KAREN G. FLEMING

T.C. Jenkins Department of Biophysics – Johns Hopkins University
3400 North Charles Street – Baltimore, MD 21218 – (410) 516-7256 – Karen.Fleming@jhu.edu

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Research Interests

I work in discovery. My research is motivated by the power a deep understanding of the physics/biology intersection can bring to disease, evolution and biological design. My approaches are driven by the unique powers that biophysics can bring to solving complex cellular problems. For many years I studied the energetics of transmembrane helix-helix interactions; I developed theory to describe their associations; I defined conditions of "forced cohabitation" of helices in micelles; and I discovered thermodynamic coupling in helix-helix dimerization reactions. Recently my work has targeted the protein-folding problem using transmembrane β-barrels. We quadrupled the number of known membrane protein stabilities; we developed a novel water-to-bilayer side chain hydrophobicity scale; we showed that aromatic side chain energies follow the polarity gradient inherent in a phospholipid bilayer; we wrote a flux model for sorting in the periplasms of bacterial envelopes that identifies roles played by chaperones and we defined the key function of the essential BAM complex.

Education

1983-1987	B.A. French and Pre-medical Studies Notre Dame, IN	Univ. of Notre Dame
1984-1985	French Language and Culture Foreign Studies, Angers, France	Université Catholique de l'Ouest
1988-1993	Ph.D. Biochemistry & Molecular Biology Washington, DC	Georgetown University
1993-1994	Postdoctoral Associate Dept. Molecular Biophysics & Biochemistry New Haven, CT	Yale University
1994-1996	NIH Postdoctoral Fellow Dept. Molecular Biophysics & Biochemistry New Haven, CT	Yale University
1997-1998	Associate Research Scientist Dept. Molecular Biophysics & Biochemistry New Haven, CT	Yale University

Academic Experience

1999-2000	Research Scientist Dept. Molecular Biophysics & Biochemistry New Haven, CT	Yale University
2000-2007	Assistant Professor T. C. Jenkins Department of Biophysics Baltimore, MD	Johns Hopkins University
Spring 2007	Visiting Academic with Prof. Carol Robinson Department of Chemistry Cambridge, U.K.	University of Cambridge

2007-2013	Associate Professor with tenure T. C. Jenkins Department of Biophysics Baltimore, MD	Johns Hopkins University
2013-Present	Full Professor with tenure T. C. Jenkins Department of Biophysics Baltimore, MD	Johns Hopkins University

Awards and Honors

2016	Thomas E. Thompson Award, Membrane Structure & Assembly, The Biophysical Society
2015	Diversity Leadership Council Award: a recognition of the *Empowering Women in STEM* workshops and website I founded and organize. This award acknowledges outstanding accomplishments whose demonstrable efforts foster greater appreciation of diversity and inclusiveness in the Johns Hopkins culture and environment.
2015	Meeting Co-Chair, 59th meeting of The Biophysical Society (with Enrique De La Cruz, Yale)
2014-2017	Elected Member of Council, ASBMB
2014	Theme Co-Organizer, Lipids & Proteins, ASBMB National Meeting (with Vinzenz Unger, Northwestern University)
2012-2014	Elected Member of the Executive Board, The Biophysical Society
2010-2014	Elected Member of Council, The Biophysical Society
2010	Elected Meeting Co-Chair, Gordon Research Conference on Biomolecular Interactions & Methods (with Gideon Schreiber, Weizmann Institute)
2010-2011	Elected President, The Gibbs Society of Biothermodynamics
2008	Elected Meeting Vice Chair, Gordon Research Conference on Biomolecular Interactions & Methods
2002-2006	Department of Defense Career Development Award
2000-2005	MRC Scholar Award, Medical Research Council of Canada (Awarded but declined.)
2000-2005	Establishment Grant and Scholarship Award, Alberta Heritage Foundation for Medical Research (Declined)
1997	Inaugural recipient of the Arne Tiselius Young Investigator Award
1994-1996	NIH NRSA Individual Postdoctoral Fellowship
1995	Fellowship Recipient, Analytical Ultracentrifugation Workshop, University of Connecticut Biotechnology Center, Storrs, CT
1991	Talbot Travel Award, The Biophysical Society
1990	Travel Award, Graduate Student Organization, to attend ASBMB meeting, New Orleans, LA
1991-1993	NIH NRSA Individual Pre-doctoral Fellowship
1985	Diplôme de Langue, Mention Très Honorable, Université Catholique de l'Ouest, Angers, France
1983-1987	Nina Heard Astin Scholar

Student Honors Resulting from Laboratory Research

2015

Sarah Kempka McDonald, Outstanding Poster Award, Gordon Research Conference on Membrane Protein Folding, Bentley University, Waltham, MA

Sarah Kempka McDonald, Selected Short Talk, Gordon Research Conference on Membrane Protein Folding, Bentley University, Waltham, MA

Sarah Kempka McDonald, Selected Platform Speaker, The 59th National Symposium of the Biophysical Society, Baltimore, MD

2011

C. Preston Moon, Student Research Achievement Award, The 55th National Symposium of the Biophysical Society, Baltimore, MD

2010

C. Preston Moon, Poster Award, Symposium on Frontiers in Membrane and Membrane Protein Biophysics, Irvine, CA

2006

Ann Marie Stanley, Selected Oral Presentation, The National Meeting of the Biophysical Society, Salt Lake City, UT

2005

Ann Marie Stanley, Selected Student Speaker, The 19th Annual Gibbs Conference on Biothermodynamics, Touch of Nature, IL

Abigail K. Doura, Talbot Travel Award to attend the National Meeting of the Biophysical Society, Long Beach, CA

Ann Marie Stanley, Student Research Achievement Award, The National Meeting of the Biophysical Society, Long Beach, CA

2004

Ann Marie Stanley, Best Poster Award, UK Analytical Ultracentrifuge Meeting, Oxford, UK

Ann Marie Stanley, Selected Student Speaker (one of eight chosen), FASEB Summer Research Conference on Membrane Molecular Biophysics, Tucson, AZ

Abigail K. Doura, Selected Student Speaker (one of eight chosen), FASEB Summer Research Conference on Membrane Molecular Biophysics, Tucson, AZ

Publications

68. McDonald SK and KG Fleming (2016) "Negative charge neutralization in the loops and turns of outer membrane phospholipase A impacts folding hysteresis at neutral pH" Under Review.

67. Fleming KG (2016) "Secrets of the Membrane to Be Revealed in the Next Quarter Century" *Physical Biology* Under review.

66. Plummer AM and KG Fleming (2016) "From Chaperones to the Membrane with a BAM!" *Trends Biochem. Sci.* **In Revision**.

65. Costello SM, Plummer AM & KG Fleming (2016) "Dynamic Periplasmic Chaperone Reservoir Facilitates Biogenesis of Outer Membrane Proteins" **In Revision**.

64. McDonald SK and KG Fleming (2016) "Aromatic Side Chain Water-to-Lipid Transfer Free Energies Show a Depth-Dependence Across the Membrane Normal" *J. Am Chem. Soc.* **In Press**. PMID: 27254476; PMCID: In Process.

63. Fleming PJ, Patel DS, Wu E, Qi Y, Yeom MS, Sousa MC Fleming KG and W Im (2016) "BamA POTRA Domain Interacts with a Native Lipid Membrane Surface" *Biophys. J.* **In Press**.

62. Zaccai NR, Sandlin CW, Hoopes JT, Curtis JE, Fleming PJ, Fleming KG and S Krueger (2016) "Deuterium labeling together with contrast variation small-angle neutron scattering suggests how Skp captures and releases unfolded outer membrane proteins" (2015) *Methods Enzymol* **566** 159-210. PMID: 26791979; PMCID: In Process.

61. Sandlin CW, Zaccai NR and KG Fleming (2015) "Skp trimer formation is insensitive to ionic strength" *Biochemistry* **54**: 7059-7062**.** PMID: 26579730; PMCID: In Process.

60. Plummer AM*, Gessmann D* and KG Fleming (2015) "The Role of a Destabilized membrane for OMP Insertion" Methods Mol. Biol. 1329: 57-65. PMID: 26427676: PMCID: N/A. *Joint First Authors.

59. Plummer AM and KG Fleming (2015) "BamA Alone Accelerates Outer Membrane Protein Folding In Vitro through a Catalytic Mechanism" *Biochemistry* **54**: 6009-6011. PMID: 26394056; PMCID: PMC4613867.

58. Danoff EJ and KG Fleming (2015) "Aqueous, Unfolded OmpA Forms Amyloid-Like Fibrils Upon Self-Association" *PLos ONE* **10**: e0132301. PMID: 26196893; PMCID: PMC4509890

57. Fleming KG (2015) "A kinetic push and thermodynamic pull as driving forces for outer membrane protein sorting and folding in bacteria" *Phil Trans R Soc Lond B Biol Sci* **370**: 1679. PMID: 26370938;

56. Danoff EJ and KG Fleming (2015) "Membrane defects accelerate outer membrane β-barrel protein folding" *Biochem* **54**: 97-99. PMID: 25513891; PMCID: PMC4303321.

55. Wu EL, Fleming PJ, Yeom MS, Widmalm G, Klauda JB, Fleming KG and W Im (2014) "*E coli* Outer Membrane and Interactions with OmpLA" *Biophys. J.* **106**: 2493. PMID: 24896129; PMCID: PMC4052237.

54. Gessmann D, Chung YH, Danoff EJ, Plummer AM, Sandlin CW, Zaccai NR and KG Fleming (2014) "Outer membrane β-barrel protein folding is physically controlled by periplasmic lipid head groups and BamA" *PNAS* **111**: 5878-93. PMID: 24715731; PMCID: PMC4000854.

53. Fleming KG (2014) "Energetics of Membrane Protein Folding" *Ann Rev Biophys* **43**: 233-55. PMID: 24895854; PMCID Pending.

52. Moon CP, Zaccai NR, Fleming PJ, Gessmann D and KG Fleming (2013) "Membrane protein thermodynamic stability may serve as the energy sink for sorting in the periplasm" *PNAS* **110:** 4285-4290. PMID: 23440211; PMCID: PMC3600475.

51. Lees JPB, Manlandro CM, Picton LK, Ebie Tan AZ, Casares S, Flanagan JM, Fleming KG and RB Hill (2012) "A designed point mutant in Fis1 disrupts dimerization and mitochondrial fission" *J. Mol. Biol.* **423**: 143-158 PMID: 22789569; PMCID: PMC3456991.

50. O'Neill MJ, Bhakta MN, Fleming KG and A Wilks (2012) "Induced Fit on Heme Binding to the Pseudomonas aeruginosa Cytoplasmic Protein (PhuS) Drives Interaction with Heme Oxygenase (HemO)" *PNAS* **109:** 5639-5644. PMID: 22451925; PMCID: PMC3326490.

49. Buchanan SK, Yamashita Y and KG Fleming (2012) "Structure and folding of outer membrane proteins" in *Comprehensive Biophysics* eds. EH Egelman and LK Tamm, Oxford: Academic Press Vol **5**: 139-163.

48. Moon CP, Kwon S and KG Fleming (2011) "Overcoming hysteresis to attain reversible equilibrium folding for outer membrane phospholipase A in phospholipid bilayers" *J. Mol. Biol.* **413**: 484-494. PMID: 21888919; PMCID: PMC3193555.

47. Fleming PJ, Freites JA, Moon CP, Tobias DJ and KG Fleming (2011) "Outer membrane phospholipase A in phospholipid bilayers: A model system for concerted computational and experimental investigations of amino acid side chain partitioning into lipid bilayers" *BBA Biomembranes* **1818**: 126-134. PMID: 21816133; PMCID: PMC3233656.

46. Danoff EJ and KG Fleming (2011) "The soluble, periplasmic domain of OmpA folds as an independent unit and displays chaperone activity by reducing the self-association propensity of the unfolded OmpA transmembrane β-barrel" *Biophys. Chem.* **159**: 194-204. PMID 21782315; PMC3169180.

45. Moon CP and Fleming KG (2011) "From the Cover: Side-chain hydrophobicity scale derived from transmembrane protein folding in lipid bilayers" *PNAS* **108:** 10174-10177. PMID 21606332; PMC3121867.

Commentary by Janice L. Robertson
"We choose to go to the membrane" *PNAS* (2011) 108(25) 10027-10028.

44. Moon CP and KG Fleming (2011) "Using tryptophan fluorescence to measure the stability of membrane proteins folded in liposomes" *Methods Enzymol. Biothermodynamics, Part D* **492**: 189-211. PMID 21333792; PMC3799943.

42. Fleming, KG (2010) "Fluorescence Theory" in *Encyclopedia of Spectroscopy and Spectrometry, 2nd edition*, J. Lindon, editor, Academic Press, p 628-634. DOI 10.1016/B978-0-12-374413-5.00357-2

42. Ebie Tan A, Burgess NK, Marold JD, DeAndrade DS & KG Fleming (2010) "Self association of unfolded outer membrane proteins" *Macromol. Biosci.* **10**: 763-7. PMID 20491126; PMC3025446.

41. Pang T, Savva CG, Fleming KG, Struck DK and R Young (2009) "Structure of the lethal phage pinhole" *PNAS* **106**: 18996-71. PMID 19861547; PMC2776468.

40. Ebie Tan A & KG Fleming (2008) "Outer membrane phospholipase A dimer stability does not correlate to occluded surface area" *Biochemistry* **47**: 12095-103. PMID 18939857

39. Burgess NK, Dao T, Stanley AM and KG Fleming (2008) "β-barrel proteins that reside in the same membrane *in vivo* demonstrate varied folding behavior *in vitro*" *J. Biol. Chem.* **283:** 26748-26758. PMID 18641391; PMC3258919

38. MacKenzie KR and KG Fleming (2008) "Association energetics of membrane spanning α-helices" *Curr. Opin. Struct. Biol.* **18**: 412-419. PMID 18539023

37. Fleming KG (2008) "Determination of membrane protein molecular weight using sedimentation equilibrium analytical ultracentrifugation" *Curr. Prot. Prot. Sci.* Aug Chapter 7: Unit 7.12.1-7.12.13. PMID 18729051

36. Stanley AM & KG Fleming (2008) "The process of folding proteins into membranes: challenges and progress" *Arch. Biochem. Biophys.* **469**: 46-66. PMID 17971290

35. Burgess NK, Stanley AM and KG Fleming (2008) "Determination of membrane protein molecular weights and association equilibrium constants using sedimentation equilibrium and sedimentation velocity" *Methods Cell Biol.* **84**: 181-211. PMID 17964932

34. Duong MT, Jaszewski TM, Fleming KG and KR MacKenzie (2007) "Changes in apparent free energy of helix-helix dimerization in a biological membrane due to point mutations" *J. Mol. Biol.* **371**: 422-434.

33. Stanley AM and KG Fleming (2007) "The Role of a Hydrogen Bonding Network in the Transmembrane β-barrel OMPLA" *J. Mol. Biol.* **370**: 912-924.

32. Ebie AZ and KG Fleming (2007) "Dimerization of the erythropoietin transmembrane domain in micelles" *J. Mol. Biol.* **366**: 517-524.

31. Stanley AM, Treubodt, AM Chauwang P, Hendrickson TL and KG Fleming (2007) "Lipid chain selectivity of outer membrane phospholipase A" *J. Mol. Biol.* **366**: 461-468.

30. Stanley AM, Chauwang P, Hendrickson TL and KG Fleming (2006) "Energetics of outer membrane phospholipase A (OMPLA) dimerization" *J. Mol. Biol.* **358**: 120-131.

29. Kroch AE and KG Fleming (2006) "Alternate interfaces may mediate homomeric and heteromeric assembly in the transmembrane domains of SNARE Proteins" *J. Mol. Biol.* **357**: 184-197.

28. Fleming, KG (2005) "Analysis of Membrane Proteins using Analytical Ultracentrifugation" in *Analytical Ultracentrifugation, Techniques and Methods*, DJ Scott, SE Harding and AJ Rowe, Eds., Royal Society of Chemistry Publishing, Cambridge, UK.

27. Stanley AM and KG Fleming (2005) "The transmembrane domains of the ErbB receptors do not dimerize strongly in micelles" *J. Mol. Biol.* **347**: 759-772.

26. Kobus, FJ and KG Fleming (2005) "The GxxxG-containing transmembrane domain of the CCK4 oncogene does not encode preferential self-interactions. *Biochemistry* 44: 1464-1470.

25. Doura AK and KG Fleming (2004) "Complex interactions at the helix-helix interface stabilize the glycophorin A transmembrane dimer" *J. Mol. Biol.* **343**: 1487-1497.

24. Raasi, S; Orlov, I; Fleming, KG; and CM Pickart (2004) "Binding of polyubiquitin chains to ubiquitin-associated (UBA) domains of HHR23A" *J. Mol. Biol.* **341:** 1367-1379.

23. Doura AK, Kobus FJ, Dubrovsky L, Hibbard, E and KG Fleming (2004) "Sequence context modulates the stability of a GxxxG-mediated transmembrane dimer" *J. Mol. Biol.* **341:** 991-998.

22. Fleming, KG* Ren CC, Doura AK, Eisley ME, Kobus FJ and AM Stanley (2004) "Thermodynamics of glycophorin A in C14 betaine micelles" *Biochem. J.* **108**:43-49. **Corresponding author*

21. Fleming, KG (2002) "Standardizing the free energy change of transmembrane helix-helix interactions" *J. Mol. Biol.* **323**: 563-571.

20. Trombetta, ES, Fleming, KG, Helenius, A (2001) "Quaternary and domain structure of glycoprotein processing glucosidase II" *Biochemistry* **40**: 10717-22.

19. Vergis, JM, Bulock, KG, Fleming, KG and Beardsley, GP (2001) "Human AICAR transformylase/IMP cyclohydrolase: A bifunctional protein requiring dimerization for transformylase activity but not for cyclohydrolase activity" *J. Biol. Chem.* **276**: 7727-7733.

18. Fleming, KG* and DM Engelman (2001) "Specificity in transmembrane helix association defines a hierarchy of stability that is independent of the hydrophobic environment" *PNAS* **98**: 14340-14344. **Corresponding author*

17. Fleming, KG* and DM Engelman (2001) "Computation and mutagenesis suggest a right-handed dimer for the synaptobrevin transmembrane domain" *Proteins* **45**: 313-317. **Corresponding author*

16. Fleming, KG (2000) Riding the wave: structural and energetic principles of helical membrane proteins" *Current Opinion in Biotechnology* (P. Hensley & D. Myszka, eds.) Vol. 11: 67-71.

15. Fleming, KG (2000) "Probing the Stability of Helical Transmembrane Proteins" in *Energetics of Biological Macromolecules, Part C*, a volume of *Meth. Enzymol.* (M. L. Johnson & G. Ackers, eds.) Academic Press, ***323***: 63-77.

14. Biswas, I; Ban, C; Fleming, KG; Qin, J; Lary, JW; Yphantis, DA; Yang, W; and P. Hsieh (1999) "Oligomerization of a MutS mismatch repair protein from *Thermus aquaticus*" **274**: 23673-23678.

13. Schubert, C; Hirsch, JA; Gurevich, VV; Engelman, DM; Sigler, PB; and KG Fleming* (1999) "Visual arrestin activity may be regulated by self-association" *J. Biol. Chem.* **274**: 21186-21190.

12. Fleming, KG; Hohl, TM; Yu, RC; Müller, SA; Wolpensinger, BA; Engel, A; Engelhardt, H; Brünger, AT; Söllner, T; and PI Hanson (1998) "A Revised Model for the Oligomeric State of the N-ethyl Maleimide Sensitive Factor, NSF" *J. Biol. Chem.* **273**: 15675-15681.

11. Fleming, KG (1998) "Measuring Transmembrane α-Helix Energies using Analytical Ultracentrifugation" in *ChemTracts: Biological Applications of the Analytical Ultracentrifuge* (J. C. Hanson, ed.) **11**: 985-990.

10. Fleming, KG (1998) "Analysis of Membrane Protein Dimerization by Sedimentation Equilibrium" *Application Information Bulletin* (A. Furst, ed.) Beckman Coulter, Inc.

9. Engelman, DM; Fleming, KG; and KR MacKenzie (1998) "Helix Stability and Interactions in Membrane Proteins" *Biol. Skr. Dan. Vid. Selsk.* **49**: 83-86.

8. O'Brien, R; DeDecker, B; Fleming, KG; Sigler, PB; and J Ladbury (1998) "The Effects of Salt on the TATA-binding Protein DNA Interaction of a Hyperthermophilic Archaeon" *J. Mol. Biol.* **279**: 117-125.

7. Fleming, KG; Ackerman, AL; and DM Engelman (1997) "The Effect of Point Mutations on the Free Energy of Transmembrane α-Helix Dimerization" *J. Mol. Biol.* **272:** 266-275.

6. Rodgers, KK and KG Fleming (1997) "Metal-dependent Structure and Self-Association of the RAG1 Zinc-binding Domain" in *Techniques in Protein Chemistry VIII.* D. K. Marshak, ed., pp. 573-584.

5. Munson, M; Balasubramanian, S; Fleming, KG; Nagi, AD; O'Brien, R; Sturtevant, JM and L Regan (1996) "What Makes a Protein a Protein? Hydrophobic Core Designs that Specify Stability and Structural Properties" *Protein Sci.* **5**: 1584-1593.

4. Rodgers, KK; Bu, Z; Fleming, KG; Schatz, DG; Engelman, DM and JE Coleman (1996) "A Zinc-binding Domain Involved in the Dimerization of RAG1" *J. Mol. Biol.* **260**: 70-84.

3. Srivastava, M; **Gibson, KR**; Pollard, HB and PJ Fleming (1994) "Human Cytochrome b_{561}: A Revised Hypothesis for Conformation in Membranes which Reconciles Sequence and Functional Information" *Biochem. J.* **303**: 915-921.

2. **Gibson, KR**; Vanek, PG; Kaloss, WD; Collier, GB; Connaughton, JF; Angelichio, M; Livi, GP and PJ Fleming (1993) "Expression of Dopamine β-Hydroxylase in Drosophila Schneider 2 Cells: Evidence for a Mechanism of Membrane Binding other than Uncleaved Signal Peptide" *J. Biol. Chem.* **268**: 9490-9495.

1. Zhang, H; Buckley, NE; **Gibson, K** and S Spiegel (1990) "Sphingosine Stimulates Cellular Proliferation via a Protein Kinase C-Independent Pathway" *J. Biol. Chem.* **265**: 76-81.

Active Research Support

2009-2017 NIH R01 079440 Role: Principle Investigator
"Membrane Protein Stability"
This grant investigates the thermodynamic stabilities of transmembrane beta-barrel proteins.

2014-2019 NSF MCB Role: Principal Investigator
"Towards a Holistic Model for OMP Sorting in the Periplasm"
This grant will develop a physical and mathematical model for outer membrane protein sorting and maturation in the periplasmic compartment of gram-negative bacteria. This proposal includes yearly REU supplements for summer undergraduate research.

2015-2016 XSEDE MCB120050 Role: Principal Investigator
"Conformational Dynamics of BamA POTRA Domains"
This grant provides computing resources for molecular dynamics calculations of BamA POTRA domains.

Pending Research Support

None

Completed Research Support

2014-2015 Anton Allocation PSCA14004P Role: Principal Investigator
"The roles of protein conformational dynamics and lipid membrane properties in the function of β-barrel assembly machinery"
This grant provides computing resources for molecular dynamics calculations of membrane proteins.

2014-2015 XSEDE MCB120050 Role: Principal Investigator
"Energetics of Lipid-Protein Interactions"
This grant provides computing resources for molecular dynamics calculations of membrane proteins.

2009-2014 NSF MCB0919868 Role: Principle Investigator
"Biophysical analysis of chaperone influences on membrane protein folding"
This grant investigates how periplasmic chaperones influence membrane protein folding pathways. The goal is to develop a quantitative flux model to describe the biological folding pathways taken by transmembrane beta-barrels. This proposal includes summer REU funding for undergraduate scientists.

2014 REU Supplement NSF Role: Principle Investigator
This award provides a summer research opportunity for an undergraduate student.

2013 REU Supplement NSF Role: Principle Investigator
This award provided a summer research opportunity for an undergraduate student.

2013-2014 XSEDE MCB120050 Role: Principal Investigator
"Energetics of Lipid-Protein Interactions"
This grant provides computing resources for molecular dynamics calculations of membrane proteins.

2012-2013 XSEDE MCB120050 Role: Principal Investigator
"Energetics of Lipid-Protein Interactions"
This grant provides computing resources for molecular dynamics calculations of membrane proteins.

2012 REU Supplement NSF MCB0423807 Role: Principle Investigator
This award provided summer research opportunities for two undergraduate students.

2004-2009 NSF MCB 0423807 Role: Principal Investigator
"Thermodynamic Analysis of Transmembrane Beta Barrel Self-Association"
This grant investigated complex formation by an outer membrane transmembrane beta-barrel protein.

2006 REU Supplement to MCB 0423807 Role: Principal Investigator
"Thermodynamic Analysis of Transmembrane Beta Barrel Self-Association.
This award provided a summer research opportunity for an undergraduate student.

2002-2006 BC010823 Career Development Award Role: Principal Investigator
Department of Defense Breast Cancer Research Fund
U. S. Army Medical Research and Materiel Command
"Energetics and Structure Prediction of the Network of Homo- and Hetero-Oligomers Formed by the Transmembrane Domains of the ErbB Receptor Family of Proteins"

2002-2005 BC 010746, Idea Award Role: Principal Investigator
Department of Defense Breast Cancer Research Fund
U. S. Army Medical Research and Materiel Command
"Energetics and Structure Prediction of the Network of Homo- and Hetero-Oligomers Formed by the Transmembrane Domains of the ErbB Receptor Family of Proteins"

1999-2003 NIH R01 GM57534 Role: Principal Investigator
"Structural and Energetic Principles of Membrane Proteins"

1994-1996 NRSA Post-doctoral Fellowship Role: Principal Investigator
NIH National Institute of General Medical Sciences

1991-1993 NRSA Individual Pre-doctoral Fellowship Role: Principal Investigator
NIH National Institute of Mental Health

Training programs and equipment grants

2000-Present NIH GM08403 Role: Participating member
"Program in Molecular Biophysics"
The goal of this grant is to provide funding for training graduate students in molecular biophysics at Homewood, the School of Medicine, and the School of Public Health (JHU)

2000-Present NIH GM007231 Role: Participating member
"Cell and Molecular Biology"
This grant provides funding for training graduate students in biophysics and biology at the Homewood campus (JHU).

2008 NIH Instrumentation Grant Role: Collaborator

PI. Jack Freed (Cornell University).
"DEER EPR Spectrometer"

2008 NIH Instrumentation Grant Role: Minor User
PI. Michael McCaffrey (JHU)
"Fluorescence Correlation Spectrometer"

2004 NSF Shared Instrumentation Grant Role: Co-Principal Investigator
"Peptide Synthesis System to Probe Protein Structure and Interactions with other Biological Macromolecules and Ions"
P.I.: Tamara Hendrickson (JHU)

2004 NIH Shared Instrumentation Grant Role: Minor User
P.I: Blake Hill (JHU)

Invited Lectures and Seminars (Since assuming Faculty Position in 2000)

2017

Conference Speaker, Gordon Research Conference on Membrane Protein Folding, Stonehill College, Easton, MA (Jun 2017)

2016

Speaker, *Women in Science: At the Intersection of Chemistry and Biology*, Texas Woman's University, Department of Chemistry and Biochemistry, Denton, TX Oct (2016)

Seminar Speaker, Department of Infectious Diseases, Genentech, South San Francisco, CA (Sep 2016)

Speaker, *Symposium on Social Science of Diversity Equity* American Chemical Society Fall Meeting, Philadelphia, PA (Aug 2016)

Conference Speaker, The 30th Annual Symposium of the Protein Society, Baltimore, MD (Jul 2016)

Conference Speaker, FASEB Summer Research Conference on Membrane Molecular Biophysics, Snowmass, CO (Jul 2016)

Conference Speaker, The American Society for Microbiology, Boston, MA (Jun 2016)

Seminar Speaker, Department of Chemistry, University of Maryland College Park (May 2016)

Seminar Speaker, Department of Chemistry, Michigan State University (May 2016)

Seminar Speaker, Literature, Science and the Arts Seminar in Biophysics, University of Michigan (Apr 2016)

Seminar Speaker, Department of Chemistry & Biochemistry, University of Colorado Boulder (Mar 2016)

Award Lecture, The Thomas E. Thompson Award, Membrane Structure and Assembly Subgroup, The Biophysical Society, Los Angeles, CA (Feb 2016)

2015

International Conference Speaker, Membrane Proteins Theme Session 22nd International Conference on Analytical Ultracentrifugation, University of Latrobe, Melbourne, Australia (Dec 2015)

Outstanding Women in Science Speaker seminar series, Inaugural speaker, Department of Chemistry, University of Alabama, Birmingham, AL (Dec 2015)

Seminar Speaker, Department of Chemistry & Biochemistry, University of Minnesota Duluth, Duluth, MN (Nov 2015)

Seminar Speaker, Department of Chemistry, Yale University, New Haven, CT (Nov 2015)

Seminar Speaker, Department of Chemistry, University of Akron, Akron, OH (Oct 2015)

Conference Speaker, Gordon Research Conference on Proteins, Holderness School, NH (Jun 2015)

Seminar Speaker, Department of Biochemistry, Vanderbilt University, Nashville, TN (Apr 2015)

Conference Speaker, Keynote Symposium on Hybrid Methods in Structural Biology, Granlibakken Resort, Tahoe City, CA (Mar 2015) (Unable to attend due to illness.)

Seminar Speaker, Department of Chemistry & Biochemistry, University of North Carolina at Wilmington, Wilmington, NC (Jan 2015)

Seminar Speaker, Department of Physiology and Biophysics, Weill Cornell Medical College, New York, NY (Jan 2015)

2014

Keynote Speaker, The 28th Gibbs Conference on Biothermodynamics, Carbondale, IL (Sep 2014)

Seminar Speaker, Biochemistry Seminar Series, University of Washington, Seattle, WA (Nov 2014)

Seminar Speaker, Structural Biology Series, Purdue University, West Lafayette, IN (Nov 2014)

Conference Speaker, Seminar on Overcoming Bias and Barriers to Achieve Gender Equity in Science, Rosetta Conference, Leavenworth, WA (Jul 2014)

Short Talk, Gordon Research Conference on Bacterial Cell Surfaces, Mount Snow, VT (June 2014).

International Speaker, Conference on Physical Approaches to Membrane Proteins, Heraeus Seminar, Bad Honnef, German, (May 2014)

Conference Speaker, Frontiers in Membrane Protein Structural Dynamics, University of Chicago, Chicago, IL (May 2014)

Conference Speaker, Delaware Membrane Symposium, University of Delaware, Newark, DE (May 2014)

Theme Organizer and Invited Speaker, Lipids & Proteins Sessions, ASBMB Annual Meeting, San Diego, CA (Apr 2014)

Seminar Speaker, Department of Chemistry, University of Massachusetts at Amherst, Amherst, MA (Apr 2014)

Student and Postdoctoral Fellow-Invited Seminar Speaker, Cell Biology and Metabolism Program (CBMP) and Program in Cellular Regulation and Metabolism (PCRM), National Institutes of Health, Bethesda, MD (Apr 2014)

Seminar Speaker, Salisbury University, Department of Chemistry, Salisbury, MD (Feb 2014)

Seminar Speaker, North Dakota State University, Department of Chemistry and Biochemistry, Fargo, ND (Jan 2014)

2013

Seminar Speaker, Department of Molecular Biosciences, University of Kansas, Lawrence, KS (Nov 2013)

Seminar Speaker, Department of Chemistry, Gettysburg College, Gettysburg, PA (Oct 2013)

Seminar Speaker, Department of Chemistry, University of Missouri, Columbia, MO (Oct 2013)

Session Chair and International Speaker, Membrane Proteins Theme Session 21st International Conference on Analytical Ultracentrifugation, Atami, Shizuoka, Japan (Sep 2013)

Conference Speaker, Telluride Workshop on Membrane Protein Folding and Function, Telluride, CO (Aug 2013)

Conference Speaker, Biological Membranes and Membrane Proteins: Challenges for Theory and Experiment, Snowmass, CO (Jul 2013)

Short Talk, Membrane Protein Structure and Function, Cold Spring Harbor Asia Meeting, Suzhou, China (13 May 2013).

Conference Speaker, Frontiers in Structural Biology of Membrane Proteins, University of Alabama at Birmingham, Birmingham, AL (Apr 2013)

Seminar Speaker, Department of Biochemistry, University of Iowa, Iowa City, IA (Apr 2013)

Seminar Speaker, Institute for Biophysical Dynamics & Department of Chemistry, University of Chicago, Chicago, IL (Mar 2013)

Conference Speaker, Teaching Science Like We Do Science Workshop at the 57th Annual Meeting of the Biophysical Society, Philadelphia, PA (Feb 2013).

2012

Seminar Speaker, University of Illinois at Urbana Champaign, Center for Physics of Living Systems, Urbana, IL (Nov 2012)

International Speaker, Queenstown Molecular Biology Meeting, Queenstown, New Zealand (Aug 2012)

International Speaker, Biomolecular Interactions Centre & Department of Biochemistry, University of Canterbury, Christchurch, New Zealand (Aug 2012)

Short Talk, FASEB Summer Research Conference on Membrane Molecular Biophysics, Snowmass, CO (Jun 2012)

Undergraduate Biophysics Symposium Speaker, University of Virginia, Department of Biochemistry & Molecular Genetics, Charlottesville, VA (Jun 2012)

Seminar Speaker, University of Virginia, Department of Physiology & Biological Physics, Charlottesville, VA (Jun 2012)

Conference Speaker, Gordon Research Conference on Biopolymers, Newport, RI, (Jun 2012)

Seminar Speaker, Department of Chemistry, Princeton University, Princeton, NJ (Apr 2012)

International Speaker, Institut de Biologie Physico-Chimique, Paris, France (Apr 2012)

Platform Talk, The 56th Annual Meeting of the Biophysical Society, San Diego, CA (Feb 2012)

Conference Speaker, Gordon Research Conference on Protons and Membrane Reactions, Ventura, CA (Feb 2012)

Invited Speaker and Discussion Leader, Gordon Research Conference on Biomolecular Interactions and Methods, Galveston, TX (Jan 2012)

2011

Seminar Speaker, University of Kentucky, Department of Chemistry, Lexington, KY (Nov 2011)

Conference Speaker, The 25th Gibbs Conference on Biothermodynamics, Carbondale, IL (Sep 2011)

Conference Speaker, The 25th Annual Symposium of the Protein Society, Boston, MA (Jul 2011)

TEMPO Guest Speaker, University of California at Irvine, Department of Physiology, Irvine, CA (Jul 2011)

Conference Speaker, Summer Research Conference on Biological Membranes and Membrane Proteins: Challenges for Theory and Experiment, Snowmass, CO (Jun 2011)

Conference Speaker, The 66th Calcon Calorimetry Conference, Kahuku, HI (Jun 2011)

International Speaker, The 2nd Cold Spring Harbor Asia Conference on Membrane Proteins: Structure and Function, Suzhou, China, (May 2011) (Was unable to attend this meeting at the last minute due to illness.)

Conference Speaker, The 241st National Meeting of the American Chemical Society, Anaheim, CA (Mar 2011)

Conference Speaker, New & Notable Symposium, The 55th Annual Meeting of the Biophysical Society, Baltimore, MD (Mar 2011)

Seminar Speaker, National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY (Feb 2011)

2010

Short Talk, Symposium on Membrane and Membrane Biophysics: Experiment and Theory, Irvine, CA (Aug 2010)

Conference Speaker, FASEB Summer Research Conference on Molecular Biophysics of Cellular Membranes, Saxtons River, VT (Aug 2010)

Seminar Speaker, Hunter College of CUNY, Department of Chemistry, New York, NY (Apr 2010)

Seminar Speaker, Lehigh University, Department of Chemistry, Bethlehem, PA (Apr 2010)

Seminar Speaker, Laboratory of Molecular Biophysics, NHLBI, NIH, Bethesda, MD (Mar 2010)

Conference Speaker, Gordon Research Conference on Chemistry & Biology of Peptides, Ventura, CA (Feb 2010)

2009

Seminar Speaker, Catholic University, Department of Biology, Washington, DC (Nov 2009)

International Speaker, The 18th International Symposium on Analytical Ultracentrifugation and Hydrodynamics, Uppsala, Sweden, (Sep 2009)

Conference Speaker, Telluride Summer Research Conference on Biological Membranes and Membrane Proteins: Challenges for Theory and Experiment, Telluride, CO (Jul 2009)

Seminar Speaker, Center for Advanced Research in Biotechnology (CARB), Rockville, MD (Apr 2009)

2008

International Speaker, The 17th International Symposium on Analytical Ultracentrifugation and Hydrodynamics, Newcastle, UK (Sep 2008)

International Speaker, University of Leeds, Department of Biochemistry, Leeds, UK (Sep 2008)

Seminar Speaker, University of Delaware, Department of Chemistry & Biochemistry, Newark, DE (Oct 2008)

Seminar Speaker, Laboratory of Structural Biology, National Institutes of Health, Bethesda, MD (Aug 2008)

International Speaker, University of Melbourne, Department of Biochemistry, Melbourne, Victoria, Australia (Feb 2008)

International Speaker, The 33rd Lorne Conference on Protein Structure and Function, Lorne, Victoria, Australia, (Feb 2008)

2007

Seminar Speaker, Texas A&M University, Department of Biochemistry & Biophysics, College Station, TX (Nov 2007)

Conference Speaker, The 21st Annual Gibbs Conference on Biothermodynamics, Touch of Nature, IL (Sep 2007)

International Speaker, Laboratory of Molecular Biology, Cambridge, UK (Mar 2007)

Seminar Speaker, University of Virginia, Dept. of Physiology and Biophysics, Charlottesville, VA (Jan 2007)

Seminar Speaker, North Carolina State University, Department of Biochemistry, Raleigh, NC (Jan 2007)

2006

Conference Speaker, Gordon Research Conference on Reversible Associations in Structural and Molecular Biology, Ventura, CA, (Jan 2006)

Seminar Speaker, Virginia Commonwealth University, Dept. of Biochemistry, Richmond, VA (Mar 2006)

Conference Speaker, Gordon Research Conference on Biopolymers, Newport, RI (Jun 2006)

Session Organizer and Invited Speaker, FASEB Summer Research Conference on Membrane Molecular Biophysics, Saxtons River, VT (Jul 2006)

International Speaker, The 15th International Symposium on Analytical Ultracentrifugation, University College London, UK (Apr 2006)

International Speaker, University of Glasgow, Glasgow, UK (Apr 2006)

International Speaker, University of Oxford, Division of Structural Bioinformatics and Computational Biochemistry, Oxford, UK (Apr 2006)

International Speaker, University of York, Division of Biochemistry, York, UK (Apr 2006)

Seminar Speaker, University of Maryland, Department of Chemistry and Biochemistry, College Park, MD (Apr 2006)

Informal Seminar, Yale University, Department of Molecular Biophysics and Biochemistry, New Haven, CT (Jun 2006)

2005

Conference Speaker, The Ninth Symposium on Modern Analytical Ultracentrifugation, University of Connecticut (Jun 2005)

Keynote Speaker, Howard Hughes Undergraduate Symposium, University of Richmond, Richmond, VA (Sep 2005)

Seminar Speaker, City University of New York, Department of Chemistry, New York, NY (Nov 2005)

2004

Seminar Speaker, Pfizer Central Research, Groton, CT (Jun 2004) (Cancelled at the last minute due to illness.)

Conference Speaker, The Ninth Symposium on Modern Analytical Ultracentrifugation, University of Connecticut (Jun 2004) (Cancelled due to illness.)

Conference Speaker, FASEB Summer Research Conference on Membrane Molecular Biophysics, Tucson, AZ (Jun 2004) (Cancelled due to illness.)

Seminar Speaker, University of Kansas Medical Center, Department of Biochemistry and Molecular Biology, Kansas City, KS (Oct 2004)

Seminar Speaker, SUNY Stony Brook, Department of Biochemistry and Cell Biology, Stony Brook, NY (Nov 2004)

2003

Seminar Speaker, University of Vermont, Department of Biochemistry, Burlington, VT (Jan 2003)

Seminar Speaker, Johns Hopkins Medical School Department of Biological Chemistry, (May 2003)

Seminar Speaker, Laboratory of Chemical Physics, National Institutes of Health, Bethesda, MD (Jul 2003)

Conference Speaker, The Seventeenth Symposium of the Protein Society, Boston MA (Jul 2003)

Seminar Speaker, Carnegie Institute of Washington, Baltimore, MD (Sep 2003)

2002

Session Chair, FASEB Summer Research Conference on Membrane Molecular Biophysics, Saxtons River, VT (Jul 2002)

International Speaker, Euro-conference on Advances in Analytical Ultracentrifugation and Hydrodynamics, Macromolecular Solution Structure and Interactions in Biological and Synthetic Systems, Autrans, France (Jun 2002)

International Speaker, CNRS National Laboratory, Department of Biophysics, Paris, France (Jun 2002)

Seminar Speaker, University of Delaware, Department of Chemistry, Newark, DE.

Seminar Speaker, Brandeis University, Department of Biochemistry, Waltham, MA (Feb 2002).

Conference Speaker, Self-Organizing Biomolecules: The Evolving Picture, The Institute for Complex Adaptive Matter, Los Alamos National Laboratory, Santa Fe, NM

Seminar Speaker, Juniata College, Department of Chemistry, Huntingdon, PA

2001

Seminar Speaker, Pennsylvania State University, Department of Biochemistry, Hershey, PA (Jan 2001)

Keystone Meeting on Membrane Protein Structure/Function, Lake Tahoe, CA (Mar 2001)

International Speaker, Keihanna International Symposium on Solution Interactions, Kyoto, Japan (Jul 2001)
International Speaker, Nara Women's University, Department of Biochemistry, Nara, Japan (Jul 2001)
Seminar Speaker, Colgate University, Departments of Physics and Biology, Hamilton, NY
Seminar Speaker, Hamilton College, Department of Biology, Clinton, NY

2000

Seminar Speaker, Johns Hopkins Medical School, Department of Cell Biology and Anatomy, Baltimore, MD
Conference Speaker, Fourteenth Annual Gibbs Conference on Biothermodynamics, Carbondale, IL, (Oct 2000)
International Speaker, The 12th International Symposium on Hydrodynamics, Glasgow, Scotland (Sep 2000)

Student Mentoring

Eleven PhD students

Abigail Kroch (Doura), PhD 2006
Immediately after graduating: NIH Postdoctoral Fellow with Keith Yamamoto at UCSF
Masters in Public Health, UC Berkeley (2011)
Current: Epidemiologist for the state of California

Ann Marie Stanley, PhD 2007
Immediately after graduating: NIH Postdoctoral Fellow with Tom Rappoport at Harvard University (2007-2010)
Current: PRAT Fellow with Susan K. Buchanan NIDDK, NIH (2011-Present).

Nancy Kathleen Burgess, PhD 2009
Immediately after graduating: Presidential Management Fellow at the US Dept. of Defense

Alexandra Ebie Tan, PhD 2009
Immediately after graduating: UC Berkeley Health Sciences Program Coordinator
Current: Post-bac coordinator Johns Hopkins University

C. Preston Moon, PhD 2011
Immediately after graduating: Seeking postdoctoral position in San Luis Obispo, CA.

Emily Danoff, PhD, 2014
Immediately after graduating: Lab manager, NIH

Sarah McDonald, PhD, 2016
Immediately after graduating: Postdoctoral Fellow with Francis Valiyaveetil at Oregon Health & Science University

Clifford Sandlin, 2012 – Present, Current Student
Ashlee Plummer, 2013 – Present, Current Student
Henry Lessen, 2014 – Present, Current Student
Dagan Marx, 2015 – Present, Current Student

Chair's Mentor, Gordon Research Symposium on Biomolecular Interactions and Methods, Jan 2010. This is a meeting organized by and for student and postdoctoral scientists. I mentored the two co-Chairs in the organization of this meeting. The two co-chairs were Dr. Ann Marie Stanley (Harvard), and Ms. Rachel Farrow (a graduate student in Justin Molloy's lab at the NIMR, London).

Undergraduate Research Mentor for 14 JHU Biophysics BA candidates; four of whom have earned authorship on publications for their research in the laboratory. (Leo Dubrovsky, Sarah Kwon, Anthony Treubodt, Diana DeAndrade, Margo Goodall, Shawn Costello, Quenton Bubb, Ellie Burton)

Postdoctoral Mentoring

Three Postdoctoral Scientists

Felix Kobus, Ph. D., Postdoctoral Associate 2001-2003
Current: High school science teacher in Sydney, Australia

Nathan R. Zaccai, Ph. D., 2011-2013
Visiting scientist from the University of Bristol

Dennis Gessmann, Ph. D., 2012-2014
Current: Industry scientist

University Service

2016-2017	Co-Chair, Status of Women Committee, Krieger School of Arts & Sciences
2015-2016	Member, Faculty Search Committee, Department of Physics
	Member, Provost's Prize for Faculty Excellence in Diversity Selection Committee
	Chair, Dissertation Defense Committee (John Froehlig)
2008–Pres.	Director of Undergraduate Studies for the biophysics major
	Manage academic affairs of ~50 biophysics majors
	Extensively interact with freshman interested in the major
	Coordinate an undergraduate mentoring program for our majors
	Organize social gatherings for current majors
	Conduct open houses for prospective high school students and their parents
	Conduct open house for new freshmen
	Attend academic ceremonies
	Coordinate an undergraduate newsletter
	http://biophysics.jhu.edu/undergraduate_newsletter.html
	Conduct exit interviews with graduating seniors
	Coordinate student awards
2011-2012.	Member, Dean's Teaching Fellowship Selection Committee
2009-2010	Interviewed Fulbright Applicants from JHU
2009	Member, Woodrow Wilson Selection Committee
2008- 2011.	Member Pre-professional Advising Committee
2001- Pres.	Committee member for 28 Graduate Board Oral Exams
2001- Pres.	Committee member for 13 Thesis defense exams
2001- Pres.	Thesis review committee, Jenkins Dept. Biophysics
2001- 2012	Thesis review committee, JHU Program in Molecular Biophysics
2001-2009	Teaching Assistant Coordinator, Jenkins Dept. Biophysics
2002-2008	Director of Graduate Student Advising, Jenkins Dept. Biophysics,
2002-2004	Member, Molecular Biophysics First Year Proficiency Exam
2002	Member, Woodrow Wilson Selection Committee
2001	Member, Howard Hughes UG Summer Research Selection Committee

Extramural Service

Empowering Women in Science & Engineering

2016	*Speaker*, *Symposium on Social Science of Diversity Equity* American Chemical Society Fall Meeting, Philadelphia, PA (Aug 2016)
2015	*Invited Speaker*, Seminar on Enhancing the Potential of Women in STEM Department of Chemical and Biomolecular Engineering, Johns Hopkins University, Baltimore, MD (Oct 2015)
2015	*Invited Speaker*, Seminar on Empowering Women on Overcoming Bias & Barriers in Science. Vanderbilt University, Nashville, TN (Apr 2015)
2014	*Workshop Presenter*, Diversity Leadership Council Annual Meeting, Johns Hopkins University (Oct 2014)
2014	*Workshop Leader*, "Overcoming Bias and Barriers to Achieve Gender Equity in STEM" Johns Hopkins University Diversity Conference, Baltimore, MD (Oct 2014)
2014-Pres.	*Founder*, Workshop Series on Achieving Gender Equity in Science *These workshops were recognized by a JHU Diversity Recognition Award in 2015.* This is a series of workshops that have the goal of raising awareness about the barriers faced by women in STEM. People of all genders are welcome to attend and participate, but it is hoped that this will have the most impact on women graduate students to empower them in their career path in science. The schedule as well as links to papers in the social psychology literature and popular press can be found here: http://genderequityinscience.wordpress.com/
2014	*Invited Speaker*, Seminar on Overcoming Bias & Barriers to Achieve Gender Equity in Science. Rosetta Conference, Leavenworth, WA (Jul 2014)
2014	*Panel Member*, Women's Networking Panel, ASBMB National Meeting, San Diego, CA (Apr 2014)

Organizational

2015	Chair of the inaugural Gordon Research Conference sponsored meeting on Membrane Protein Folding, Waltham, MA (Jun 2015)
2015	Co-chair (with Enrique De La Cruz, Yale Univ.) of the 59th meeting of the Biophysical Society, Baltimore, MD (Feb 2015)
2014-2017	Elected Member of Council, American Society for Biochemistry and Molecular Biology
2014	Theme Sessions Organizer for Lipids & Proteins, ASBMB National Meeting, San Diego, CA (Apr 2014)
2012-2013	Elected Member of the Executive Board, The Biophysical Society
2013	International Scientific Organizing Committee, 21st International Conference on Analytical Ultracentrifugation, Atami, Shizuoka, Japan (Sep 2013)
2011-2014	Elected Member of Council, The Biophysical Society
2011-2014	Member, Program Committee for the 57th and 58th meetings of the Biophysical Society (2013 & 2014 meetings)
2011-2013	Co-chair (with James Bowie, UCLA) of a new thematic meeting on Membrane Protein Folding. Inaugural meeting held in May 2013 in Seoul, Korea; Jointly sponsored by the Korean and US Biophysical Societies
2011-2012	Scientific Organizing Committee, 20th Analytical Ultracentrifugation Conference, San Antonio, TX (Mar 2012)

2010-2011	President, The Gibbs Society of Biothermodynamics
2011	Member, Meeting Organization Committee, 25th Gibbs Conference on Biothermodynamics, Carbondale, IL (Sep 2011)
2011-Pres.	Webmaster, Gibbs Society of Biothermodynamics
2010	Chair, Gordon Research Conference on Biomolecular Interactions & Methods, Galveston, TX (Jan 2010)
2009	Scientific Organizing Committee, The 18th International Symposium on Analytical Ultracentrifugation and Hydrodynamics, Uppsala, Sweden (Sep 2009)
2008	Vice Chair, Gordon Research Conference on Biomolecular Interactions & Methods, Ventura, CA (Jan 2008)
2006	Co-Chair, The 20th Annual Gibbs Conference on Biothermodynamics, Touch of Nature, IL (Oct 2006)
2001	Scientific Organizing Committee, The Keihanna International Symposium on Solution Interactions, Kyoto, Japan (Jul 2001)

Advisory

2006-2014	Member, various NSF Review Panels for the Divisions of Molecular Biophysics, Advancing Theory in Biology, Membrane Dynamics and Biophysics, Physics of Living Systems, and Career Panels.
2013-Pres.	Member, NIH BBM Study Section
2012	Member, BCMB-H Study Section, Internet Assisted Review, Jul 2012
2012	External Thesis Examiner, Yale University, (Andrew Miranker, PI)
2009	Ad hoc Member, NIH Study Section BBM, Biophysics of Membranes, Fall panel
2009	International External Thesis Examiner, University of Melbourne, Dept. Biochemistry (Geoff Howlett, PI)
2009	International Grant Reviewer, FONDECYT Program, Chile
2009	External Reviewer, NSF, Shared Instrumentation Study Section
2008-2014	External grant reviewer, NSF, Various Divisions
2006	External Thesis Examiner, Yale University, Dept. Pharmacology (Andrew Miranker, PI)
2005	Swarthmore College Honors Examiner (Kathleen Howard, PI)
2002-2005	Member, NIH Study Section for Shared Instrumentation Grant Program

Editorial

2003- Pres.	Member, Editorial Board, *Proteins*
2006	Contributing Member, Faculty of 1000.
2000- Pres.	Reviewer of manuscripts for *Science*, *Nature*, *PNAS*, *Structure*, *Journal of Molecular Biology*, *Biochemistry*, *Protein Science*, *Proteins*, *Biophysical Journal*, *BBA Biomembranes*.

Community

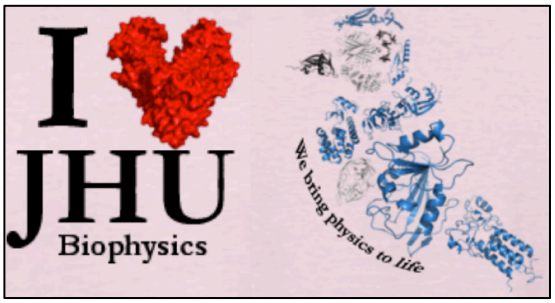
2012	Faculty Advisor for the USA Science & Engineering Fair, Washington, DC Apr 28-29, 2012
2012	Science Fair Judge, Montgomery County Regional Science Fair, MD
2008-2011	Math and Science tutor for 6th-8th graders at Severna Park Middle School, Severna Park, MD

Teaching

My current teaching load is the equivalent of 1.5 semesters per academic year. My teaching style stems from the belief that students should be actively engaged in the learning process. I tend to organize class time into either Socratic or small group, student led investigations of problems with the goal of illustrating important concepts.

250.421 Advanced Seminar in Membrane Protein Structure Function & Pharmacology (2013-Pres., Even years)

I teach this literature based capstone course to senior undergraduate Biophysics majors. We cover fundamental literature on membrane bilayer structure, membrane protein folding and thermodynamics, transporter regulation, ion channel structure and function. I include a writing component in this course to help students develop scientific writing skills.



Front (left) and back (right) of 2012 winning T-Shirt design. The Blue Jay on the right is the JHU mascot and was created by the freshmen using nine different PDB files. The students chose pink for the 2012 T-shirt color, but this varies from year to year.

250.420 Macromolecular Binding (2015-Pres., Odd years)

Alternating with 250.421, I teach this undergraduate elective course on macromolecular interactions. We cover the mathematical formalisms for binding reactions; students are instructed in modeling of reactions using MATLAB; and the last part of the course is a seminar style discussion of key binding literature. I include a writing component in this course to help students develop scientific writing skills.

250.383 Molecular Interactions Laboratory (2009-2012.)
Originally titled 250.382 Molecular Biophysics Laboratory

I designed and introduced this capstone laboratory course for juniors and seniors in Spring 2009 and teach everything except the NMR lectures. This is an active-learning discovery class in which students experience circular dichroism and fluorescence spectroscopy, calorimetry, sedimentation equilibrium, and sedimentation velocity ultracentrifugation to investigate yet-unstudied properties of proteins that relate to their folding and interactions. Students collect and fit data using appropriate equations and software and evaluate goodness of fit using statistical tools and residual graphs. For most techniques, the students are given a large leeway in experimental design so that they can explore questions that interest them.

In addition, students learn basic crystallography theory, grows crystals of lysozyme, learn to seed crystals, and use Coot to build atomic coordinates into density maps. In 2011, a writing component was introduced to this course, which requires a minimum of 20 written pages by students with at least one (usually more) editing exchange between me and the students. I teach the Molecular Interactions course in my laboratory using our research grade equipment.

250.131 Topics in Biophysics Research (freshman seminar) (2004-Pres)

I teach half of this course and completely revamped my sections to introduce modern Biophysics concepts and research areas through active student participation. I cover molecular interactions and structures, bioinformatics, Boltzmann and kinetic energies. Since most students have limited backgrounds and are generally taking Introductory Chemistry, the level is necessarily basic, but the active learning strategies lead to some interesting and stimulating discussions. The activities are a mix of group and individual-driven initiatives. Some examples include:

- I teach them about the amino acid interactions important in protein folding using a meet and greet activity in which students are assigned functional groups and must meet all other

members of the class and decide if their functional groups will interact "favorably" or "unfavorably" and to decide what kind of interaction they will have (H-bond, ionic, van der Waals). By the end they know the different interactions, the distinction between amino acid types, and they have met all the other students in the course, which fosters a sense of community for our majors from their earliest days at Hopkins.

- I bring them into our computer room and teach them the basics of the Protein Data Bank. They each have their own computer, and they learn to download structures and visualize them in several different representations using PyMOL. We start with rhodopsin in which they receive instructions on exactly what to click and type, but the homework for this lab is to pick a structure of their choice and generate a slide to present in class. The final project in the course is an "epic T-shirt competition" in which they are divided into groups that design a freshman T shirt that must have a "JHU Biophysics" theme and include a molecular image they generate using PyMOL. The whole class votes to determine the winning shirt, which I then order and give out in the spring semester.
- I designed a mutations dice game to illustrate principles of evolution as applied to the sequence of a zinc finger. Students do this in small groups, and after a few rounds of "evolution", we discuss PAM and BLOSSUM substitution matrices and how mutations propagate to populations. We follow this session with one in the computer lab in which they are exposed to BLAST searches using the different substitution matrices.

250.690 Methods in Molecular Biophysics (2001-2008)

I organized and served as the main lecturer for this graduate course, which emphasizes the Physics and Chemistry underlying the most frequently employed biophysical methods. I taught the spectroscopy (basic quantum mechanics, absorbance, fluorescence and circular dichroism spectroscopy, light scattering) and analytical ultracentrifugation (sedimentation velocity and equilibrium) sections; the course also included NMR spectroscopy and crystallography taught by other faculty members.

250.690 Methods in Molecular Biophysics (2009-Pres)

I teach the analytical ultracentrifugation (sedimentation velocity and equilibrium) sections in this course.

250.644 Graduate Biophysical Chemistry (2014)

I teach lectures on proteins structure and forces.

250.372, Introduction to Biophysical Chemistry From 2004-2006 I contributed statistical thermodynamics and molecular binding lectures to this undergraduate course.