Emergent Mechanisms in Biology of Robustness, Integration & Organization

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

Issue 35: June 28, 2024

DIRECTORS' NOTE

We are looking forward to an engaging Annual Retreat, and productive Summer School, and especially seeing most of you in person the week of July 8th . Our events will be hosted in the Weldon School of Biomedical Engineering. Check these links for updated agendas, poster template, and slide presentation template on our website:

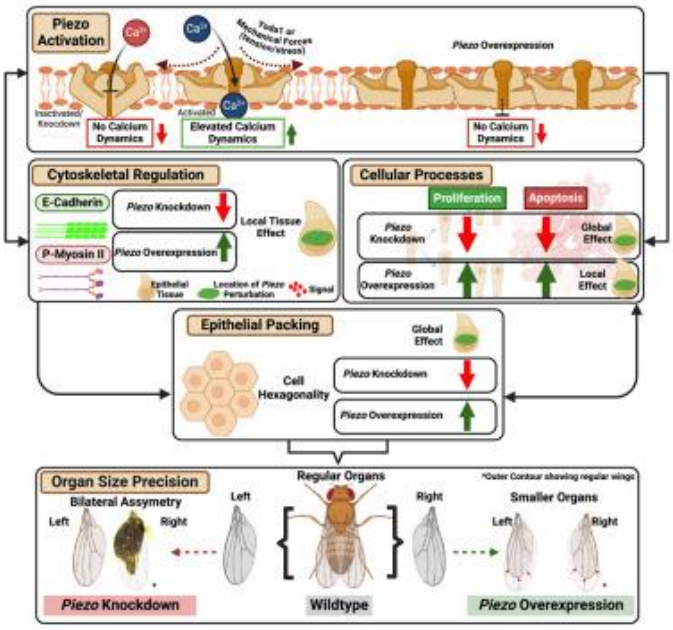
Summer School
Annual Retreat

Deadlines are coming up Monday to submit poster abstracts and lightning talk slides, along with submissions for the scientific figure competition. With the Independence holiday next week, we won't be able to extend these deadlines:

Posters & Lightning Talks - Info is Due July 1st
Those presenting posters will also present a 1-minute lightning talk prior to the poster session. These will be organized as much as possible in order by Thrust and lab.
Deadline extension - Due by Monday, July 1st: You will upload your abstract with full citation, along with a one slide PowerPoint for your lightning talk. Your PowerPoint slide may be identical to your poster, or alternatively can include specific aspects or talking points of your poster to highlight. You **don't** need to upload your poster file. However, plan on bringing your printed poster to the retreat (note that EMBRIO, and the BME department for non-BME students, **can't** print your poster - no exceptions).

Scientific Figure Competition - Submissions Due July 1st
Submit your scientific figure, live cell video, or model simulation - due by July 1st - for the competition during our annual retreat. There will be two divisions: I. Graduate Students, II. Postdocs & Staff Research Scientists. Share your best work with the community! Instructions, submission and upload: https://purdue.ca1.qualtrics.com/jfe/form/SV_6FPX9yViX0tJN66

Announcing NEW EMBRIO papers hot off the digital press:
A Cell Reports paper on Piezo including EMBRIO authors Mayesha Mim, Nilay Kumar, David Umulis, Maria Unger, and Jeremy Zartman, is titled **"Piezo regulates epithelial topology and promotes precision in organ size and control"**. The work shows that Piezo regulates organ size and cell topology by controlling cell tension, cell division, cell death, and tissue properties both locally and non-locally. Piezo ensures precise organ growth by regulating cellular processes and tissue architecture through tension-mediated feedback control of cell division and elimination. This effort helps to lay an initial foundation for ongoing integration with between Thrust 2 and 3.



Highlights from the paper include:

- Piezo regulates the bilateral precision of organ size.
- Piezo's functions include phenotypic effects that span from cells to tissues.
- Piezo regulates emergent tissue-level properties both locally and non-locally.
- A computational model shows Piezo's role in linking subcellular processes to growth.

Through an integration of Thrust 1 and 2, a Biophysical Journal Research Highlights paper titled **"Proteins clump: Mechanics and transport during neurodegeneration"** has been authored by David Gazzo, Tami Kinzer-Ursem, and Jeremy Zartman highlighting new mechanistic insights into key biomechanical and biophysical aspects of neurodegeneration.

EMBRIO members have received awards and promotions recently:
Stephanie Gardner received the 2024 Charles B. Murphy Award. This is Purdue University's highest undergraduate teaching award. Congratulations on your many contributions to teaching and curriculum, Steph!! Read about Stephanie's teaching with undergraduates, and the award.

Alejandra Magana has been elected a Fellow of the American Society for Engineering Education (ASEE). Congratulations, Ale, on your many contributions to understanding the processes of learning, problem solving, and innovation across many domains in teaching, and in team science!!

Congratulations on recent faculty promotions for EMBRIO members Tami Kinzer-Ursem, Qing Deng, and GuangJun Zhang were promoted to Full Professor, and to Elsje Pienaar for promotion to Associate Professor!

Upcoming 2024-2025 Staff Promotions include:
Weiwei Zhang is receiving a promotion to Principal Research Scholar with her new title as Senior Plant Cell Biologist.
Brent Ladd is being promoted to a P4 level Managing Director.

Annual Multicell Virtual-Tissue Modeling Online Summer School and Hackathon
There are several upcoming opportunities for scientific exchange and training found in the Upcoming Dates section, including the Glazier lab will be offering the 19th Annual Multicell Virtual-Tissue Modeling Online Summer School and Hackathon July 28th – Aug. 4th. Applications open.
https://compucell3d.org/Workshop24

David, Chris, Anjali, Janice, Jeremy, Alejandra, and Brent

QUICK LINKS

EMBRIO Summer School (video preview, slides)

Institute Skills and Strengths Sharing Platform

Sign the Data Sharing Policy Agreement

RSVP: EMBRIO Summer School & Annual Meeting

All-Hands Meetings Recordings

RCN interdisciplinary mentorship survey

Orientation to EMBRIO

ABIDES Culture and Mentoring resources

MEMBER SPOTLIGHT

Dr. Scott Bolton
Research Scientist (and Data Management Scientist for EMBRIO!)
Kinzer-Ursem Lab
Weldon School of Biomedical Engineering, Purdue University

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

I'm originally from Chicago, but I have also lived in Texas, Connecticut, and Florida. I am a city person, so I miss the energy and diversity that comes with living downtown. But living here provides a great environment to settle down and raise a family.

What are your hobbies?

I am a musician, a multi-instrumentalist and have played keyboards in neo-soul and hip-hop bands. I cook all different types of cuisine from around the world and love to throw dinner parties with lots of food, wine, music, and kids running all around the house! I also love interior design, fashion, art, and playing frisbee with my two whippet dogs.

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

I have always wanted to understand how things work. I had always been interested in electronics and chemistry and was fascinated by keyboard synthesizers as a kid. My undergraduate degree was a dual degree in music composition and in computer engineering, and that set the stage for an engineering career. I worked in digital signal processing research and development, specifically audio and video compression. When I went back for my master's degree, I joined a lab that studied collaborative virtual reality environments, which was fun. After working at both startup and large companies, I discovered the possibilities of combining computational simulations, chemistry, and biology and realized this was something with endless potential. So, I persuaded my wife and family that starting a career completely over again in organic chemistry was a really great idea! We packed up everything and moved here to Purdue so I could start a new career in science. After graduating from the Purdue PULSe program, I now get to experiment with chemical biology, structural biology, and computer modeling to investigate the molecular behavior of neurons, and it is incredibly rewarding.

Tell us the main point of your research (or staff efforts) as it relates to EMBRIO:

The Kinzer-Ursem lab works at the intersection of computer simulation and wet-lab biological experiments. We use spatial-stochastic coarse-grained simulations to model mechanisms of calcium-dependent protein activity at the post-synaptic density of hippocampal neurons. We then probe primary neuronal cells with labeled proteins with the goal of validating the simulations. Specifically, I study the time and spatial gradients of kinase activation intertwined with actin remodeling that occurs during calcium simulation of the post-synaptic spine.

I have also taken on a data management role to lead the integration of all EMBRIO digital image data into a publicly facing repository that is persistent and extensible, rich in metadata, and standardized for mining by machine learning algorithms. With my backgrounds in machine vision, microscopy, and protein labeling, I hope to make this repository a success for EMBRIO and useful to everyone in the institute.

EMBRIO SURVEYS

MANDATORY ANNUAL EVALUATION SURVEY - (All members receiving EMBRIO support must complete)

Identical to last year, the Gardner lab is conducting the third annual evaluation survey supporting required NSF data, as well as Thrust 4 research into the interdisciplinary nature of the Institute. If you have not yet responded, look for the **individual reminder email delivered to each active member's inbox via the Qualtrics Survey System. Please commit to 20 min. to complete this mandatory survey ASAP! We are required to submit the information to our NSF funder. Like last year's survey, you will have the ability to opt out of having your answers used in the research component, though completing the survey is still mandatory. Consenting to allow your answers to be used in the research component is much appreciated.** Contact Soumi Mukherjee and Dr. Stephanie Gardner for questions or concerns about the survey **(**mukher42@purdue.edu and sgardne@purdue.edu **).**

Grad Students: (paid participation) Research Study on Interdisciplinary STEM identity among graduate student trainees in EMBRIO. Contact Emily Georgopoulos, Gardner Lab, egeorgop@purdue.edu

We are recruiting EMBRIO graduate students for a research study to identify and describe the development and trajectory of interdisciplinary STEM identity among graduate student trainees in EMBRIO. We want to know how grad students' experiences in different contexts of their academic and personal lives contribute to the way they see themselves as researchers. To participate in this study you must be 18 or older. You must be a current active graduate student in the EMBRIO institute from any affiliated institution. Participation will entail a virtual session, including an interview and a survey, that will last no more than 70 minutes. You may be invited to a second follow-up interview during the next academic year, which will last no more than 70 minutes.
To compensate you for your time, you will receive $20 in the form of an Amazon gift card. If you are invited and choose to participate in a second interview, you will receive a second $20 gift card.
Your participation in this study is voluntary and not required as a member of EMBRIO. You can withdraw at any time, and your decision on whether to participate will not affect any aspect of your association with EMBRIO. If you wish to participate in this study or have any questions, check your emails for a message from Emily Georgopoulos (egeorgop@purdue.edu) to schedule an interview session.

EMBRIO SUMMER SCHOOL

July 8-10, 2024. Summer School (followed by the Annual Meeting, July 11-12th). Hosted at Purdue, Please complete this RSVP asap. All Institute members are encouraged to participate. There may be room for graduate TA's at Purdue outside of EMBRIO to also participate.

EMBRIO INSTITUTE'S 3rd ANNUAL SUMMER SCHOOL: Communicating your research with novice audiences through computational media.

Participants will identify a topic of their research (or teaching) that they want to make accessible to novice audiences. Following best practices of learning design or mentoring, participants will create a product (e.g., a computational Colab notebook, a digital poster, a Prezi presentation, or similar) to teach or communicate their selected topic to broader audiences. The products will be broadly disseminated through the Institute.

EMBRIO Institute's 2nd Annual Summer Training Workshop took place July 10-12, 2023. Workshop Schedule of Sessions. Hosted by Dr. Jeremiah Zartman at the University of Notre Dame with a theme of ***Image Acquisition, Processing, and Analysis***, tutorials and hands-on sessions were specifically aimed at benefiting trainees from both computational and experimental domains. Slides, handouts, and video recordings from this workshop are available on our shared Box account: https://app.box.com/s/mzo5ihlqiq4tfeig2psx2l6rmmdxto0c

EMBRIO ALL-HANDS ANNUAL RETREAT

EMBRIO INSTITUTE'S 3rd ANNUAL ALL-HANDS MEETING: July 11-12, 2024, at Purdue University. Please complete this RSVP asp. Last year the annual meeting brought more than sixty EMBRIO members engaging in research talks, poster presentations, programmatic discussions, and informal gatherings. A call for posters and talks will be forthcoming.

STUDENT LEADERSHIP COUNCIL CORNER

The Student Leadership Council has put together a resource to boost collaboration since collaboration is at the heart of EMBRIO. We have created a platform (google slide deck) where we can all share a little

about who we are and what kinds of strengths we can and are willing to share with others. **We kindly request that all members take a few minutes to fill out a slide for themselves by April 29th**. This way, we can also use this to gauge what topics would be of most value to EMBRIO for hosting workshops.

The SLC is recruiting new officers to represent your university and your perspective for EMBRIO. Reach out to David Gazzo (dgazzo@nd.edu), incoming president, for more information, and log your ideas for future topics or events that the SLC could organize. Access SLC slides and documents, and consider signing up to give or receive mentoring for/from EMBRIO trainees in helping support and orient to the EMBRIO mission and interdisciplinary framework.

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

Dr. Anjali Iyer-Pascuzzi, EMBRIO ABIDES Director and Professor at Purdue, leads activities for Institute members. A session on mentorship and project management was presented January 29th. A series of mentoring topics were presented at the beginning of Weekly meetings this past Fall, and a continuation of the Mentoring Panel topics from the annual retreat was presented October 23rd , 2023 during the EMBRIO Weekly with a deeper dive into how culture impacts our mentoring and team thinking.

BTW, if you missed "The role of culture and communication in mentoring" mini-workshop – view it here, or the previous "mentoring snacks" check out the slides and resources in the ABIDES > Mentoring folder, and listen to "The Secret of Great Teams" episode of The Hidden Brain podcast.

JOURNAL CLUBS

Journal Club on Calcium Imaging Techniques meets Monday's 11am ET

Due to the need within our EMBRIO community to process and analyze Ca2+ Images, Dr. Norma Perez Rosas (nperezro@purdue.edu) is helping lead this club in discussing papers regarding methods and tools for analyzing calcium imaging. **The goal, beyond integrating these techniques, is to write a review paper.** The Club is meeting weekly on Mondays at 11am. Please contact Norma about participating.

Journal Club on Multimodal Functions of Calcium in Tuning and Regulating Cytoskeleton Networks

Please contact Dr. Linlin Li (li2212@purdue.edu) for information. The club is in 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/1Cpg77yjtioWiIuRmiDMCcAiAd4jNNX_J7s64RQk8xOU/edit?usp=sharing

UPCOMING DEADLINES, IMPORTANT DATES, & INFO

EMBRIO All-hands Meeting Schedule, Monday's 3-4pm ET. Zoom. All Hands Zoom Meeting Recordings

April	22	break
	29	Thrust 1B Seminar, Dr. Janice Evans
May	6	Thrust 3A Seminar, Dr. Mary Mullins

13 break
20 Thrust 3B Seminar, Dr. Qing Deng
27 No Meeting: Memorial Day

Biological Sciences Seminar Series, Thursday, April 18, 12PM, LILY 1-117 (Zoom link): "In Vivo Force Measurement with Two, One, and Half and Zero GFP", by Yuan Ren, Ph.D., Postdoctoral Associate, Dept of Molecular Biophysics & Biochemistry, Nanobiology Institute, Yale University.

Chicago Cytoskeleton Event April 19th

Please join us for the last Chicago Cytoskeleton meeting of the academic year on April 19!
This meeting with feature three of the four **CC Flash Talk winners** *and* the **2024 Keynote Lecture** by Dan Fletcher (UC Berkeley). For info and to participate, contact Holly Goodson <holly.v.goodson.1@nd.edu>

Speakers for April 19:

• Margaret E. Utgaard (Beach/Oakes labs, Loyola University)
Septins anchor a unique cytoskeletal network under the nucleus

• Sharon R. Garrott (DeSantis lab, University of Michigan)
Ndel1 modulates dynein activity in multiple ways

• Sarah E. Yde (Kovar lab, University of Chicago)
Capping Protein contributes to the balance of actin assembly among different F-actin networks

2024 Keynote by Dan Fletcher (UC Berkeley):
Use the force: Harnessing actin networks for good and evil

May 30, 2024. NSF Annual Report Due to Program Officer.

July 8-12, 2024. Summer School & Annual Meeting. Hosted at Purdue, Summer School will be July 8th – 10th, followed by our All-Hands Annual Meeting, July 11th-12th. Please complete this RSVP asap. See details above.

July 28th – August 4th, 2024. CompuCell 3D. The 19th Annual Multicell Virtual-Tissue Modeling Online Summer School and Hackathon! Applications open soon. https://compucell3d.org/Workshop24

This year's summer workshop will focus on the basics of building virtual tissue models modeling using CompuCell3D, as well as advanced features and capabilities of the CompuCell3D software. A two-day model-building Hackathon will be hosted the weekend after the workshop, from Friday August 9th to Sunday August 11th. Workshop attendees will work in teams to build a functioning model of their problem of interest with instructor support. Workshop attendance is required for admission to the hackathon. Attendees of previous workshops may apply to attend only the hackathon. If you are already a proficient CompuCell user and would like to lead a project or assist with the hackathon, please contact us directly to discuss.

Summer school attendance guarantees admission to the Model-Building Hackathon. The Hackathon organizers will help group attendees by topic of interest. Experienced modelers will be embedded within each group. Workshop instructors will be available to assist Hackathon participants throughout the two-day session. Everyone will leave with a functioning core model that they can further customize.

Hot Off the Press: New EMBRIO Journal Papers

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

Check out our Google Scholar Page

See a more complete list of **Scholarly Products produced under support of EMBRIO Institute**

REMINDER: EMBRIO Acknowledgement for Scholarly Papers and Posters.

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."**

Awards

Let us know about your grants and other awards!

EMBRIO graduate student Abasiafak (Aby) Ndifreke (Magana Lab) received First Place Research Poster Prize awarded during the National Society of Black Engineers' 50th Annual Convention. The title of his poster: *"Characterizing Teamwork Interactions and Interdisciplinary Learning in the Context of Computational Modeling and Simulation Projects."*

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 , or they have graduated, let Brent know their names and email contacts (laddb@purdue.edu)

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