

ROBERT FAIRMAN

Work Address

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411 Maryland Avenue
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EDUCATION

1990-1993 The DuPont Merck Pharmaceutical Co.; Wilmington, DE
NIH Post-Doctoral Fellowship, with William DeGrado and Stephen Brenner
1984-1990 Stanford University; Stanford, CA
Program: Biochemistry; Thesis Advisor: Professor Robert L. Baldwin
Degree: Ph.D.
1980-1984 Southampton College of Long Island University; Southampton, NY
Degree: B.S., Chemistry, *magna cum laude*
Minors: Computer Science, Mathematics

PROFESSIONAL APPOINTMENTS

2013- Adjunct Professor, Department of Biochemistry and Biophysics, University of Pennsylvania
2010- Professor, Department of Biology, Haverford College.
2005-2013 Adjunct Associate Professor, Department of Biochemistry and Biophysics, University of Pennsylvania
2004-2010 Associate Professor, Department of Biology, Haverford College.
2002-2005 Adjunct Assistant Professor, Department of Biochemistry and Biophysics, University of Pennsylvania
1997-2004 Assistant Professor, Department of Biology, Haverford College.
1993-1997 Research Investigator, Bristol-Myers Squibb.

Haverford Leadership Assignments

2017-2020 Chair, Department of Biology
2012-2016 Associate Provost for Faculty Development and Support
2009-2011 Faculty Representative to the Board of Managers
2009-2011 Member, Academic Council
2008-2010 Director, Koshland Integrated Natural Sciences Center
2007-2009 Chair, Department of Biology
2005-2010 Director, HHMI program coordinating committee
2000-2018 Director, MAST outreach program (intermittent)

Haverford Committee Assignments

2018-2019 Chair, Institutional Biosafety and Laboratory Safety Committee
2018 Chair, Ad Hoc Search for Lab Instructor in Biology
2017 Member, Institutional Biosafety and Laboratory Safety Committee
2016 Member, Ad Hoc Search for tenure-track faculty member in Biology (microbiology)
2015 Member, Ad Hoc Search for tenure-track faculty member in Biology (biochemistry)
2015 Member, Ad Hoc Search for Science Librarian
2015 Member, IITS Policy Committee
2014 Member, Ad Hoc Search for Faculty Dossier Coordinator
2014-2016 Chair, College Space Planning Executive Committee
2013-2014 Chair, Institutional Biosafety and Laboratory Safety Committee
2013-2014 Member, Committee on Faculty Rights, Responsibilities, and Conduct
2012-2015 Chair, Academic Spaces Programming Committee
2012 Member Ad Hoc Search for Grants Manager

2012 Member, Ad Hoc Search for Director of Facilities
 2010-2011 Member, Office of Academic Resources development committee
 2009-2010 Co-Chair, Institutional Biosafety and Laboratory Safety Committee
 2008 Member, Middle States Reaccreditation subcommittee on faculty and curriculum
 2008 Member, Ad Hoc Search for women's field hockey head coach
 2008 Member, Ad Hoc Search for communications editor
 2007 Member, Ad Hoc Search for Executive Director, CPGC
 2006-2007 Chair, Laboratory Safety Committee
 2006 Member, Ad Hoc Search for Executive Director, CPGC
 2005-2007 Member, steering committee for the Center for Peace and Global Citizenship
 2005-2006 Member, Ad Hoc Tenure Track Faculty Search, Biology, Bryn Mawr
 2003-2006 Member, KINSC steering committee
 2002-2003 Member, Committee on Admissions
 2001-2006 Member, Mellon Tri-College Forum Faculty Committee
 2001-2002 Coordinator, Biochemistry and Biophysics concentration
 2001-2002 Member, Ad Hoc Tenure-Track Faculty Search, Biology
 2000-2018 Director, MAST outreach program
 1999-2000 Institutional Animal Care & Use Committee
 1999-2000 Radiation Safety Committee
 1998-1999 Member, Ad Hoc Tenure-Track Faculty Search, Psychology
 1997-2018 Member, Biochemistry & Biophysics Concentration

INVITED SEMINARS AND CONFERENCES

ACS Mid Atlantic Regional Meeting, Hershey, PA, June 2017
 Department of Biochemistry, Drexel University, February 2017
 AU Mini-Symposium, University of Pennsylvania, October 2016
 Grants Workshop, Georgia College & State University, October 2016
 BITC Summer Symposium, University of Delaware, July 2016
 Department of Biochemistry, Gettysburg College, PA, February, 2013
 Department of Biology, Tufts University, MA, February, 2013
 Department of Chemistry, Hunter College, NY, October, 2012
 HHMI advisory panel on assessment, Chevy Chase, MD, June 2008
 National Science Foundation Directorate for Education and Human Resources, Boston, MA, May 2008
 HHMI conference on undergraduate research, Ashburn, VA, January 2008
 American Chemical Society Western Regional Meeting, San Diego, CA, October 2007
 Department of Chemistry, Emory University, Georgia, December 2005
 The Protein Society, Boston, MA, July 2005
 Department of Chemistry, Princeton University, NJ, November 2004.
 Department of Biology, Villanova University, PA, September 2004.
 Department of Chemistry, Pennsylvania State University, PA, October 2003.
 Department of Biochemistry, U. Arizona, AZ, October 2003.
 Department of Biochemistry and Molecular Pharmacology, U. Massachusetts, MA, August 2003
 Department of Biochemistry, UMDNJ-Robert Wood Johnson Medical School, NJ, August 2003
 Department of Chemistry & Biochemistry, U. Delaware, DE, November 2001
 Techniques in analytical ultracentrifugation, Conshohocken, PA. Sponsored by Beckman Instruments,
 May 1998
 Department of Molecular Biology, Princeton University, NJ, February 1997
 Department of Chemistry, Penn. State University, PA, November 1995
 Cold Spring Harbor Symposium on Topoisomerases, NY, March 1986

PROFESSIONAL MEMBERSHIPS

2005- The American Chemical Society, member
 1988- American Association for the Advancement of Science, member
 1987- The Protein Society, member

PROFESSIONAL HONORS AND SERVICE

2016-2018 Member, Protein Science Membership Committee
 2015 Graduate Research Fellowships Panel, NSF

2014 Biology Panel, NSF
 2011 Chemistry Panel, NSF
 2006-2005 Member, Editorial Board, Biochemistry and Molecular Biology Education
 2004-2012 Graduate Research Fellowships Panel, NSF
 2004-2012 Member, Editorial Advisory Board, Protein Science
 2004-2006 Member, Education Committee, The Protein Society
 2004 Molecular Biochemistry Panel, NSF
 2001-2004 Chair, Education Committee, The Protein Society
 2001-2002 Nanoscale Panel, NSF

OTHER PROFESSIONAL SERVICE WORK

2014-2020 Member, Biochemistry thesis committee, Drexel University College of Medicine
 2013 Member, Biochemistry and Molecular Biophysics thesis committee, U. Penn.
 2010 Member, Biochemistry and Molecular Biophysics thesis committee, U. Penn.
 2003 Member, Biochemistry and Molecular Biophysics thesis committee, U. Penn.
 1991-1993 Chair, Post-Doctoral Science Committee, DuPont Merck
 1987-1988 Member, Grants-In-Aid Awards Committee, Stanford University
 1986-1989 Chair, Graduate Housing Advisory Committee, Stanford University

SCHOLARSHIPS, FELLOWSHIPS AND AWARDS

1990-1993 DuPont Merck Post-Doctoral fellowship
 1990-1992 NIH Post-Doctoral training fellowship
 1990 NATO Fellowship, Birkbeck College, London
 1984-1989 NIH Training Grant Fellowship and Lucille T. Markey Charitable Trust Pre-Doctoral Fellowship, Stanford University
 1982, 1983 Summer Student Program, Brookhaven National Laboratory
 1982, 1983 Presidential Citizenship Award, Long Island University
 1980-1984 Presidential Scholarship, New York State Regents Scholarship, Dean's List, Faculty Honors List, Long Island University

GRANTS

2013-2018 National Science Foundation RUI, "The chemical basis for protein self-assembly and polymerization." Award: \$448,107.
 2012-2016 National Institutes of Health R15 AREA, "*In vivo* and crude extract analysis of polyQ aggregation intermediates." Lead coPI, Award: \$350,612.
 2009-2012 National Science Foundation MRI, "Acquisition of molecular and cellular imaging instrumentation." Lead coPI, Award: \$996,294.
 2009-2012 Noyce Teacher Scholarship Program at Bryn Mawr and Haverford College. coPI, Award: \$897,421.
 2008-2012 Howard Hughes Medical Institute grant to Haverford College, lead writer, \$1,400,000
 2008-2012 National Science Foundation RUI, "The chemical basis for protein self-assembly and polymerization." Award: \$508,220.
 2006-2010 National Science Foundation RUI, "Self-assembling porphyrins and porphyrin-modified peptides and studies of their photoelectronic properties." Award: \$400,000.
 2005-2008 National Science Foundation RUI, "Learning the rules that govern the folding and stability of coiled coils." Award: \$339,839.
 2005-2006 National Science Foundation, "A systems biology workshop, career panel and speaker session for the promotion of undergraduate protein science education and research." Award: \$14,400.
 2002-2005 National Science Foundation RUI, "Learning the rules that govern the folding and stability of coiled coils." Award: \$313,353.
 2000-2006 Packard Foundation, "Protein-Based Biomaterials for Biotechnology." Lead coPI, Award: \$966,020.
 1999-2002 National Science Foundation RUI, "Learning the rules that govern the folding and stability of coiled coils." Award: \$270,000.
 2000-2002 National Science Foundation MUE, "RUI: Advanced microscopy and manipulation instrument cluster for biological and biophysical studies." Award: \$160,000.

- 1999-2001 National Science Foundation MBE, "RUI: Acquisition of a circular dichroism spectropolarimeter." Award: \$56,000.
- 1999 Zimmer Corporation, "A Proposal submitted to the Zimmer Corporation for Supporting Interdisciplinary Science Research and Education." Award: \$100,000.
- 1998-2001 Petroleum Research Fund, American Chemical Society, "Using electrostatics to design heteromeric coiled-coil interactions." Award: \$30,000.
- 1998 Zimmer Corporation, "Interdisciplinary studies of structure and reactivity of proteins." Award: \$100,000.

MEETING PRESENTATIONS (*Indicates Haverford undergraduates.)

- Robinson, Emma,* Nelson, Sophia,* Arango, Ashley,* Wong, Zoe,* Kokona, Bashkim,* **Fairman, Robert**. The effects of Hsp104 on *c9orf72*-associated polyGA aggregation and toxicity in *Drosophila melanogaster*. July 2018 Protein Society meeting, Boston, Massachusetts.
- Wu, Jillian,* Jung, Helen S.,* Kokona, B., Smith, Walter, **Fairman, Robert**. Designing nanowires using *Geobacter sulfurreducens* Filamentous Protein. July 2018 Protein Society meeting, Boston, Massachusetts.
- Vosatka, Karl,* Kokona, Bashkim, **Fairman, Robert**. ALS-associated dipeptide repeat peptide structures interact with G-quadruplex DNA. July 2018 Protein Society meeting, Boston, Massachusetts.
- Fairman, Robert**, Kokona, Bashkim, Winesett, Emily S.*, von Krusenstiern Alfred N.*, Cryle Max J. and Charkoudian Louise K. Probing the Selectivity of Peptide Carrier Protein-Tailoring Enzyme Interactions using Analytical Ultracentrifugation. July 2015 Protein Society meeting, Barcelona, Spain.
- Kokona, Bashkim, May, Carrie A., Cunningham, Nicole R., Richmond, Lynne*, Garcia, Franklin J.*, Durante, Julia*, Ulrich, Kathleen M., Roberts, Christine M., Link, Christopher D., Stafford, Walter F., Laue, Thomas M., and **Fairman, Robert**. Applying an analytical ultracentrifuge equipped with fluorescence detection to the study of polyglutamine aggregation in *Caenorhabditis elegans*. July 2015 Protein Society meeting, Barcelona, Spain.
- Garcia, Franklin*, and **Fairman, Robert**. Quantifying the effect of the Hsp70 chaperone on polyQ aggregation *in vivo*. April 2014, Biomedical Science Careers Program, Boston Massachusetts.
- Taggart, James C.*, Welch, Elizabeth Z.*, Bashkim Kokona, and **Fairman, Robert**. Exploring the interactions between a coiled-coil peptide model system and metallated porphyrins towards the design of photoelectronically active biomaterials. February 2013 Biophysical Society meeting, Philadelphia.
- Kokona, Bashkim, Rosenthal, Zachary*, Johnson, Karl A., and **Fairman, Robert**. Using a peptide system to test the coiled-coil model of polyglutamine aggregation. February 2013 Biophysical Society meeting, Philadelphia.
- Smith, Zachary*, Kokona, Bashkim, May, Carrie, Roberts, Christine, Link, Christopher, Laue, Thomas, and **Fairman, Robert**. Sedimentation velocity analysis of PolyQ assembly in *Caenorhabditis elegans* using a fluorescence detection system. February 2013 Biophysical Society meeting, Philadelphia.
- Cuesta, Adolfo*, Weaver, Jessica*, Kokona, Bashkim, and **Fairman, Robert**. Using a beta hairpin system to model polyglutamine aggregation. August 2010 Protein Society meeting, San Diego, poster selected for oral presentation.
- Kokona, Bashkim, Tsang, Betty*, Bretscher, Heidi*, Manning, Robert, and **Fairman, Robert**. Thermodynamic analysis of self-assembly in coiled-coil biomaterials. August 2010 Protein Society meeting, San Diego.
- Pepe-Mooney, Brian J.* and **Fairman, Robert**. Self-assembly of coiled-coil peptide porphyrin complexes. August 2009 Protein Society meeting, Boston.
- Alfieri, Katherine N.*, **Fairman, Robert**, Kokona, Bashkim, Miles, Timothy F.*, Smith, Melanie H.*, Meyerowitz, Justin*, and Capron, Kelsey*. Evidence for both steric zipper and polar zipper structures in polyglutamine fibrillar intermediates. August 2009 Protein Society meeting, Boston.
- Pepe-Mooney, Brian J.* Kokona, Bashkim, and **Fairman, Robert**. Self-assembly of coiled-coil peptide porphyrin complexes. July 2009 Beckman Symposium, Irvine CA.
- Pepe-Mooney, Brian J.*, Minassian, Haig*, Kokona, Bashkim and **Fairman, Robert**. Self-assembly of coiled-coil peptide porphyrin complexes. June 2009 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.

- Alfieri, Katherine N.*, Kokona, Bashkim, Miles, Timothy F.*, Smith, Melanie H.*, Meyerowitz, Justin*, Capron, Kelsey*. and **Fairman, Robert**. Evidence for both steric zipper and polar zipper structures in polyglutamine fibrillar intermediates. June 2009 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Pepe-Mooney, Brian J.*Kokona, Bashkim and **Fairman, Robert**. The utilization of peptide porphyrin complexes: toward the development of photoelectronically conductive regulated filaments. June 2008 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Alfieri, Katherine N.*, Miles, Timothy F.*, Kokona, Bashkim and **Fairman, Robert**. A β -hairpin model for probing glutamine interactions in fibril formation. June 2008 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Bretscher, Heidi*, Tsang, Betty*, Kokona, Bashkim and **Fairman, Robert**. Characterization of designed peptides that self-assemble into nanoropes. June 2007 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Kokona, Bashkim, Rigotti, Daniel J., Wasson, Andrew S.*, Lawrence, Sarah H., Fazliyev, Farit, Jaffe, Eileen K. and **Fairman, Robert**. Probing the oligomeric assemblies of pea porphobilinogen synthase by analytical ultracentrifugation: implications for biological activity. June 2007 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Miles, Tim*, Sheehan, Molly*, Smith, Melanie H.* and **Fairman, Robert**. Examination of the role of glutamines in amyloidogenic sequences with model peptides. June 2007 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Smith, Melanie H.*, Aziz, Mohammed, Kokona, Bashkim, and **Fairman Robert**. A *de novo* designed model for the investigation of the effects of glutamines on the self-assembly of a β -hairpin into amyloid-like fibrils. August 2006 Protein Society meeting, San Diego, poster selected for oral presentation.
- Smith, Melanie H.*, Aziz, Mohammed, Kokona, Bashkim, and **Fairman Robert**. A *de novo* designed model for the investigation of the effects of glutamines on the self-assembly of a β -hairpin into amyloid-like fibrils. July 2006 Beckman Symposium, Irvine CA.
- Smith, Melanie H.*, Aziz, Mohammed, Kokona, Bashkim and **Fairman, Robert**. A *de novo* designed model for the investigation of the effects of glutamines on the self-assembly of a β -hairpin into amyloid-like fibrils. June 2006 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Smith, Melanie H.*, Aziz, Mohammed, Kokona, Bashkim, and **Fairman Robert**. A *de novo* designed model for the investigation of the effects of glutamines on the self-assembly of a β -hairpin into amyloid-like fibrils. June 2006 Biopolymers Gordon Conference, Newport RI.
- Monahan, Kevin G.*, Kokona, Bashkim, Woolley, Andrew, and **Fairman, Robert**. Creating light- and metal-responsive coiled-coil polymers: towards the design of smart biomaterials. August 2005 Protein Society meeting, Boston.
- Narayanan, Shilpa* and **Fairman, Robert**. Nickel-driven formation of noncovalent coiled-coil polymers: towards the design of smart biomaterials. August 2005 Protein Society meeting, Boston.
- Kokona, Bashkim, Wasson, Andrew S.*, Rigotti, Daniel J., Jaffe, Eileen K. and **Fairman, Robert**. Probing the oligomeric state of pea porphobilinogen synthase by analytical ultracentrifugation: implications for biological activity. June 2005 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Narayanan, Shilpa* and **Fairman, Robert**. Nickel-driven formation of noncovalent coiled-coil polymers. June 2005 Department of Biochemistry & Biophysics (UPenn), Swarthmore, PA.
- Wagner, Daniel*, Phillips, Charles*, Rigotti, Daniel, Smith, Walter, and **Fairman, Robert**. Design and characterization of protein nanoropes. March 2003 Protein Society meeting, Florence, Italy.
- Rigotti, Daniel, Horne, Theresa*, Manning, Robert, Amador, Suzanne, **Fairman, Robert**. Structural properties of polymerization of the *Acanthamoeba castellanii* myosin II rod domain. 2003 Biophysical Society meeting, San Antonio, TX.
- Rigotti, Daniel, Smith, Walter, **Fairman, Robert**. Study of the stability and polymerization of myosin II from *Acanthamoeba castellanii*. August 2002 Protein Society meeting, San Diego.
- Wagner, Daniel*, Phillips, Charles*, Rigotti, Daniel, Smith, Walter, and **Fairman, Robert**. Designing coiled-coil polymers that employ short peptide building blocks. August 2002 Protein Society meeting, San Diego.
- Robblee, James*, Solan, Amy*, Ratia, Kiira*, **Fairman, Robert**. Exploring the Structure Determinants for a Four-Chain Coiled Coil. July 2000 Protein Society meeting, San Diego.

Wright, Nathan*, Ali, Wasif*, Werner, Karin*, Wolpin, Eric*, Mosher, Rachel*, **Fairman, Robert**. Folding and design of a four-chain coiled coil towards the development of self-assembling biomaterials. July 1999 Protein Society meeting, Boston.

MANUSCRIPTS IN PREPARATION (*Indicates Haverford undergraduates.)

Kokona, Bashkim, Cunningham, Nicole R., Quinn, Jeanne*, and **Fairman, Robert**. 2018. Aggregation Profiling of *C9orf72* Dipeptide Repeat Proteins Transgenically Expressed in *Drosophila melanogaster* Using an Analytical Ultracentrifuge Equipped With Fluorescence Detection. 2018. *Submitted, Methods in Molecular Biology*.

Kokona, Bashkim, Cunningham, Nicole R., Quinn, Jeanne M. *, and **Fairman, Robert**. 2018. Sample Preparation and Size Analysis of *C9orf72* Dipeptide Repeat Proteins Expressed in *Drosophila melanogaster* Using Semi-Denaturing Detergent Agarose Gel Electrophoresis. 2018. *Submitted, Methods in Molecular Biology*.

Rivas, Marco*, Courouble, Valentine*, Baker, Miranda C.*, Fiore, Kristen*, Frost, Alexander J.*, Jordan, Michael R.*, Krasnow, Emily N.*, Mollo, Aurelio*, Ridings, Stephen*, Sawada, Keisuke*, Shroff, Kavita D.*, Studnitzer, Bradley*, Thiele, Grace A.R.*, Sisto, Ashley*, Huff, Adam, **Fairman, Robert**, Beld, Joris Kokona, Bashkim, Charkoudian Louise K.. 2018. Thermal stability of type II polyketide acyl carrier proteins., *Submitted*.

Kokona, Bashkim, Quinn, Jeanne M. *, Hofmann, Jennifer, Cunningham, Nicole R., Jacobsen, Danielle R. *, D'Acunto, Victoria F. *, Garcia, F. Jay*, Carlomagno, Yari, Petrucelli, Leonard, Link, Christopher D., Bonini, Nancy M., Laue, Thomas M., and **Fairman, Robert**. 2018. Biochemical and Biophysical analysis of aggregation of *C9orf72* dipeptide repeat proteins in *Drosophila melanogaster*. *Submitted, Protein Science*.

PUBLICATIONS (*Indicates Haverford undergraduates.)

81. Cookmeyer, David L. *, Winesett, Emily S. *, Kokona, Bashkim, Aliev, Sabina*, Bloch, Noah, B. *, Bulos, Joshua A. *, Evans, Irene L. *, Fagre, Christian R. *, Godbe, Kerilyn N. *, Khromova, Maryna*, Konstantinovskiy, Daniel M. *, Lafrance, Alexander E. *, Lamacki, Alexandra J. *, Parry, Robert C. *, Quinn, Jeanne M. *, Thurston, Alana M. *, Tsai, Kathleen J. S.-C. *, Cryle, Max J., **Fairman, Robert** and Charkoudian, Louise K. 2017. Uncovering Protein-Protein Interactions through a Team-based Undergraduate Biochemistry Course. *PLoS Biol*, **15**(11):11:e2003145.
80. Kim, Surin*, D'Acunto, Victoria F. *, Kokona, Bashkim, Hofmann, Jennifer, Cunningham, Nicole R., Bistline, Emily M. *, Garcia, F. Jay*, Akhtar, Nabeel M. *, Hoffman, Susanna H. *, Doshi, Seema H. *, Ulrich, Kathleen M. *, Jones, Nicholas M., Bonini, Nancy M., Roberts, Christine M., Link, Christopher D., Laue, Thomas M., and Fairman, Robert. 2017. Sedimentation velocity analysis with fluorescence detection of mutant huntingtin exon 1 aggregation in *Drosophila Melanogaster* and *Caenorhabditis Elegans*. *Biochemistry* **56**:4676. doi: 10.1021/acs.biochem.7b00518.
79. Fairman, Robert. May 17, 2017, Twists and Turns in Protein Assembly. Not peer reviewed. <http://www.scientia.global/professor-robert-fairman-twists-turns-protein-assembly/>
78. Glaubman, Jessica, Hofmann, Jennifer, Bonney, Megan E. *, Park, Sumin*, Thomas, Jessica M. *, Kokona, Bashkim, Ramos-Falcón, Laura I. *, Chung, Yoonjie K. *, **Fairman, Robert**, and Okeke, Iruka N. 2016. Self-association motifs in the *Escherichia coli* heat-resistant agglutinin 1. *Microbiology* **162**:1091.
77. Boyaci, H., Shah, T., Hurley, A., Kokona, Bashkim., Li, Z., Ventocilla, C., Jeffrey, P.D., Semmelhack, M.F., **Fairman, R.**, Bassler, B.L., and Hughson, F.M. 2016. Structure, regulation, and inhibition of the quorum-sensing signal integrator Lux). *PLoS Biol* **14**:e1002464.
76. Kokona, Bashkim, May, Carrie A., Cunningham, Nicole R., Richmond, Lynne*, Garcia, F. Jay*, Durante, Julia C. *, Ulrich, Kathleen M. *, Roberts, Christine M., Link, Christopher D., Stafford, Walter F., Laue, Thomas M., and **Fairman, Robert**. 2016. Applying an analytical ultracentrifuge equipped with fluorescence detection to the study of polyglutamine aggregation in *Caenorhabditis elegans*. *Protein Science*, **25**:605.

75. Kokona, Bashkim, Winesett, Emily S.*, von Krusenstiern, Alfred N.*, Cryle, Max J., **Fairman, Robert**, and Charkoudian, Louise K. 2016. Probing the selectivity of beta-hydroxylation reactions in non-ribosomal peptide synthesis using analytical ultracentrifugation. *Analyt. Biochem.*, **495**:42.
74. Little, Wheaton*, Robblee, James*, Dahlberg, Caroline*, Kokona, Bashkim, and **Fairman, Robert**. 2015. Effect of helical length on the stability of the Lac repressor antiparallel coiled coil. *Biopolymers*, **104**:395.
73. Zhao, et al., 2015. A Multilaboratory Comparison of Calibration Accuracy and the Performance of External References in Analytical Ultracentrifugation. *PLoS One*, **10**:e0126420.
72. Taggart, James C.*, Welch, Elizabeth Z.*, Mulqueen, Mary F.*, Dioguardi, Vincent B.*, Cauer, Alexandra G.*, Kokona, Bashkim, and **Fairman, Robert**. 2014. Testing the role of charge and structure on the stability of peptide-porphyrin complexes. *Biomacromolecules*, **15**:4544.
71. Kokona, Bashkim, Johnson, Karl A., and **Fairman, Robert**. 2014. Effect of helical flanking sequences on the morphology of polyglutamine-containing fibrils. *Biochemistry*, **53**:6747.
70. Kokona, Bashkim, Rosenthal, Zachary P.*, and **Fairman, Robert**. 2014. Role of the coiled-coil structural motif in polyglutamine aggregation. *Biochemistry*, **53**:6738.
69. Cheng, Richard P., Wang, Wei-Ren, Girinath, Prashant, Yang, Po-An, Ahmad, Raheel, Li, Jhe-Hao, Hart, Pier*, Kokona, Bashkim, **Fairman, Robert**, Kilpatrick, Casey, Argiros, Annmarie. 2012. Effect of charged residue side chain length on intrahelical glutamate-lysine ion pairing interactions. *Biochemistry*, **51**:7157.
68. Pepe-Mooney, Brian J.*, Kokona, Bashkim, and **Fairman, Robert**. 2011. Characterization of mesoscale coiled-coil peptide-porphyrin complexes. *Biomacromolecules*, **12**:4196.
67. Tsang, Betty*, Bretscher, Heidi S.*, Kokona, Bashkim, Robert S. Manning, and **Fairman, Robert**. 2011. Thermodynamic analysis of self-assembly in coiled-coil biomaterials. *Biochemistry*, **50**:8548.
66. Cheng, Richard P., Girinath, Prashant, Suzuki, Yuta, Kuo, Hsiu-Ting, Hsu, Hao-Chun, Wang, Wei-Ren, Yang, Po-An, Gullickson, Donald, Wu, Cheng-Hsun, Koyack, Marc J., Chiu, Hsien-Po, Weng, Yi-Jen, Hart, Pier*, Kokona, Bashkim, **Fairman, Robert**, Lin, Tzu-En, Barrett, Olivia. 2010. Positional Effects on Helical Ala-Based Peptides. *Biochemistry*, **49**:9372.
65. Smith, Melanie H.*, Miles, Timothy F.*, Sheehan, Molly*, Alfieri, Katherine N.*, Kokona, Bashkim, and **Fairman, Robert**. 2010. Polyglutamine fibrils are formed using a simple designed β -hairpin model. *Proteins: Struct. Funct. Bioinf.*, **78**:1971.
64. Chiu, Hsien-Po, Kokona, Bashkim, **Fairman, Robert**, and Cheng, Richard P. 2009. Effect of highly fluorinated amino acids on protein stability at a solvent-exposed position on an internal strand of protein G B1 domain. *J. Am. Chem. Soc.*, **131**:13192.
63. Pepe-Mooney, Brian J.* and **Fairman, Robert**. 2009. Peptides as materials. *Curr. Opin. Struct. Biol.*, **19**:483-494.
62. Kokona, Bashkim, Kim, Andrew M.*, Roden, R. Claire*, Daniels, Joshua P.*, Pepe-Mooney, Brian J.*, Kovaric, Brian C.*, de Paula, Julio C., Johnson, Karl A., and **Fairman, Robert**. 2009. Self-assembly of coiled-coil peptide-porphyrin complexes. *Biomacromolecules*, **10**:1454.
61. Root, Benjamin C.*, Pellegrino, Laurel*, Crawford, Emily D.*, Kokona, Bashkim, **Fairman, Robert**. 2009. Design of a heterotetrameric coiled coil. *Protein Sci.*, **18**:329.
60. Salinger, Nina*, Kokona, Bashkim, **Fairman, Robert**, and Okeke, Iruka N. 2009. The plasmid-encoded regulator activates factors conferring lysozyme resistance on enteropathogenic *Escherichia coli*. *Appl. Environ. Microbiol.*, **75**:275.
59. Kokona, Bashkim, Rigotti, Daniel J., Wasson, Andrew S.*, Lawrence, Sarah H., Jaffe, Eileen K., and **Fairman, Robert**. 2008. Probing the oligomeric state of pea porphobilinogen synthase by analytical ultracentrifugation. *Biochemistry*, **48**:10649.
58. Chiu, Hsien-Po, Suzuki, Yuta, Gullickson, Donald, Ahmad, Raheel, Kokona, Bashkim, **Fairman, Robert**, Cheng, Richard P. 2006. Helix propensity of highly fluorinated amino acids. *J. Am. Chem. Soc.*, **128**:15556.
57. Kovaric, Brian C.*, Kokona, Bashkim, Schwab, Alexander D., Twomey, Margaret A.*, de Paula, Julio C. and **Fairman, Robert**. 2006. Self-assembly of peptide porphyrin complexes: towards the development of smart biomaterials. *J. Am. Chem. Soc.*, **128**:4166.
56. Tang, Lei, Breing, Sabine, Stith, Linda, Mischel, Adele, Tannir, Justin, Kokona, Bashkim, **Fairman, Robert**, and Jaffe, Eileen. 2006. Single amino acid mutations alter the distribution of human porphobilinogen synthase quaternary structure isoforms (morpheesins). *J. Biol. Chem.*, **281**:6682.
55. Lehtiö, Lari, Grossmann, J. Günter, Kokona, Bashkim, **Fairman, Robert**, and Goldman, Adrian. 2006. Crystal structure of a glycyl radical enzyme from *Archaeoglobus fulgidus*. *J. Mol. Biol.*, **357**:221.

54. Rigotti, Daniel J., Kokona, Bashkim, Horne, Theresa*, Acton, Eric K.*, Lederman, Carl D.*, Johnson, Karl A., Manning, Robert S., Amador Kane, Suzanne, Smith, Walter F., and **Fairman, Robert**. 2005. Quantitative atomic force microscopy image analysis of unusual filaments formed by the *Acanthamoeba castellanii* myosin II rod domain. *Analyt. Biochem.*, **346**:189.
53. Wagner, Daniel E.*, Phillips, Charles L.*, Ali, Wasif M.*, Nybakken, Grant E.*, Crawford, Emily D.*, Schwab, Alexander D., Smith, Walter F., and **Fairman, Robert**. 2005. Towards the development of peptide nanofilaments and nanoropes as smart materials. *Proc. Natl. Acad. Sci., USA*, **102**:12656.
52. Cedervall, Tommy, André, Ingemar, Selah, Cheryl, Robblee, James*, Krecioch, Peter C.*, **Fairman, Robert**, Linse, Sara, Åkerfeldt, Karin S. 2005. Calbindin D_{28k} EF-hand ligand binding and oligomerization: four high-affinity sites-three modes of action. *Biochemistry*, **44**:13522.
51. **Fairman, Robert** and Åkerfeldt, Karin S. 2005. Peptides as smart materials. *Curr. Opin. Struct. Biol.*, **15**:453.
50. Dunetz, Joshua*, Sandstrom, Clair*, Young, Elizabeth R.*, Baker, Paul*, VanName, Steven*, Cathopolous, Terry*, **Fairman, Robert**, de Paula, Julio C. and Åkerfeldt Karin S. 2005. Self-assembly of a porphyrin-derivatized peptide: toward the design of chromophore aggregates for light-harvesting applications. *Org. Lett.*, **7**:2559.
49. Chao, Yang, Shiozaki, Eric N., Srinivasula, Srinivasa M., Rigotti, Daniel J., **Fairman, Robert**, and Shi, Yigong. 2005. Engineering a dimeric caspase-9: a re-evaluation of the induced proximity model for caspase activation. *PLoS-Biology*, **3**:e183.
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RESEARCH INTERESTS

My laboratory is interested in applying protein design principles to the study of polymerizing systems. Two general areas that we are exploring are: (1) polymerizing systems for biomaterials design; and (2) polymerizing systems as models for protein aggregative disease.

We are interested in the creation of novel biomaterials. We have focused on using the coiled-coil structural motif as a model system for creating 1D polymers that can be decorated with different chemical functionalities to create electronically conducting materials. Recently, we have found a way to use the coiled coil structure to create polymers in the nanoscale size range. We do this by distributing nonpolar residues in a sequence in such a way that forces the stagger of the two helices that make up the coiled coil structure. This staggered intermediate then templates the growth of polymers that range in the nanometer to micrometer size range as seen in afm studies. We are exploring the rules that govern the assembly of

these structures, looking principally at how hydrophobic considerations influence polymer growth. We are also exploring how we might further regulate reversible polymer assembly in response to specific environmental cues, such as metal binding or light. Incorporation of porphyrin derivatives (both by covalent and noncovalent approaches) is being explored to impart electronic functionality.

We are also interested in understanding the role of polyglutamine repeats in the problem of protein aggregation in diseases such as Huntington's. We are interested in developing a detailed understanding of the molecular mechanism of aggregation in which we will probe the importance of hydrogen bonding between glutamines in the polymer assembly process. We developed a beta-hairpin model that will allow precise control over the assembly of early folding intermediates. We hope to probe the role of glutamines in beta-hairpin folding and stability and in folding and stability of facial and lateral assembly processes. More recently, we began exploring *in vivo* aggregation of polyglutamine repeats, using two animal model systems: *Drosophila melanogaster* and *Caenorhabditis elegans*. We are interested in the polyQ length dependence, and mechanisms of mitigation, of aggregation, using a variety of biochemical probes, including analytical ultracentrifugation with fluorescence detection capabilities.

NAMES OF RESEARCH ADVISEES

- 2017** Alex Belfi, Helen Jung, Catheline Phan, Karl Vosatka, Zoe Wong
 2016 Victoria D'Acunto, Alex Frost, Emily Krasnow, Sofia Tieze
 2015 Tolani Babatunde, Noah Bloch, Christian Fagre, Jay Garcia, Jeanne Quinn
 2014 Claire-Marie Caseau, Seema Doshi, Chris Gardner, Surin Kim
 2013 Vin Dioguardi, Sue Hoffman, Mike Iannacone, Zach Rosenthal, Katie Ulrich
 2012 Nabeel Akbhar, Sydney Hyder, Lynn Richmond, Zachary Smith, James Taggart
 2010 Julia Durante, Sam McCrimons, Kara Percival, Grace Smith Vidaurre, Zoe Welch
 2009 Grace Bundens, Adolfo Cuesta, Elizabeth Gallo, Jill Geratowski, Andrew Kim, Andrew McNeal, Haig Minassian, Brian Pepe-Mooney
 2008 Kate Alfieri, Sarah Graves, Borin Kim, Justin Meyerowitz, Tim Miles, Mary Mulqueen, Rachel Oristano, Brian Pepe-Mooney
 2007 Heidi Bretscher, Pier Hart, Andrew Kim, Tim Miles, Laurel Pellegrino, Ross Sager, Yao Yao
 2006 Alan Ackroyd-Isales, Tim Miles, Sharon O'Neill, Claire Roden, Neha Rastogi, Molly Sheehan, Betty Tsang
 2005 Linda Cendes, Elizabeth Graef, Ben Root, Nina Salinger, Melanie Smith, Sarah Steenbergen, Meg Twomey
 2004 Katherine Hart, Brian Kovaric, Kevin Monahan, Ami Naik, Shilpa Narayanan
 2003 Benjamin Gordon, Katherine Hart, Jeffrey Jopling, Kevin Monahan, Ethan Roland
 2002 Emily Crawford, Judith Lin, Esi Nkyekyer, Catherine Seager, Daniel Wagner
 2001 Emily Crawford, Caroline Dahlberg, Peter Law, Wheaton Little, Charles Phillips, Ambika Sohal, Andrew Wasson
 2000 Caroline Dahlberg, Lawrence Lee
 1999 Wasif Ali, Chollaratt Boonlarrpradab, Marcelline Ciuffreda, Lawrence Lee, Grant Nybakken, Amy Solan, Colynda Vu, Nathan Wright
 1998 Marcelline Ciuffreda, Robert Eskuchen, Rachel Mosher, Ian Pitha-Rowe, Kiira Ratia, James Robblee, Karin Werner, Eric Wolpin
 1997 T.J. Filip, Jaimie Goralnick, Kandice Gu, Peter Krecioch, Maria Lemos

TEACHING EXPERIENCE

Haverford College (1997-)

Bio100, What is Life?

Bio125, Perspectives in Biology: Genetic Roil and Royal Families

Bio200, Cell Structure and Function

Bio220, Unlocking Key Concepts in Biology

Bio300, Laboratory in the Biochemistry of DNA and Proteins

Bio303, Structure and Function of Proteins

Bio357, Protein Design

Bio403, Senior Research Tutorial in Protein Folding and Design

Bio493, Interdisciplinary Examinations of Biologically Significant Research

Bio499, Senior Department Studies

Bioc390, Laboratory in Biochemical Analysis

Chem101, General Chemistry II

University of Massachusetts (2003)

Analytical Ultracentrifugation workshop

UMDNJ (2003)

Analytical Ultracentrifugation workshop

Princeton University (2002,2004)

2 lectures for CHEM515, Biophysical Chemistry I

University of Pennsylvania (2001,2005)

3 lectures for BMB615, Proteins from the Ground Up

Stanford University (1984-1985)

Graduate Teaching Assistant, Biochemistry.