Joel L. Kaar
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University of Colorado Boulder
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EDUCATION

Ph.D. Chemical Engineering, University of Pittsburgh, September 2007.
Dissertation title: Using enzyme structure-environment-activity relationships to enhance biocatalyst utility
Advisor: Dr. Alan J. Russell

B.S. Chemical Engineering, University of Pittsburgh, December 2001.

PROFESSIONAL EXPERIENCE

Assistant Professor, University of Colorado Boulder, Department of Chemical and Biological Engineering, August 2010 – present.

Postdoctoral Research Fellow, UK Medical Research Council Centre for Protein Engineering, University of Cambridge, January 2008 – July 2010.
Advisor: Sir Alan R. Fersht, F.R.S.

Bayer Corporation, Leverkusen, Germany, May – August 2000.

Bayer Corporation, Baytown, TX, August - December 1999.

Bayer Corporation, Pittsburgh, PA, January – April 1999.

PUBLICATIONS

1. McLoughlin SY, Kastantin M, Schwartz DK, **Kaar JL**. Protein Engineering-Enabled Single Molecule Resolution of Protein Structure at Biomaterial Interfaces. (In preparation).

2. Nordwald E, **Kaar JL**. Stabilization of enzymes in ionic liquids via modification of enzyme charge. *Biotechnol Bioeng* (Submitted).

3. Nordwald E, Garst A, Gill, RT, **Kaar JL**. Synthetic biology-enabled protein engineering. *Curr Opinion Biotechnol* (Submitted).

4. Brandt T, **Kaar JL**, Fersht AR, Veprintsev DB. Kinetic and equilibrium stability of p53 homologs. *PLoS One* 2012 (In press).

5. **Kaar JL**. Lipase activation and stabilization in room temperature ionic liquids. *Methods Mol Biol* 2011;679:25-35.

6. **Kaar JL**, Basse N, Joerger AC, Stephens E, Rutherford TJ, Fersht AR. Stabilization of mutant p53 vial alkylation of cysteines and effects on DNA binding. *Protein Sci* 2010;19(12):2267-2278.

7. Basse N[1], **Kaar JL**[1], 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.
   [1]*Authors contributed equally*

8. 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.

9. **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.

10. 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.

11. **Kaar JL**[1], Oh H[1], Russell AJ, Federspiel WJ. Towards improved artificial lungs through biocatalysis. *Biomaterials* 2007;28(20):3131-3139.
    [1]*Authors contributed equally*

12. 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.

13. 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.

14. 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.

15. Russell AJ, **Kaar JL**, Berberich JA. Using biotechnology to detect and counteract chemical weapons. *The Bridge* (a publication of the National Academy of Engineering) 2003;33(4):19-24.

16. 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.

17. **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.

18. Russell AJ, Erbeldinger 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

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.

CONFERENCE PRESENTATIONS

1. **Kaar JL**, Basse N, Settanni G, Joerger AC, Rutherford TJ, Fersht AR. Towards the rational design of p53 stabilizing drugs: probing the surface of the oncogenic Y220C mutant. *American Institute of Chemical Engineers Annual Meeting*, Nashville, TN, November 2009.

2. Basse N, **Kaar J**, Rutherford T, Fersht A. NMR and thermal shift: comparison of methods for fragment-based lead discovery. *MipTec*, Basel, Switzerland, October 2009.

3. **Kaar JL**, Li Y, Blair HC, Asche G, Koepsel RR, Huard J, Russell AJ. Matrix metalloproteinase-1 treatment of muscle fibrosis. *Tissue Engineering and Regenerative Medicine International Society-Europe Meeting*, Porto, Portugal, June 2008.

4. **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*, Sedona, AZ, July 2007.

5. **Kaar JL**, Li Y, Blair HC, Huard J, Russell AJ. Reversing the effects of scarring in lacerated muscle tissue using matrix metalloproteinase-1. *Tissue Engineering and Regenerative Medicine International Society-North America Meeting*, Toronto, Canada, June 2007.

6. Oh H, **Kaar JL**, Russell AJ, Federspiel WJ. Application of carbonic anhydrase for improved CO_2 gas exchange in artificial lungs. *Biomedical Engineering Society Annual Meeting*, Chicago, IL, October 2006.

7. Oh H, **Kaar JL**, Russell AJ, Federspiel WJ. Immobilization and assessment of carbonic anhydrase on hollow fiber membranes for enzyme-enhanced artificial lungs. *American Society for Artificial Internal Organs Annual Meeting*, Chicago, IL, June 2006.

8. **Kaar JL**, Koepsel RR, Li Y, Huard J, Russell AJ. Mitigation of scar tissue formation with PEGylated matrix metalloproteinase-1. *8th Annual Tissue Engineering Society International Meeting*, Shanghai, China, October 2005.

9. **Kaar JL**, Koepsel RR, DeFrank JJ, Russell AJ. Biocatalytic pH control for nerve agent detoxification. *American Institute of Chemical Engineers Annual Meeting*, Austin, TX, November 2004.

10. Sharma NK, **Kaar J**, Russell AJ. Potential applications of ionic liquids in enzyme-catalyzed polymer synthesis. *American Chemical Society Annual Meeting*, Philadelphia, PA, August 2004.

11. Berberich JA, Mesiano AM, **Kaar JL**, Sharma NK, Russell. Green approach to polyester synthesis using enzymes. *Environmental Protection Agency Science Forum: Emerging Technologies*, Washington D.C., May 2003.

12. Berberich JA, **Kaar JL**, Mesiano AM, Erbeldinger M, Russell AJ. Biocatalysis and enzyme stability in ionic liquids. *American Institute of Chemical Engineers Annual Meeting*, Boston, MA, August 2002.

13. **Kaar J**, Berberich JA, Drevon G, Russell AJ. Nerve agent biosensing polyurethane coating. *American Institute of Chemical Engineers Annual Meeting*, Reno, NV, November 2001.

INVITED TALKS

1. Understanding Protein Structure-Function-Environment Relationships at Solvent and Material Interfaces, Army Research Office Reactive Chemical Systems Workshop, Providence, RI, October 4, 2012.

2. Understanding and Exploiting Protein-Structure-Function-Environment Relationships. Department of Chemical and Biochemical Engineering Seminar, Colorado School of Mines, April 27, 2012.

3. Understanding and Exploiting Protein-Structure-Function-Environment Relationships. Department of Chemical and Biochemical Engineering Seminar, Colorado State University, December 9, 2011.

4. Small Molecules to the Rescue: Toward the Rational Design of p53-Stabilizing Drugs. Department of Chemistry and Biochemistry, Molecular Biophysics Program Seminar, University of Colorado Boulder, January 10, 2011.

5. Engineering the Activity and Stability of Proteins Based on Structure-Function-Environment Relationships. Department of Chemical and Biological Engineering Seminar, University of Colorado Boulder, February 23, 2010.

6. Engineering the Activity and Stability of Proteins Based on Structure-Function-Environment Relationships. Department of Chemical and Biolmolecular Engineering Seminar, Clemson University, February 4, 2010.

7. Biocatalytic pH Control for Detoxification of Organophosphates. 18th NATO Project Group 31 Meeting on Non-Corrosive, Biotechnology-Based Decontaminants for Chemical and Biological Weapons, Pittsburgh, PA, March 31, 2004.

TEACHING EXPERIENCE

Instructor, Pharmaceutical Biotechnology, Department of Chemical and Biological Engineering, University of Colorado Boulder, Spring 2013.

Instructor, Applied Data Analysis, Department of Chemical and Biological Engineering, University of Colorado Boulder, Fall 2012.

Instructor, Applied Data Analysis, Department of Chemical and Biological Engineering, University of Colorado Boulder, Fall 2011. *(5.2/6.0 overall rating).*

Instructor, Pharmaceutical Biotechnology, Department of Chemical and Biological Engineering, University of Colorado Boulder, Spring 2011. *(5.5/6.0 overall rating).*

Instructor, Applied Data Analysis, Department of Chemical and Biological Engineering, University of Colorado Boulder, Fall 2010. *(4.7/6.0 overall rating).*

Teaching Assistant, Foundations of Chemical Engineering (Instructor: Dr. Mohammad Ataai), Department of Chemical Engineering, University of Pittsburgh, Fall 2005.

Teaching Assistant, Foundations of Chemical Engineering (Instructor: Dr. Mohammad Ataai), Department of Chemical Engineering, University of Pittsburgh, Fall 2004.

Teaching Assistant, Introduction to Engineering Analysis (Instructor: Dr. Daniel Budny), School of Engineering, University of Pittsburgh, Spring 2003.

Engineering Tutor, Freshman Engineering Program, School of Engineering, University of Pittsburgh, Spring 1999.

STUDENTS SUPERVISED

Erik Nordwald, PhD student, University of Colorado Boulder, 2011 – present.

Kelsey Childress, PhD student, University of Colorado Boulder, 2012 – present.

Joseph Plaks, PhD student, University of Colorado Boulder, 2013 – present.

Nuria Codina, PhD student, University of Colorado Boulder, 2013 – present.

Karine Hoff, undergraduate researcher, University of Colorado Boulder, 2012 – present.

Cuining Liu, undergraduate researcher, University of Colorado Boulder, 2012.

Gregory Nierode, undergraduate researcher, University of Colorado Boulder, 2011 - 2012.

Cassie Dymecki, undergraduate researcher, University of Colorado Boulder, 2011 – 2012.

Hannes Harbrecht, Erasmus student, MRC Centre for Protein Engineering, University of Cambridge, 2010.

Stephan Hammer, Erasmus student, MRC Centre for Protein Engineering, University of Cambridge, 2008.

Anton Lindqvist, visiting graduate student, University of Pittsburgh, 2004.

Jonathan Kinross, undergraduate researcher, University of Pittsburgh, 2003.

AWARDS AND FELLOWSHIPS

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.

National Science Foundation Research for Undergraduates Fellowship, University of Pittsburgh, Summer 2001.

Tau Beta Pi (Engineering Honor Society), 2000.
Omega Chi Epsilon (Chemical Engineering Honor Society), 2000.

REVIEWER FOR JOURNALS
ACS Chemical Biology
Acta Biomaterialia
Biomacromolecules
Bioprocess and Biosystems Engineering
Biotechnology Progress
Biotechnology and Bioengineering
Cell and Molecular Bioengineering
Enzyme and Microbial Technology
Encyclopaedia of Catalysis
FEBS Letters
Journal of Molecular Catalysis B: Enzymatic
Organic Letters
Langmuir

REVIEWER FOR PROPOSALS
U.S. Army Research Office
American Chemical Society Petroleum Research Fund

PROFESSIONAL AFFILIATIONS
American Institute of Chemical Engineers
Tissue Engineering & Regenerative Medicine International Society

PROFESSIONAL ACTIVITIES
Participating Faculty Member of Molecular Biophysics Program, University of Colorado Boulder.
Participating Faculty Member of Pharmaceutical Biotechnology Program, University of Colorado Boulder.
Session Chair, Protein Engineering, SBE International Conference on Biomolecular Engineering, January 2013, Fort Lauderdale, FL.
Session Chair, Protein Structure, Function, and Stability II, AIChE Annual Meeting, November 2012, Pittsburgh, PA.
Organizing Committee and session chair, Enzyme Engineering XXI Conference, September 2011, Vail, CO.
Session Co-Chair, Protein Engineering I, AIChE Annual Meeting, October 2011, Minneapolis, MN.
Participating Member of 18th NATO Project Group 31 Meeting on Non-Corrosive, Biotechnology-Based Decontaminants for Chemical and Biological Weapons. Pittsburgh, PA, 2004.
Participating Member of 16th NATO Project Group 31 Meeting on Non-Corrosive, Biotechnology-Based Decontaminants for Chemical and Biological Weapons. Cazaux, France, 2002.