



Emergent Mechanisms in Biology of
Robustness, Integration & Organization

Emergence: A biweekly newsletter of discovery, education, and outreach from the EMBRIO Institute

Issue 18: May 18, 2023 “Graduation Issue”

DIRECTORS’ NOTE

Much deserved congratulations to all EMBRIO graduates, mentors, as well as those on the “green light” side of qualification exams! View a list of graduates and their thesis titles with available links below, as well as those passing prelim exams, and receiving promotions.

Thank you to Leo Green for presenting his research at our most recent Weekly Update meeting ([recording available](#)). Our upcoming meeting on Monday, May 22nd will feature **Nissa Larson** presenting her EMBRIO Ph.D. research project *Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis*. Learn more about Nissa in the Member Spotlight of this issue.

David Gazzo and Mayesha Mim (Zartman Lab) will lead an introduction to scientific figure creation employing BioRender during our June 12th Weekly (details below).

As the summer session gets started, we are working on the schedule and registration for the EMBRIO summer training workshop hosted by the Zartman Lab at Notre Dame July 10-12, followed by our Annual All-Hands meeting at Purdue July 13-14.

The Glazier Lab & Biocomplexity Institute at IU are offering a two week online live course in basic and advanced CompuCell3D July 31 - August 13. Details below.

As members prepare for presentations and posters at conferences, and manuscripts for publication please remember to acknowledge our NSF award: “This work is based upon efforts supported by EMBRIO Institute, contract #2120200, a National Science Foundation (NSF) Biology Integration Institute.” Find recommended poster and PowerPoint templates, along with EMBRIO and NSF logos on our Box account in the “Poster and Presentation Templates & Logos” folder. [Direct Link](#).

We want to hear about your news and announcements. Send them to Brent (laddb@purdue.edu) by April 28th for inclusion in the next issue of *Emergence*.

David, Chris, Stephanie, Anjali, and Brent

Notable Quote

“Fall in love with some activity and do it! Nobody ever figures out what life is all about, and it doesn't matter. Explore the world. Nearly everything is really interesting if you go into it deeply enough.” ~ [Richard Feynman](#), Theoretical Physicist and Nobel Prize in Physics (1965).

QUICK LINKS

Journal Club – Calcium Imaging Techniques: [Monday’s 11am Zoom](#), [papers to be discussed](#)

[CompuCell3D School and Hackathon July 31 – August 13](#)

[Schedule Your One-on-One Interview with Soumi](#)

[Weekly Update Meeting Recordings](#)

CELEBRATING GRADUATES, PRELIMS, & PROMOTIONS

A shout out to EMBRIO trainees who have graduated recently (or anytime in the past year)! And congratulations to all those passing your prelims/quals, as well as those receiving promotions (Let me (laddb@purdue.edu) know if I’ve missed someone).

Recent EMBRIO Graduates

CORE:

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

Rocha Clavijo, Daniel (2023). Towards a rapid estimation system in calcium signaling. MS Thesis. Co-Advisors: M. Cabrera and C. Isaza. EMBRIO Committee members: D. Umulis, C. Staiger.

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>
Matt is now a Data Scientist with The Ohio State University.

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).
Catherine is a Postdoctoral Researcher in Quantitative Systems Pharmacology at Pfizer

Thrust 2, Project 2B:

Kumar, Nilay. (2023). Reverse Engineering Epithelial Morphogenesis: A Systems Biology Approach. University of Notre Dame. (Advisor: J.J. Zartman)
Nilay is joining EMBRIO as a Sr. Research Scientist in October.

Soundarrajan, Dharsan. 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>
Dharsan is a Mathematical Modeler at Immunetrics

Vijay Kumar Naidu, Velagala. (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>

Velagala is a Data Scientist at Zifo

Thrust 3, Project 3B

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>

Yueyang is a Research Fellow with Harvard Medical School

Thrust 4.

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>

Joseph is an instructor at Purdue University in the Engineering Honors/Goss Scholars program

Preliminary/Qualifying Exams Passed:

Chang Ding, Purdue University

PI: Qing Deng (Thrust 3B)

Project: "ROS relax wounds to allow healing and regrowth"

David Gazzo, Notre Dame University,

PI. Jeremy Zartman (Thrust 2B)

"Reverse Engineering Calcium Signaling Crosstalk and Integration Responses to Pathogen and Cellular Damage Cues"

Nissa Larson, Purdue University

PI: David M. Umulis (CORE)

"Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis"

Mayesha Mim, Notre Dame

PI: Jeremy Zartman (Thrust 2B)

Project: "Calcium-Mediated Morphogenesis: Forward Engineering Organ Development with Optogenetics and Mechanosensation"

Soumi Mukherjee, Purdue University

PI: Stephanie Gardner (Thrust 4)

Project: "Investigating the nature and development of interdisciplinary competencies, identity formation and collaboration amongst members participating in a Biology Integration Institute"

Dhulika Ravinuthala, Purdue University

PI: Janice Evans (Thrust 1B)

Project: "Influence of Calcium Signaling in Mammalian Eggs on the Actomyosin Cytoskeleton in the Cortex and its Role in the Prevention of Polyspermy"

Promotions:

Anjali S. Iyer-Pascuzzi, (ABIDES Director, and Thrust 2A Investigator) was promoted from Assoc. Prof. to Professor of Botany and Plant Pathology, Purdue University

David M. Umulis, (EMBRIO Director, CORE Investigator) has been promoted to Sr. Vice Provost for Purdue in Indianapolis.

Congrats Anjali and David!

MEMBER SPOTLIGHT



Nissa Larson, 2nd year Graduate Research Assistant, BME, Purdue University

PI: David M. Umulis

Multiscale Modeling of BMP Signaling Pathway during Zebrafish Embryogenesis

<https://engineering.purdue.edu/UmulisLab>

What's your hometown, State, Country (and one thing you love, miss, remember, or want to tell others about it)?

I am from Charleston, Illinois – a small town in central Illinois. I go back every now and then to see my family and the animals. I also brought a couple of cats to West Lafayette with me. I really miss having fresh eggs.

What are your hobbies?

I walk my cats a couple of times a week and play on a few intramural sports teams. I also play a few instruments (primarily flute & piccolo) in both a Purdue concert band and the Lafayette Citizens' Band. And the strawberries have started blooming on my community garden plot at Cumberland Park!

What drew you into becoming a scientist or engineer (or both)?

I think the cross-section of disciplines is such an important place to be. Each person in the institute is doing incredible work, but the implications cannot be realized without bringing things together. This requires being able to think both as an engineer and as a scientist.

Tell us the main point of your research as it relates to EMBRIO:

I am building a multiscale model of the BMP network that drives dorsoventral cell differentiation during zebrafish embryogenesis. Working both computationally and experimentally, I'm investigating the origins of noise throughout the signal transduction process as well as mechanisms of robustness and resulting phenotypic variability.

You find yourself alone on an elevator with the president of your university – who knows very little about your field: They ask you to tell them about your research (15 seconds - go!):

Every cell in your body contains the same information in the form of DNA, so where does the information come from to tell them all specifically what to do? The bone morphogenetic protein network is known to provide some of this information in similar pathways throughout the animal kingdom. The network is extremely complex however, so I'm trying to elucidate what mechanisms allow it to be so good at what it does.

What's on the horizon for you (research, career, personal, whatever you want to share)?

I'm writing this the day before my qualifying exam – so hopefully that goes well. Then I'm looking forward to getting some optogenetics experimentation completed this summer along with image quantification and use of the light sheet microscope.

What's your various URL/social media handles that others can follow (prof. website, twitter, LinkedIn, blog, etc)?

[linkedin.com/in/nissa-larson-234b9923a](https://www.linkedin.com/in/nissa-larson-234b9923a)

JOURNAL CLUBS

CALCIUM IMAGING TECHNIQUES Meets Monday's 11am ET [via Zoom \(use this link through June 26th\)](#)

Due to the need within our EMBRIO community to process and analyze Ca²⁺ Images, Director Umulis has proposed to discuss papers regarding methods and tools for analyzing calcium imaging as part of a new journal club. **The goal, beyond integrating these techniques, is to write a review paper.**

Norma Perez (nperezro@purdue.edu), EMBRIO Postdoc with the Buganza-Tepole and Umulis Labs, is leading the effort with this journal club, please contact her about participating in the club.

The club is currently discussing the following papers:

https://docs.google.com/document/d/1uESi45Zv_kGL369NW8sPW60GByOAXme7-vr1XKBM18U/edit?usp=sharing

ONGOING CLUB: Multimodal Functions of Calcium in Tuning and Regulating Cytoskeleton Networks

Please contact Dr. Linlin Li (li2212@purdue.edu) for information. The club is currently entering the writing stage for organizing and publishing a review paper on the topic. It isn't too late to join.

Here is the link to the current working documents:

https://docs.google.com/document/d/1Cpg77ytioWiluRmiDMCcAiAd4jNNX_J7s64RQk8xOU/edit?usp=sharing

BioRender Mini-Workshop

During regular EMBRIO Weekly on June 12th. Led by David Gazzo and Mayesha Mim (Zartman Lab), with support from EMBRIO Student Leadership Council. ALL EMBRIO MEMBERS WELCOME!!

Are you exhausted spending hours, days, and countless meetings pouring over PowerPoint, Illustrator, or Inkscape figure designs? Well, we're here to help you change that!

Join our BioRender-ing workshop for a crash course on how to create professional, beautiful scientific images in a fraction of the time. But what is BioRender . . . ?

[BioRender](#) is the easy friendly-to-use illustration platform geared for scientific use that is quickly taking over research and academic institutions around the world! We will be showing you the tips, tricks, and amazing aspects that we have learned through our own use of BioRender. Mainly focusing on figure design and creation, but also covering BioRender's slide/presentation and poster design aspects as well. **You can sign-up and create a BioRender account for free at www.biorender.com and follow along with us as we show you a new world.**

Calcium: An EMBRIO Course in the Basics

Norma C. Perez Rosas, Postdoc Fellow in the Buganza Tepole and Umulis labs, has designed and delivered a minicourse on the basics of understanding calcium in different systems. Perez first delivered this course live over eight sessions to the UPRM group who are working on incorporating calcium data from biological experiments into optimized models. The initial course material is now available to all EMBRIO members via our shared Box file system: "EMBRIO Courses_Modules > Calcium: An EMBRIO Course in the Basics (Norma Perez Rosas)". Norma is updating the materials periodically with a potential live series being offered during Fall semester. Direct link:

<https://app.box.com/s/79nzu1br18c4g33t1c9z45zb4krbecs2>

EMBRIO ABIDES (Access, Belonging, Inclusion, Diversity, Equity, Support)

Dr. Anjali Iyer-Pascuzzi, EMBRIO ABIDES Director and Associate Professor at Purdue, leads activities for Institute members. Stay tuned for ABIDES activities for this summer and Fall semester.

UPCOMING DEADLINES, IMPORTANT DATES, & INFO

Weekly Research & Education Zoom Meetings Spring & Summer, Monday's 3 – 4 pm.

Recordings: EMBRIO Box account > Weekly Update Meeting. [Direct URL](#).

Spring & Summer [Zoom link](#):

- January 9 – Krishna Jayant, Asst. Prof., BME, Purdue
- January 16 – Martin Luther King, Jr. Day – No Meeting, please volunteer locally
- January 23 – Trainee Professional Development, Grants Series Session #2
- January 30 – Anjali Iyer-Pascuzzi, Assoc. Prof., BPP, Purdue, DEI Director, EMBRIO
- February 6 – Thrust & Site Leads Update Meeting
- February 13 – Priyanka Baloni, Asst. Prof, HHS, Purdue
- February 20 – Trainee Professional Development, Grants Series Session #3
- February 27 – Bakary Samasa, Mary Mullins Lab
- March 6 – Thrust & Site Leads Update Meeting – NSF site visit debrief, next steps
- March 13 – Spring break, no meeting
- March 20 – NSF site visit debrief and trainee orientation to the Institute
- March 27 – Nilay Kumar, Ph.D. Candidate, Zartman Lab, Notre Dame
- April 3 – Thrust & Site Leads Update Meeting
- April 10 – Manager Meets
- April 17 – Project Discussions
- April 24 – Project Discussions
- May 1 – No meeting. Integrated and Enabling Project Proposals Due.
- May 8 – No Meeting
- May 15 – Leopold Green, Assist. Prof. BME, Purdue
- May 22 – Nissa Larson, Ph.D. Student, Umulis Lab, BME, Purdue
- May 29 – No meeting, Memorial Day
- June 5 – Thrust and Site Leads Meet
- June 12 – BioRender mini-workshop (organized by EMBRIO Student Leadership Council).

June 1, 2023. NSF Annual Report Due.

June 8, 2023. Quantitative Biology Symposium, Hosted by the Department of Cell and Developmental Biology, Northwestern University, 8am – 6pm CT. <https://planitpurple.northwestern.edu/event/590383>

June 12, 2023. BioRender Mini-Workshop. During regular EMBRIO Weekly, 3-4pm ET.

July 10-12, 2023. EMBRIO Trainees Summer Workshop, Notre Dame University. Details forthcoming.

July 13-14, 2023. EMBRIO All-Hands Annual Meeting, Purdue University. More information forthcoming.

July 31 - August 13, 2023. 2023 Multicell Virtual-Tissue Modeling Online Summer School and Hackathon
Learn to model your biological system of interest with one-on-one help. Week 1 will cover CC3D basics. Week 2 will cover advanced topics in CC3D, followed by a 2-day model-building hackathon. Physicists, biologists, computer scientists, and modelers team up to build research-grade models of biological systems. All experience levels are welcome. For more information, email compucell3d.iu@gmail.com or visit www.compucell3d.org/Workshop23. Register at: www.tinyurl.com/CC3D2023.

INSTITUTE EVALUATION: SIGN UP FOR YOUR ONE-ON-ONE INTERVIEW (hint: it's mandatory)

If you are a member of the EMBRIO institute currently doing a research project, we would like to invite you for participating in this study. Participation in the evaluation process is **MANDATORY** for all the members of the institute.

As a part of the evaluation process, you will take part in an online session (via Zoom), which includes an interview and a brief survey, and the entire process should be completed in less than an hour. Interviews will be conducted annually for the total duration of your participation in the institute and the session would not exceed an hour and would be completed in a day.

Please fill in all the times you may be available for our interviews using the link below with either your name or email address. This information is requested so that we may contact you to set up an online session, but we will use a randomly generated 4-digit code in place of your name to identify all your information for the data collection and analysis.

<https://www.when2meet.com/?18327719-shNWM>

Your participation will not affect any aspect of your association with the EMBRIO institute. If you have any doubts regarding the evaluation process, please reach out to Soumi at mukher42@purdue.edu."

With Regards
Soumi

Hot Off the Press: New EMBRIO Journal and Conference Papers

Let us know about new papers you want to highlight for the EMBRIO community!

REMINDER: EMBRIO Acknowledgement for Scholarly Papers.

For EMBRIO related research publications, NSF requires acknowledgement of EMBRIO NSF funding for our Institute to claim the work in our reporting back to NSF. Please include the following acknowledgement in your journal and conference papers and posters: "This work is based upon efforts supported by EMBRIO Institute, contract #2120200, a National Science Foundation (NSF) Biology Integration Institute."

Conference Presentations:

Let us know about your conference presentations.

Awards

Congrats to Weiwei Zhang. She received a professional development award at Purdue:

<https://www.purdue.edu/newsroom/purduetoday/releases/2023/Q2/mapsac-awards-professional-development-grants-to-15-employees.html>

Open Positions

Two Open-Rank Professor Positions in Technology and Research Related to Next-Generation Biomedical Digital Twins

The Department of Intelligent Systems Engineering at Indiana University is pleased to announce a search to fill Two Open-Rank Professor Positions in Technology and Research Related to Next-Generation Biomedical Digital Twins. Appointments can be at Full, Associate or Assistant Professor level and two-person cluster hires are possible. Appointments can begin as early as August 1, 2023. This search is part of a broad collaborative initiative to create key hardware and software components of next-generation digital twins for research, bioengineering and clinical application.

To learn more about Luddy School, ISE, and to apply online, please visit <https://indiana.peopleadmin.com/postings/16811>

For more details see attached full announcement.

Questions, nominations, and confidential inquiries may be sent to Prof. James A. Glazier (jaglazier@gmail.com)

New Lab Members?

Did you recently have new students or staff members join your EMBRIO projects? We want to add them to the listserv, Box account, demographics survey, and Personnel List for ensuring their inclusion in communications and participation. If they are not already on our Personnel spreadsheet (<https://app.box.com/s/frd9275xc069gmtbe3y1osoz1j7ssk7>), or they have graduated, let Brent know their names and email contacts (laddb@purdue.edu)

Submit your items for the next newsletter by **May 26th** to Brent (laddb@purdue.edu)