Products of the EMBRIO Institute

Updated April 5, 2024

ALL Peer-reviewed Journal Papers: (14)

Arigye, J., Lyon, J.A., Magana, A.J., and Pienaar, E. (2024). The reflective modeling practitioner: Promoting reflective practices through computational modeling assignments. International Journal of Engineering Education.

Cao, L., W. Wang , W. Zhang , and C.J. Staiger. 2022. Lipid signaling requires ROS production to elicit actin cytoskeleton remodeling during plant innate immunity. Int. J. Mol. Sci. 23: 2447 https://doi.org/10.3390/ijms23052447

Kumar, N., Rangel Ambriz, J., Tsai, K., Mim, M. S., Flores-Flores, M., Chen, W., ... & Alber, M. (2024). Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development. Nature Communications, 15(1), 2477.

Levis M, Hyland C, Zartman J. Engineering Distance Learning: The Promise and Challenges of Microfluidics. Biomed Eng Education. 2023 Jul;3(2):267–278.

Li, L., Wang, X., Chai, J., Wang, X., Buganza-Tepole, A., & Umulis, D. M. (2022). Determining the role of advection in patterning by bone morphogenetic proteins through neural network model-based acceleration of a 3D finite element model of the zebrafish embryo. Frontiers in Systems Biology, 2, 983372. https://doi.org/10.3389/fsysb.2022.983372

Madamanchi, A., Ingle, M., Hinck, A. P. & Umulis, D. M. Computational modeling of TGF-β2:TβRI:TβRII receptor complex assembly as mediated by the TGF-β coreceptor betaglycan. Biophys J 122, 1342–1354 (2023).

Pawar, A., Li, L., Gosain, A. K., Umulis, D. M., & Tepole, A. B. (2022). PDE-constrained shape registration to characterize biological growth and morphogenesis from imaging data. Engineering with Computers, 38(5), 3909-3924.

Sanchez-Pena, M., Vieira C., and Magana, A.J. (2022). Data Science Knowledge Integration: Affordances of a computational cognitive apprenticeship on student conceptual understanding. Computer Applications in Engineering Education. 31(2), p. 239-259. http://doi.org/10.1002/cae.22580

Shaikh, R., Larson, N. J., Hanjaya-Putra, D., Zartman, J., Umulis, D. M., Li, L., & Reeves, G. T. (2024). Optimal Performance Objectives in the Highly Conserved Bone Morphogenetic Protein Signaling Pathway. bioRxiv, 2024-02 (Under review with NPJ Systems Biology and Applications)

Shoaib, H., Madamanchi, A., Pienaar, E., Umulis, D. M., & Cardella, M. E. (2023). "I Think I Am Getting There" Understanding the Computational Identity of Engineering Students Participating in a Computationally Intensive Thermodynamics Course. Biomedical Engineering Education, 3(1), 1-21.

Thompson, M. J., Young, C. A., Munnamalai, V. & Umulis, D. M. Early radial positional information in the cochlea is optimized by a precise linear BMP gradient and enhanced by SOX2. Scientific Reports 2023 13:1 13, 1–14 (2023).

Wang Y, Troughton LD, Xu F, Chatterjee A, Ding C, Zhao H, Cifuentes LP, Wagner RB, Wang T, Tan S, Chen J, Li L, Umulis D, Kuang S, Suter DM, Yuan C, Chan D, Huang F, Oakes PW, Deng Q. Atypical peripheral actin band formation via overactivation of RhoA and nonmuscle myosin II in mitofusin 2-deficient cells. Elife. 2023 Sep 19;12:e88828. doi: 10.7554/eLife.88828.

Wang, J., Chatterjee, A., Zigan, C., Alborn, M., Chan, D. D., & Chortos, A. (2023). Pneumatic Non-Equibiaxial Cell Stretching Device With Live-Cell Imaging. IEEE Transactions on Biomedical Engineering.

Xu, L., L. Cao, J. Li , and C.J. Staiger. 2024. Cooperative actin filament nucleation by the Arp2/3 complex and formins maintains the homeostatic cortical array in Arabidopsis epidermal cells. Plant Cell 36: 764-789 https://doi.org/10.1093/plcell/koad301

Peer-reviewed journal with multi-lab EMBRIO authors: (6)

Arigye, J., Lyon, J.A., Magana, A.J., and Pienaar, E. (2024). The reflective modeling practitioner: Promoting reflective practices through computational modeling assignments. International Journal of Engineering Education.

Li, L., Wang, X., Chai, J., Wang, X., Buganza-Tepole, A., & Umulis, D. M. (2022). Determining the role of advection in patterning by bone morphogenetic proteins through neural network model-based acceleration of a 3D finite element model of the zebrafish embryo. Frontiers in Systems Biology, 2, 983372. https://doi.org/10.3389/fsysb.2022.983372

Pawar, A., Li, L., Gosain, A. K., Umulis, D. M., & Tepole, A. B. (2022). PDE-constrained shape registration to characterize biological growth and morphogenesis from imaging data. Engineering with Computers, 38(5), 3909-3924.

Shaikh, R., Larson, N. J., Hanjaya-Putra, D., Zartman, J., Umulis, D. M., Li, L., & Reeves, G. T. (2024). Optimal Performance Objectives in the Highly Conserved Bone Morphogenetic Protein Signaling Pathway. bioRxiv, 2024-02 (Under review with NPJ Systems Biology and Applications)

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Wang Y, Troughton LD, Xu F, Chatterjee A, Ding C, Zhao H, Cifuentes LP, Wagner RB, Wang T, Tan S, Chen J, Li L, Umulis D, Kuang S, Suter DM, Yuan C, Chan D, Huang F, Oakes PW, Deng Q. Atypical peripheral actin band formation via overactivation of RhoA and nonmuscle myosin II in mitofusin 2-deficient cells. Elife. 2023 Sep 19;12:e88828. doi: 10.7554/eLife.88828.

Peer-reviewed journal paper within a single lab: (8)

Cao, L., W. Wang , W. Zhang , and C.J. Staiger. 2022. Lipid signaling requires ROS production to elicit actin cytoskeleton remodeling during plant innate immunity. Int. J. Mol. Sci. 23: 2447 https://doi.org/10.3390/ijms23052447

Kumar, N., Rangel Ambriz, J., Tsai, K., Mim, M. S., Flores-Flores, M., Chen, W., ... & Alber, M. (2024). Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development. Nature Communications, 15(1), 2477.

Levis M, Hyland C, Zartman J. Engineering Distance Learning: The Promise and Challenges of Microfluidics. Biomed Eng Education. 2023 Jul;3(2):267–278.

Madamanchi, A., Ingle, M., Hinck, A. P. & Umulis, D. M. Computational modeling of TGF-β2:TβRI:TβRII receptor complex assembly as mediated by the TGF-β coreceptor betaglycan. Biophys J 122, 1342–1354 (2023).

Sanchez-Pena, M., Vieira C., and Magana, A.J. (2022). Data Science Knowledge Integration: Affordances of a computational cognitive apprenticeship on student conceptual understanding. Computer Applications in Engineering Education. 31(2), p. 239-259. http://doi.org/10.1002/cae.22580

Thompson, M. J., Young, C. A., Munnamalai, V. & Umulis, D. M. Early radial positional information in the cochlea is optimized by a precise linear BMP gradient and enhanced by SOX2. Scientific Reports 2023 13:1 13, 1–14 (2023).

Wang, J., Chatterjee, A., Zigan, C., Alborn, M., Chan, D. D., & Chortos, A. (2023). Pneumatic Non-Equibiaxial Cell Stretching Device With Live-Cell Imaging. IEEE Transactions on Biomedical Engineering.

Xu, L., L. Cao, J. Li , and C.J. Staiger. 2024. Cooperative actin filament nucleation by the Arp2/3 complex and formins maintains the homeostatic cortical array in Arabidopsis epidermal cells. Plant Cell 36: 764-789 https://doi.org/10.1093/plcell/koad301

Preprint/submission/in-review peer-reviewed journal with multi-lab EMBRIO authors: (3)

Hammad F. Khan[1,3], Sayan Dutta[2,3], Alicia N. Scott[2,3], Shulan Xiao[1,3], Saumitra Yadav[1,3], Xiaoling Chen[2,3], Tamara L. Kinzer- Ursem[1,3], Jean-Christophe Rochet[2,3], and Krishna Jayant[1,3, *] "Site-specific seeding of Lewy pathology induces distinct pre-motor cellular and dendritic vulnerabilities in the cortex", In revision (revise and resubmit at Nature Communications).

Hiles, R., A. Rogers, N. Jasiwal, W. Zhang [P], J. Butchacas, M.V. Merfa, T. Klass, E. Kaser, J.M. Jacobs, C.J. Staiger, M. Helm, and A.S. Iyer-Pascuzzi.* 2024. A Ralstonia solanacearum type III effector alters the actin and microtubule cytoskeleton to promote bacterial virulence in plants. Available on bioRxiv at https://biorxiv.org/cgi/content/short/2023.11.01.565113v1

Magana, A.J., Arigye, J., Udosen, A., Lyon, J., Joshi, P. and Pienaar, E. (under review, major revision). Scaffolded team-based computational modeling and simulation projects for promoting model-based reasoning, conceptual understanding, and regulatory processes. Journal of the Learning Sciences.

Preprint/submission/under-review peer-reviewed journal single EMBRIO lab: (7)

Huizar, F.J., Kumar, N Unger, M, Velagala, V, Wu, Q., Brodskiy, P.A. and
Zartman, J.J. "G protein-coupled Receptor Contributions to Wing Growth and Morphogenesis in Drosophila melanogaster." In revision and bioRxiv (2022). doi:
https://doi.org/10.1101/2022.09.09.506847 (revison efforts supported in part by EMBRIO)

Kumar, Nilay, Mayesha Sahir Mim, Megan Levis, Maria Unger, Gabriel Miranda, Trent Robinett, and Jeremiah J. Zartman. "Piezo regulates epithelial topology and promotes precision in organ size control." bioRxiv (2023): 2023-08. doi: https://doi.org/10.1101/2023.08.16.553584 (supported in part by EMBRIO)

Kumar, Nilay, Mim, Mayesha, Dowling, Alexander, Zartman Jeremiah J.. "Reverse engineering morphogenesis through Bayesian optimization of physics-based models." bioRxiv (2023): 2023-08. doi: https://doi.org/10.1101/2023.08.21.553928 (editor indicated preliminary accept in npj Systems Biology and Applications, supported in part by EMBRIO)

Shaikh R, Larson NJ, Hanjaya-Putra D, Zartman JJ, Umulis DM, Li L, Reeves GT. Optimal Performance Objectives in the Highly Conserved Bone Morphogenetic Protein Signaling Pathway. bioRxiv. Cold Spring Harbor Laboratory; 2024;2024–02. doi: https://www.biorxiv.org/content/10.1101/2024.02.01.578451 (supported in part by EMBRIO, in review in npj Systems Biology and Applications)

Tan, S., Chang Ding, Jeremiah Zartman, Qing Deng. Life in Plastic: Low-cost PETL lamination to adapt microfluidics designs for zebrafish imaging. JOVE

Unger , Maria F. [+], Vijay Velagala[@], Dharsan K. Soundarrajan[@], Marycruz Flores-Flores, David Gazzo[@], Nilay Kumar[@], Jun Li, Jeremiah Zartman "The multimodal action of G alpha q in coordinating growth and homeostasis in the Drosophila wing imaginal disc." bioRxiv (2023): 2023-01. Doi: https://doi.org/10.1101/2023.01.08.523049. (in revision, supported in part by EMBRIO)

Xiao, Shulan, Saumitra Yadav, and Krishna Jayant, "Probing multiplexed dendritic integration using 3D two-photon holographic uncaging". (Under review)

Manuscripts in Preparation:

June Hyung Kim, Taeyoon Kim, "Revealing the mechanisms of dynamic steady states in lamellipodia" (plan to be submitted before May 2024)

Brandon Slater, Taeyoon Kim, "Clustering and phase separation driven my mobile motors" (plan to be submitted before May 2024)

June Hyung Kim, Chris Staiger, Taeyoon Kim, "Simulations of dynamics and mechanics of the actin cytoskeleton in plant cells" (plan to be submitted before Aug 2024)

"Unveiling the World of Calcium Signaling: An Exploration of Calcium Imaging and Analysis Pipeline" Norma C Perez-Rosas, Gabriel I Miranda-Contreras, Deiver Suarez-Gomez, Santiago R Colom-Braña, Weiwei Zhang, Mayesha Sahir, Shelly Tang, David Gazzo, Hong-Anh Nguyen, Javier Muñoz Briones, Mothieshwar Jayaraman Krishnan, Linlin Li, Adrian Buganza Tepole, Qing Deng, Clara E Isaza-Brando, Gregory T Reeves, Christopher J. Staiger, David Umulis, Jeremiah Zartman, Mauricio Cabrera-Ríos, In preparation (2024) Title and list/order of coauthors are preliminary

Suarez-Gomez, D., N.C. Perez-Rosas, G.I. Miranda-Contreras, S.R. Colom-Braña, W. Zhang[P], M. Sahir Mim, S. Tan, D. Gazzo, Q. Deng, C.J. Staiger, G. Reeves, C.E. Isaza-Brando, D. Umulis, J. Zartman, M. Cabrera. 2024. CalciumInsights: An open-source, tissue-agnostic graphical interface for high-quality analysis of calcium signals. To be submitted to PLoS ONE

Kim, J, W. Zhang, J. Coulter, C.J. Staiger, T. Kim. 202X. An agent-based model of the homeostatic cortical actin array in plant epidermal cells. In preparation; to be submitted before end of Y3

W. Zhang, J. R. Helwig, A. Hoerter, D. Umulis, E. Pienaar, J. Zartman, A. Iyer-Pascuzzi, C. J. Staiger. 202X. Plant defense-induced calcium signals are heterogenous in Arabidopsis epidermal cells and exhibit limited cell-to-cell spread. In preparation; to be submitted before end of Y3

Microfluidics for Zebrafish Imaging – with Qing Deng's group.

David Gazzo and Jeremiah Zartman. Calcium Imaging in Drosophila. Springer: Methods in Molecular Biology

David Gazzo and Jeremiah Zartman. Calcium's Role in Neurodegeneration. Biophysical Journal: Research Highlights

Mayesha Mim and co-authors. "Optogenetic control of organ growth (working title).

Sharon Minsuk and co-authors, on modeling tissue morphogenesis mechanics of epiboly.

Ziyu Dong, SungJun Park, Dingxun Wang, Qing Deng, GuangJun Zhang. Peer-reviewed journal manuscript on zebrafish piezo3 gene. (will be submitted during the summer of 2024).

Mukherjee and Gardner: Topic: Definitions of integration and interdisciplinary research and collaboration and mechanisms to support members.

Books

Magana, A.J. (2024). Teaching and Learning in STEM with Computation, Modeling, and Simulation Practices: A Guide for Practitioners and Researchers. Purdue University Press. https://www.press.purdue.edu/9781612499260/?_ga=2.243274764.885627327.1707142455-362007689.1703953845

ALL Peer-reviewed conference presentations, papers, and posters: (45)

Arigye, J., Magana, A.J., Lyon, J.A., and Pienaar, E. (2023). Biomedical and agricultural engineering undergraduate students' programming self-beliefs and changes resulting from computational pedagogy. In Proceedings of the 2023 ASEE Annual Conference & Exposition. Baltimore MD. June 25 - 28.

Arigye, J., Magana, A.J., Lyon, J.A., Pienaar, E. (2023). Biomedical and Agricultural Engineering Undergraduate Students Programming Self-Beliefs and Changes Resulting from Computational Scaffolding [Poster presentation]. Technical Research Exhibition, The 49th National Society of Black Engineers Convention(NSBE), Kansas City, Mo USA, March 2023.

Arigye, J., Udosen, A.N., Pravin, J.P., and Magana, A.J. (2023). The evolution of team coordination commitments in the context of computational projects. In Proceedings of the 2023 IEEE ASEE Frontiers in Education Conference. College Station, Texas. October 18–21, 2023.

Chatterjee, Aritra & Turner, Jordan & Banks, Jonathan & Adebowale, Joan & Chan, Deva & Mendenhall, Juana. (2023). Fabrication And Mechanical Characterization Of Direct Ink Write 3d Printed Methacrylated Hyaluronic Acid Cerium Oxide Scaffolds.

Deng, Q. Society for Leukocyte Biology 56th Annual Meeting, Athens, GA (Sep 2023) Title: Fishing for new regulators of neutrophil migration. Special Interest Group Session "Myeloid cells in inflammatory diseases"

Ding, Chang and Qing Deng. Reactive Oxygen Species (ROS) Relax Wounds to allow Healing & Regrowth. The Allied Genetics Conference 2024, March, 2024, National Harbor, VA.

Fennell, H. (2023). "Computational Apprenticeship: A Constructivist Approach for Teaching Modeling and Simulation" Society for Mathematical Biology, June 2023, Columbus, OH.

Kinzer-Ursem, TL. (2023). Frequency Decoding by Calmodulin and CaMKII on Actin Polymerization Dynamics and Dendritic Spine Morphology, BMES October 2023 Seattle

Gazzo, David, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman, "Leveraging Drosophila Locomotion Assays to Elucidate Protein-Protein Interactions in Neurodegeneration" Midwest Drosophila Conference, Bloomington. October 2023

Iyer-Pascuzzi, Anjali (2022) "A bacterial effector protein impacts the cytoskeleton of plant cells". ASPB/CSPB Annual Meeting. Portland, Oregon. July, 2022.

Iyer-Pascuzzi, A. 2023. "Genomic and phenomic approaches to understanding bacterial wilt disease resistance". International Bacterial Wilt Symposium, Keynote lecture. Uruguay, March 2023.

Kinzer-Ursem TL Integrative Approaches to Elucidate Mechanisms of Neurological Disorders, American Institute of Chemical Engineers (AIChE) Annual Meeting, Phoeniz Arizona, November 2022

Kumar, N., J. Ambriz, K. Tsai, M.Mim, M. Flores Flores, W. Chen, M. Alber, J. Zartman. Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development. The Allied Genetics Conference 2024, Washington, D.C., March 8, 2024. (poster presentation)

Kumar, Nilay, Jennifer Rangel Ambriz, Kevin Tsai, Mayesha Sahir Mim, Marycruz Flores Flores, Weitao Chen, Mark Alber,*, Jeremiah J. Zartman "Reverse engineering the interplay between tissue growth and cytoskeletal regulation during organ development," Biomedical Engineering Society's (BMES) Cellular and Molecular Bioengineering (CMBE) Conference, San Juan, Puerto Rico, January 2-6, 2024. (poster).

Larson, N., Li, L., Umulis, D. Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis. BMES 2023, October 2023, Seattle

Li, L., Wang, X., Wu, T. C, Buganza-Tepole, A., Umulis, D., Integrating Dynamic Cell Imaging Data into Moving Mesh Finite Element Models of Developing Zebrafish Embryos, International Zebrafish Conference 2021, Online

Lu, S., Wang, Y., & Wang, X. (2024). Debiasing Attention Mechanism in Transformer without Demographics. In the Twelfth International Conference on Learning Representations (ICLR). https://openreview.net/forum?id=jLIUfrAcMQ

Madamanchi, A., Larson, N., Karim, M. S., Umulis, D. Stochastic Modeling of BMP Receptor Pathways: Complex Formation and Signal Transduction in Zebrafish Embryogenesis & BMES 2022, October 2022

Magana, A. (2022). Promoting model-based reasoning through computational modeling and simulation practices. Plenary session at the Spring 2022 Meeting of the Illinois Section of the AAPT. April 9th, 2022.

Mim M., N. Kumar, J. Zartman. Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation. The Allied Genetics Conference 2024, Washington, D.C., March 7, 2024. (poster presentation)

Mim M., N. Kumar, J. Zartman. Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation. Biophysical Society 68th Annual Meeting, Washington, D.C., February 14, 2024. (poster presentation)

Mim, M S., et al., ". Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development", Predictive Modeling in Biology and Medicine Conference, Riverside, CA, Nov 17, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", SWSDB Meeting, Aurora, CO, Mar 2, 2024

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", BMES CMBE Conference, San Juan, PR, Jan 2, 2024

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", ASCB/EMBO Cell Bio, Boston, MA, Dec 2, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", 64th Drosophila Research Conference, Chicago, IL, Mar 2, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", BMES Annual Meeting, Seattle, WA, Oct 13, 2023

Minsuk, S. (2023). "Modeling the Mechanical Forces Driving Epithelial Morphogenesis and Cell Rearrangement during Zebrafish Epiboly" Society for Mathematical Biology, 2023, Columbus, Ohio.

Mukherjee S and Gardner SM (2023, talk) Exploring theoretical frameworks to guide the design, evaluation, and collaboration in an interdisciplinary institute. X-DBER virtual conference

Mukherjee S, Karippadath A, Georgopoulos E, Gardner SM (poster) Conceptualizing the Meaning of Interdisciplinarity in a Biology Integration Institute. Annual meeting of the Society for the Advancement of Biology Education Research (SABER), Twin Cities, MN, July 2023.

Mukherjee, S, Georgopoulos E, and Gardner SM (under review, 2024) Exploring the features of integration in a Biology Integration Institute (BII). Annual meeting of the Society for the Advancement of Biology Education Research (SABER), Twin Cities, MN, July 2024

Samasa, Bakary, Joe Zinski, Mary C. Mullins. Poster presentation at The Allied Genetics Conference 2024, March, 2024, National Harbor, VA "Investigating the role of cytoskeletal dynamics during epiboly morphogenesis in the zebrafish"

Samasa, Bakary, Joe Zinski, Mary C. Mullins. Poster presentation at the Mid-Atlantic Regional Zebrafish meeting, September, 2022, Temple University, "Investigating the role of Calcium signaling during epiboly morphogenesis in the zebrafish".

Shulka S[UG*], Davis BF[G], Kinzer-Ursem T. Computational Modeling of the Role of Ca2+ Flux Frequency Decoding by Calmodulin and CaMKII on Actin Polymerization Dynamics and Dendritic Spine Morphology, BMES October 2023 Seattle

Staiger, C. (Zhang, W.) (2022). Keynote speaker: "Actin dynamics during the plant innate immune response." Invited talk: "Arabidopsis Myosin XIK interacts with the exocyst complex to facilitate vesicle tethering during exocytosis." Presented by Dr. Weiwei Zhang due to health reasons. Gordon Research Conference, Plant and Microbial Cytoskeleton, Proctor Academy, Andover, NH, August 14-19, 2022.

Tan, Shelly and Qing Deng. Calcium-actomyosin crosstalk in zebrafish wound closure. American Society for Cell Biology 2023, Boston, MA

Udosen, A. N., Arigye, J., Joshi, P. P., & Magana, A. J., Lyon, J.A., Pienaar, E. (2023). Enactment of Undergraduate Students' Computational Model-Based Reasoning through Epistemic Thinking Practices [Poster presentation]. Purdue Polytechnic Research Impact Areas, Spring 2023 Student Poster Symposium, Purdue University, USA, March 24th, 2023.

Unger, Maria F. [*] (Zartman Lab), et al., "Gαq homeostasis is required in organ size regulation, initiation of larval to pupal metamorphosis and larval survival in Drosophila melanogaster," 2023 Midwest Drosophila Conference, Allerton, Illinois, October 21-22. (talk).

Wilson-Gray[UG] Ariel *, Kim E[G], Tan E[G], Kinzer-Ursem TL Optimizing Fc-Specific Antibody-Oligonucleotide Conjugation to Improve Sensitivity of Immunoassay Probes, Annual Biomedical Research Conference for Minoritized Students (ABRCMS) November 2023* Won Best Poster Award

Zartman, J.J., Kumar, N. and Alexander Dowling. (2022) Morphogenetic cartography: Mapping morphogens to tissue shapes. Year 3 Pilot Project Investigators, 4th Annual Conference on Quantitative Approaches in Biology, Northwestern University, March 16-17, 2022.

Zartman*, Jeremiah J. , et al., "Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development," 2023 Midwest Drosophila Conference, Allerton, Illinois, October 21-22. (talk).

Zhang, W. (2023) Title: The actin cytoskeleton negatively feeds back on defense induced calcium dynamics. (poster presentation by Weiwei Zhang). ISMPMI Congress, Providence, RI.

Zhang, W. (2024) Invited talk: "Decoding Ca2+ signatures and signaling to the actin cytoskeleton in plant immune response", TAGC24, The Allied Genetics Conference, 5-9 March, 2024. Washington, DC.

Peer-reviewed conference presentations, papers and posters with multi-lab EMBRIO authors: (5)

Arigye, J., Magana, A.J., Lyon, J.A., and Pienaar, E. (2023). Biomedical and agricultural engineering undergraduate students' programming self-beliefs and changes resulting from computational pedagogy. In Proceedings of the 2023 ASEE Annual Conference & Exposition. Baltimore MD. June 25 - 28.

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Li, L., Wang, X., Wu, T. C, Buganza-Tepole, A., Umulis, D., Integrating Dynamic Cell Imaging Data into Moving Mesh Finite Element Models of Developing Zebrafish Embryos, International Zebrafish Conference 2021, Online

Udosen, A. N., Arigye, J., Joshi, P. P., & Magana, A. J., Lyon, J.A., Pienaar, E. (2023). Enactment of Undergraduate Students' Computational Model-Based Reasoning through Epistemic Thinking Practices [Poster presentation]. Purdue Polytechnic Research Impact Areas, Spring 2023 Student Poster Symposium, Purdue University, USA, March 24th, 2023.

Peer-reviewed conference presentations, papers and posters single EMBRIO Lab (40):

Arigye, J., Udosen, A.N., Pravin, J.P., and Magana, A.J. (2023). The evolution of team coordination commitments in the context of computational projects. In Proceedings of the 2023 IEEE ASEE Frontiers in Education Conference. College Station, Texas. October 18–21, 2023.

Deng, Q. (2022) Mitofusin 2 Regulates Cytoskeleton Reorganization During Cell Spreading and Migration. GRC calcium signaling, Ventura, CA (Jun 2022).

Deng, Q. (2022). Mitofusin 2 Regulates Cytoskeleton Reorganization During Cell Spreading and Migration. GRC signaling by Adhesion receptors, Manchester, NH (Jul 2022).

Ding, Chang and Qing Deng. Reactive Oxygen Species (ROS) Relax Wounds to allow Healing & Regrowth. The Allied Genetics Conference 2024, March, 2024, National Harbor, VA.

Deng, Q. Society for Leukocyte Biology 56th Annual Meeting, Athens, GA (Sep 2023) Title: Fishing for new regulators of neutrophil migration. Special Interest Group Session "Myeloid cells in inflammatory diseases"

Gazzo, David, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman, "Leveraging Drosophila Locomotion Assays to Elucidate Protein-Protein Interactions in Neurodegeneration" Midwest Drosophila Conference, Bloomington. October 2023

Fennell, H. (2023). "Computational Apprenticeship: A Constructivist Approach for Teaching Modeling and Simulation" Society for Mathematical Biology, June 2023, Columbus, OH.

Iyer-Pascuzzi, Anjali (2022) "A bacterial effector protein impacts the cytoskeleton of plant cells".
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Kumar, N., J. Ambriz, K. Tsai, M.Mim, M. Flores Flores, W. Chen, M. Alber, J. Zartman. Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development. The Allied Genetics Conference 2024, Washington, D.C., March 8, 2024. (poster presentation)

Kumar, Nilay, Jennifer Rangel Ambriz, Kevin Tsai, Mayesha Sahir Mim, Marycruz Flores Flores, Weitao Chen, Mark Alber,*, Jeremiah J. Zartman "Reverse engineering the interplay between tissue growth and cytoskeletal regulation during organ development," Biomedical Engineering Society's (BMES) Cellular and Molecular Bioengineering (CMBE) Conference, San Juan, Puerto Rico, January 2-6, 2024. (poster).

Larson, N., Li, L., Umulis, D. Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis. BMES 2023, October 2023, Seattle

Larson, N., Li, L., Umulis, D. Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis. BMES 2023, October 2023, Seattle

Lu, S., Wang, Y., & Wang, X. (2024). Debiasing Attention Mechanism in Transformer without Demographics. In the

Twelfth International Conference on Learning Representations (ICLR).
https://openreview.net/forum?id=jLIUfrAcMQ

Madamanchi, A., Larson, N., Karim, M. S., Umulis, D. Stochastic Modeling of BMP Receptor Pathways: Complex Formation and Signal Transduction in Zebrafish Embryogenesis & BMES 2022, October 2022

Magana, A. (2022). Promoting model-based reasoning through computational modeling and simulation practices. Plenary session at the Spring 2022 Meeting of the Illinois Section of the AAPT. April 9th, 2022.

Minsuk, S. (2023). "Modeling the Mechanical Forces Driving Epithelial Morphogenesis and Cell Rearrangement during Zebrafish Epiboly" Society for Mathematical Biology, 2023, Columbus, Ohio.

Mim M., N. Kumar, J. Zartman. Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation. The Allied Genetics Conference 2024, Washington, D.C., March 7, 2024. (poster presentation)

Mim M., N. Kumar, J. Zartman. Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation. Biophysical Society 68th Annual Meeting, Washington, D.C., February 14, 2024. (poster presentation)

Mim, M S., et al., ". Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development", Predictive Modeling in Biology and Medicine Conference, Riverside, CA, Nov 17, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", SWSDB Meeting, Aurora, CO, Mar 2, 2024

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", BMES CMBE Conference, San Juan, PR, Jan 2, 2024

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", ASCB/EMBO Cell Bio, Boston, MA, Dec 2, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", 64th Drosophila Research Conference, Chicago, IL, Mar 2, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", BMES Annual Meeting, Seattle, WA, Oct 13, 2023

Mukherjee S and Gardner SM (2023, talk) Exploring theoretical frameworks to guide the design, evaluation, and collaboration in an interdisciplinary institute. X-DBER virtual conference

Mukherjee S, Karippadath A, Georgopoulos E, Gardner SM (poster) Conceptualizing the Meaning of Interdisciplinarity in a Biology Integration Institute. Annual meeting of the Society for the Advancement of

Biology Education Research (SABER), Twin Cities, MN, July 2023.

Mukherjee, S, Georgopoulos E, and Gardner SM (under review, 2024) Exploring the features of integration in a Biology Integration Institute (BII). Annual meeting of the Society for the Advancement of Biology Education Research (SABER), Twin Cities, MN, July 2024

Samasa, Bakary, Joe Zinski, Mary C. Mullins. Poster presentation at The Allied Genetics Conference 2024, March, 2024, National Harbor, VA "Investigating the role of cytoskeletal dynamics during epiboly morphogenesis in the zebrafish"

Samasa, Bakary, Joe Zinski, Mary C. Mullins. Poster presentation at the Mid-Atlantic Regional Zebrafish meeting, September, 2022, Temple University, "Investigating the role of Calcium signaling during epiboly morphogenesis in the zebrafish",

Shulka S[UG*], Davis BF[G], Kinzer-Ursem T. Computational Modeling of the Role of Ca2+ Flux Frequency Decoding by Calmodulin and CaMKII on Actin Polymerization Dynamics and Dendritic Spine Morphology, BMES October 2023 Seattle

Staiger, C. (Zhang, W.) (2022). Keynote speaker: "Actin dynamics during the plant innate immune response." Invited talk: "Arabidopsis Myosin XIK interacts with the exocyst complex to facilitate vesicle tethering during exocytosis." Presented by Dr. Weiwei Zhang due to health reasons. Gordon Research Conference, Plant and Microbial Cytoskeleton, Proctor Academy, Andover, NH, August 14-19, 2022.

Tan, Shelly and Qing Deng. Calcium-actomyosin crosstalk in zebrafish wound closure. American Society for Cell Biology 2023, Boston, MA

Unger, Maria F. [*] (Zartman Lab), et al., "Gαq homeostasis is required in organ size regulation, initiation of larval to pupal metamorphosis and larval survival in Drosophila melanogaster," 2023 Midwest Drosophila Conference, Allerton, Illinois, October 21-22. (talk).

Wilson-Gray[UG] Ariel [*], Kim E[G], Tan E[G], Kinzer-Ursem TL Optimizing Fc-Specific Antibody-Oligonucleotide Conjugation to Improve Sensitivity of Immunoassay Probes, Annual Biomedical Research Conference for Minoritized Students (ABRCMS) November 2023* Won Best Poster Award

Zartman, Jeremiah J. , et al., "Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development," 2023 Midwest Drosophila Conference, Allerton, Illinois, October 21-22. (talk).

Zartman, J.J., Kumar, N. and Alexander Dowling. (2022) Morphogenetic cartography: Mapping morphogens to tissue shapes. Year 3 Pilot Project Investigators, 4th Annual Conference on Quantitative Approaches in Biology, Northwestern University, March 16-17, 2022.

Zhang, W. (2023) Title: The actin cytoskeleton negatively feeds back on defense induced calcium dynamics. (poster presentation by Weiwei Zhang). ISMPMI Congress, Providence, RI.

Zhang, W. (2024) Invited talk: "Decoding Ca2+ signatures and signaling to the actin cytoskeleton in plant immune response", TAGC24, The Allied Genetics Conference, 5-9 March, 2024. Washington, DC.

Non-juried conference products:

Davis BF[G]*, Banks-Koehn M, Kinzer-Ursem TL, (Poster) Coarse-Grained Protein Systems Model of Phosphoregulation in the Cardiac Dyad, Purdue Institute for Drug Discovery (PIDD) Symposium, West Lafayette, IN September 2022

Gazzo , David, Pablo Cisternas, Jeremiah Zartman, "A Dynamic Interaction Between Ion Channels: Piezo and SERCA" EMBRIO Annual Retreat, Purdue. July, 2023

Gazzo , David, Pablo Cisternas, Yiduo Liu Jeremiah Zartman, "A Behavioral Assay Elucidating The Dynamic Interaction Between Ion Channels: Piezo and SERCA" CBE Engineering Graduate Research Symposium, Notre Dame. September, 2023

Gazzo , David, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman, "A Novel High Throughput Behavioral Platform for Characterization Of Neurodegeneration Through the Lens of Protein-Protein Interactions" National Science Foundation, Biology Integration Institutes 2024 Awardees Meeting, NSF Headquarters, Alexandria, VA. January 2024

Gazzo , David, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman, "A High Throughput Behavioral Platform to Elucidate Protein-Protein Interactions in Neurodegeneration". BIPH Advisory Board Meeting, Notre Dame. November, 2023

Gazzo, David, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman, "A Novel High Throughput Behavioral Platform for Characterization Of Neurodegeneration" Colleges of Science and Engineering Research Horizons Symposium, Notre Dame. November 2023

Jones KT[UG]*, Tan E[G], Kim ES[G], Kinzer-Ursem TL, (Poster) Investigation of the Interactions of Neuronal Proteins in an Animal Model of Alzheimer's Disease, Purdue 2022 Summer Undergraduate Research Symposium, West Lafayette, IN July 2022

Mim, M S., et al., "Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development", Cytoskeleton Talk, Chicago, IL, March 15, 2024

Mim, M S., Kumar, N., Zartman, J. et al., "Balancing competing effects of tissue growth and cytoskeletal regulation during Drosophila wing disc development", Bioengineering Seminar, ND, Spring 2021, 2023, Fall 2022, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", HCRI Cancer Research Symposium, ND, Mar 28, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", Engineering Advisory Council Visit, ND, Sep 1, 2023

Mim, M S., Kumar, N., Zartman, J., "Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Piezo", 9th CBE Symposium, Notre Dame, IN, October 5, 2023

Mim. M S., "Imaging D melanogaster", EMBRIO Photomanipulation Workshop, West Lafayette, IN, Apr 5, 2023

Rafiq M[UG]*, Sikandar F[UG], Doszpoly A[G], Kim ES[G], Kinzer-Ursem TL, The Effect of Ca^{2+} Signal Dependence on Actin Morphology of Dendritic Spines in an Alzheimer's Mouse Model, Purdue 2022 Summer Undergraduate Research Symposium, West Lafayette, IN July 2022

Samasa , Bakary, Joe Zinski, Mary C. Mullins . Poster presentation at the Developmental, Stem Cell, and Regenerative Biology graduate program retreat, September, 2022, Swarthmore, PA, "Investigating the role of Calcium signaling during epiboly morphogenesis in the zebrafish",

Sikandar F[UG]*, Rafiq M[UG], Doszpoly A[G], Kim ES[G], Kinzer-Ursem TL, (Poster) Investigating Effects of Calcium-Dependent CaMKII Signaling on Dendritic Spine Morphology During Alzheimer's Disease, Purdue 2022 Summer Undergraduate Research Symposium, West Lafayette, IN July 2022

Unger , Maria F., Nilay Kumar, Marycruz Flores Flores , Vijay Velagala, Jun Li , Jeremiah Zartman. Gαq homeostasis is required for achieving the optimal organ shape and size through JAK/STAT signaling and P-myosin contractility in developing Drosophila wing disc. Cytoskeleton meeting 2024, Chicago, IL

Unger , Maria F., Nilay Kumar, Marycruz Flores Flores , Vijay Velagala, Jun Li , Jeremiah Zartman. The multimodal action of Gαq in coordinating growth and homeostasis in the Drosophila melanogaster wing imaginal disc. EMBRIO INSTITUTE ANNUAL RETREAT 2023, Purdue University, IN (poster)

Non-Juried Posters/Presentations (Con't – per Event)
FROM BIOLOGY INTEGRATION INSTITUTES CONFERENCE, NATIONAL SCIENCE FOUNDATION HEADQUARTERS, JAN. 22-23, 2024.

Linlin Li, Shenyu Lu, Xiaoqian Wang, Amirhossein Amiri Hezaveh, Adrian Buganza-Tepole, and David M. Umulis. 2024. Integrating Artificial Intelligence in Computational Biology. Poster.

Linlin Li. 2024. Lightning Talk: Integrating Artificial Intelligence in Computational Biology.

Weiwei Zhang, Jessica R. Helwig, Alexis Hoerter, Deiver Suarez Gomez, Abbie Rogers, June Hyung Kim, Elsje Pienaar, Clara E. Isaza, Mauricio Cabrera-Ríos, Jeremiah J. Zartman, Taeyoon Kim, Anjali lyer-Pascuzzi, Christopher J. Staiger. 2024. Decoding Ca^{2+} signatures and signaling to the actin cytoskeleton in plant immune response. Poster.

Weiwei Zhang. 2024. Lightning Talk: Decoding Ca^{2+} signatures and signaling to the actin cytoskeleton in plant immune response.

David Gazzo, Pablo Cisternas, Yiduo Liu, and Jeremiah Zartman. 2024. A Novel High Throughput Behavioral Platform for Characterization of Neurodegeneration. Poster.

FROM EMBRIO INSTITUTE ANNUAL RETREAT 2023 RESEARCH POSTER SESSION, JULY 13TH.

1. Ravinuthala,D., Branca,N., McCarthy,A., and Evans, J. Understanding events of the egg-to-embryo transition through studies   of calcium, actin, and sperm-egg interaction dependent signals.

2. Saad,S., McGinnis,L., Melendez,V.S., and Evans, J. Nexilin: An actin-binding and candidate calcium-regulating protein in oocytes, eggs, and embryos.

3. *Talbert, A*., Evans, J., Chan, D., Ravinuthala, D., and Chatterjee, A. Development and application of Atomic Force Microscopy (AFM) and imaging tools towards the measurement of oocyte mechanical behavior.

4. Owens, J. and Mendenhall, J. Investigating the role of $[Ca^{2+}]$ signaling and NF-κB response under Oxidative Stress in chondrocyte cells using an Osteoarthritis model.

5. Akande,F.P., Mengiste, T., and Staiger, C.J. Investigating the Role of AtPIEZO as a Possible Mechanoreceptor During Plant Defense.

6. *Rosario-Marcano, C*., Zhang, W., Staiger, C.J. Arp 2/3 complex's role in plant's immune response.

7. Deiver Suarez, Daniel Rocha, Jessica R. Helwig, Weiwei Zhang, Chris J. Staiger, Clara Izaza, Mauricio Cabrera. Use of functional ANOVA and Artificial Neural Networks to model Calcium Signaling in plants.

8. Hiles, R., Rogers, A., Jasiwal, N., Zhang, W., Butchacas, J., Klass, T., Jacobs, J., Staiger, C.J., Helm, M., Iyer-Pascuzzi, A.S. A *Ralstonia solanacearum* type III effector disrupts the actin and microtubule cytoskeleton to promote bacterial virulence in plants.

9. *Kaser,E.,* Rogers,A., and Iyer-Pascuzzi, A. Investigating functional domains of the Rip6 bacterial effector protein.

10. Gazzo, D. and Cisternas, P. A Dynamic Interaction Between Ion Channels: Piezo and SERCA.

11. Mayesha Sahir Mim, Nilay Kumar, Jeremiah J. Zartman. Shining Light on Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation.

12. Unger, MF, Velagala, V, Soundarrajan, D.K., Flores- Flores, M., Gazzo, D., Kumar,N., Li, J., and Zartman, J. Gαq homeostasis is required in organ size regulation, initiation of larval to pupal metamorphosis and larval survival in *Drosophila*.

13. Ding, C. and Deng, Q. Calcium-Actomyosin Crosstalk in Zebrafish Wound Closure.

14. *Rivera, K.,* Tan, S., Deng, Q. Characterization of calcium-sensing receptor (CaSR) in zebrafish embryo wound response.

15. Tan, S., Li,L. and Deng, Q. Calcium-Actomyosin Crosstalk in Zebrafish Wound Closure.

16. Dong, Z. and Zhang, G. Zebrafish p*iezo* genes are duplicated and are expressed in diverse tissues during early embryogenesis.

17. *Kim, C.,* Dong, Z., and Zhang, G. Testing NEMOs, a New Genetically Encoded Calcium Indicator in Zebrafish Embryos.

18. *Erbol Nishanov*, Ziyu Dong, Sung Jun Park, GuangJun Zhang. Revealing cellular electric activity in the *Danio rerio* (zebrafish) caudal fin folds via Voltron, a genetically encoded voltage indicator.

19. Perez-Rosas, N., Li, L, Buganza-Tepole, A., and Umulis, D. Calcium Activity Model at the Cleavage Stage of Zebrafish Development.

20. *Gichaba, E.M.,* Pérez,N., Pienaar, E., and Buganza Tepole, A. Computational Modeling of Calcium Dynamics.

21. Magana, A. J., Arigye, J., **Udosen, A. N**., Lyon, J.A., Joshi, P., & Pienaar, E. (2023). Model-Based Reasoning as a Form of Competent Epistemic Performance in the Context of Scaffolded Computational Modeling and Simulation Projects.

22. Li, L., Wang, X., **Chai, J**., Wang, X., Buganza-Tepole, A., & Umulis, D. M. (2022). Determining the role of advection in patterning by bone morphogenetic proteins through neural network model-based acceleration of a 3D finite element model of the zebrafish embryo.

23. Dima, SS, and Reeves, G. Quantification of properties of Zelda in *Drosophila* embryo using

Raster Image Correlation Spectroscopy.
24. Shaikh, R.R., Reeves, G.T., (2023, July 13-14) Mathematical modeling shows that the BMP signaling pathway spatiotemporally regulates Drosophila ovarian germline stem cell differentiation through negative feedback loop.
25. Jayaraman Krishnan, M., Tan, SG., Pienaar, E., Li, L., Deng, Q., Umulis, DM., Rosas, NP. A computational model to understand the role of calcium activity in the zebrafish tailfin wound healing process.
26. Larson, N.J., and Umulis, D.M. Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis.
27. Liu, S., and Zartman, J.J. Deciphering the Interplay of Morphogen and Bioelectric Signaling in *Drosophila* Wing Discs.

Lightning Talks – Friday, July 14th, 11:20am
1. *John, E.,* Kim, E.S., and Kinzer-Ursem, T. Spatial Localization of Proteins in Structural Homeostatic Plasticity.

2. *Shiv, S.,* Davis, B., and Kinzer-Ursem, T. Computationally Modeling the Role of Ca2+ Flux Frequency Decoding by Calmodulin and CaMKII Role on Actin Polymerization Dynamics and Dendritic Spine Morphology.

3. *Sierra, I.*, Cabrera, M., Isaza, C., Zhang, W., Staiger, C.J. Cross-talk of Ca2+ and ROS in plant immune response.

From 2021-2022:
Adriana P. Santos Bagu´e, Tyler Pikes, and **Qing Deng**. Act1 Knockout effects on Interleukin 17 mediated neutrophil recruitment. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

Ale Magana. Toward a computational cognitive apprenticeship for promoting model-based reasoning. Spring 2022 Distinguished Lecture of The Grainger College of Engineering at the University of Illinois Urbana-Champaign. April 22nd, 2022.

Ale Magana. Promoting model-based reasoning through computational modeling and simulation practices. Plenary session at the Spring 2022 Meeting of the Illinois Section of the AAPT. April 9th, 2022.

Ambrose Haskin, Aritra Chatterjee, Juana Mendenhall, and **Deva Chan**. Measuring the Effect of Cerium Oxide Nanoparticles (CeO NPs) in 3D Printed Hydrogels. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

Anne Malott, Mayesha Sahir Mim, Jeremiah Zartman. Functional Analysis of Piezo in Rasv12 Mediated Cancer Progression. Research Cures Cancer Corps Symposium. Thursday, July 28, 2022. (poster)

Chiana Barski, Weiwei Zhang, and **Christopher J. Staiger**. ARP 2/3 Complex Mediated Actin Filament Response in Presence of MAMP Treatment. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

David Umulis. September 2021. Modeling the living embryo- Data fusion approaches to determine mechanism. NCSU- Chancellors keynote speaker.

J.J. Zartman, **Nilay Kumar**, Alexander Dowling. Morphogenetic cartography: Mapping morphogens to

tissue shapes. Year 3 Pilot Project Investigators, 4th Annual Conference on Quantitative Approaches in Biology, Northwestern University, March 16-17, 2022.

Jaylin Trice, Melinda A. Lake, and *Jacqueline C. Linnes*. Blood Sample Preparation for HIV Diagnostics in a Smartphone-based Microfluidic Device. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

José Martínez, *David Gazzo*, **Francisco Huizar**, and *Jeremiah Zartman*. Identification of new organ size regulators: Positive feedback between the G-protein Coupled Receptor Methuselah like-8 and Galphaq. ND Summer Undergraduate Research Symposium, Jordan Hall Galleria, Wednesday, July 20th, 2022. (poster)

Kenneth T. Jones, Eric Tan, *Eugene Kim*, and *Tamara Kinzer-Ursem*. Investigation of the Interactions of Neuronal Proteins in an Animal Model of Alzheimer's Disease. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

Kioni Bush, Shelly Tan, and *Qing Deng*. Integration of Actin and Calcium in Embryonic Zebrafish Wounding Model. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

Morgan Murff and *Chris Staiger*. Exploration into pre-penetration MAMPs and their effect on actin cytoskeleton rearrangement. Purdue Summer Undergraduate Research Symposium (SCARF), July 28 – August 4, 2022.

Qing Deng. Mitofusin 2 Regulates Cytoskeleton Reorganization During Cell Spreading and Migration. GRC calcium signaling, Ventura, CA (Jun 2022).

Qing Deng. Mitofusin 2 Regulates Cytoskeleton Reorganization During Cell Spreading and Migration. GRC signaling by Adhesion receptors, Manchester, NH (Jul 2022).

Ting Hsuan Ku, Tianqi Wang, and **Qing Deng**. Improving Under Agarose Gel Assay by 3D Printing for Investigating Neutrophil Migration. Summer Undergraduate Research Fellowship Symposium, Purdue University, July 27-28, 2022.

M.S. and Ph.D. Theses:

Adebowale, Joan (2022). MS Thesis. Advisor: J. Mendenhall.

Daniel Rocha (2023) Towards Rapid Estimation System in Calcium Signaling, MS Thesis in Bioengineering, (Thesis Advisor: Dr. Clara E. Isaza, Coadvisor: Dr. Mauricio Cabrera-Ríos). Currently under a 2 year embargo in ProQuest to allow for publication of papers

Feyisayo P. Akande. 2023. MS Thesis, Purdue University. Investigating the role of AtPIEZO as a possible mechanoreceptor during plant defense. (Staiger, major professor; J. Zartman, committee member)
June Hyung Kim, MS thesis, "Probing the roles of actin dynamics in the cytoskeleton of animal and plant cells," May 2024 (upcoming)

Kumar, N. (2023). "Reverse Engineering Epithelial Morphogenesis: A Systems Biology Approach." University of Notre Dame. (Advisor: J.J. Zartman)

Lyon, Joseph Alan (2022): "Characterizing Computational Thinking Through The Use Of Modeling And Simulation Activities Within The Engineering Classroom." Purdue University Graduate School. Thesis. (Advisor: A. Magana) https://doi.org/10.25394/PGS.19692784.v1

Nicole Branca, MS thesis, "The Membrane Block to Polyspermy in Mammalian Eggs: Analyses of Calcium Signaling and Actin Dynamics During Fertilization" (Thesis Advisor: Janice Evans, committee member, Chris Staiger)
Soundarrajan, D. K. (2022). "Dynamics of Calcium Signaling in Multicellular Systems: Quantitative Experiments and Computational Modelling." University of Notre Dame. (Advisor: J.J. Zartman)https://doi.org/10.7274/dj52w379b8f

Thompson, Matthew J (2022): "Precision of Positional Information Along the Developing Cochlea Radial Axis: Linear BMP Activity Helps Set the Stage." Purdue University Graduate School. Thesis. (Advisor: D. Umulis. EMBRIO Committee members: T. Kinzer-Ursem) https://doi.org/10.25394/PGS.21301113.v1

Velagala, V. K. N. (2023). "Mechanisms of Crosstalk and Signal Integration of Calcium Signaling in Epithelial Tissues." University of Notre Dame. (Advisor: J.J. Zartman) https://doi.org/10.7274/sq87br89z23

Wang, Yueyang (2022): "Mitofusin 2 regulates actin cytoskeleton and cell migration." Purdue University Graduate School. Thesis. (Advisor: Q. Deng) https://doi.org/10.25394/PGS.19661556.v1

Weathered, Catherine (2022): "Multiscale Spatiotemporal Modeling For Human Disease: Agent Based Models For Nontuberculous Mycobacterium Infections And Alzheimer's Disease." Purdue University Graduate School. Thesis. https://doi.org/10.25394/PGS.21298182.v1. (Advisor: E. Pienaar. EMBRIO Committee members: T. Kinzer-Ursem, P. Escalante, G. Knipp).

Invited Seminars and Presentations (Non-Conference):

Chan, D. Presented work in biomechanics and imaging at an invited seminar series at University of Wisconsin, Madison (March 14, 2024)

Chan, D. Presented work in biomechanics and imaging at an invited seminar series at University of Notre Dame (April 2, 2024)

Iyer-Pascuzzi, A. 2022 "Genomic and phenomic approaches to understanding bacterial wilt disease resistance". University of Massachusetts, Amherst, Department of Plant Biology, October.

Iyer-Pascuzzi, A. 2023 "A bacterial effector protein impacts the cytoskeleton of plant cells" University of Oxford, Oxford, England.

Iyer-Pascuzzi, A. 2023 "Genomic and phenomic approaches to understanding bacterial wilt disease resistance". University of Tennessee, Knoxville, Plant Research Center.

Jayant, K. IUSM Stark Neurosciences, Feb 8th, 2024

Jayant, K. UC Irvine Neurobiology and Anatomy, March 14th, 2024

Kinzer-Ursem TL Computational Biology of Molecular Mechanisms in Biological and Biomedical

Systems, Department of Biomedical Engineering, University of Michigan, October 2021

Kinzer-Ursem TL Computational Methods to Explore Fundamental Molecular Mechanisms of Biological and Biomedical Systems, Ohio State University, February 2024

Kinzer-Ursem TL Computational Methods to Explore the Fundamental Molecular Mechanisms of Biological and Biomedical Systems. Department of Chemical Engineering, City College of New York, March 2021

Kinzer-Ursem TL Computational Tools to Study Protein Signaling, Institute of Biology III, University of Freiburg, October 2021

Kinzer-Ursem TL Integrative Approaches to Elucidate Mechanisms of Neurological Disorders. Frank J. Kollarits Seminar Series, Department of Bioengineering, University of Toledo, February 2023

Kinzer-Ursem TL Multidisciplinary Approaches For Precise Descriptions of Protein Function, FRIAS Natural and Life Science Colloquium, Freiburg Institute for Advanced Studies, University of Freiburg, Germany, November 2021

Kinzer-Ursem TL Protein Function at Multiple Scales: Tools Development across Disciplines, joint seminar BIOSS Center for Biological Signaling Studies and CIBSS Centre for Integrative Biological Signalling Studies, Freiburg University, Germany, February 2022

Kinzer-Ursem TL Protein Function at Multiple Scales: Tools Development across Disciplines. Max Plank Institute for Brain Research, Frankfurt Germany, March 2022

Kinzer-Ursem TL Integrative Approaches to Elucidate Mechanisms of Neurological Disorders. Department of Biomedical Engineering, George Mason University, April 2023

Li, L., Shenyu Lu, Xiaoqian Wang, Amirhossein Amiri Hezaveh, Adrian Buganza-Tepole, and David M. Umulis, (2024) Integrating Artificial Intelligence in Computational Biology, NSF BII Conference, Alexandria Old Town, VA

Li, L., Wang, X., Chai, J., Wang, X., Buganza-Tepole, A., & Umulis, D. M. (2023) Neural Network Model-Based Acceleration of a 3D Finite Element Model of the BMP Patterning Formation in Zebrafish Embryo. USNCCM, Albuquerque, New Mexico

Li, L., Wang, X., Shenyu Lu., Wang, X., Buganza-Tepole, A., & Umulis, D. M. (2023) AI-supported biological modeling acceleration and parameter optimization, BMES 2023, Seattle

Magana, A.J. (2022). Scaffolding Students' Development of Computational Adaptive Expertise. IFE Living Lab & Data Hub Seminar. Technologico y de Estudios Superiores de Monterrey, Campus Monterrey.

Magana, A.J. (2022). Toward a computational cognitive apprenticeship for promoting model- based reasoning. Spring 2022 Distinguished Lecture of The Grainger College of Engineering at the University of Illinois Urbana-Champaign. April 22nd, 2022.

Magana, A.J. (2023). A Scaffolding Framework for Supporting Students' Development of Computational Adaptive Expertise. Presentation at the Global Faculty Week. Technologico y de Estudios Superiores de Monterrey. Campus Estado de Mexico, March 7th, 2023.

Magana, A.J. (2023). A Scaffolding Framework for Supporting Students' Development of Computational Adaptive Expertise. Presentation at the Global Faculty Week. Technologico y de Estudios Superiores de Monterrey. Campus Ciudad de Mexico, March 8th, 2023.

Mukherjee S and Gardner SM (2023, talk) Exploring Frameworks to Guide the Design, Evaluation, and Collaboration in an Interdisciplinary Institute. BII Evaluators meeting, July 2023

Mukherjee S and Gardner SM (2023, talk) Exploring Frameworks to Guide the Design, Evaluation, and Collaboration in an Interdisciplinary Institute. INSITE BII presentation, April 2023

Umulis, D. September 2021. Modeling the living embryo- Data fusion approaches to determine mechanism. NCSU- Chancellors keynote speaker.

Wang, X. (2022). Explainable and Fair Machine Learning with Applications in Biomedical Data Science. Clemson University, School of Computing seminar. April 2022

Wang, X. (2022). Fair and Explainable Machine Learning. Purdue University, Weldon School of Biomedical Engineering seminar. Nov 2022

Wang, X. (2023). Fair and Explainable Machine Learning. Consortium of Universities for Global Health (CUGH 2023). Apr 2023

Xu. L. Chicago Cytoskeleton, Northwestern University, Feinberg School of Medicine, March 24, 2023. Invited talk: "Cooperative actin filament nucleation in the homeostatic cortical array of plant cells." Presented by PhD student Liyuan Xu. Also served as judge for poster competition to select trainees for talks at April meeting; reviewed 12 virtual posters/lightning talks and participated in 2 rounds of voting.

Zhang, W. 2024 NSF BII Awardees Meeting, Alexandria, VA. Title: Decoding Ca^{2+} signatures and signaling to the actin cytoskeleton in plant immune response. (invited talk and poster presentation by Weiwei Zhang)

Technologies or Techniques
Updated versions of CompuCell3D multiscale simulation environment and associated documentation and tutorials downloadable from www.compucell3d.org (updates partly supported by EMBRIO Institute)

Tissue Forge multiscale simulation environment and associated documentation and tutorials downloadable from https://tissue-forge-documentation.readthedocs.io/en/latest/ (updates partly supported by EMBRIO Institute)

Developed a semester course:
Evans, Ladd, Magana, and Pienaar co-developed the course titled Computational Understanding of Biological Systems and Data. (piloting course Summer 2024)

Xiaoqian developed a new graduate course: ECE 695 - Machine Learning in Bioinformatics and Healthcare, where she integrated EMBRIO focused materials of using machine learning models in computational biology and integrating data across scales into course development. Students enrolled in this course are from various departments, including Electrical and Computer Engineering, Biomedical Engineering, Biological Sciences, etc.

Elsje Pienaar, Chris Staiger: Course-based undergraduate research experience (CURE) – Calcium signaling in plants. BME 401 (Fall 2023).

Adapted a semester course to include new EMBRIO materials and knowledge:
Taeyoon Kim significantly revised materials in the course titled "BME 542: Cell & Tissue Mechanics" to teach more topics relevant to EMBRIO.

Dr. Zartman taught CBE40479/60579 Introduction to Cell and Tissue
Engineering. Significant course adaptations were made in the Spring 2023 including updating the material to reflect the significant advances that are being made in cell and tissue engineering. The upgraded course includes an increased emphasis on the integrative final project. Dr. Zartman received positive feedback on the course from students.

Developed a module (materials, code, problem sets):
Deva Chan: Integration of atomic force microscopy (AFM) into course "Experimental Methods in Biomechanics" (BME 31400) – discussed and enacted improvements to class activity (worksheet) associated to AFM module under advice from Ale Magana and performed with TA support (TA was Alexander Donabedian, who was previously part of EMBRIO but not paid, due to interests in education and in image-based biomechanics efforts)

UPRM: Tutorial for the use of CalciumInsights software
UPRM: Manuals for sharing data in EMBRIO

Developed a tool or software:
Calcium Insights Software (Collaboration across EMBRIO Institute, our group was represented by Dr. Deiver Suárez and Santiago Colom)
R Code for Statistical Analysis of Actin Filament Growth (Collaboration with Dr. Steiger´s Lab)
R Code for Statistical Analysis of Zebrafish´s tails regeneration (Collaboration with Dr. Qing Deng)
R Code for Statistical Analysis of Calcium Traces (Collaboration with Dr. Steiger´s Lab)
R Code for Functional Anova (Collaboration with Dr. Steiger´s Lab)
Jupyter Notebook with full Multiple Criteria Optimization capabilities

Proposal submission (collaborating across EMBIO):
$2,000,000 (declined). CUE-T: Attaining Self-Regulation and Learning Agency in Computation, Enabled by a Computational Cognitive Apprenticeship; National Science Foundation (PI: Magana, Co-PI: Pienaar et al.).

$750,000 (under review). Cognitive Apprenticeships and Professional Development in Computing and Data Science for Enhancing Interdisciplinary Engineering Education. National Science Foundation (PI: Magana, Co-PI: Pienaar et al.).

$1,162,684. Optimality of morphogen signal transduction across the animal kingdom. National Science Foundation (PI: Zartman, Co-PIs: Umulis, Li, Reeves) Support letter from Isaza-Cabrera lab for Dr. Zartman´s NIH MIRA 35 Proposal

$24,000,000 (declined; revising to resubmit fall 2024). BioFoundry: Synaptic Ultra- Structure and Experience (SUSE). PI: Huang; CoPIs: Chubykin, Rochet, Gardner

$2,357,012 (under review) Optimality of morphogen signal transduction across the animal kingdom, NSF, (PI: Gregory T. Reeves, Co-PI: Jeremiah Zartman, Linlin Li, David Umulis, Donny Hanjaya-Putra.).

$20,000. Design and Instruction of a Team-Based Transdisciplinary Cross-Listed Course in Computational Understanding of Biological Systems and Data. Purdue University Lilly Endowment, Office of the Provost, Innovation Hub (PIs: Evans, J., Ladd, B.T., Magana, A., Pienaar, E.)

$40,000. Phase II Implementation Proposal: Design and Instruction of a Team-Based Transdisciplinary Cross-Listed Course in Computational Understanding of Biological Systems and Data. Purdue University Lilly Endowment, Office of the Provost, Innovation Hub (PIs: Evans, J., Ladd, B.T., Magana, A., Pienaar, E.).

Grants awarded, leveraging EMBRIO:
$29,188 (awarded) Design and Instruction of a Team-Based Transdisciplinary Cross-Listed Course in Computational Understanding of Biological Systems and Data. Purdue University Lilly Endowment, Office of the Provost, Innovation Hub (PIs: Evans, J., Ladd, B.T., Magana, A., Pienaar, E.)

$43,448 (awarded) Phase II Implementation Proposal: Design and Instruction of a Team-Based Transdisciplinary Cross-Listed Course in Computational Understanding of Biological Systems and Data. Purdue University Lilly Endowment, Office of the Provost, Innovation Hub (PIs: Evans, J., Ladd, B.T., Magana, A., Pienaar, E.).

Grant awarded to Bakary Samasa: Predoctoral Ford Foundation fellowship, $27,000/year, 3 years expected, beginning September, 2023

Workshops Organized

Staiger, C. and Zhang, W. Organized and taught two mini-workshops on advanced imaging and image analysis (SDC/photomanipulation), including introductory training of nearly two dozen students and faculty, as well as expert-level training for two PhD students (Shelly and Abbie)

Zartman, J., Li, L., and Reeves, G. Organized EMBRIO Workshop at TAGC2024, March 9th Washington D.C. Advancing Computational Developmental Biology: Integrating Experimental and Computational Systems Approaches. 60 attendees.

Zartman, J. w/ Staiger, C., Ladd, B.T. Organizer, 2023 NSF Biology Integration Institute EMBRIO Training Workshop, July 10-11, 2023, University of Notre Dame.

Glazier, J., Fennell, H. CompuCell3D User Training Workshop, July/August 2023 with EMBRIO member participation

Glazier, J., Sego, J. , Fennell, H. CompuCell3D User Training Workshop, July/August 2022 with EMBRIO member participation

Glazier, J., Sego, J. , Fennell, H. Intro to CompuCell3D EMBRIO Summer Workshop, 2022 Purdue University.

Umulis, D. w/ Pienaar, E., Glazier, J., Zartman, J, Gardner, S., Staiger, C., Huetteman, C., Ladd, B.T. Organizer, 2022 NSF Biology Integration Institute EMBRIO Training Workshop, July 18-20, 2022, Purdue University.

White Papers, and Reports, Other EMBRIO products

Evaluation report to EMBRIO directors (Gardner, Mukherjee, Georgopoulos)

Competencies for EMBRIO Institute: Gardner, Magana, Pienaar, Kinzer-Ursem, Ladd, Mukherjee, Georgopoulos

Websites

- http://sites.nd.edu/zartmanlab/
- https://engineering.purdue.edu/PienaarLab
- https://engineering.purdue.edu/tepolelab/
- https://linktr.ee/appliedoptuprm
- https://polytechnic.purdue.edu/profile/admagana
- https://scholar.google.co.in/citations?hl=en&user=R4GLFtcAAAAJ&view_op=list_works&sortby=pubdate
- https://web.ics.purdue.edu/~laddb/
- https://www.purdue.edu/research/embrio/
- https://compucell3d.org
- https://github.com/tissue-forge/tissue-forge
- Twitter EMBRIO Institute (@EMBRIOInstitute) / Twitter
- LinkedIn https://www.linkedin.com/company/embrioInstitute/?viewAsMember=true
- CompuCell3D Twitter: https://twitter.com/compucell3d
- CompuCell3D LinkedIn: https://www.linkedin.com/company/compucell3d
- CompuCell3D Facebook: https://www.facebook.com/groups/334212941816369/
- CompuCell3D YouTube Channel: https://www.youtube.com/channel/UCJWJZHM_1QsY6mO6bpkqacw
- James Glazier's YouTube Channel: https://www.youtube.com/channel/UC5S95t7ixIk_CJFwCXReKsQ
- Facebook: The Applied Optimization Group at UPRM (@AppliedOptUPRM)
- Twitter: The Applied Optimization Group at UPRM (@AppliedOptUPRM)
- LinkedIn: The Applied Optimization Group at UPRM (://www.linkedin.com/in/the-applied-optimization-group-3984551b8/)

Other Products
- Strategic plan is available on our shared file account and through our website
- Weekly Meeting seminar recordings are available on our shared file account.
- CompuCell3D Models developed for EMBRIO workshop are available on line
- Videos of Lectures on Multiscale modeling using CompuCell3D are available on line in a variety of forms: As a formal course (E443/E543 Virtual Tissue Modeling with CompuCell3D, 2022),
  https://youtube.com/playlist?list=PLiEtieOeWbMLuvVyRJ1ss_kQrheLKpRuQ
- All lecture materials, slide decks and exercises are available on line
- Videos of Lectures on Multiscale modeling using CompuCell3D are available on line in a variety of forms: As a formal course (E443/E543 Virtual Tissue Modeling with CompuCell3D, 2023),
- https://youtube.com/playlist?list=PLiEtieOeWbMJTch7kleSZxkM06bLoYm7i
- All lecture materials, slide decks and exercises are available on line
- Videos of Lectures on Multiscale modeling using CompuCell3D are available on line in a variety of forms: From 2022 Summer School:
- https://youtube.com/playlist?list=PLiEtieOeWbMLfULmThmkzdTD2jbWZCszS
- All lecture materials, slide decks and exercises are available on line
- Videos of Lectures on network modeling using Antimony are available on line in a variety of forms: As a formal course (ENG340/542 Dynamic Network Modeling, 2022),

"AiThority Interview with David Umulis, Head of Biomedical Engineering at Purdue University." August 11, 2022. https://aithority.com/technology/life-sciences/aithority-interview-with-david-umulis-at-purdue-university/