

Songon “Song” An, Ph.D.**Associate Professor**

Department of Chemistry and Biochemistry, University of Maryland, Baltimore County (UMBC)

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Work: san@umbc.edu Tel: 410-455-2514**Education**

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Yonsei University, Seoul, South Korea	B.S.	02/1997	Chemistry
Yonsei University, Seoul, South Korea (with Prof. Kwan Soo Kim (retired))	M.S.	02/1999	Organic Synthesis
University of Minnesota, Minneapolis, MN (with Prof. Karin Musier-Forsyth, currently at the Ohio State University, Columbus, OH)	Ph.D.	08/2005	Biological Chemistry
Pennsylvania State University, University Park, PA (with Prof. Stephen J. Benkovic)	Postdoctoral	08/2011	Biochemistry & Cell Biology

Academic Appointments

2019-present	<u>Faculty Member</u> , Graduate Program in Molecular and Cellular Biology (MOCB), University of Maryland Baltimore County (UMBC), Baltimore, Maryland
2018-present	<u>Associate Professor with Tenure</u> , Department of Chemistry and Biochemistry, UMBC, Baltimore, Maryland
2018-present	<u>Faculty Member</u> , Program in Oncology, University of Maryland Marlene and Stewart Greenebaum Cancer Center (UMGCCC), University of Maryland Medical School, Baltimore, Maryland
2011-present	<u>Faculty Member</u> , Graduate Program in Life Sciences (GPILS), Department of Biochemistry and Molecular Biology, UMB, Baltimore, Maryland
2011-2018	<u>Assistant Professor</u> , Department of Chemistry and Biochemistry, UMBC, Baltimore, Maryland

Grant Review Panels/Reviewers

- NIH F04S Study Section (2023)
- NIH/NCI ZCA1 SRB-K(O1) P Study Section (2021)
- ERC (European Research Council), European Union (2020)
- NIH MSFA Study Section (2019)
- ANR (Agence Nationale De La Recherche), France (2018, 2020)
- NIH Early Career Reviewer, NIH MSFC Study Section (2016)
- MRC (Medical Research Council), Research Grant, UK (2016)
- NSF Graduate Research Fellowship Program (2015, 2017)

Editorial/Advisory Board Members (Selected)

- 2023-present Associate Editor, the Cellular Biochemistry section in *Frontiers Journals*: *Frontiers in Chemistry*, *Frontiers in Molecular Biosciences*, and *Frontiers in Cell and Developmental Biology*
- 2023-present Review Editor, the Molecular Biophysics section in *Frontiers Journals*: *Frontiers in Chemistry*, *Frontiers in Molecular Biosciences*, and *Frontiers in Cell and Developmental Biology*
- 2016-2021 *Scientific Reports* (Nature Publishing Group)

- 2014-present Global Technology Cooperation Group, the Korea Institute for Advancement of Technology (KIAT)
- 2014-2017 AACR-Chemistry in Cancer Research Working Group, American Association for Cancer Research (AACR)
- 2013-2022 Faculty of 1000 (F1000) for Chemical Biology

Scholarships, Fellowships, and Awards (Selected)

- 2020, The Mid-Career Faculty Excellence Award, UMBC
- 2018, NIH/NCI R03 Award
- 2017, NIH/NIGMS R01 Award
- 2016, AACR-Bayer Innovation and Discovery Award
- 2012 & 2014, UMBC Summer Faculty Fellowship
- 1998, Graduate Student Academic Achievement Award, Lotte Scholarship Foundation, South Korea
- 1996, International Undergraduate Research Internship Award, The International Association for the Exchange of Students for Technical Experience (IAESTE)
- 1995, Undergraduate Academic Achievement Award, Shell Pacific Enterprises Ltd Korea Branch, South Korea

Conference/Workshop/Symposium Organized

- 2024 May 4: The Mid-Atlantic Frontiers in Chemistry and Biology Interface Symposium (FCBIS), UMBC, Baltimore, MD. (*together with* Drs. Chengpeng Chen, Deepak Koirala, Herana Kamal Seneviratne, and Aaron T. Smith (UMBC))
- 2022 Dec 3-7: Special Interest Subgroup – Organization and Regulation of Cell Metabolism by Enzyme Assemblies: Metabolons and Filaments, Cell Bio 2022 – ASCB/EMBO meeting, Washington, DC. (*together with* Dr. Justin Kollman (Univ of Washington, Seattle) and Dr. John Calise (Univ of Washington, Seattle))
- 2019 Nov 9: The 6th Chesapeake Bay Area Single Molecule Biology (CbaSMB) Meeting, UMBC, Baltimore, MD. (*together with* Dr. Minjoung Kyoung (UMBC))
- 2015 May 16: The Mid-Atlantic Frontiers in Chemistry and Biology Interface Symposium (FCBIS), UMBC, Baltimore, MD. (*together with* Drs. James Fishbein, Elsa Garcin, Marie-Christine Daniel, Marcin Ptaszek, and Ryan White (UMBC))

Publications from UMBC, Baltimore, MD

Since August 23, 2011, I have mentored a total of 48 students/trainees at UMBC (*as of February 2024*), which include senior research scientists (2), postdoctoral scholars (3), graduate students (8), undergraduate students (30) and high-school students (5). Noticeably, a former senior research scientist (Dr. M Kyoung) is now a tenured Associate Professor at UMBC, and a former graduate student (Dr. DL Schmitt) is a tenure-track Assistant Professor at the University of California, Los Angeles (UCLA). Also, 12 of 30 undergraduate students and 2 of 5 high-school students are from underrepresented minority (URM) groups. Note that URM and non-URM undergraduate students who have contributed to scholarly articles are highlighted with red and blue, respectively, in the cited articles here. URM graduate students are also highlighted with purple.

1. Schmitt DL[†], Dranchak P[†], Parajuli P, Blivis D, Voss T, Kohnhorst CL, Kyoung M, Inglese J, **An S***. High-throughput screening identifies cell cycle-associated signaling cascades that regulate a multienzyme metabolic assembly in human cells. *PLoS One* (2023) 18, e0289707 [PMCID:10403072] and *bioRxiv* (2022) Available from: <https://doi.org/10.1011/2022.06.10.495654>
2. Jeon M, Schmitt DL, Kyoung M, **An S***. Size-specific modulation of a multienzyme glucosome assembly during the cell cycle. *ACS Bio & Med Chem Au* (2023) 3, 461-470 [PMCID: 10591302] (selected as the front cover) and *bioRxiv* (2022) Available from: <https://doi.org/10.1101/2022.01.06.475270>
3. Kang HW*, Nguyen L, **An S***, Kyoung M*. Mechanistic insights of glucosome condensate formation by stochastic modeling approaches *bioRxiv* (2022) [Preprint] Available from: <https://doi.org/10.1101/2022.06.27.497813>
4. Kennedy EL, Jeon M, Augustine F, Chauhan KM, **An S**, Kyoung M*. Functional regulation of 4D metabolic network between multienzyme glucosome condensates and mitochondria in living cells. *bioRxiv* (2022) [Preprint] Available from: <https://doi.org/10.1101/2022.05.16.491844>
5. Jeon M, Chauhan KM, Szeto GL, Kyoung M, **An S***. Subcellular regulation of glucose metabolism through multienzyme glucosome assemblies by EGF-ERK1/2 signaling pathways. *J. Biol. Chem.* (2022) 298, 101675 [PMCID: 8892083]

6. **An S***, Parajuli P, **Kennedy EL**, Kyoung M* Multi-dimensional fluorescence live-cell imaging for glucosome dynamics in living human cells. *Methods Mol. Biol.* (2022) 2487, 15-26 [PMCID:9191769]
7. **An S**, Schmitt DL, Inglese J, Dranchak P "High content screening identifies the association of the cell cycle with the multienzyme metabolic assembly of glucose metabolism" *Patent* (2019) Application No.16/452767. Filing Date (06/26/2019) & Publication (12/26/2019)
8. **An S***, Jeon M, **Kennedy EL**, Kyoung M* Phase-separated condensates of metabolic complexes in living cells: purinosome and glucosome. *Methods Enzymol.* (2019) 628, 1-17 [PMID:31668224]
9. Jeon M, Kang H-W*, **An S*** A mathematical modeling of the enzyme clustering in glucose metabolism. *Sci. Rep.* (2018) 8, 2696 [PMCID: 5807315]
10. Schmitt DL, Sundaram A, Jeon M, **Luu, B-T**, **An S*** Spatial alterations of de novo purine biosynthetic enzymes by Akt-independent PDK1 signaling pathways. *PLoS One.* (2018) 13, e0195989 [PMCID: 5905998]
11. Schmitt DL, **An S*** Spatial organization of metabolic enzyme complexes in cells. *Biochemistry* (2017) 56, 3184-3196 [PMCID: 5574030]
12. Kohnhorst CL[†], Kyoung M[†], Jeon M, Schmitt DL, **Kennedy EL**, **Ramirez J**, **Bracey SM**, **Luu B-T**, **Russell SJ**, **An S*** Identification of a multienzyme complex for glucose metabolism in living cells. *J. Biol. Chem.* (2017) 292, 9191-9203 [PMCID: 5454101]
13. Schmitt DL, Cheng Y, Park J, **An S*** Sequestration-mediated downregulation of de novo purine biosynthesis by AMPK. *ACS Chem. Biol.* (2016) 11, 1917-1924 [PMCID: 5675104]
14. Kohnhorst CL, Schmitt DL, Sundaram A, **An S*** Subcellular functions of proteins under fluorescence single-cell microscopy. *BBA - Proteins and Proteomics* (Special Issue of Physiological Enzymology) (2016) 1864, 77-84 [PMCID: 5679394]
15. Kyoung M, **Russell SJ**, Kohnhorst CL, **Esemoto NN**, **An S*** Dynamic architecture of the purinosome involved in human de novo purine biosynthesis. *Biochemistry* (2015) 54, 870-880 [PMCID: 5678927]

* Corresponding author [†] Equal Contribution

Publications from the Penn State University, University Park, PA

16. Davis BW, Aumiller WM, Hashemian N, **An S**, Armaou A, Keating CD* "Colocalization and sequential enzyme activity in aqueous biphasic systems: experiments and modeling" *Biophysical J.* (2015) 109, 2182-2194 [PMCID: 4656855]
17. French JB, Zhao H, **An S**, Niessen S, Deng Y, Cravatt BF, Benkovic SJ* The Hsp70/Hsp90 chaperone machinery is involved in the assembly of the purinosome. *Proc. Natl. Acad. Sci. USA* (2013) 110, 2528-2533 [PMCID: 3574928]
18. Deng Y, Gam J, French JB, Zhao H, **An S**, Benkovic SJ* "Mapping protein-protein proximity in the purinosome" *J. Biol. Chem.* (2012) 287, 36201-36207 [PMCID: 3476287]
19. Verrier F, **An S**, Fang Y, Benkovic SJ "Methods to identify targets and molecules regulating purinosomes and their uses" *Patent* (2012) Application No.13/185018. Filing Date (7/18/2011) & Publication (07/26/2012)
20. Verrier F[†], **An S**[†], Ferrie AM, Sun H, Kyoung M, Deng H, Fang Y, Benkovic SJ* GPCR signaling regulates the assembly of a multienzyme complex for purine biosynthesis. *Nat. Chem. Biol.* (2011) 7, 909-915 [PMCID: 3218230]
21. **An S**, Deng Y, Tomsho JW, Kyoung M, Benkovic SJ* Microtubule-assisted mechanism for functional metabolic macromolecular complex formation. *Proc. Natl. Acad. Sci. USA* (2010) 107, 12872-12876 [PMCID: 2919939]
22. **An S**, Kyoung M, Allen JJ, Shokat KM, Benkovic SJ* Dynamic regulation of a metabolic multi-enzyme complex by protein kinase CK2. *J. Biol. Chem.* (2010) 285, 11093-11099 [PMCID: 2856985]
23. **An S***, Kumar R, Sheets ED*, Benkovic SJ* Reversible compartmentalization of de novo purine biosynthetic complexes in living cells. *Science* (2008) 320, 103-106 [PMID: 18388293]

* Corresponding author [†] Equal Contribution

Publications from University of Minnesota, Twin Cities, MN

24. So BR, **An S**, Kumar S, Das M, Turner DA, Hadad CM, Musier-Forsyth K* Substrate-mediated fidelity mechanism ensures accurate decoding of proline codons. *J. Biol. Chem.* (2011) 286, 31810-31820 [PMCID: 3173103]
25. Mascarenhas A, **An S**, Rogen AE, Martinis S, Musier-Forsyth K* Fidelity mechanism of aminoacyl-tRNA synthetases in *Protein Engineering* (2009) Eds. Uttam L. RajBhandary and Caroline Köhrer, Springer-Verlag Berlin Heidelberg, ISBN: 978-3-540-70937-4, e-ISBN: 978-3-540-70941-1, pp155-203

26. Burke B, **An S**, Musier-Forsyth K* Functional guanine-arginine interaction between tRNA^{Pro} and Pprolyl-tRNA synthetase that couples binding and catalysis. *BBA - Proteins and Proteomics* (2008) 1784, 1222-1225 [PMCID: 2559941]
27. **An S**, Barany G, Musier-Forsyth K* Evolution of acceptor stem tRNA recognition by class II prolyl-tRNA synthetase. *Nucleic Acids Res.* (2008) 36, 2514-2521 [PMCID: 2377447]
28. **An S**, Musier-Forsyth K* Cys-tRNA^{Pro} Editing by *Haemophilus influenzae* YbaK via a novel synthetase-YbaK-tRNA ternary complex. *J. Biol. Chem.* (2005) 280, 34465-34472 [PMID: 16087664]
29. **An S**, Musier-Forsyth K* Trans-editing of Cys-tRNA^{Pro} by *Haemophilus influenzae* YbaK protein. *J. Biol. Chem. - Accelerated Publication* (2004) 279, 42359-42362 [PMID: 15322138]

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Invited Lectures/Seminars (Since 2009)

Academic Departments/Institutions

- 2023 November 15: Department of Chemistry and Biochemistry, Montclair State University, Montclair, NJ
- 2021 March 1*: The Graduate School of "Protein Complex Assembly," Braunschweig University of Technology, Germany ([Invitation from Graduate Student Association](#))
- 2020 February 25: Department of Chemistry and Biochemistry, University of Maryland, College Park, MD
- 2018 October 24: Department of Chemistry and Chemical Biology, Northeastern University, Boston, MA
- 2018 September 13: Department of Chemistry and Biochemistry, The Ohio State University, Columbus, OH
- 2018 February 23: Department of Chemistry and Biochemistry, University of Texas, Arlington, TX
- 2017 September 15: Department of Chemistry and Biochemistry, UMBC, Baltimore, MD
- 2017 May 16: Department of Pharmacology & Department of Chemistry and Biochemistry, University of California, San Diego, CA
- 2017 April 13: Department of Chemistry, Penn State University, University Park, PA
- 2017 March 3: Department of Biological Sciences, Marquette University, Milwaukee, WI
- 2017 March 2: Department of Chemistry and Biochemistry, George Mason University, Manassas and Fairfax, VA
- 2016 November 2: The Institute for Structural Biology, Drug Discovery and Development (ISB3D), School of Pharmacy, Virginia Commonwealth University, Richmond, VA
- 2016 September 26: Department of Chemistry and Biochemistry, University of Delaware, Newark, DE
- 2014 February 10*: Department of Biochemistry and Molecular Biology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD ([Invitation from Graduate Student Association](#))
- 2013 February 8: Department of Chemistry and Biochemistry, George Washington University, Washington, DC
- 2012 September 26: Department of Biological Sciences, UMBC, Baltimore, MD
- 2011 February: Department of Biochemistry and Biophysics, University of Pennsylvania School of Medicine, Philadelphia, PA
- 2011 January: Department of Biochemistry, University of Texas Southwestern Medical Center, Dallas, TX
- 2011 January: Department of Chemistry and Biochemistry, UMBC, Baltimore, MD
- 2010 December: Department of Chemistry, University of Michigan, Ann Arbor, MI
- 2010 March: Department of Chemistry and Chemical Biology, and the Weill Institute of Molecular and Cell Biology, Cornell University, Ithaca, NY
- 2009 September: Rockefeller University, New York, NY
- 2009 February: Cardiovascular Research Institute, University of California, San Francisco, CA
- 2009 January: Departments of Chemistry, and Molecular and Cell Biology, University of California, Berkeley, CA

Conferences/Workshops

- 2021 July 15: Virtual InSiDE Seminar Series – Signaling Dynamics and Encoding, Organized by Dr. John Albeck (Chair) at the University of California, Davis.
- 2019 April 12: Keystone Symposia - Biomolecular Condensates: Phase-Separated Organizers of Cellular Biochemistry, Snowbird, Utah, USA
- 2019 February 21: 2019 Winter Q-Bio: Quantitative Biology on the Hawaiian Islands, Four Seasons Ko Olina, Oahu, HI
- 2018 September 30: The AACR Metabolism and Cancer (Plenary Session 5), New York, NY

- 2018 January 19: Annual Biochemistry and Molecular Biology Retreat, University of Maryland School of Medicine, Baltimore, MD
- 2016 September 7: Biology, Chemistry and Physics of Non-membranous Organelle, Johns Hopkins University School of Medicine, Baltimore, MD
- 2016 August 11: US-Korea Conference 2016 on Sciences, Engineering and Entrepreneurship, Hyatt Regency DFW International Airport, Dallas, TX
- 2016 July 25: Gordon Research Conference: Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2015 January 14: Protein Meet-Up Symposium 2015, The Protein Society, UMBC, Baltimore, MD
- 2014 December 6: Special Interests Subgroup - Cytoophidia, Snakes within the Cell: Compartmentalization and Filamentation of Metabolic Pathways, Annual Meeting of the American Society for Cell Biology (ASCB), Philadelphia, PA
- 2014 January 10: Annual Biochemistry and Molecular Biology Retreat 2014, University of Maryland School of Medicine, Baltimore, MD
- 2013 August 9: Cancer and Metabolism Section, US-Korea Conference 2013 on Sciences, Engineering and Entrepreneurship, Sheraton Meadowlands Hotel and Conference Center, NJ
- 2012 April 28: Annual Frontiers at the Chemistry-Biology Interface Symposium (FCBIS), University of Pennsylvania, Philadelphia, PA
- 2010 December: Special Interests Subgroup - Cell Biology of Metabolic Pathways, 50th Annual Meeting of the American Society for Cell Biology (ASCB), Philadelphia, PA
- 2009 March: National Institutes of Health – Chemical Genomic Center, Rockville, MD

Research Support

Ongoing Research Support

- NIH R01 GM134086 07/01/19-06/30/24 Kyoung (P.I.)
4D Functional Mapping of Glucose Metabolism in Living Cells
Role: Co-Investigator

Completed Research Support (Last 5 Years)

- NIH R01 GM125981 12/04/17-11/30/23 An (P.I.)
A Multienzyme Metabolic Complex for Glucose Metabolism
Role: P.I.
- NIH R03 CA219609 07/03/18-6/30/20 An (P.I.)
Functional Contribution of Metabolic Complex to Cancer Cell Metabolism
Role: P.I.

Teaching at UMBC and University of Maryland, Baltimore (UMB) *(since 2011)*

Primary Responsible Courses at UMBC

- CHEM 438/638: Comprehensive Biochemistry II
: Metabolism and the Central Dogma of Molecular Biology
- CHEM 490/684: Special Topics for Chemistry
: Molecular Imaging for Drug Discovery (including Laboratory Hands-on Activities)

Previously Taught Courses at UMBC

- CHEM 713: Departmental Chemistry and Biochemistry Seminar Series
- CHEM 690: Chemistry Student Seminar
- CHEM 490/684: Special Topics for Chemistry – Cellular Biochemistry
- CHEM 124: Introduction to General, Organic and Biochemistry II

Previously Contributed Courses at UMB

- MBIC/GPLS 709: Advanced Biochemistry

Other Conference Presentations/Participations *(since 2011)*

Enzyme-Focused Conferences

*GRC: Gordon Research Conference

- 2023 July 16-21: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2019 July 21-26: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2018 July 22-27: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2017 June 11-16: GRC - Bioorganic Chemistry, Proctor Academy, Andover, NH
- 2016 July 24-29: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2015 July 12-17: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH
- 2013 July 14-19: GRC - Enzymes, Coenzymes and Metabolic Pathways, Waterville Valley, NH

*Others

- 2017 January 4-8: (*Invited as a Session Chair*) The 25th Enzyme Mechanisms Conference, St Pete Beach, FL

Cancer Metabolism-related Conferences

*AACR: The American Association for Cancer Research

- 2018 September 28-October 1: AACR - Metabolism and Cancer, New York, NY
- 2016 April 16-20: AACR Annual Meeting, Ernest N Memorial Convention Center, New Orleans, LA
- 2015 June 7-10: AACR - Metabolism and Cancer, Hyatt Regency Bellevue, Bellevue, WA
- 2013 September 18-22: AACR - International Conference - Frontiers in Basic Cancer Research, National Harbor, MD
- 2013 April 6-10: AACR Annual Meeting, Washington, DC
- 2011 October 16-19: AACR - Metabolism and Cancer, Baltimore, MD

*Others

- 2018 April 5-6: Strategic Workshop on Imaging Subcellular to Cellular Cancer Biology, NCI and ASCB-Cosponsored, NIH, Natcher Auditorium, Bethesda, MD
- 2014 August 12-16: The CSHL - Mechanisms and Models for Cancer, Cold Spring Harbor Laboratory, NY
- 2013 June 24-25: Cancer and Metabolism-2013, Amsterdam, the Netherlands

Biomolecular Condensate-related Conferences

- 2019 April 10-14: Keystone Symposia - Biomolecular Condensates: Phase-Separated Organizers of Cellular Biochemistry (D5), Snowbird, Utah, USA
- 2019 February 19-22: 2019 Winter Q-Bio: Quantitative Biology on the Hawaiian Islands, Four Seasons Ko Olina, Oahu, HI
- 2016 September 7: Biology, Chemistry and Physics of Non-membranous Organelle, Johns Hopkins University, Baltimore, MD

Other National/International Conferences (Selected)

*ASCB: American Society for Cell Biology

- 2022 December 2-7: The Cell Bio 2022 - The Annual Meeting of ASCB/EMBO, Washington, DC
- 2014 December 6-10: The Annual Meeting of ASCB, Philadelphia, PA

*BPS: Biophysical Society

- 2019 March 2-6: BPS Annual Meeting, Baltimore, MD
- 2015 February 7-11: BPS Annual Meeting, Baltimore, MD

*ASBMB: The American Society for Biochemistry and Molecular Biology

- 2018 April 21-25: The ASBMB Annual Meeting, San Diego, CA
- 2016 April 2-6: Experimental Biology 2016, The ASBMB Annual Meeting, San Diego, CA
- 2015 March 28-April 1: Experimental Biology 2015, The ASBMB Annual Meeting, Boston, MA

*ACS: American Chemical Society

- 2017 August 20-24: ACS National Meeting, Washington, DC.
- 2015 August 16-20: ACS National Meeting and Exposition, Boston, MA

*ABRCMS: Annual Biomedical Research Conference for Minority Students

- 2015 November 11-14: Annual ABRCMS Meeting, Seattle, WA

Other Regional / Local Conferences (Selected)

*FCBIS: Frontiers at the Chemistry-Biology Interface Symposium

- 2021 May 7: Annual FCBIS, University of Maryland, College Park, MD (*Invited as a Session Chair*)
- 2015 May 16: Annual FCBIS, UMBC, Baltimore, MD (*Co-Organizing Committee*)

*Others

- 2019 November 9: The 6th Chesapeake Bay Area Single Molecule Biology Meeting, UMBC, Baltimore, MD (*Co-Organizers*)
- 2017 January 27: Biotech Symposium 2017, The Protein Society, UMBC, Baltimore, MD
- 2016 August 12-14: The Benkovic Symposium, Penn State University, University Park, PA
- 2015 January 14: Protein Meet-Up Symposium 2015, The Protein Society, UMBC, Baltimore, MD