



Emergent Mechanisms in Biology of
Robustness, Integration & Organization

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

Issue 27: November 29, 2023

DIRECTORS' NOTE

As we enter the home stretch of the semester, we hope everyone had an enjoyable Thanksgiving break. This coming Monday don't miss our next EMBRIO seminar, December 4th, by Javier Muñoz (Brubaker/Green Lab) titled *Systems modeling for Multiomics Analysis Integration in Inflammatory Bowel Disease* (abstract in this issue).

If you missed the all-hands session last time featuring Dr. Weiwei Zhang presenting thrust 2 seminar titled *Decoding Ca²⁺ signatures and signaling to the actin cytoskeleton during the plant innate immune response*, you can access the video in our Box account under the "All-Hands Meetings Recordings" folder.

Purdue labs looking/planning for undergraduate researchers now or next summer (*and our partner institutions who have students who want to come to Purdue for a summer research experience*), the SURF REU program portal is open for faculty to submit your projects, with an early deadline of this Friday, Dec. 1st. See the info from Kay Kobak, their new Assoc. Director in this issue. When submitted your project, please indicate it is attached to the EMBRIO Institute, and note that EMBRIO will cover the PI's portion of the SURF program cost.

Please hold January 22-23 for the annual NSF BII conference. This year's conference will be a hybrid, with most attending via zoom, and a smaller team in person at NSF headquarters. [View the draft agenda](#).

A reminder that if you are new to EMBRIO (or want a refresher), we recommend that you take a look at the resources on the shared Box account in the [Orientation to EMBRIO](#) sub-folder. We will dedicate an all-hands session in the spring to this topic.

We want to hear about your news and announcements. Send them to Brent (laddb@purdue.edu) by December 8th for inclusion in the next issue of *Emergence*.

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

Notable Quote

"The real problem has far less to do with what is really out there than it does with our resistance to finding out what is really out there." ~ Barbara Brown Taylor, *Learning to Walk in the Dark*.

QUICK LINKS

[BII Conference Agenda](#)

[SURF Post a Research Project Portal](#)

[All-Hands Meetings Recordings](#)

[Orientation to EMBRIO](#)

[ABIDES Culture and Mentoring resources](#)

Undergraduate Researchers Opportunities for EMBRIO Labs and Students

Note from Kay Kobak, Assoc. Dir., EURO, Purdue:

Hello Undergraduate Research Allies,
[SURF Post a Research Project Portal](#) is now open for faculty



Program Name	Description	Student Compensation	In-Lab Time Commitment	Funding provided by	Call for applications*
Summer Undergraduate Research Fellowships (SURF)	Summer program for both Purdue Internal and external students, full time research experience.	A total of \$6000 paid over 12 weeks.	30-40 hours/week	Cost shared 1:1:1 between EURO, the College, and the lab. (EMBRIO Note: the Institute will pay the PI tab of \$2K, plus the \$1K housing stipend if a non-Purdue student)	Summer 2024 project portal open now. Early deadline is Dec. 1st

**if you have already identified a student you wish to work with for a given time period, we still ask you post the project so we can maintain that information for our records. We can expedite the selection process and then close the project to other applicants if you already have someone in mind.*

Additional opportunities if you're currently hosting undergraduate researchers:

[EURO Travel Grant](#): For Purdue affiliated undergraduates who will be presenting their research at a conference - \$500 awarded by EURO

[OUR Fall Expo](#): While the abstract deadline has passed for those wishing to give a talk, undergraduate researchers can still request to present virtually or give a poster Nov. 14-21.

Other undergrad researcher funding opportunities can be found [here](#), [here](#), and [here](#).

Please feel free to reach out if you have any questions,

Kay Kobak, Ph.D.

she, her, hers

Associate Director, Engineering Undergraduate Research Office

STUDENT LEADERSHIP COUNCIL CORNER

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 series of mentoring topics have been presented at the beginning of Weekly meetings, and a continuation of the Mentoring Panel topics from the annual retreat was presented October 23rd 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/1Cpg77ytioWiluRmiDMCcAiAd4jNNX_J7s64RQk8xOU/edit?usp=sharing

EMBRIO SUMMER WORKSHOP RESOURCES

EMBRIO Institute’s 2nd Annual Summer Training Workshop took place July 10-12. [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/mzo5ihlqiq4tfeig2psx2l6rmdxto0c>

EMBRIO ALL-HANDS ANNUAL RETREAT MATERIALS

EMBRIO Institute's Annual Retreat was hosted in the Weldon School of Biomedical Engineering on the Purdue University West Lafayette Campus, July 13-14, 2023. The annual retreat brought together the large majority of EMBRIO members in one physical place, with more than 60 of us engaging in research talks, poster presentations, programmatic discussions, and informal gatherings. Slide decks and posters from the annual retreat can be accessed here: <https://app.box.com/s/rmsiuvydlsccezhugyjp2b5v72xlg9l>

UPCOMING DEADLINES, IMPORTANT DATES, & INFO

EMBRIO All-hands Meeting Schedule, Monday's 3-4pm ET. [Zoom link](#). [Weekly Update Meeting Recordings](#)

Aug	14	Benchling Workshop - SLC (Feyisayo)
Aug	21	Student Leadership Council - Grads and Postdocs Only Session
Aug	28	Faculty Investigators Only
Sept	4	Labor Day no meeting
Sept	11	Dr. Linlin Li: Part I: Solving mathematical modeling with ODE or PDE in MatLab or Python (Google Colab)
Sept	18	Dr. Linlin Li: Part II: Solving mathematical modeling with ODE or PDE in MatLab or Python (Google Colab)
Sept	25	Dr. Adrian Buganza Tepole: Part I: Physics informed machine learning
Oct	2	Dr. Adrian Buganza Tepole: Part II: Physics informed machine learning
Oct	9	Fall Break - no meeting
Oct	16	Open Discussion and Thrust Project Breakout Rooms
Oct	23	ABIDES: Culture, Mentoring, & Teams Mini Workshop
Oct	30	No meeting. Thrust Leads organize own meetings
Nov	6	VCell tutorial by Dr. Michael Blinov, Center for Cell Analysis and Modeling, UConn
Nov	13	No meeting. Thrust Leads organize own meetings
Nov	20	Dr. Weiwei Zhang, Staiger Lab, Thrust 2 Integrations
Nov	27	No meeting. Thrust Leads organize own meetings
Dec	4	Javier Muñoz (Brubaker/Green Lab)
Dec	11	No meeting. Thrust Leads organize own meetings
Winter Break		

December 4, 2023. EMBRIO All-Hands. Systems modeling for Multiomics Analysis Integration in Inflammatory Bowel Disease. This work in the CORE thrust is presented by Javier Muñoz from the Brubaker/Green Lab.

Systems modeling for Multiomics Analysis Integration in Inflammatory Bowel Disease.

Javier Munoz-Briones and Doug Brubaker

Crohn's disease and ulcerative colitis are chronic inflammatory bowel diseases (IBD) with a rising global prevalence, influenced by clinical and demographics factors. The pathogenesis of IBD involves complex interactions between gut microbiome dysbiosis, epithelial cell barrier disruption, and immune hyperactivity, which are poorly understood. This necessitates the development of novel approaches to integrate and model multiple clinical and molecular data modalities from patients, animal models, and *in vitro* systems to discover effective biomarkers for disease progression and drug response. For this presentation, my focus is on the lack of understanding of regarding the composition and functional interactions of the gut microbiome in IBD. As sequencing technologies advance, the amount of molecular and compositional data from paired measurements of host and microbiome systems is exploding. While it is become routine to generate such rich, deep datasets, tools for their interpretation lag behind. Here, I present a computational framework for integrative modeling of microbiome multi-omics data: Latent Interacting Variable Effects (LIVE) modeling. LIVE combines various types of microbiome multi-omics data using single-omic latent variables (LV) into a structured meta-model to determine the most predictive combinations of multi-omics features predicting an outcome, patient group, or phenotype. I implemented and tested LIVE using publicly available metagenomic and metabolomics data set from Crohn's Disease (CD) and ulcerative colitis (UC) status patients in the PRISM and LLDeep cohorts. The findings show that LIVE reduced the number of features interactions from the original datasets for CD to tractable numbers and facilitated prioritization of biological associations between microbes, metabolites, enzymes, clinical variables, and a disease status outcome. LIVE modeling makes a distinct and complementary contribution to the current methods to integrate microbiome data to predict IBD status because of its flexibility to adapt to different types of microbiome multi-omics data, scalability for large and small cohort studies via reliance on latent variables and dimensionality reduction, and the intuitive interpretability of the meta-model integrating -omic data types.

January 2 – 6, 2024. BMES – CMBE Conference. San Juan, Puerto Rico. Conference details: <https://www.bmes.org/cmbe2024>

BII Annual Conference - January 22-23, 2024 . NSF is planning a hybrid one and 1/2 day meeting for all Biology Integration Institutes. Most attendees will be virtual, with a few of us in person at NSF headquarters. [View the draft agenda.](#)

February 6-7, 2024. EMBRIO Thrust & Site Leads Retreat. Thrust and site leads, and key investigators, will engage in two days of thrust and project working sessions in person (and yes, actual retreat social activity, as well). Logistics have been shared with all involved.

March 6-10, 2024. The Allied Genetics Conference (TAGC24). Washington D.C. (Genetics Society of America). <https://genetics-gsa.org/tagc-2024/> Note: EMBRIO is organizing a workshop for this conference. More TBA.

Hot Off the Press: New EMBRIO Journal Papers

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

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

Congrats to Feyisayo Akande (Staiger Lab, Purdue) for passing her thesis defense: **Investigating the role of *atpiezo* as a possible mechanoreceptor during plant defense**. Feyisayo will be continuing her research career at the University of Missouri in the plant sciences Ph.D. program. We wish you continued success, Feyi!

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 **Dec. 8** to Brent (laddb@purdue.edu)