

## Adam Z. Higgins

### Associate Professor

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### EDUCATION

Ph.D. Bioengineering, Georgia Institute of Technology, 2008  
B.S. Bioengineering, Oregon State University, 2002  
B.A. International Studies, Oregon State University, 2002

### ACADEMIC POSITIONS

Assistant Professor, Oregon State University, 2008-2014  
Associate Professor, Oregon State University, 2014-present

### NON-ACADEMIC POSITIONS

Visiting Engineer, Microfluidics Futures Group, HP Inc., Corvallis, OR, 2016-2017

### FIELDS OF SPECIALIZATION

Cryobiology, biopreservation, biotransport, mathematical optimization, microfluidics, blood

### PUBLICATIONS

#### Journal Publications (reverse chronological order)

35. Garcia-Martinez T, Martinez-Rodero I, Roncero-Carol J, Yanez-Ortiz I, Higgins AZ, Mogas T. "Impact of equilibration duration combined with temperature on the outcome of bovine oocyte vitrification." *Theriogenology*, 184: 110-123, 2022
34. Garcia-Martinez T, Martinez-Rodero I, Roncero-Carol J, Vendrell-Flotats M, Gardela J, Gutierrez-Adan A, Ramos-Ibeas P, Higgins AZ, Mogas T. The role of aquaporin 7 in the movement of water and cryoprotectants in bovine in vitro matured oocytes. *Animals*, 12 (4), 530, 2022.
33. Lahmann JM, Faase RA, Leu HY, Jacques SL, Scottoline B, Schilke KF, Baio JE, Higgins AZ. "Microfluidic photoreactor to treat neonatal jaundice." *Biomicrofluidics*, 15 (6): 064104, 2021.
32. Gulieva RE, Higgins AZ. "Human induced pluripotent stem cell derived kidney organoids as a model system for studying cryopreservation." *Cryobiology*, 103: 153-156, 2021
31. Warner RM, Shuttleworth R, Benson JD, Eroglu A, Higgins AZ. "General tissue mass transfer model for cryopreservation applications." *Biophysical Journal*, 120 (22): 4980-4991, 2021.
30. Garcia-Martinez T, Mogas T, Mullen SF, Martinez-Rodero I, Gulieva RE, Higgins AZ. "Effect of cryoprotectant concentration on bovine oocyte permeability and comparison of two membrane permeability modeling approaches." *Scientific Reports*, 11 (1): 1-15, 2021.
29. Warner RM, Ampo E, Nelson D, Benson JD, Eroglu A, Higgins AZ. "Rapid quantification of multi-cryoprotectant toxicity using an automated liquid handling method." *Cryobiology*, 98: 219-232, 2021.
28. Lahmann JM, Sanchez CC, Benson JD, Acker JP, Higgins AZ. "Implications of variability in cell membrane permeability for design of methods to remove glycerol from frozen-thawed erythrocytes." *Cryobiology*, 92: 168-179, 2020.

27. Drake AC, Lee Y, Burgess EM, Karlsson JOM, Eroglu A, Higgins AZ. "Effect of water content on the glass transition temperature of mixtures of sugars, polymers and penetrating cryoprotectants in physiological buffer." *PLOS ONE*, 13 (1): e0190713, 2018.
26. Vasquez A, Sommer KK, Oldenhof H, Higgins AZ, Brockbank K, Hilfiker A, Wolkers W. "Simultaneous monitoring of different vitrification solution components permeating into tissues." *The Analyst*, 143 (2): 420-8, 2018.
25. Lahmann JM, Benson JD, Higgins AZ. "Concentration dependence of the cell membrane permeability to cryoprotectant and water and implications for design of methods for post-thaw washing of human erythrocytes." *Cryobiology*, 80: 1-11, 2018.
24. Benson JD, Higgins AZ, Desai K, Eroglu A. "A toxicity cost function approach to CPA equilibration in tissues." *Cryobiology*, 80: 144-155, 2018.
23. Koretsky MD, Brooks BJ, Higgins AZ. "Written justification to multiple-choice concept questions during active learning in class." *International Journal of Science Education*, 38 (11): 1747-1765, 2016.
22. Moss A, Higgins AZ. "Investigating the potential for cryopreservation of human granulocytes with concentrated glycerol." *Cryobiology*, 72 (3): 290-3, 2016.
21. Runyon DE, Higgins AZ. "The effect of human serum albumin and hematocrit on the cake collapse temperature of lyophilized red blood cells." *Biopreservation and Biobanking*, 13 (5): 376-8, 2015.
20. Davidson AF, Glasscock C, McClanahan DR, Benson JD, Higgins AZ. "Toxicity minimized cryoprotectant addition and removal procedures for adherent endothelial cells." *PLoS One*, 10 (11): e0142828, 2015.
19. Lusianti, RE, Higgins, AZ. "Continuous removal of glycerol from frozen-thawed red blood cells in a microfluidic membrane device." *Biomicrofluidics*, 8: 054124, 2014.
18. Davidson, AF, Benson, JD, Higgins, AZ. "Mathematically optimized cryoprotectant equilibration procedures for cryopreservation of human oocytes." *Theoretical Biology and Medical Modelling*, 11: 13, 2014.
17. Zhurova, M, Lusianti, RE, Higgins, AZ, Acker, JP. "Osmotic tolerance limits of red blood cells from umbilical cord blood." *Cryobiology*, 69 (1): 48-54, 2014.
16. Vian, AM, Higgins, AZ. "Membrane permeability of the human granulocyte to water, dimethyl sulfoxide, glycerol propylene glycol and ethylene glycol." *Cryobiology*, 68 (1): 35-42, 2014.
15. Karlsson, JOM, Szurek, EA, Higgins, AZ, Lee, SR, Eroglu, A. "Optimization of cryoprotectant loading into murine and human oocytes." *Cryobiology*, 68 (1): 18-28, 2014.
14. Higgins, AZ, Karlsson, JOM. "Effect of intercellular junction protein expression on intracellular ice formation in mouse insulinoma cells." *Biophysical Journal*, 105 (9): 2006-2015, 2013.
13. Higgins, AZ, Karlsson, JOM. "Effect of intercellular junction protein expression on water transport during freezing of MIN6 cells." *Cryobiology*, 67 (2): 248-250, 2013.
12. Davidson, AF, Higgins, AZ. "Detection of volume changes in calcein-stained cells using confocal microscopy." *Journal of Fluorescence*, 23 (3): 393-398, 2013.
11. Lusianti, RE, Benson, JD, Acker, JP, Higgins, AZ. "Rapid removal of glycerol from frozen thawed red blood cells." *Biotechnology Progress*, 29 (3): 609-620, 2013.
10. McLean, M, Han, XY, Higgins, AZ. "Spray drying for preservation of erythrocytes: effect of atomization on hemolysis." *Biopreservation and Biobanking*, 11 (2): 122-123, 2013.
9. Fry, AK, Higgins, AZ. "Measurement of cryoprotectant permeability in adherent endothelial cells and applications to cryopreservation." *Cellular and Molecular Bioengineering*, 5 (3): 287-298, 2012.
8. Benson, JD, Kearsley, AJ, Higgins, AZ. "Mathematical optimization of procedures for cryoprotectant equilibration using a toxicity cost function." *Cryobiology*, 64: 144-151, 2012.
7. Higgins, AZ, Karlsson, JOM. "Comparison of cell membrane water permeability in monolayers and suspensions." *Cryo-Letters*, 33 (2): 96-107, 2012.

6. Higgins, AZ, Cullen DK, LaPlaca, ML, Karlsson, JOM. "Cryopreservation of rat embryonic neural cells using dimethyl sulfoxide and a two-step freezing protocol." *Journal of Neuroscience Methods*, 201: 9-16, 2011.
5. Higgins, AZ, Karlsson, JOM. "Analysis of solution exchange in flow chambers with applications to cell membrane permeability measurement." *Cellular and Molecular Bioengineering*, 3 (3): 269-285, 2010.
4. Higgins, AZ, Karlsson, JOM. "Curve fitting approach for measurement of cellular osmotic properties by the electrical sensing zone method. II. Membrane water permeability." *Cryobiology*, 60: 117-128, 2010.
3. Higgins, AZ, Karlsson, JOM. "Curve fitting approach for measurement of cellular osmotic properties by the electrical sensing zone method. I. Osmotically inactive volume." *Cryobiology*, 57: 223-233, 2008.
2. Higgins, AZ, Karlsson, JOM. "Coincidence error during measurement of cellular osmotic properties by the electrical sensing zone method." *Cryo-Letters*, 29 (6): 447-461, 2008
1. Bower, CK, Parker, JE, Higgins, AZ, Oest, ME, Wilson, JT, Valentine, BA, Bothwell, MK, McGuire, J. "Protein antimicrobial barriers to bacterial adhesion: *in vitro* and *in vivo* evaluation of nisin-treated implantable materials." *Colloids and Surfaces B: Biointerfaces*. 25: 81-90, 2002.

#### Archival Conference Publications

44. Warner RM, Brown KS, Eroglu A, Higgins AZ. "Mathematical model of cryoprotectant toxicity for predicting promising mixtures for vitrification." *Cryobiology*, 103, 166-167, 2021
43. Warner RM, Shuttleworth R, Benson JD, Eroglu A, Higgins AZ. "General mass tissue transfer model for cryopreservation applications." *Cryobiology*, 103: 171, 2021.
42. Warner R, Ampo E, Nelson D, Benson J, Eroglu A, Higgins A. "Leveraging high throughput screening to characterize the toxicity of multiple cryoprotectants." *Cryobiology*, 97: 265, 2020.
41. Gulieva R, Warner R, Ampo E, Kuntz T, Tan YH, Nelson D, Benson J, Eroglu A, Higgins A. "High throughput method for characterizing the effects of temperature on cryoprotectant toxicity." *Cryobiology*, 97: 291, 2020.
40. Gulieva R, Higgins A. "Kidney organoids as a model to study CPA toxicity." *Cryobiology*, 97: 263, 2020.
39. Garcia-Martinez T, Higgins AZ, Mullen SF, Mogas T. "Permeability of bovine oocyte membrane to water and CPA is dependent on solute concentration." *Cryobiology*, 91: 166, 2019
38. Warner R, Ampo A, Nelson D, Benson JD, Eroglu A, Higgins AZ. "High throughput screening for development of cryoprotectant toxicity cost functions." *Cryobiology*, 91: 191, 2019
37. Benson JD, Higgins AZ, Desai K, Eroglu A. "A toxicity cost function approach to optimal CPA equilibration in tissues." *Cryobiology*, 91: 147, 2019
36. Higgins AZ. "Concentration dependence of cryoprotectant permeability and implications for design of cryopreservation procedures." *Cryobiology*, 85: 126-7, 2018
35. Warner RM, Higgins AZ. "Biomechanical model of cryoprotectant transport in tissues with high cell density." *Cryobiology*, 85: 154, 2018
34. Warner RM, Nemanic S, Higgins AZ. "Effect of cryoprotectant carrier solution tonicity on transport during organ perfusion." *Cryobiology*, 85: 141, 2018
33. Higgins AZ, Warner R. "Development of organ perfusion strategies to reduce CPA toxicity." *Cryobiology*, 81: 218, 2018.
32. Higgins AZ, Lahmann J, Lusianti R, Benson JD, Acker J. "Design of methods for expedited deglycerolization of cryopreserved red blood cells." *Cryobiology*, 80: 176, 2018.
31. Warner R, Higgins AZ. "Extending single cell cytotoxicity minimization strategies to 3D tissues." *Cryobiology*, 80: 187, 2018.

30. Higgins AZ, Eroglu A, Benson JD. "Extension of cellular toxicity cost functions to tissues." *Cryobiology*, 80: 160, 2018.
29. Warner R, Yang J, Higgins AZ. "Toxicity reduction during organ cryopreservation by manipulating the CPA loading solution." *Cryobiology*, 80: 175, 2018.
28. Burgess E, De La Ree A, Lee Y, Eroglu A, Karlsson JOM, Higgins AZ. "Glass transition temperatures of mixtures of sugars, polymers and penetrating cryoprotectants." *Cryobiology*, 73(3): 439, 2016.
27. Higgins AZ. "Intracellular ice formation, ice recrystallization, and the importance of warming rate." *Cryobiology*, 73(3): 411, 2016.
26. Lahmann JM, Cruz-Sanchez C, Huntley C, Benson JD, Higgins AZ. "Variability in the permeability of the erythrocyte membrane and implications for design of rapid deglycerolization procedures." *Cryobiology*, 71(3): 552, 2015.
25. Moss A, Higgins AZ. "Investigating the potential for cryopreservation of human granulocytes with concentrated glycerol." *Cryobiology*, 71(3): 564, 2015.
24. Lusianti RE, Lahmann JM, Dickinson A, Benson JD, Acker JP, Higgins AZ. "Accelerating post-thaw erythrocyte washing using microfluidics." *Cryobiology*, 71(3): 538-9, 2015.
23. Higgins, AZ. "Designing innovative procedures for avoiding cryoprotectant toxicity." *Cryobiology*, 71(1): 174, 2015.
22. Higgins, AZ. "Kinetic modeling of CPA toxicity and implications for design of cryopreservation procedures." *Cryobiology*, 69(3): 510, 2014.
21. Higgins, AZ, Lusianti, RE. "Microfluidic processing of cryopreserved blood." *Cryobiology*, 69(3): 505, 2014.
20. Vian, AM, Higgins, AZ. "Membrane permeability properties of human granulocytes." *Cryobiology*, 67(3): 435, 2013.
19. Lahmann, JM, Higgins, AZ. "Deglycerolization and separation of human red blood cells in a microfluidic focusing channel." *Cryobiology*, 67(3): 432, 2013.
18. Han, XY, Valdivia, A, Witter, S, Falk, R, Baumann, J, Higgins, AZ. "Defining the operating space for spray drying of red blood cells." *Cryobiology*, 67(3): 440, 2013.
17. Davidson, AF, Newman, R, Kuninger, D, Higgins, AZ. "Biophysical parameters of adherent human induced pluripotent stem cells for the rational design of cryoprotectant addition and removal procedures." *Cryobiology*, 67(3): 423-424, 2013.
16. Zhurova, M, Lusianti, RE, Higgins, AZ, Acker, JP. "Osmotic tolerance limits of fetal and adult red blood cells." *Cryobiology*, 67(3): 432, 2013.
15. Lusianti, RE, Higgins, AZ. "Continuous removal of glycerol from frozen-thawed blood in a microscale membrane device." *Cryobiology*, 67(3): 430, 2013.
14. Lusianti, RE, Benson, JD, Higgins, AZ. "Rapid removal of glycerol from frozen-thawed red blood cells." *Cryobiology*. 65(3): 345, 2012.
13. Fry, AK, Higgins, AZ. "Investigation of osmotic tolerance limits for rational design of vitrification procedures." *Cryobiology*. 65(3): 358-359, 2012.
12. Koretsky, MD, Williamson, KJ, Nason, JA, Jovanovic, GN, Chang, C, Higgins, AZ, Gates, CM, Roehner, RM. "Using studios as a strategy to respond to increasing enrollment." *Proceedings of the 2012 American Society for Engineering Education Annual Conference & Exposition*. 2012.
11. Fry, AK, McClanahan, DR, Higgins, AZ. "Rational design of toxicity minimized cryoprotectant addition and removal procedures for vitrification of adherent cell monolayers." *Cryobiology*. 63(3): 312, 2011.
10. Fry, AK, Higgins, AZ. "Toxicity-minimized cryoprotectant addition and removal procedures for human oocytes." *Cryobiology*. 63(3): 330, 2011.

9. Higgins, AZ. “Mathematical minimization of toxicity during addition and removal of cryoprotectants.” *Cryobiology*. 61(3): 371, 2010.
8. Lusianti, RE, Jovanovic, GN, Higgins, AZ. “Cryoprotectant removal using a microscale dialysis device.” *Cryobiology*. 61(3): 372, 2010.
7. Fry, AK, Wilson, J, Higgins, AZ. “Cryoprotectant permeability and osmotic tolerance limits of adherent neuronal cells.” *Cryobiology*. 61(3): 390-391, 2010.
6. Fry, AK, Higgins, AZ. “Determination of cryoprotectant permeability properties in monolayers of bovine endothelial cells using an in situ fluorescence quenching technique.” *Cryobiology*. 59(3): 382, 2009.
5. Higgins, AZ, Karlsson, JOM. “Effect of Hold Temperature and Cooling Rate on Intracellular Ice Formation in Micropatterned Tissue Constructs.” *Cryobiology*. 57(3): 326, 2008.
4. Higgins, AZ, Karlsson, JOM. “Effect of Intercellular Junction Protein Expression on Intracellular Ice Formation in Genetically Modified Pancreatic Beta-Cells.” *Cryobiology*. 55(3): 330, 2007.
3. Higgins, AZ, Karlsson, JOM. “Comparison of Membrane Permeability Properties in Monolayers and Suspensions of Bovine Endothelial Cells.” *Cryobiology*. 55(3): 375, 2007.
2. Higgins, AZ, Stott, SL, Karlsson, JOM. “Effect of Instrument Dynamic Range on the Estimation of Osmotic Properties Using Electronic Cell Sizing Techniques.” *Cryobiology*. 53(3): 444-445, 2006.
1. Higgins, AZ, Karlsson, JOM. “Quantification of Tissue Dehydration by Measurement of Fluorescence Quenching.” *Cryobiology*. 51(3): 413, 2005.

### Book Chapters

1. Warner RM, Higgins AZ. “Mathematical modeling of protectant transport in tissues” in Wolkers WF and Oldenhof H (Eds), *Cryopreservation and Freeze-Drying Protocols. Methods in Molecular Biology, Humana, New York, NY, vol 2180: 173-188, 2021.*

### Patents Filed and In Process

1. Drost K, Higgins A, Jovanovic GN, McGuire J, Schilke K, Sharp K. Microfluidic device for removal of constituents from blood. Patent Application PCT/US2015/049758, filed Sept. 11, 2015.
2. Corrigan GH, Higgins A, Domingue C. Determine viscosity of fluids using a capillary channel. Patent Application PCT/US2017/017355, filed Feb. 10, 2017.
3. Govyadinov A, Higgins A, Kornilovich P. Microfluidic devices. Patent Application PCT/US2017/026571, filed April 7, 2017
4. Ely H, Higgins A, Dudenhofer C, Nielsen JA. DNA concentrate dispensing. Patent Application PCT/US2017/051893, filed Sep. 15, 2017
5. Higgins A, Shkolnikov V, Nielson JA. Sequencing nucleic acid sequences. Patent Application PCT/US2017/056579, filed Oct. 13, 2017
6. Shkolnikov V, Higgins A, Nielsen JA. Partition liquid into samples. Patent Application PCT/US2017/056602, filed Oct. 13, 2017.
7. Higgins A, Kornilovich P, Govyadinov AN, Day MJ. Nucleic acid amplification. Patent Application PCT/US2017/057672, filed Oct. 20, 2017.
8. Higgins A, Govyadinov A, Cumbie M. Temperature-cycling microfluidic devices. Patent Application PCT/US2017/063107, filed Nov. 22, 2017.
9. Higgins A, Govyadinov A. Temperature-controlling microfluidic devices. Patent Application PCT/US2017/062935, filed Nov. 22, 2017.
10. Tornainen ED, Ely H, Cumbie MW, White RM, Higgins A. Multizonal microfluidic devices. Patent Application PCT/US2017/062943, filed Nov. 22, 2017.
11. Ely H, Higgins A, White R, Tornainen E, Woodford T, Cumbie M, Chen CH. Microfluidic devices with lid for loading fluid. Patent Application PCT/US2017/062925, filed Nov. 22, 2017

12. Ely H, Cumbie MW, Higgins A, White RM, Tornaiainen ED. Fluid thermal processing. Patent Application PCT/US2018/054265, filed Oct. 3, 2018.
13. Lahmann J, Higgins AZ. Microfluidic removal of excess bilirubin from blood. US Patent Application 16/431,928, filed June 5, 2019

## **PRESENTATIONS**

### **Invited and Peer-Selected Conference Oral Presentations**

39. Warner RM, Shuttleworth R, Benson JD, Eroglu A, Higgins AZ. "General mass tissue transfer model for cryopreservation applications." Annual Meeting of the Society for Cryobiology, July 20-23, 2021
38. Warner, RM, Brown, KS, Eroglu A, Higgins AZ. "Mathematical model of cryoprotectant toxicity for predicting promising mixtures for vitrification." Annual Meeting of the Society for Cryobiology, July 20-23, 2021
37. Warner RM, Shuttleworth R, Benson JD, Eroglu A, Higgins AZ. "A general strategy for modeling the distribution of cryoprotectants in tissues." Annual Meeting of the Society for Mathematical Biology, June 13-17, 2021
36. Warner, RM, Brown, KS, Eroglu A, Higgins AZ. "Rational design of less toxic cryoprotectant solutions for cryopreservation." Annual Meeting of the Society for Mathematical Biology, June 13-17, 2021
35. Higgins AZ. "Strategies for reducing the toxicity of cryoprotectants." Biostasis Conference, Oct 24-25, 2020.
34. Gulieva R, Higgins A. "Kidney organoids as a model to study CPA toxicity." Annual Meeting of the Society for Cryobiology, July 21-23, 2020.
33. Warner R, Ampo E, Nelson D, Benson J, Eroglu A, Higgins A. "Leveraging high throughput screening to characterize the toxicity of multiple cryoprotectants." Annual Meeting of the Society for Cryobiology, July 21-23, 2020.
32. Benson JD, Higgins AZ, Desai K, Eroglu A. "A toxicity cost function approach to optimal CPA equilibration in tissues." Annual Meeting of the Society for Cryobiology, San Diego, CA, July 22-25, 2019.
31. Garcia-Martinez T, Higgins AZ, Mullen SF, Mogas T. "Permeability of bovine oocyte membrane to water and CPA is dependent on solute concentration." Annual Meeting of the Society for Cryobiology, San Diego, CA, July 22-25, 2019.
30. Warner RM, Higgins AZ. "Organ perfusion strategies to reduce toxicity during cryopreservation." Annual Meeting of the Biomedical Engineering Society, Atlanta, GA, Oct 17-20, 2018.
29. Warner RM, Nemanic S, Higgins AZ. "Effects of cryoprotectant carrier solution tonicity on transport during organ perfusion." Annual Meeting of the Society for Cryobiology, Madrid, Spain, July 10-13, 2018.
28. Warner RM, Higgins AZ. "Biomechanical model of cryoprotectant transport in tissues with high cell density." Annual Meeting of the Society for Cryobiology, Madrid, Spain, July 10-13, 2018.
27. Higgins AZ. "Concentration dependence of cryoprotectant permeability and implications for design of cryopreservation procedures." Annual Meeting of the Society for Cryobiology, Madrid, Spain, July 10-13, 2018.
26. Higgins AZ, Warner R. "Development of organ perfusion strategies to reduce CPA toxicity." Summit on Organ Banking through Converging Technologies, Boston, MA, August 3-6, 2017.
25. Higgins AZ, Lahmann J, Lusianti R, Benson JD, Acker J. "Design of methods for expedited deglycerolization of cryopreserved red blood cells." Annual Meeting of the Society for Cryobiology, Hefei, China, July 20-24, 2017.
24. Higgins AZ, Eroglu A, Benson JD. "Extension of cellular toxicity cost functions to tissues." Annual Meeting of the Society for Cryobiology, Hefei, China, July 20-24, 2017.

23. Warner R, Yang J, Higgins AZ. "Toxicity reduction during organ cryopreservation by manipulating the CPA loading solution." Annual Meeting of the Society for Cryobiology, Hefei, China, July 20-24, 2017.
22. Higgins AZ. "Intracellular ice formation, ice recrystallization and the importance of warming rate." Annual Meeting of the Society for Cryobiology, Ottawa, Canada, July 24-27, 2016.
21. Lahmann JM, Cruz-Sanchez C, Huntley C, Benson JD, Higgins AZ. "Variability in the permeability of the erythrocyte membrane and implications for design of rapid deglycerolization procedures." Annual Meeting of the Society for Cryobiology, Ostrava, Czech Republic, July 26-29, 2015.
20. Lusianti RE, Lahmann JM, Dickinson A, Benson JD, Acker JP, Higgins AZ. "Accelerating post-thaw erythrocyte washing using microfluidics." Annual Meeting of the Society for Cryobiology, Ostrava, Czech Republic, July 26-29, 2015.
19. Higgins, AZ. "Microfluidic platform for treatment of sepsis." TechConnect World Innovation Conference and Expo, Washington DC, June 14-17, 2015.
18. Higgins, AZ. "Designing innovative procedures for avoiding cryoprotectant toxicity." Organ Banking Summit, Palo Alto, CA, Feb. 26-28, 2015.
17. Higgins, AZ. "Kinetic modeling of cryoprotectant toxicity and implications for design of cryopreservation procedures." Annual Meeting of the Society for Cryobiology, Savannah, GA, May 31-June 4, 2014.
16. Higgins, AZ, Lusianti, RE. "Microfluidic processing of cryopreserved blood." Annual Meeting of the Society for Cryobiology, Savannah, GA, May 31-June 4, 2014.
15. Lusianti, RE, Higgins, AZ. "Improving the post-thaw wash process for frozen red blood cells: an integrated theoretical and experimental approach." AIChE Annual Meeting, San Francisco, CA, Nov. 2-7, 2013.
14. Davidson, AF, Newman, R, Kunniger, D, Higgins, AZ. "Biophysical parameters of adherent human induced pluripotent stem cells for the rational design of cryoprotectant addition and removal procedures." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
13. Lusianti, RE, Higgins, AZ. "Continuous removal of glycerol from frozen-thawed blood in a microscale membrane device." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
12. Lusianti, RE, Benson, JD, Higgins, AZ. "Rapid removal of glycerol from frozen-thawed red blood cells." Annual Meeting of the Society for Cryobiology, Rosario, Argentina, June 3-6, 2012.
11. Fry, AK, Benson, JD, Higgins, AZ. "Toxicity-minimized cryoprotectant addition and removal procedures for human oocytes." Annual Meeting of the Society for Cryobiology, Corvallis, OR, USA. July 24-27, 2011.
10. Fry, AK, McClanahan, DR, Higgins, AZ. "Rational design of toxicity minimized cryoprotectant addition and removal procedures for vitrification of adherent cell monolayers." Annual Meeting of the Society for Cryobiology, Corvallis, OR, USA. July 24-27, 2011.
9. Higgins, AZ. "Cost functions for optimization of cryopreservation procedures." International Congress on Industrial and Applied Mathematics, Vancouver, British Columbia, Canada. July 18-22, 2011
8. Fry, AK, Wilson, JL, Higgins, AZ. "Cryoprotectant permeability and osmotic tolerance limits of adherent neuronal cells." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
7. Lusianti, RE, Jovanovic, GN, Higgins, AZ. "Cryoprotectant removal using a microscale dialysis device." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
6. Higgins, AZ. "Mathematical minimization of toxicity during addition and removal of cryoprotectants." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.

5. Fry, AK, Houran, N, Rondema, A, Higgins, AZ. "Cell membrane permeability properties for endothelial tissue and computer-aided optimization of cryoprotectant addition and dilution procedures." AIChE Annual Meeting, Nashville, TN. November 8-13, 2009.
4. Fry, AK, Higgins, AZ. "Determination of cryoprotectant permeability properties in monolayers of bovine endothelial cells using an in situ fluorescence quenching technique." Annual Meeting of the Society for Cryobiology, Sapporo, Japan. July 19-23, 2009.
3. Higgins, AZ, Karlsson, JOM. "Effect of Hold Temperature and Cooling Rate on Intracellular Ice Formation in Micropatterned Tissue Constructs." Annual Meeting of the Society for Cryobiology, Charlotte, NC. July 20-23, 2008.
2. Higgins, AZ, Karlsson, JOM. "Effect of Intercellular Junction Protein Expression on Intracellular Ice Formation in Genetically Modified Pancreatic Beta-Cells." Annual Meeting of the Society for Cryobiology, Lake Louise, Canada. July 29-Aug 1, 2007.
1. Higgins, AZ, Karlsson, JOM. "Kinetics of Membrane Water Transport in Pancreatic Tissue." Regenerate International Conference and Exposition. Atlanta, GA. June 2-3, 2005.

### **Conference Poster Presentations**

47. Shuttleworth R, Higgins AZ, Eroglu A, Benson JD. "Comparison of dilute and nondilute transport models for erythrocytes in the presence of permeating solutes." European Conference on Mathematical and Theoretical Biology, September 19-23, 2022.
46. Forcier R, Heussner R, Buchanan K, Al Rawashdeh W, Johnstone B, Woods E, Higgins A. "Novel Introduction of Cryoprotectants into Tissues via Carbonation and Vacuum Cycling." Oregon Bioengineering Symposium, Nov 11-12, 2021.
45. Faase RA, Hummel MH, Schilke KF, Higgins AZ, Baio JE. "Bio-Inspired Pseudo SAMs Coating to Increase the Hemocompatibility of a Microfluidic Photoreactor for the Treatment of Neonatal Jaundice." Oregon Bioengineering Symposium, Nov 5, 2020.
44. Forcier R, Higgins A. "A mathematical model for cryopreservation of bone marrow stem cells in situ." Oregon Bioengineering Symposium, Nov 5, 2020.
43. Shuttleworth R, Warner R, Eroglu A, Higgins AZ, Benson JD. "Application of a cell-dense multiphase model to cryoprotectant equilibration." Annual Meeting of the Society for Mathematical Biology, August 17-20, 2020.
42. Gulieva R, Warner R, Ampo E, Kuntz T, Tan YH, Nelson D, Benson J, Eroglu A, Higgins A. "High throughput method for characterizing the effects of temperature on cryoprotectant toxicity." Annual Meeting of the Society for Cryobiology, July 21-23, 2020.
41. Faase R, Prusinski W, Schilke K, Higgins AZ, Baio J. "Blood compatible coating using tethered heparin to reduce coagulation in microfluidic devices." Oregon Bioengineering Symposium, Corvallis, OR, Nov 22, 2019.
40. Tan YH, Baez S, Balijepalli A, Guske M, Higgins AZ, Dallas D. "Continuous maintenance of euglycemia in premature infants." Oregon Bioengineering Symposium, Corvallis, OR, Nov 22, 2019.
39. Warner RM, Ampo A, Gulieva R, Nelson D, Benson JD, Eroglu A, Higgins AZ. "Characterizing the toxicity of cryoprotectants using high throughput screening for mathematical optimization in cryopreservation." Oregon Bioengineering Symposium, Corvallis, OR, Nov 22, 2019.
38. Warner RM, Ampo A, Nelson D, Benson JD, Eroglu A, Higgins AZ. "High throughput screening for development of cryoprotectant toxicity cost functions." Annual Meeting of the Society for Cryobiology, San Diego, CA, July 22-25, 2019.
37. Lahmann JM, Faase R, Prusinski W, Schilke K, Baio J, Higgins AZ. "Microfluidic photoreactor for treatment of hyperbilirubinemia in neonates." 35<sup>th</sup> International Symposium on Microscale Separations and Bioanalysis, Corvallis, OR, March 25-28, 2019.
36. Warner RM, Higgins AZ. "Effect of cell density on cryoprotectant transport in tissues." Annual Meeting of the Biomedical Engineering Society, Atlanta, GA, Oct 17-20, 2018.



35. Warner RM, Higgins AZ. "Extending single cell cytotoxicity minimization strategies to 3D tissues." Annual Meeting of the Society for Cryobiology, Hefei, China, July 20-24, 2017.
34. Burgess EM, De La Ree AD, Lee Y, Eroglu A, Karlsson JOM, Higgins AZ. "Glass transition temperatures of mixtures of sugars, polymers and penetrating cryoprotectants." Annual Meeting of the Society for Cryobiology, Ottawa, Canada, July 24-27, 2016.
33. Lahmann JM, Cruz-Sanchez C, Huntley C, Benson JD, Higgins AZ. "Rapid processing to prepare cryopreserved blood for transfusions." Annual Meeting of the Biomedical Engineering Society, Tampa, FL, Oct 7-10, 2015.
32. Lahmann JM, Ryder MP, Fowler JE, Durant E, Raman R, Yu B, Seals S, Baio JE, Sharp KV, Schilke KF, Higgins AZ, McGuire J. "Enhanced capture of particles and pathogens from blood in a bifurcated microfluidic device." Annual Meeting of the Biomedical Engineering Society, Tampa, FL, Oct 7-10, 2015.
31. Lahmann, JM, Meza Wynkoop, J, Dickinson, AJ, Higgins, AZ. "Accelerating post-thaw processing of cryopreserved blood using mathematical modeling and microfluidics." OSU Engineering Expo, Portland, OR, March 4, 2015.
30. Durant, E, Sharp, K, Higgins, AZ. "Modeling of shear-induced red blood cell migration for guiding microfluidic device design." Annual Meeting of the APS Division of Fluid Mechanics, San Francisco, CA, November 23-25, 2014.
29. Dickinson, A, Lahmann, J, Higgins, AZ. "Microfluidic Device for Washing Frozen/Thawed Red Blood Cells." AIChE Annual Meeting, Atlanta, GA, Nov. 16-21, 2014.
28. Meza Wynkoop, J, Lahmann, J, Higgins, AZ. "Investigating a Three Step Deglycerolization Method for Cryopreserved Red Blood Cells." AIChE Annual Meeting, Atlanta, GA, Nov. 16-21, 2014.
27. Lusianti, RE, Higgins, AZ. "Improving the Post-thaw Wash Process for Cryopreserved Red Blood Cells Using Microfluidics." Annual Meeting of the Biomedical Engineering Society, Seattle, WA, September 25-28, 2013.
26. Durant, E, Higgins, AZ, Sharp, KV. "A Multi-phase CFD Model of Blood Flow in Microfluidic Devices." Annual Meeting of the Biomedical Engineering Society, Seattle, WA, September 25-28, 2013.
25. Lahmann, JM, Higgins, AZ. "Deglycerolization and separation of human red blood cells in a microfluidic focusing channel." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
24. Zhurova, M, Lusianti, RE, Higgins, AZ, Acker, JP. "Osmotic tolerance limits of fetal and adult red blood cells." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
23. Vian, AM, Higgins, AZ. "Membrane permeability properties of human granulocytes." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
22. Han, XY, Valdivia, A, Witter, S, Falk, R, Baumann, J, Higgins, AZ. "Defining the operating space for spray drying of red blood cells." Annual Meeting of the Society for Cryobiology, Bethesda, MD, July 28-31, 2013.
21. Lusianti, RE, Benson, JD, Higgins, AZ. "Optimization of the post-thaw wash process for cryopreserved red blood cells." Annual Meeting of the Biomedical Engineering Society, Atlanta, GA, October 24-27, 2012.
20. Fry, AK, Higgins, AZ. "Rational design of vitrification procedures for cryopreservation of adherent cell monolayers." Annual Meeting of the Biomedical Engineering Society, Atlanta, GA, October 24-27, 2012.
19. Higgins, AZ. "A virtual laboratory for teaching cellular mass transfer." ASEE Chemical Engineering Summer School, Orono, ME, July 21-27, 2012.
18. Higgins, AZ. "Concept-based instruction in energy balances using the AIChE Concept Warehouse." ASEE Chemical Engineering Summer School, Orono, ME, July 21-27, 2012.

17. Koretsky, M, Williamson, KJ, Nason, JA, Jovanovic, G, Chang, C-H, Higgins, AZ, Gates, CM, and Roehner, RM. "Using Studios as a Strategy to Respond to Increasing Enrollment." Proceedings of the 2012 American Society for Engineering Education Annual Conference & Exposition, San Antonio, TX. June 10-13, 2012.
16. Fry, AK, Higgins, AZ. "Investigation of osmotic tolerance limits for rational design of vitrification procedures." Annual Meeting of the Society for Cryobiology, Rosario, Argentina, June 3-6, 2012.
15. Fry, AK, Higgins, AZ. "Rational design of vitrification procedures for human oocytes." Northwest Reproductive Sciences Symposium, Portland, OR. April 27-28, 2012.
14. Benson, JD, Fry, AK, Kearsley, AJ, Higgins, AZ. "Mathematical minimization of toxicity for vitrification of human oocytes." Northwest Reproductive Sciences Symposium, Corvallis, OR. May 13-14, 2011.
13. Benson, JD, Kearsley, AJ, Higgins, AZ. "Identification and Minimization of a Toxicity Cost Functional for the Optimal Addition and Removal of Cryoprotectants." 18<sup>th</sup> Annual NIST Sigma Xi Postdoctoral Poster Session, Gaithersburg, MD, Feb. 16, 2011.
12. Glasscock, C, Fry A, Higgins, AZ. "Osmotic Tolerance Limits of Cultured Endothelial Cells." Undergraduate Student Poster Competition, AIChE Annual Meeting, Salt Lake City, Utah, Nov. 7-12, 2010.
11. Fry, A, Elder, R, Lowery, N, Higgins, AZ. "In Situ Measurement of Cryoprotectant Permeability in Cultured Endothelial Cells and Applications to Cryopreservation." Annual Meeting of the Biomedical Engineering Society, Pittsburgh, PA. October 7-10, 2009.
10. Higgins, AZ, Karlsson, JOM. "Comparison of Membrane Permeability Properties in Monolayers and Suspensions of Bovine Endothelial Cells." Annual Meeting of the Society for Cryobiology, Lake Louise, Canada. July 29-Aug 1, 2007.
9. Higgins, AZ, Stott, SL, Karlsson, JOM. "Effect of Instrument Dynamic Range on the Estimation of Osmotic Properties Using Electronic Cell Sizing Techniques." Annual Meeting of the Society for Cryobiology, Hamburg, Germany. July 24-27, 2006.
8. Higgins, AZ, Karlsson, JOM. "Quantification of Tissue Dehydration by Measurement of Fluorescence Quenching." Annual Meeting of the Society for Cryobiology, Minneapolis, MN. July 24-27, 2005.
7. Higgins, AZ, Karlsson, JOM. "Cell Membrane Water Permeability and Activation Energy in Hepatic Tissue." Hilton Head Engineering Tissues Workshop, Hilton Head, SC. March 9-13, 2005.
6. Higgins, AZ, Karlsson, JOM. "Factors Affecting the Viability of Neural Tissue After Cryopreservation." Tissue Engineering Society International Annual Meeting, Lausanne, Switzerland. October 10-13, 2004.
5. Higgins, AZ, Karlsson, JOM. "Fluorescence Self-Quenching Technique to Quantify Tissue Dehydration During Cryopreservation." Tissue Engineering Society International Annual Meeting, Lausanne, Switzerland. October 10-13, 2004.
4. Higgins, AZ, Karlsson, JOM. "Fluorescence Quenching Technique for Measurement of Mass Transport During Tissue Preservation." Georgia Tech Emory Center for the Engineering of Living Tissues Educational Partners Symposium. Atlanta, GA. October 5-6, 2004.
3. Higgins, AZ, Karlsson, JOM. "Measurement of Water Transport in Cell Monolayers Using Calcein Self-Quenching." Georgia Tech Emory Center for the Engineering of Living Tissues NSF Site Visit Meeting. Atlanta, GA. April 13-15 2004.
2. Higgins, AZ, Karlsson, JOM. "Cryopreservation of Primary Cortical Neurons." Georgia Tech Emory Center for the Engineering of Living Tissues Educational Partners Symposium. Atlanta, GA. October 19-21, 2003.
1. Bower, CK, Parker, JE, Higgins, AZ, Oest, ME, Wilson, JT, Valentine, BA, Bothwell, MK, McGuire, J. "Protein antimicrobial barriers to bacterial adhesion: *in vitro* and *in vivo* evaluation of nisin-treated

implantable materials.” American Chemical Society National Meeting, Orlando, FL, April 7-11, 2002.

### **Invited Seminars (non Conference)**

13. “Development of organ perfusion strategies to reduce CPA toxicity.” Pacific Northwest Transplant Bank, May 2, 2018.
12. “Development of organ perfusion strategies to reduce CPA toxicity.” Oregon State University College of Veterinary Medicine, December 12, 2017.
11. “Microfluidics for chemical processing of blood: treating sepsis, improving blood banking and more.” Max Planck Institute for Polymer Research, Mainz, Germany, July 23, 2015.
10. “Applications of microfluidics for chemical processing of blood: treating sepsis, improving blood banking and more.” Division of Pulmonary & Critical Care Medicine, Oregon Health & Science University, Portland, OR. January 14, 2013.
9. “Chemical processing of blood using microfluidics.” Tech Tuesday, Corvallis, OR. March 13, 2012.
8. “Cryopreservation of cell-based biosensors.” US Army Center for Environmental Health Research, Fort Detrick, MD. Feb. 11, 2011
7. “Minimization of toxicity during cryopreservation.” Division of Reproductive Medicine Seminar Series, Oregon National Primate Research Center, Beaverton, Oregon. Sept. 23, 2010.
6. “Minimization of toxicity during vitrification: optimal CPA addition and removal.” 21<sup>st</sup> Century Medicine, Inc. Fontana, CA. Feb. 1, 2010.
5. “Strategies for cryopreservation of complex cellular systems.” Life Technologies, Inc. Eugene, Oregon. Dec. 16, 2009.
4. “Long-term stabilization of living cells and tissues by cryopreservation.” Oregon State University, Materials Science Program Seminar Series, Corvallis, OR, April 30, 2009.
3. “Factors affecting intracellular ice formation during tissue cryopreservation.” Oregon Health and Science University, Biomedical Engineering Seminar Series, Portland, OR, Jan. 9, 2009.
2. “Measurement of cellular osmotic properties by the Coulter counter method and applications to cryopreservation.” The Coulter Principle: Foundations and Advanced Applications. Harvard University, Boston, MA, Oct. 15, 2008.
1. “High-speed imaging of biological samples.” Bioengineering and Biosciences Unified Graduate Student Technique Symposium, Atlanta, GA, June 26-28, 2006.

### **Other Presentations (Panels, etc.)**

1. Panel member, “The Medical Field: Not Just for Doctors.” Sponsored by the mentors/mentees in the women and minorities in engineering program, Oregon State University, Corvallis, OR, April 22, 2010.

## **GRANTS AND CONTRACTS**

### **Competitive & External Grant Awards**

1. National Institutes of Health, \$2,460,218. D Dallas (PI), AZ Higgins (co-I). Can high pressure processing (HPP) and ultraviolet-C irradiation (UV-C) treatment preserve donor milk bioactive protein structure and function better than holder pasteurization? July 2021 – June 2026
2. HP Inc, \$30,000 (includes \$15,000 OSU match), AZ Higgins (OSU PI), E Fu (OSU co-PI), Mike Cumbie (HP PI), Viktor Shkolnikov (HP co-PI). Digital microfluidic platform. Jan 2021 – Nov 2021.
3. Murdock Charitable Trust, \$879,000 (includes \$442,000 OSU cost match). AZ Higgins (PI), E Fu (co-PI), A Wang (co-PI), L Cheng (co-PI), M Johnston (co-PI), J Baio (co-PI), M Giers (co-PI). Biomedical Prototyping and Characterization Instruments. May 2020 – Dec 2023.
4. National Institutes of Health, \$1,456,963. EJ Woods (PI), AZ Higgins (co-I), Novel strategies for storage and recovery of cadaveric bone marrow stem cells. March 2020 – Feb 2022.

## *Curriculum Vitae* for Adam Z. Higgins

5. Erkkila Foundation, \$22,500. AZ Higgins (PI), High throughput screening using organoids to assess novel organ preservation strategies. July 2019 – June 2020.
6. Hirsch Foundation, \$62,344. AZ Higgins (PI), High throughput screening of cryoprotectant toxicity kinetics. Sept. 2018 – Sept. 2019.
7. National Institutes of Health, \$371,872. AZ Higgins (PI), J Baio (co-PI), K Schilke (co-PI), Microfluidic photoreactor for treatment of hyperbilirubinemia. Sept. 2018 – Aug. 2020.
8. National Institutes of Health, \$1,400,000. A Eroglu (PI), AZ Higgins (co-I), JD Benson (co-I), Viable banking of human tissues. Sept. 2018 – May 2022.
9. Murdock Charitable Trust, \$60,000. AZ Higgins (PI), J Baio (co-PI), K Schilke (co-PI), Visible Light Photoreactor for Blood Treatment. Sept. 2016 – June 2018.
10. Oregon Talent Council, \$672,403. MS Chapman (PI), B Tyler (co-PI), D McNannay (co-investigator), J Black (co-investigator), JH Chang (co-investigator), JW Gray (co-investigator), AZ Higgins (co-investigator), MT Hinds (co-investigator), J McGuire (co-investigator), PT Spellman (co-investigator), JD Sweeney (co-investigator), Industry-relevant training and research experiences for biomedical engineering and data science students. June 2016 – June 2017
11. Clean Water Services, \$2520, AZ Higgins (PI), Freeze-drying of nitrifying bacteria. April 2015-March 2016.
12. National Institutes of Health, \$453,066. A. Eroglu (PI), AZ Higgins (co-investigator), New cell desiccation strategy using non-isothermal drying and biophysical models. Feb. 2015-Feb. 2017.
13. National Science Foundation, \$200,000. AZ Higgins (PI), J McGuire (co-PI), K Sharp (co-PI), K Schilke (co-PI), J Turner (co-PI), Microfluidic platform for therapeutic removal of blood constituents. June 2014-December 2015.
14. HP Inc, \$30,000, AZ Higgins (PI), Development of sample preparation methods to enable blood cell quantification using a point of care impedance based microfluidic chip. March-August 2015.
15. HP Inc, \$20,000 (includes \$10,000 OSU Advantage Partnerships match), AZ Higgins (PI), Development of sample preparation methods to enable blood cell quantification using a point of care impedance based microfluidic chip. August 2014 – February 2015
16. National Science Foundation, \$400,000. AZ Higgins (PI), CAREER: Microfluidics for Cell Cryopreservation. February 2012-2017.
17. Life Technologies, Collaborative Research Compacts Program, \$30,000. Rhonda Newman (Life Technologies Investigator), AZ Higgins (External Collaborator). Stem cell cryopreservation medium: development of a reduced DMSO, serum-free cryopreservation medium for storage of human embryonic and induced pluripotent stem cells. June-December 2012.
18. Collins Medical Trust, \$29,957. AZ Higgins (co-PI), Kendra Sharp (co-PI), Microfluidic Platform for Treatment of Sepsis. September 2012-2013.
19. Medical Research Foundation of Oregon, \$40,000. AZ Higgins (PI), Optimal Loading of Cryoprotectant Additives for Vitrification of Cells and Tissues. May 2010-November 2011.
20. Good Samaritan Hospital Foundation, Erkkila Endowment for Health and Human Performance, \$14,950. AZ Higgins (PI), Cell Surface Engineering to Control Cell-Ice Interactions During Cryopreservation. June 2008-2009.

### **OSU Internal Awards for Research**

1. OSU Venture Development Fund AID Award, \$6,000, D Dallas (PI), AZ Higgins (co-PI), PediaNourish, Jan. 2020 – July 2020.
2. College of Engineering and Public Health & Human Sciences Joint Interdisciplinary Research Grant Program, \$10,000. D Dallas (PI), AZ Higgins (co-PI), Optimizing premature infant glucose balance via continuous glucose monitoring and data-controlled glucose infusion. July 2017-July 2019.
3. OSU Venture Development Fund, \$90,000. AZ Higgins (PI), J Baio (co-PI), K Schilke (co-PI), Visible Light Photoreactor for Blood Treatment. Sept. 2016 – Sept. 2018.
4. OSU Venture Development Fund, \$85,000. AZ Higgins (PI), G Jovanovic (co-PI), J McGuire (co-PI), J Parker (co-PI), Brian Paul (co-PI), K Sharp (co-PI), K Schilke (co-PI). Demonstration of microfluidic adsorption device for treatment of sepsis. March 2015-February 2016.

## *Curriculum Vitae* for Adam Z. Higgins

5. OSU Venture Development Fund, \$25,000. AZ Higgins (PI), Visible light photoreactor for blood treatment. March 2015-Aug. 2015.
6. OSU College of Veterinary Medicine, \$5000, J Parker (PI), AZ Higgins (co-PI), S Tornquist (co-PI), A Viall (co-PI). Separation of plasma from equine blood using a novel microfluidic-based separation system. July 2013-2014.
7. OSU HHMI, \$8000, Undergraduate Research, Summer 2011
8. OSU URISC, \$1500, Undergraduate Research, Winter-Spring 2011
9. OSU URISC, \$997, Undergraduate Research, Fall 2009.
10. OSU HHMI, \$7600, Undergraduate Research, Summer 2009.
11. OSU General Research Fund, \$10,000. AZ Higgins, PI. Biopreservation of Cell-Based Devices. April 2009-2010.
12. OSU HHMI, \$3800, Undergraduate Research, Summer 2008.
13. OSU Research Equipment Reserves Fund (RERF), \$29,000 (excludes 61% match). AZ Higgins, PI. High-Speed Video Thermal Microscopy System. June 2008.

## **PROFESSIONAL SERVICE**

### **Conference Leadership**

1. Program committee, Oregon Bioengineering Symposium, Nov 11-12, 2021
2. Program committee chair, Annual Meeting of the Society for Cryobiology, July 20-23, 2021
3. Program committee, Oregon Bioengineering Symposium, Nov 5, 2020.
4. Program committee chair, Annual Meeting of the Society for Cryobiology, July 21-23, 2020.
5. Program committee chair and lead organizer of the inaugural Oregon Bioengineering Symposium, Corvallis, OR, Nov 22, 2019.
6. Session organizer, “Mathematical modeling and optimization in cryobiology.” and “Mechanisms of cryoinjury and cryoprotection.” Annual Meeting of the Society for Cryobiology, San Diego, CA, July 22-25, 2019.
7. Session organizer, “Mathematical modeling for design of cell and tissue cryopreservation procedures.” Annual Meeting of the Society for Cryobiology, July 10-13, 2018, Madrid, Spain.
8. Session organizer, “Transport Models in Cryobiology.” Annual Meeting of the Society for Cryobiology, July 24-27, 2016, Ottawa, Canada.
9. Session organizer, “Osmotic Stress and Cryoprotectant Toxicity.” Annual Meeting of the Society for Cryobiology, May 31-June 4, 2014, Savannah, GA.
10. Conference co-chair, 48<sup>th</sup> Annual Meeting of the Society for Cryobiology, Corvallis, OR July 24-27, 2011.
11. Judge, Best Student Poster Award, Annual Meeting of the Society for Cryobiology, 2008, 2009, 2010, 2012, 2013, 2014, 2016, 2018
12. Judge, Peter L. Steponkus Crystal Award (best student oral presentation), Annual Meeting of the Society for Cryobiology, 2009, 2012, 2013, 2019

### **External Peer Review: Journals and Proposals**

*Manuscript Review:* Cryobiology Journal, Journal of Theoretical Biology, Cryo-Letters, Biopreservation and Biobanking, Biotechnology Progress, PLoS ONE, Journal of Biomechanical Engineering, Micromachines, BMC Biotechnology, Biochimica et Biophysica Acta - Biomembranes, Biochimica et Biophysica Acta - General Subjects, Journal of Fluorescence, Scientific Reports, Langmuir, Sensors and Actuators B, ACS Applied Materials and Interfaces, ASME Bio, Biomedical Microdevices, Biotechnology Advances, J Phys Chem, Microfluidics Nanofluidics, Vox Sanguinis, International Journal

of Pharmaceutics, ACS Omega, Acta Biomaterialia, Biointerphases, Biophysical Journal, Frontiers in Physiology, Nature Chemistry Reviews

### **Panel & Site Review**

1. NIH Cell and Molecular Biology Review Panel, June 28, 2022.
2. NIH Cell and Molecular Biology Review Panel, Feb. 20-21, 2019
3. NIH Cell and Molecular Biology SBIR/STTR Review Panel, Nov. 15-16, 2017.
4. NIH Cell and Molecular Biology SBIR/STTR Review Panel, March 16-17, 2016.
5. NIH Innovative Molecular Analysis Technology Development for Cancer Research and Clinical Care SBIR/STTR Review Panel, March 31, 2015, March 2, 2016
6. NSF SBIR/STTR proposals, Sept. 8, 2015.
7. NSF CBET BBBE Program, Unsolicited Proposals, Dec. 2-3, 2013, Jan. 20-21, 2015
8. NIH Mentored Career Development Award applications, June 25, 2012, Feb. 7, 2013.
9. NSF CBET BME Program, CAREER Proposals, Oct. 20-21, 2010.
10. NSF CBET BME Program, Unsolicited Proposals, June 10-11, 2010.

### **Professional Society Memberships (past and present)**

Cryobiology Society (2003-present), Biomedical Engineering Society (2009-present, intermittent).

### **Professional Society Leadership**

1. President, Society for Cryobiology, 2020-2021
2. President-elect, Society for Cryobiology, 2018-2019
3. Treasurer, Society for Cryobiology, 2014-2017.
4. Board of Governors, Society for Cryobiology, 2013-2014.
5. Society for Cryobiology Program Committee, 2010-2014

### **Consulting Assignments**

1. Life Technologies Corp., Eugene, OR, 2012
2. Oregon Freeze Dry, Inc., Albany, OR, 2009 – 2014
3. CytoDome, Inc., Atlanta, GA, 2007

## **UNIVERSITY SERVICE**

### **School of Chemical, Biological and Environmental Engineering (CBEE)**

- Director, Bioengineering graduate program, 2017-2018, 2019-present
- Search Committees: Biointerfaces Provost Hire (2011), Biosensors Provost Hire (2015), Bioengineering search (2017-2018), Bioengineering search chair (2018-2019), Bioengineering search (2020-2021)
- Committees
  - Chair, BIOE Graduate Curriculum and Assessment Committee, 2021-2022
  - Chair, BIOE Graduate Recruiting and Admissions Committee, 2021-2022
  - Member, CBEE Diversity, Equity, and Inclusion Committee, 2021-2022
  - Member, CBEE Building Committee, 2019-2022
  - Member, CBEE Undergraduate Curriculum Committee, 2008-2009, 2010-2015
  - Member, CBEE Awards Committee, 2017-2019
  - Member, CBEE Graduate Committee, 2011-2012, 2015-2016, 2017-2018, 2019-2020, 2020-2021
  - Member, CBEE Scholarship Committee, 2008-2011, 2012-2016
  - Member, CBEE Computer and Facilities Committee, 2008-2009
  - Member, CBEE Marketing and Recruitment Committee, 2009-2011, 2019-2020
  - Member, CBEE Faculty Status Committee, 2018-2020
- OSU lead for establishing partnership with the University of Oregon to offer a joint BIOE PhD program; the joint program was approved in fall 2020.

## *Curriculum Vitae* for Adam Z. Higgins

- Contributed to the development of a Category I proposal to create a new BIOE graduate program; the program was approved in 2016.
- Co-Organizer, CBEE Seminar, Winter/Spring 2010-2013 (co-organizer with Jeff Nason)
- Organizer, Chemical Engineering Seminar, Spring 2008, Spring 2009
- BIOE Faculty Advisor, CBEE Student Club, 2008-2014
- Undergraduate student advisor for ~40 students, 2008-2014
- Premed advisor for College of Engineering (with Kim Compton), 2013-present

### **College-Level and University-Level Service**

- Taskforce on Interdisciplinary Graduate Education Programs, 2017-2018
- High-Throughput Screening Services Laboratory advisory board, 2019-2020
- Health Sciences Taskforce, 2020

### **Outreach**

- Hands on demonstration about using microfluidics to wash frozen red blood cells, 4-H International Summer Camp for Latino Middle School Students, 2012-2016.
- Presentation about research opportunities for undergraduate and high school students, 4-H International Summer Camp for Latino High School Students, July 6, 2012.
- Mentor, Oregon Academy of Science and Engineering, Summer 2008, Summer 2012 - 2016.
- Mentor, Summer Experience in Science and Engineering (SESEY), Summer 2000, Summer 2009, Summer 2010, Summer 2012 - 2016.
- Presentation about bioengineering, Crescent Valley High School, November 26, 2008.
- Presenter, Buzz on Biotechnology High School Open House, Fall 2003, Fall 2004, Fall 2005.

### **AWARDS**

1. 2021 Strategic Partnering Award to recognize outstanding efforts to build a strategic partnership that advances the College's efforts to create mutually beneficial relationships with industry and/or university partners, government agencies, collaborative coalitions, and philanthropic donors.
2. 2018 Arthur W. Rowe Best Paper Award, Benson JD, Higgins AZ, Desai K, Eroglu A. "A toxicity cost function approach to CPA equilibration in tissues." *Cryobiology*, 80: 144-155, 2018.
3. 2016 Austin Paul Award to recognize faculty who develop student relationships in which they lead, encourage, and stimulate students in the pursuit of creative and innovative engineering ideas.
4. TechConnect 2015 National Innovation Awardee, selected through an industry-review process of the submitted technologies into the TechConnect National Innovation Summit.
5. National Science Foundation Faculty Early Career Development (CAREER) Award, 2012. The NSF CAREER award recognizes faculty members who are "most likely to become the academic leaders of the 21st Century."
6. Peter L. Steponkus Crystal Award awarded to PhD student Allyson Fry, Annual Meeting of the Society for Cryobiology, Corvallis, OR, July 24-27, 2011.
7. *National Science Foundation Graduate Fellowship*, 2005-2008
8. *Howard Hughes Medical Institute Graduate Fellowship*, 2003-2005
9. *Medtronic Fellowship*, Georgia Institute of Technology, 2004-2005
10. *George Family Foundation Fellowship*, Georgia Institute of Technology, 2006-2008
11. *Whitaker Foundation Fellowship Offer*, 2003\*
12. *National Defense Science & Engineering Fellowship Offer*, 2003\*

\*Unable to accept offer because funding from other sources exceeded the salary cap.

### **GRADUATE STUDENTS**

**Current Graduate Students** (1 Ph.D.)

Name & Degree	Thesis Topic & Tentative Thesis Title	Completion Date
1. Nima Ahmadkhani	Ph.D. Cryopreservation of tissues/organs	2026

**Former Graduate Students (4 Ph.D., 4 M.S.)**

Name & Degree	Thesis Title	Completion Date
1. Ratih Lusianti	M.S. Removal of cryoprotectant with the use of a microseparation device	9/10
2. Allyson Fry Davidson	Ph.D. Optimization of cryoprotectant addition and removal procedures for cryopreservation of adherent mammalian cells	1/13
3. Alex Vian	M.S. Membrane permeability properties of human granulocytes	3/13
4. Ratih Lusianti	Ph.D. Improving the post-thaw processing of cryopreserved red blood cells using a combined approach of mathematical modeling and microfluidics	3/14
5. Hsuan-Yu Leu	M.S. Spray drying for erythrocyte preservation at room temperature	12/14
6. John Lahmann	Ph.D. Blood processing technologies for cryopreservation of transfusion products and extracorporeal treatment applications	9/18
7. Ross Warner	Ph.D. Mathematical and Experimental Approaches for Designing Less Toxic Cryopreservation Methods	11/20
8. Ryan Forcier	M.S. Experimental and Mathematical Approaches for Overcoming Mass and Heat Transfer Limitations in Cryopreservation of Vertebral Bodies	3/22

Revised 05/13/22