatment of muscle fibrosis. *Acta Biomater* 2008;4(5):1411-1420.
51. Depp V, **Kaar JL**, Russell AJ, Lele BS*. Enzyme sheathing enables nanoscale solubilization of biocatalyst and dramatically increases activity in organic solvent. *Biomacromolecules* 2008;9(4):1348-1351.
52. **Kaar JL**#, Oh H#, Russell AJ, Federspiel WJ*. Towards improved artificial lungs through biocatalysis. *Biomaterials* 2007;28(20):3131-3139.

53. Bedair H, Liu TT, **Kaar JL**, Badlani S, Russell AJ, Li Y*, Huard J. Matrix metalloproteinase-1 therapy improves muscle healing. *J Appl Physiol* 2007;102(6):2338-2345.
54. Xu H, **Kaar JL**, Russell AJ, Wagner WR*. Characterizing the modification of surface proteins with poly(ethylene glycol) to interrupt platelet adhesion. *Biomaterials* 2006;27(16):3125-3135.
55. Sharma NK, Tickell MD, Anderson JL, **Kaar J**, Pino V, Wicker BF, Armstrong DW*, Davis JH Jr*, Russell AJ*. Do ion tethered functional groups affect solvent properties? The case of sulfoxides and sulfones. *Chem Commun* 2006;6:646-648.
56. Russell AJ*, **Kaar JL**, Berberich JA. Using biotechnology to detect and counteract chemical weapons. *The Bridge* 2003;33(4):19-24. Invited peer-reviewed article published by the National Academy of Engineering.
57. Berberich JA, **Kaar JL**, Russell AJ*. Use of salt hydrate pairs to control water activity for enzyme catalysis in ionic liquids. *Biotechnol Prog* 2003;19(3):1029-1032.
58. **Kaar JL**, Jesionowski AM, Berberich JA, Moulton R, Russell AJ*. Impact of ionic liquid physical properties on lipase activity and stability. *J Am Chem Soc* 2003;125(14):4125-4131.
59. Russell AJ*, Erbelinger M, DeFrank JJ, **Kaar J**, Drevon G. Catalytic buffers enable positive-response inhibition-based sensing of nerve agents. *Biotechnol Bioeng* 2002;77(3):352-357.

PATENTS

1. Chado GR, Stoykovich MP, **Kaar JL**. Tuning the molecular interaction of solvents via protein polymer modification. PCT Application No. PCT/US2019/055416.
2. Oh H, **Kaar JL**, Russell AJ, Federspiel WJ. Devices, systems and methods for reducing the concentration of carbon dioxide in fluids. US Patent Number 7763097.

INVITED PRESENTATIONS

1. ARO Chemical Sciences Division Program Review Meeting, 01/2021
2. Seminar, Department of Chemical and Biological Engineering, Colorado State University, 09/2020
3. Biological and Pharmaceutical Complex Fluids III: Protein Self-Assembly, Rheology and Interfacial Properties Conference, 07/2019
4. Seminar, School of Engineering, Matter, Transport, and Energy, Arizona State University, 04/2019
5. Seminar, Chemical and Petroleum Engineering Department, University of Pittsburgh, 02/2019
6. Seminar, Department of Chemical and Biological Engineering, Colorado State University, 02/2019
7. Seminar, Department of Chemistry, Colorado School of Mines, 01/2019
8. Seminar, Department of Chemical and Biomolecular Engineering, Tulane University, 10/2018
9. ARO Chemical Sciences Division Program Review Meeting, 07/2018
10. Center for Polymer-based Protein Engineering Meeting, 06/2018
11. Seminar, Material Science and Engineering Department, West Virginia University, 04/2018
12. Biomaterials and Biointerfaces Symposium, COLL Division, ACS Spring Meeting, 03/2018
13. Colorado Single Molecules and Membrane Meeting, 01/2018
14. ARO Chemical Sciences Division Program Review Meeting, 08/2017
15. Center for Polymer-based Protein Engineering Meeting, 06/2017
16. Advances in Biophysical Methods for Protein Characterisation Conference, 10/2016
17. Center for Polymer-based Protein Engineering Meeting, 06/2016
18. Seminar, Department of Chemistry, University of Miami Ohio, 04/2016

19. Biostability Symposium, Army Natick Soldier Research Development and Engineering Center, 09/2015
20. Colorado Protein Stability Conference, 07/2015
21. Frontier of the Interface of Materials and Biology: Using Nanotechnology To Investigate Cellular and other Biological Systems Session, COLL Division, ACS Fall Meeting, 08/2014
22. Biophysical Society Summer Course, University of North Carolina, 06/2014
23. Colorado Center for Biofuels and Biorefining Semi-Annual Meeting, 04/2014
24. Seminar, Department of Chemical Engineering, University of Washington, 11/2013
25. Research Symposium, Department of Chemical & Biological Engineering, University of Colorado, 10/2013
26. Army Research Office Reactive Chemical Systems Meeting, 10/2012
27. Seminar, Department of Chemical & Biological Engineering, Colorado School of Mines, 04/2012
28. Seminar, Department of Chemical and Biological Engineering, Colorado State University, 12/2011
29. Biophysics Supergroup, University of Colorado, 01/2011
30. Seminar, Department of Chemical & Biological Engineering, University of Colorado, 02/2010
31. Seminar, Department of Chemical and Biomolecular Engineering, Clemson University, 02/2010
32. NATO PG31 Meeting on Non-Corrosive, Biotechnology-Based Decontaminants for Chemical and Biological Weapons, 03/2004

CONTRIBUTED PRESENTATIONS

(* denotes presenter)

1. Sánchez-Morán H*, Weltz JS, Schwartz KD, Kaar JL. Machine Learning Guided Evaluation of Protein Surface Hydrophobicity. AIChE Annual Meeting, 2020 (talk).
2. Kienle DF*, Falatach RM, Kaar JL, Schwartz DK. Correlating structural and functional heterogeneity of immobilized enzymes. AIChE Annual Meeting, 2020 (talk).
3. Bisirri E*, Schwartz DK, Kaar JL. Promoting native protein conformation at biomaterial interfaces through rationally designed polymer brushes. University of Colorado, 2020 (talk).
4. Kienle DF*, Falatach RM, Kaar JL, Schwartz DK. Correlating structural and functional heterogeneity of immobilized enzymes. Biophysics Supergroup, University of Colorado, 2019 (talk).
5. Chaparro Sosa AF*, Black KJ, Kaar J, Schwartz DK. Tuning surface charge as a general approach to improving immobilized enzyme function on mixed lipid bilayers. ACS Fall Meeting, 2019 (talk).
6. Bull D*, Kienle D, Chaparro Sosa A, Nelson N, Konetski D, Roy S, Bowman C, Cha J, Schwartz DK, Kaar J, Goodwin AP. Reversible nanobubble surface modifications form protective surface layers at solid/liquid interfaces. ACS Fall Meeting, 2019 (talk)
7. Chado GR, Holland EN, Tice AK, Stoykovich MP, Kaar JL*. Reversibly tuning the interaction of enzymes with solvents via polymer modification for biocatalysis. ACS Spring Meeting, 2019 (talk).
8. Kienle DF*, Falatach RM, Kaar JL, Schwartz DK. Correlating structural and functional heterogeneity of immobilized enzymes. ACS Fall Meeting, 2018 (talk).
9. Faulón Marruecos D*, Kastantin M, Grover N, McLoughlin SY, Schwartz DK, Kaar JL. Connecting protein conformation and dynamics with ligand-receptor binding using three-color Förster resonance energy transfer tracking. ACS Spring Meeting, 2018 (talk).
10. Chaparro Sosa AF*, Kienle DF, Falatach RM, Kaar JL, Schwartz DK. Enhanced stability of immobilized enzymes on heterogeneous lipid bilayers. ACS Spring Meeting 2018 (talk).

11. Faulón Marruecos D, Kim HH, Schwartz DK, Kaar JL*. Dynamic and chemically heterogeneous polymer brushes stabilize protein conformation. ACS Spring Meeting 2018 (talk).
12. Plaks J*, Uzarski JR, Lawton TJ, Filocamo S, Kaar J. Structurally-guided design of chimeric proteins containing novel peptide loops. ACS Spring Meeting, 2017 (talk).
13. Choudhury A*, Wang Z, Kaar JL, Gill RT. Whole genome regulator mutant library for expedited identification of beneficial mutations for enhanced tolerance towards environmental stress. Synthetic Biology: Engineering, Evolution, and Design Conference, 2017 (poster).
14. Choudhury A*, Wang Z, Kaar J, Gill R. Whole genome libraries with mutated regulatory function for applications in metabolic engineering. ACS Spring Meeting, 2017 (talk).
15. Choudhury A*, Wang Z, Kaar J, Gill R. Development of whole genome regulator mutation library in *Escherichia coli* provides a platform to study beneficial mutations to diverse stresses. Society of Molecular Biology and Evolution Annual Meeting, 2017 (poster).
16. Faulón Marruecos D*, Schwartz DK, Kaar JL. Chemically heterogeneous polymer brushes stabilize protein conformation. AIChE Annual Meeting, 2017 (talk).
17. Faulón Marruecos D*, Schwartz DK, Kaar JL. Chemically heterogeneous polymer brushes stabilize protein conformation. Biophysics Supergroup, University of Colorado, 2017 (talk).
18. Faulón Marruecos D*, Schwartz DK, Kaar JL. Conformation and dynamics of fibronectin influence integrin binding kinetics and stability. Biophysics Supergroup, University of Colorado, 2016 (talk).
19. Faulón Marruecos D*, Schwartz DK, Kaar JL. Mixed poly(ethylene glycol) and poly(sulfobetaine) brushes to control protein adsorption and denaturation on biomaterial surfaces. AIChE Annual Meeting, 2016 (talk).
20. Chado GR*, Phenicie CM, He C, Kaar JL, Stoykovich MP. Morphological control by localized blending in phase separated block copolymer thin films. AIChE Annual Meeting, 2016 (talk).
21. Chado GR*, Stoykovich MP, Kaar JL. Role of dimension and spatial arrangement on the activity of coupled biocatalytic reactions on scaffolds. AIChE Annual Meeting, 2016 (poster).
22. Weltz JS*, Schwartz DK, Kaar JL. Controlling protein unfolding at the solution-solid interface by modifying the nanoscale environment of the surface. AIChE Annual Meeting, 2016 (talk).
23. Choudhury A*, Wang Z, Garst A, Kaar JL, Gill RT. Whole genome regulator mutant library for expedited identification of beneficial mutations for enhanced tolerance to diverse stresses. Synthetic Biology: Engineering, Evolution, Design Conference, 2016 (poster).
24. Faulón Marruecos D*, Kastantin M, Schwartz DK, Kaar JL. Dense poly(ethylene glycol) brushes reduce adsorption and stabilize the unfolded conformation of fibronectin. ACS Spring Meeting 2016 (talk).
25. Nordwald EM, Plaks JG, Snell J, Sousa MC, Kaar JL*. Crystallographic investigation of imidazolium ionic liquid effects on enzyme structure and inactivation. AIChE Annual Meeting, 2015 (talk).
26. Weltz JS*, Schwartz DK, Kaar JL. Surface-mediated protein unfolding as a search process for denaturing sites. AIChE Annual Meeting, 2015 (talk).
27. Plaks JG*, Falatach R, Berberich JA, Kaar JL. Post-translational azide functionalization for optimizing immobilized protein properties. AIChE Annual Meeting, 2015 (talk).
28. Falatach R, Plaks J, Page R, Konkolewicz D, Kaar JL, Berberich JA*. Synthesis of well-defined protein-polymer conjugates using ligase-mediated site-specific modification and RAFT polymerization. AIChE Annual Meeting, 2015 (poster).

29. Weltz JS*, Schwartz DK, Kaar JL. Surface-mediated protein unfolding as a search process for denaturing sites. Biophysics Supergroup, University of Colorado, 2015 (talk).
30. Kastantin M*, Grover N, Marruecos DF, Schwartz DK, Kaar JL. Fibronectin conformation and integrin binding on crowded surfaces. ACS Spring Meeting, 2015 (talk).
31. Nordwald EM*, Brunecky R, Himmel ME, Beckham GT, Kaar JL. Charge engineering of cellulases improves ionic liquid tolerance and reduces lignin inhibitions. ACS Spring Meeting, 2015 (talk).
32. Nordwald EM*, Armstrong GS, Kaar JL. NMR-guided rational engineering of an ionic liquid tolerant lipase. ACS Spring Meeting, 2015 (talk).
33. Plaks JG*, Berberich JA, Kaar JL. Ligase-mediated biorthogonal insertion of click reactive groups for site-specific protein modification. ACS Spring Meeting, 2015 (talk).
34. MacConaghy KI*, Kaar JL, Stoykovich MP. Photonic crystal platform for biomolecular sensing. ACS Spring Meeting, 2015 (talk).
35. MacConaghy KI*, Kaar JL, Stoykovich MP. Material considerations in the design of sensitive and rapid biosensors based on optically diffracting hydrogels. ACS Spring Meeting, 2015 (poster).
36. Weltz JS*, Schwartz DK, Kaar JL. Probing protein denaturation at the solid-liquid interface with single-molecule fluorescence microscopy. ACS Spring Meeting, 2015 (talk).
37. MacConaghy KI*, Geary CI, Kaar JL, Stoykovich MP. Development of a photonic crystal biosensor for assaying kinase activity. AIChE Annual Meeting, 2014 (talk).
38. MacConaghy KI*, Kaar JL, Stoykovich MP. Characterization of the key properties of optically diffracting hydrogels for biosensing applications. AIChE Annual Meeting, 2014 (poster).
39. Nordwald EM*, Kaar JL. Effect of site-specific mutations on solvent-induced inactivation of lipase in ionic liquids: towards the rational design of ionic liquid tolerant enzymes. AIChE Annual Meeting, 2014 (poster).
40. Nordwald EM*, Kaar JL. Charge engineering of cellulases improves ionic liquid tolerance and reduces lignin inhibition. AIChE Annual Meeting, 2014 (poster).
41. Nordwald EM*, Kaar JL. Stabilization of enzymes in ionic liquids via modification of enzyme charge. AIChE Annual Meeting, 2013 (talk).
42. McLoughlin SY, Kastantin MJ, Schwartz DK, Kaar JL*. Protein engineering-enabled single molecule resolution of protein structure at biomaterial interfaces. AIChE Annual Meeting, 2013 (talk).
43. Kastantin MJ*, McLoughlin S, Kaar JL, Schwartz DK. Single-molecule observations of fibronectin conformation and its interaction with model integrins. AIChE Annual Meeting, 2013 (talk).
44. Plaks J*, Kaar JL. Engineering proteins for biomaterial applications. RosettaCon, 2013 (poster).
45. McLoughlin SY, Kastantin M, Schwartz DK, Kaar JL*. Protein engineering-enabled single-molecule resolution of protein structure at biomaterial interfaces. Colorado Protein Stability Conference, 2013 (poster).
46. McLoughlin S, Kastantin M*, Schwartz DK, Kaar JL. Protein engineering-enabled single molecule resolution of protein structure at biomaterial interfaces. Biophysics Supergroup, University of Colorado, 2013 (talk).

47. Nordwald EM*, Kaar JL. Improving the tolerance of cellulosic enzymes to ionic liquids using barcoded PROSAR for sustainable biofuel production, Biophysics Supergroup, University of Colorado, 2012 (talk).
48. Nordwald EM*, Kaar JL. Enzyme structure-function-microenvironment relationships in ionic liquids. Enzyme Engineering XXI Conference, 2011 (poster).
49. Kaar JL*, Basse N, Settani G, Joerger AC, Rutherford TJ, Fersht AR. Towards the rational design of p53 stabilizing drugs: probing the surface of the oncogenic Y220C mutant. AIChE Annual Meeting, 2009 (talk).
50. Basse N*, Kaar J, Rutherford T, Fersht A. NMR and thermal shift: comparison of methods for fragment-based lead discovery. MipTec, 2009 (poster).
51. Kaar JL*, Li Y, Blair HC, Asche G, Koepsel RR, Huard J, Russell AJ. Matrix metalloproteinase-1 treatment of muscle fibrosis. TERMIS-Europe Meeting, 2008 (poster).
52. Kaar JL*, Li Y, Huard J, Koepsel RR, Russell AJ. Reversing the effects of scarring in lacerated muscle tissue using matrix metalloproteinase-1. TERMIS-North America Meeting, 2007 (poster).
53. Kaar JL, Amitai G*, DeFrank JJ, Russell AJ. Biocatalytic pH control for nerve agent detoxification in aqueous solution and fire-fighting foam. Self-Detoxifying Materials for CB Defense Conference, 2007 (talk).
54. Oh H*, Kaar JL, Russell AJ, Federspiel WJ. Application of carbonic anhydrase for improved CO₂ gas exchange in artificial lungs. BMES Annual Meeting, 2006.
55. Oh H*, Kaar JL, Russell AJ, Federspiel WJ. Immobilization and assessment of carbonic anhydrase on hollow fiber membranes for enzyme-enhanced artificial lungs. ASAIO Annual Meeting 2006.
56. Kaar JL*, Koepsel RR, Li Y, Huard J, Russell AJ. Mitigation of scar tissue formation with PEGylated matrix metalloproteinase-1. TESI Annual Meeting, 2005 (poster).
57. Kaar JL*, Koepsel RR, DeFrank JJ, Russell AJ, Biocatalytic pH control for nerve agent detoxification, AIChE Annual Meeting, 2004 (talk).
58. Sharma NK*, Kaar J, Russell AJ. Potential applications of ionic liquids in enzyme-catalyzed polymer synthesis. ACS Fall Meeting, 2004 (talk).
59. Berberich JA, Mesiano AM, Kaar JL, Sharma NK*, Russell AJ. Green approach to polyester synthesis using enzymes. EPA Forum on Emerging Technologies, 2003.
60. Berberich JA*, Kaar JL, Mesiano AM, Erbelinger M, Russell AJ, Biocatalysis and enzyme stability in ionic liquids. ACS Fall Meeting, 2002 (talk).
61. Kaar J*, Berberich JA, Drevon G, Russell AJ. Nerve agent biosensing polyurethane coating. AIChE Annual Meeting, 2001 (poster).

PERSONNEL SUPERVISED (Fall 2010 – present)

Graduate Students (18 total), **Postdocs** (3 total), **Visiting Scholars** (2 total)

Erik Nordwald, PhD student, 2011 – 2015

Kelsey (Childress) MacConaghy, PhD student, 2012 – 2016

Nuria Codina, MS student, 2013 – 2015

Garrett Chado, PhD student, 2015 – 2018

Joseph Plaks, PhD student, 2013 – 2018

James Wertz, PhD student, 2014 – 2019

David Faulón Marruecos, PhD student, 2015 – 2018

Samantha Summers, PhD student, 2015 – 2020

Alaksh Choudhury, PhD student, 2015 – 2019

Rebecca Falatach, PhD student, 2016 – 2018

Andres Chaparro Sosa, PhD student, 2016 – present

Louis Sacks, PhD student, 2018 – 2019
Evan Bisirri, PhD student, 2019 – present
Hector Sanchez-Moran, PhD student, 2020 – present
Albert Velasco Abadia, PhD student, 2020 – present
Victoria Reichelderfer, PhD student, 2021 – present
Holly Coleman, PhD student, 2021- present
Nicholas Van Horn, PhD student, 2012
Katerina Voigt, PhD student, 2011
Dr. Luciana Goncalves, Visiting Scholar, 2020 – present
Dr. Sabrina Matos, Visiting Scholar, 2019 – 2020
Dr. Sean Yu McLoughlin, Postdoc, 2012 – 2013
Dr. Navdeep Grover, Postdoc, 2014 – 2016
Dr. Sukwon Jung, Postdoc, 2016 – 2017

Undergraduate Students (30 total)

Marvin Gonzalez, undergraduate researcher, 2020 – present
Ya Lin Liu, undergraduate researcher, 2019 - 2020
Samuel Blackman, REU student, 2019 (summer)
Kenneth Black, undergraduate researcher, 2018 – 2019
Alexandra Davis, REU student, 2018 (summer)
Reilly Fankhauser, undergraduate researcher, 2016 – 2018
Andrew Tice, undergraduate researcher, 2017 – 2018
Elijah Holland, undergraduate researcher, 2017 – 2018
Casey Kraft, undergraduate researcher, 2017 – 2020
Kevin Sun, undergraduate researcher, 2017 – 2018
Jeff Brewer, undergraduate researcher, 2017 – 2018
Tay Anthony Arthur Nguyen, undergraduate researcher, 2017 – 2018
Salome Philip, undergraduate researcher, 2017
Nicole Jacobsen, undergraduate researcher, 2016 – 2017
Allison Corwin, undergraduate researcher, 2016 – 2017
Steven Denny, REU student, 2016 (summer)
Hye Hyun Kim, undergraduate researcher, 2016 – 2017
Michael McKenna, undergraduate researcher (completed senior thesis), 2015 – 2016
Clare Wise, undergraduate researcher (completed senior thesis), 2015 – 2016
Whitney Sinclair, REU student, 2015 (summer)
Melissa Rabin, undergraduate researcher, 2015
Vanessa Witte, undergraduate researcher, 2014
Caine Leuschner, undergraduate researcher, 2014
Chloe Anderson, undergraduate researcher 2013
David Faulón Marruecos, visiting undergraduate researcher, 2013
Karine Hoff, undergraduate researcher, 2012 – 2013
Cuining Liu, undergraduate researcher, 2012
Gregory Nierode, undergraduate researcher (completed senior thesis), 2011 – 2012
Cassie Dymecki, undergraduate researcher, 2011 – 2012
Joseph Gardener, undergraduate researcher, 2011 – 2012

TEACHING

- **Fall 2020** Protein and Enzyme Engineering CHEN 4838/5838 (46 students), 3 credits
- **Fall 2019** Applied Data Analysis CHEN 3010 (47 students), 3 credits
- **Fall 2018** Protein and Enzyme Engineering CHEN4838/5838 (20 students), 3 credits
- **Spring 2018** Biokinetics CHEN 4830 (76 students), 3 credits
- **Spring 2017** Biokinetics CHEN 4830 (93 students), 3 credits
- **Fall 2016** Applied Data Analysis CHEN 3010 (96 students), 3 credits
- **Fall 2015** Applied Data Analysis CHEN 3010 (105 students), 3 credits
- **Spring 2015** Biokinetics CHEN 4830 (65 students), 3 credits
- **Fall 2014** Pharmaceutical Biotechnology CHEN 4801 (50 students), 3 credits
- **Fall 2013** Applied Data Analysis CHEN 3010 (60 students), 3 credits
- **Spring 2013** Pharmaceutical Biotechnology CHEN 4801 (67 students), 3 credits
- **Fall 2012** Applied Data Analysis CHEN 3010 (53 students), 3 credits
- **Fall 2011** Applied Data Analysis CHEN 3010 (57 students), 3 credits
- **Spring 2011** Pharmaceutical Biotechnology CHEN 4801 (co-taught, 77 students), 3 credits
- **Fall 2010** Applied Data Analysis CHEN 3010 (co-taught, 111 students), 3 credits

SERVICE ACTIVITIES

Reviewer for journals

ACS Applied Materials & Interfaces, ACS Catalysis, ACS Chemical Biology, ACS, Omega, ACS Sustainable Chemistry & Engineering, Acta Biomaterialia, Analyst, Angewandte Chemie, Biochemical Engineering Journal, Bioconjugate Chemistry, Biomacromolecules, Bioprocess and Biosystems Engineering, Biotechnology Advances, Biotechnology Progress, Biotechnology and Bioengineering, BMC Biotechnology, Cell and Molecular Bioengineering, Cell Chemical Biology, ChemBioChem, Chemical Communications, Chemical Engineering Science, Chemistry Select, Current Nanoscience, Environmental Science & Technology, Enzyme and Microbial Technology, Encyclopaedia of Catalysis, FEBS Letters, Langmuir, Journal of the American Chemical Society, Journal of Molecular Catalysis B: Enzymatic, Journal of Physical Chemistry, Journal of Polymer Science (Part A), Macromolecules, Materials Today Communications, Methods in Enzymology, Nature Catalysis, Nucleic Acids Research, Organic Letters, PLoS One, Protein Engineering, Design, and Selection, Scientific Reports, Soft Matter, Tissue Engineering, Topics in Catalysis

Service for journals

Nominating committee for 2018 ACS Catalysis Lectureship for the Advancement of Catalytic Science Award

Reviewer for grant agencies

National Science Foundation, US Army Research Office, Defense Threat Reduction Agency, American Chemical Society Petroleum Research Fund, University of Colorado Innovative Seed Grant Program, ETH Zurich Research Commission

Professional meetings, workshops, and conferences

- Organizer and Chair, Biomaterials and Biointerfaces symposium, ACS Spring Meeting, 2020
- Organizer and Co-chair, Polymer Bioconjugates for a Changing World, Division of Polymer Chemistry, ACS Spring Meeting, 2019
- Invited Participant, Biomaterials Synthesis and Assembly US Army Planning Strategy Meeting, 2016

- Area Coordinator, Biomolecular and Biophysical Processes Symposium, BIOT Division, ACS Spring Meeting, 2016 (responsible for organizing and coordinating 12 sessions as well as selecting the keynote speaker for symposium)
- Chair, Controlling the Interface of Proteins, Cells and Materials session, BIOT Division, ACS Spring Meeting, 2016
- Co-chair, Biocatalysis and Biosynthesis II session: Applications, AIChE Annual Meeting, 2015
- Co-chair, Protein Engineering II: Rational and Computational Techniques session, AIChE Annual Meeting, 2015
- Co-chair, Protein Characterization Technologies session, BIOT Division, ACS Spring Meeting, 2015
- Co-chair, Protein Engineering session, AIChE Society for Biological Engineering International Conference on Biomolecular Engineering, 2013
- Chair, Protein Structure, Function, and Stability II session, AIChE Annual Meeting, 2012
- Co-chair, Protein Engineering I session, AIChE Annual Meeting, 2011
- Organizer and Chair, Pathway and Genome Engineering for Biofuels and Biochemicals sessions, Enzyme Engineering XXI, 2011

Professional affiliations (member of)

American Chemical Society, American Institute of Chemical Engineers, Participating member of University of Colorado Molecular Biophysics Program, Affiliate of University of Colorado Renewable and Sustainable Energy Institute (RASEI), Participating member of University of Colorado Interdisciplinary Quantitative Biology Program, Tau Beta Pi Engineering Honor Society, Omega Chi Epsilon Chemical Engineering Honor Society

University Service

- Member of NIH/CU Molecular Biophysics Training Program Steering Committee, 2014 – present
- Member of CU Boulder Institutional Animal Care and Usage Committee (IACUC), 2012 – 2013
- Member of CU RASEI Faculty Search Committee, 2013
- Volunteered to lead group discussions for the graduate Responsible Conduct of Research course, 2014 (on authorship issues and peer review), 2015 (on mentor/trainee issues), 2016 (on mentor/trainee issues), 2020 (on authorship issues and peer review)
- Volunteered to lead IQ Biology Idea Exchange discussion, 2017, 2018, 2019

Department Service

- Director of Graduate Program, 2018 – present
- Chair of Diversity, Equity, and Inclusion Committee, 2020
- Director of Undergraduate Young Scholars Summer Research Program, 2017
- Member of Department Executive Committee, 2018 – present
- Member of Department Faculty Committee, 2016 – 2018
- Member of Department Leadership Committee, 2013 – 2016, 2018 – present
- Organizer for Department Seminar Series, 2012 – 2015
- Member of Department Strategic Planning Committee, 2011
- Member of GAANN advisory committee, 2015 – present, involved in the review of trainee applications
- Member of Department Chair Search Committee, 2011

- Member of Department Graduate Committee, 2010 – present, involved in graduate admissions and recruiting, new graduate student orientation, and review of course variances
- Member of Department Faculty Search Committee, 2010
- Member of Department Academic Review and Planning Committee, 2010
- Undergraduate Advisor, 2010 – 2011
- Member of Doctoral Thesis Committee (60 total):
 - Evan Liechty (2020-present), John Bertam (2020-present), Katherine Mains (2020-present), Jason Silver (2019-present), Connor Thompson (2019-present), Kendall Neuberger (2019-present), Ibraheem Alshankiti (2018), Ankur Sakar (2018-present), Alex Harris (2018-2020), Emerson Grey (2018), Max Levy (2018-2020), Hao Wu (2018-2019), Shambojit Roy (2018-present), Aaron Aziz (2018), Milly Dong (2017-2018), Michael Hjortness (2017-2018), David Bull (2017-2020), Partha Chowdhury (2017-2019), Leila Saleh (2017-2020), Kate Morrissey (2017-2019), Akarawin (Ed) Hongdusit (2017-2020), Margaret Schneider (2016 – 2019), Della Shin (2016-present), Jeremiah Traeger (2016-2019), Patrick Chaffey (2016), Ke Ma (2015-2017), Jared Snell (2016-2019), Lea Sorrett (2015-2018), Anna Corts (2015-2018), Lauren Andrews (2010-2012), Amanda Cordes (2010-2011), Maliheh Shomali (2010-2013), Nicholas Sandoval (2010-2011), Navakanth Gandavarapu (2010-2013), Josh McCall (2010-2012), Mohamed Seyam (2010-2011), Alana Gerhardt (2010-2014), Joost Groot (2010-2014), Mark Tidbitt (2011-2012), Chris Koehler (2011-2012), Carolyn Schoenbaum (2011-2014), Rhea Williams (2011-2014), Blake Langdon (2011-2014), Patrick Noonan (2011-2013), Kimberly Hassett (2011-2014), Carly Fleagle (2011-2015), Mark Swartzlander (2011-2014), Stacey Skaalure (2011-2014), Emi Tokuda (2011-2014), Samir Singh (2011-2014), Aaron McUmbert (2011-2015), Sarah Gould (2012-2013), Luke Amer (2012-2016), Yemin Xu (2012-2014), Josh Mabry (2012-2015), Libby Beneski (2012-2015), Daniel McKinnon (2012-2014), Isaac Godfroy (2013-2015), Sophie Weiss (2013-2015), Katie Lewis (2013-2015)
- Member of Master Thesis Committee (2 total):
 - Alexander VanFosson (2013), Keith Britt (2011)
- Department Representative, College of Engineering Outstanding Dissertation Award Committee, 2012
- Volunteered to speak at undergraduate senior seminar on entering academia, 2012, 2013
- Volunteered to speak at undergraduate senior seminar on graduate school, 2017
- Volunteered to speak at CU AICHE student chapter meeting on the benefits of Co-Op education, 2012

Community Outreach

- Mentor to nine Boulder Valley High School seniors (Taylor Andrews, Richard Noack, Michael Loesel, Nicole Jacobson, Gabriel Greenberg, Jonathan Wang, Cooper Hanley, Cosmo Mitchell, Liam Barnes) through the Boulder Valley Science Research Seminar Program
- Invited speaker (virtual), Rock Canyon High School Biotechnology Program