

ANNE SKAJA ROBINSON

Associate Professor of Chemical Engineering
University of Delaware
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EDUCATION

- 1994 **Ph.D., Chemical Engineering** University of Illinois at Urbana-Champaign
Dissertation: "*Engineering the Yeast Secretory Pathway: The role of BiP and PDI in the secretion of foreign proteins in Saccharomyces cerevisiae.*"
Advisors: Prof. _____, Prof. _____
- 1989 **M.S., Chemical Engineering** The Johns Hopkins University
Thesis: "*Isolation and Characterization of Proteolytic Enzymes from the Hyperthermophilic Archaeobacterium Pyrococcus furiosus.*"
Advisor: Prof. _____
- 1988 **B.S., Chemical Engineering** The Johns Hopkins University
Departmental Honors _____

PROFESSIONAL EXPERIENCE

- 2003-present **Associate Professor**
University of Delaware, Department of Chemical Engineering
- 1997-2003 **Assistant Professor**
University of Delaware, Department of Chemical Engineering
- 1994-1997 **Postdoctoral Fellow**
Massachusetts Institute of Technology, Department of Biology
Advised by Professor _____
Determined the role of cysteine side chains in the folding of the tailspike protein of P22 bacteriophage. Identified a novel intermediate along the folding pathway, a disulfide-bonded association intermediate in a non-disulfide bonded protein. The existence of this intermediate has a major impact on our understanding of the forces that drive protein folding.
- 1990-1994 **Research Assistant**
University of Illinois at Urbana-Champaign, Department of Chemical Engineering
Advised by Professor _____ and Professor _____
Determined the effect of changing the levels of folding assistant proteins (BiP and PDI) on protein production in yeast. Identified key molecular parameters and developed a mechanistic model to link those parameters to experimental observations and make predictions about the impact of varying key parameters on protein production. Developed for our laboratory the use of cloning, western blot analysis, pulse-chase analysis and ribonuclease protection assays.

1990-1992 **Graduate Teaching Assistant**
University of Illinois at Urbana-Champaign, Department of Chemical Engineering
 Responsibilities included weekly recitation sections, preparation of several lectures, preparation of quizzes and test questions, supervision of laboratory, and grading of problem sets, quizzes and tests.
Courses taught: Material and Energy Balances, Plant Design, Unit Operations Lab

1986 **Guest Researcher**
National Institutes of Health (NIAID), Bethesda, Maryland.
 Assayed cell and supernatant samples for the presence of exotoxin A in *Pseudomonas aeruginosa* cultures. Started and managed large scale *Pseudomonas* fermentations. Assisted a graduate student in the analysis of factors important to the production of exotoxin A in the laboratory of Dr. _____.

ACADEMIC HONORS

2002 Outstanding Junior Faculty Member, College of Engineering, University of Delaware
 2000-2005 NSF Presidential Early Career Award in Science and Engineering (PECASE/Career)
 ~400 Career Awards/year. PECASE award for subset of Career Award winners – 20
 awarded for all NSF Directorates in 2000, of which only 2 were to chemical
 engineers.
 2000-2003 DuPont Young Professor
 2000 National Academy of Engineering, Sixth Annual Frontiers in Engineering,
 One of 100 invited participants, Irvine, CA
 1996-97 NIH Postdoctoral Fellowship (~900 awarded/yr)
 1992-94 Clare Booth Luce Graduate Fellowship (~350 awarded since 1970)
 1989-92 Department of Defense Fellowship (NDSEG) (~100 awarded/yr)
 1988-89 NSF Creativity Award for Scientists and Engineers
 ~20 awarded/yr following review of proposal and personal interview
 1988 National Science Foundation Fellowship awarded (declined)
 (~30 in Chemical Engineering/yr of 900 awarded in all disciplines)
 1988-89 Tau Beta Pi Fellowship (~30 awarded/yr)
 1984-88 Beneficial Hodson Scholarship, Johns Hopkins University (~15 awarded/yr)

PATENTS

- A) Kelly, R.M., A.K.S. Robinson, I.I. Blumentals, S.H. Brown, and C.B. Anfinsen. "Proteolytic Enzymes from Hyperthermophilic Bacteria and Processes for Their Production." Patent # 5,242,817. Filed 9/12/89. Accepted 9/7/93. Licensed to Takara Shuzo.
- B) Robinson, A.S. and K.D. Wittrup. "Methods for Increasing Secretion of Overexpressed Proteins." Patent # 5,773,245. Filed 10/92. Accepted 6/30/98.
- C) _____
 _____ ' Patent applied for, _____
 Filed 10/99.

PUBLICATIONS

- 1) Blumentals, I. I., R. M. Kelly, A. K. Skaja [Robinson] and J. Shiloach. (1987) "Effect of Culturing Conditions on the Production of Exotoxin A by *Pseudomonas aeruginosa*." *Ann N Y Acad. Sci.* **506**, 663-668.
- 2) Blumentals, I. I., A. S. Robinson and R. M. Kelly. (1990). "Characterization of Sodium Dodecyl Sulfate Resistant Proteolytic Activity in the Hyperthermophilic Archaeobacterium *Pyrococcus furiosus*." *Appl. Envir. Microbiol.* **56**, 1992-1998.
- 3) Blumentals, I.I., S.H. Brown, R.N. Schicho, A.K. Skaja [Robinson], H.R. Costantino, and R.M. Kelly. (1990) "The Hyperthermophilic Archaeobacterium, *Pyrococcus furiosus*: Development of Culturing Protocols, Perspectives on Scale-Up, and Potential Applications." *Ann. N.Y. Acad. Sci.*, **589**, 301-314.
- 4) Robinson, A.S. and K.D. Wittrup (1993) "Role of the Protein Folding Chaperone BiP in Secretion of Foreign Proteins in Eucaryotic Cells." in *Protein Folding: In vivo and In vitro*. ACS Symposium Series 526. Jeffrey Cleland, Ed., 121-132.
- 5) Robinson, A.S., V. Hines, and K.D. Wittrup (1994) "Overexpression of Protein Disulfide Isomerase Increases Secretion of Foreign Proteins in the Yeast *Saccharomyces cerevisiae*." *Bio/Tech.* **12**, 381-384.
- 6) Wittrup, K.D., A.S. Robinson, R.N. Parekh, and K.J. Forrester (1994) "Existence of an Optimal Expression Level for Secretion of Foreign Proteins in Yeast." *Ann. N.Y. Acad. Sci.* **745**, 321-330.
- 7) Robinson, A.S. and K.D. Wittrup (1995) "Constitutive Overexpression of Secreted Heterologous Proteins Decreases Extractable BiP and PDI Levels in *Saccharomyces cerevisiae*." *Biotech Prog.* **11**, 171-177.
- 8) King, J., C. Haase-Pettingell, A.S. Robinson, M. Speed, and A. Mitraki (1996) "Thermolabile Folding Intermediates: Inclusion Body Precursors and Chaperonin Substrates" *FASEB J.*, **10**, 57-66.
- 9) Robinson, A.S., J.A. Bockhaus, A.C. Voegler, and K.D. Wittrup (1996) "Reduction of BiP levels decreases heterologous protein secretion in *Saccharomyces cerevisiae*" *J. Biol. Chem.* **271**, 10017-10022.
- 10) Robinson, A.S. and D.A. Lauffenburger (1996) "Model for ER Chaperone Dynamics and Secretory Protein Interactions." *AICHE J.* **42**, 1443-1453.
- 11) Robinson, A.S. and J. King, (1997) "Disulfide-Bonded Intermediate on the Folding and Assembly Pathway of a Non-Disulfide Bonded Protein." *Nature Struct. Biol.*, **4**, 450-455.
- 12) Foguel, D., Robinson, C.R., Caetano de Sousa Jr., P., Silva, J. L. and A. S. Robinson (1999), "Hydrostatic Pressure Rescues Protein Aggregates", *Biotech. Bioeng.* **63**, 552-558.
- 13) Haase-Pettingell, C., Betts, S., Raso, S.W., Stuart, L., Robinson, A.S. and J. King (2001), "Role for Cysteine Residues in the In Vivo Folding and Assembly of the Phage P22 Tailspike," *Protein Sci.* **10**, 397-410.
- 14) Kauffman, K., P. Dhurjati, A.S. Robinson, and F.J. Doyle III, "Framework for Modeling Information Flow in Biological Processes: Application to the Unfolded Protein Response." *Proc. IFAC Conf. Comput. Appl. Biotech (CAB)*, 2001.
- 15) Kauffman, K., Pridgen, E.M., Doyle, F.J. III, Dhurjati, P., and A.S. Robinson (2002) "Decreased Protein Expression and Oscillating BiP Levels Result during Heterologous Protein Expression in *S. cerevisiae*," *Biotech. Prog.*, **18**, 942-940. DOI: [10.1021/bp025518g](https://doi.org/10.1021/bp025518g)
- 16) Sinacola, J. and A.S. Robinson (2002) "Rapid refolding and polishing of single-chain antibodies from *E. coli* inclusion bodies" *Protein Exp. Purif.*, Vol. 26, No. 2, Nov 2002, pp. 301-308. DOI: [10.1016/S1046-5928\(02\)00538-7](https://doi.org/10.1016/S1046-5928(02)00538-7)
- 17) Smith, J.D. and A.S. Robinson (2002) "Expression of an archaeal enzyme in a eucaryotic host: A secretion bottleneck at the ER," *Biotech. Bioeng.*, **79**, 7, p. 713-723. DOI: [10.1002/bit.10367](https://doi.org/10.1002/bit.10367)

- 18) Lefebvre, B.G., and A.S. Robinson (2003), "Pressure treatment of tailspike aggregates rapidly produces on-pathway folding intermediates," *Biotech. Bioeng*, **82**, 5, p. 595-604. DOI: 10.1002/bit.10607
- 19) Danek, B.L., and A. S. Robinson (2003) "Non-native interactions between cysteines direct productive assembly of P22 tailspike protein," *Biophys J.*, **85**, 5, p. 1-11.
- 20) Butz, J., Niebauer, R. T., and A.S. Robinson (2003), "Interaction with ER-resident Proteins is not a Bottleneck for Mammalian G-Protein Coupled Receptor Expression in Yeast," *Biotech. Bioeng.*, **84**, 3, p. 292-304. DOI: 10.1002/bit.10771.
- 21) Gage, M.J. and A.S. Robinson (2003) "C-terminal Hydrophobic Interactions Play a Critical role in Oligomeric Assembly of the P22 Tailspike Trimer," *Protein Sci.*, **12**, 12, p. 2732-47.
- 22) Smith, J.D., Tang, B.C., and A.S. Robinson (2004) "Protein disulfide isomerase, but not binding protein, overexpression enhances secretion of a non-disulfide-bonded protein in yeast", *Biotech. Bioeng.*, **85**, 3, p. 340-50.
- 23) Niebauer, R. T. and A.S. Robinson (2004) "Saccharomyces cerevisiae protein expression: From protein production to protein engineering" in Expression Technologies, Horizon Scientific Press.
- 24) Lefebvre, B.G., Gage, M.J., and A.S. Robinson (2004) "Maximizing Recovery of Native Protein from Aggregates by Optimizing Pressure Treatment," *Biotechnology Progress*, **20**, 2, p. 623-629. [10.1021/bp034221v](https://doi.org/10.1021/bp034221v).
- 25) Lefebvre, B.G., Comolli, N.K., Gage, M.J. and A.S. Robinson (2004), "Pressure dissociation studies provide insight into oligomerization competence of temperature-sensitive mutants of P22 tailspike," *Protein Sci.*, **13** (6) 1538-46.
- 26) Danek, B.L. and A. S. Robinson (2004) "P22 tailspike trimer assembly is governed by interchain redox associations," *Biochem. Biophys. Acta*, **1700**(1):105-16.
- 27) Gage, M.J., Lefebvre, B.G., and A.S. Robinson (2005) "Determinants of Protein Folding and Aggregation in P22 Tailspike," in *Misbehaving Proteins*, ACS Publications, eds. Regina Murphy and Amos Tsai.
- 28) Niebauer, R.T., Wedekind, A. and A.S. Robinson (2004) "Decreases in yeast expression yields of the human adenosine receptor are a result of translational or post-translational events", *Protein Exp. Purif.*, **37** (1) 134-143.
- 29) Xu, P., Raden, D., Doyle, F.J. III, and A.S. Robinson (2005) "Analysis of unfolded protein response during single-chain antibody expression in *Saccharomyces cerevisiae* reveals different roles for BiP and PDI in folding", *Metabolic Engineering*, **7** (4) 269-279.
- 30) Gage, M.J., Zak, J. and A.S. Robinson (2005) "Three Amino Acids that are Critical to Formation and Stability of the P22 Tailspike Trimer", *Protein Science*, **14** (9) 2333-43.
- 31) Smith, J.D., Richardson, N.E. and A.S. Robinson (2005) "Improved protein folding at elevated expression temperature in a mesophilic host results in increased secretion of a hyperthermophilic enzyme," *Biochem. Biophys. Acta*, **1752** (1) 18-25.
- 32) Niebauer, R. T., and A.S. Robinson (2005) "Exceptional total and functional yields of the human adenosine (A2a) receptor expressed in the yeast *Saccharomyces cerevisiae*", *Prot. Exp. Purif.*, in press.

INVITED SEMINARS

Department of Chemical Engineering, UC Santa Barbara, January 2006

Department of Chemical Engineering, Rutgers University, NJ, November 2005

Department of Chemical Engineering, Pennsylvania State University, State College, PA, March, 2005

Department of Chemical Engineering, Drexel University, Philadelphia, PA, February 2004.

Bioscience Symposium, University of Maryland at College Park, November 2003.

Department of Chemical Engineering, Kansas University, October 2003.

Department of Chemical Engineering, University of Wisconsin, Madison, WI, October 2002.
Merck Pharmaceuticals, West Point, PA, September 2002
Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh, PA April 2002.
Department of Chemical Engineering, Cornell University, Ithaca, NY, March 2002.
Department of Chemical Engineering, University of Texas, Austin, TX, March 2002.
Department of Chemical Engineering, University of Florida, Gainesville, FL, February 2002.
Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, January 2002.
New Directions in Biotechnology Workshop, Biophysical Society Annual Meeting, February 2001, Boston, MA.
Department of Chemical Engineering, University of Virginia, Charlottesville, VA, February 2001.
Molecular Cell Biology and Biotechnology program, Virginia Polytechnic Institute, Blacksburg, September 2000.
Department of Chemical Engineering, University of Massachusetts at Amherst, December 1999.
Department of Chemical Engineering, Johns Hopkins University, November 1999.
Department of Biology, University of Delaware, October 1998.
DuPont Chemical Co., Wilmington, Delaware, October 1998.
Department of Agricultural Sciences, University of Delaware, October 1998.
Brazilian Biochemical Society, XXVII Annual Meeting, Caxambu, MG, Brasil, May 1998.
3-Dimensional Pharmaceuticals, Exton, PA, January 1998.
North Carolina State University, Department of Chemical Engineering, April 1997.
University of Wisconsin, Department of Chemical Engineering, March 1997.
University of Delaware, Department of Chemical Engineering, March 1997.

GRADUATE RESEARCH THESES

PhD Students

- 1) _____
_____ May 2002
- 2) _____ June 2002
- 3) _____ March
2003
- 4) _____
August, 2003
- 5) _____ July 2003
- 6) _____ July 2005

MChE Students

- 1) _____ BChE/MChE,
May 1999
- 2) _____, March 2005

PROFESSIONAL SERVICE

National and local organization leadership

- 2005 American Chemical Society BIOT Division Chair Elect
- 2004 American Chemical Society BIOT Division Program Co-Chair
- 2001 Member, NSF Future of Engineering Education Workshop, July 16-17 2001
- 2000 Mid-Atlantic Bioengineering Consortium Conference, Meeting Chair and Organizer, April 7, 2000, University of Delaware
- 1995-96 Macromolecular Structure and Function Seminar Series, Chair, Massachusetts Institute of Technology (MIT)
- 1995-97 Provost's National Advisory Board for the Initiative to Diversify the Professoriate in Engineering and Science, MIT

Session Chair or Co-Chair

- 2002 Chair, Protein Engineering and Biocatalysis, 2002 AIChE Fall Meeting, Indianapolis
- 2001 Chair, Advances in Protein Expression, 2001 AIChE Fall Meeting, Reno
- 2000 Co-Chair, Advances in Protein Expression, 2000 AIChE Fall Meeting, Los Angeles
- 1999 Chair, Young Faculty Forum, 1999 AIChE Fall Meeting, Dallas
- 1999 Co-chair, Advances in Protein Expression, 1999 AIChE Fall Meeting, Dallas
- 1999 Chair, Biosensors Session, 1999 Organic Thin Films Gordon Conference, Newport, RI
- 1998 Co-chair, Young Faculty Forum, 1998 AIChE Fall Meeting, Miami
- 1998 Co-chair, Protein Folding and Stability session, ACS BIOT Division, Boston, MA

Reviewer for the following journals and organizations

- AIChE Journal*
- Biochemistry*
- Biotechnology and Bioengineering*
- Biotechnology Progress*
- Industrial & Engineering Chemistry Research*
- Journal of the American Chemical Society*
- Journal of Biotechnology*
- Nature Biotechnology*
- Protein Science*

Cambridge University Press

National Science Foundation

- Ad hoc reviewer for Biology and Engineering Directorates
- Panel reviewer for Exploratory Research in Biosystems at the Nanoscale
- Panel reviewer for CAREER awards
- Panel reviewer for MathBio awards

National Institutes of Health

- SBIR panel review
- Program Project Grant panel review
- Protein Structure Initiative II panel review
- BBCA Ad Hoc member

Petroleum Research Fund, American Chemical Society

U.S. Civilian Research and Development Foundation (CRDF)

Society Member

- 1986- Tau Beta Pi

1988- Sigma Xi Research Society
1986- American Institute of Chemical Engineers (AIChE)
1992- American Chemical Society (ACS)
1995- Protein Society

**APPEARS THIS WAY
ON ORIGINAL**