

# BIO SIGMAA Fall 2019 Newsletter

## *Activities at the 2020 Joint Mathematics Meetings*

The BIO SIGMAA **Business Meeting, Reception, and Guest Speaker** will take place on Thursday, January 16, 2020, 6:00pm to 8:00pm in Room 507 at the Colorado Convention Center. Our speaker be **Dr. Karin Leiderman**, Associate Professor and Director of Graduate Studies in the Department of Applied Math & Statistics at the Colorado School of Mines. Her talk will begin at 7:00 pm. The talk title and abstract follow:

*Title: Recent challenges and successes in mathematical modeling of blood clotting*

**Abstract:** Blood clot formation is a complex and nonlinear process that occurs under flow and on multiple spatial and temporal scales. Defects and perturbations in the clotting system can result in serious bleeding or pathological clot formation, but due its complexity, the responses and their underlying mechanisms are challenging to predict. Mechanistic mathematical models of blood clot formation and coagulation can elucidate biochemical and biophysical mechanisms, help interpret experimental data, and guide experimental design. In this talk I will briefly describe such models and show how our integrated mathematical and experimental approach has facilitated discovery of previously unrecognized interactions within the clotting system. I will also discuss a recent study to determine how the major clotting enzyme, thrombin, is strongly sequestered by the polymer that thrombin itself produces. Using Bayesian inference, we learned model parameter distributions from experimental data, but for the model to best fit the data, we had to make an additional assumption that thrombin could become irreversibly sequestered; this led to a new hypothesis that thrombin becomes physically trapped during polymerization.

The BIO SIGMAA-sponsored **MAA Invited Paper Session on Trends in Mathematical and Computational Biology** will take place Thursday, January 16, 2020, 8:00 a.m. to 10:50 a.m. in Room 610/612, Meeting Room Level, Colorado Convention Center.

## *Activities at Mathfest*

The BIO SIGMAA sponsored the Themed Contributed Paper Session, *Mathematics for the Life Sciences: Initiatives, Programs, and Curricula*, on Thursday, August 1. The session was organized by Tim Comar (Benedictine University), Carrie Diaz Eaton (Bates College), and Raina Robeva (Randolph-Macon College). The 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences identified the life sciences as a key path through the mathematics major to graduate programs and the workforce. Topics included scholarly contributions addressing initiatives, programs, curricula, and course materials at the interface

of mathematics and the life sciences that have been implemented and tested at institutions of higher education. Talks included “Modeling Calculus: A First Course for Everyone Including Biology Majors,” by Mariah Birgen (Wartburg College), “Mathematical Modeling and Applied Calculus,” by Joel Kilty and Alex M. McAllister (Centre College), “Linking Introductory Mathematics Courses to the Life Sciences,” by Bori Mazzag (Humboldt State University), “Mathematical Modeling for the Life Sciences: A Curricular Update,” by Douglas Norton (Villanova University), “Strengthening the STEM Curriculum through the Introduction of an Undergraduate Quantitative Bio-track Program,” by Sanjukta Hota (Fisk University), “Pain Medication and Tree Leaves: Mathematical Modeling Tasks for Future Secondary Teachers,” by Brynja Kohler (Utah State University), “Engaging Undergraduates in Research in Mathematical Biology with Limited Resources,” by Timothy D. Comar (Benedictine University), and “Data Analysis with Destructive Samples: Spina Bifida Case,” Marepalli B. Rao and Rigwed Tatu (University of Cincinnati).



Pictures from the Themed Contributed Paper Session, *Mathematics for the Life Sciences: Initiatives, Programs, and Curricula*

The 2019 winners of the Anderson Prize for the MAA are **Ciara Andersen** and **Issa Susa** of Smith College for their presentation “Modeling Population Distributions and Spatial-Temporal Patterns of Animal Groups with Producer-Scrounger Behavior.” The winner of the for PME award is **Eric Leu** of Hope College for his presentation “Remote Identification of Cloud Forest Landslides: A Machine Learning Approach.”

Mathematical biology was also the theme of an invited paper session organized by Nicholas Battista and Rebecca Everett, both current Project NExT fellows. All speakers at the session entitled Mathematical Diversity in Mathematical Biology were 2019 Project NExT fellows themselves. The research talks, that ranged from modeling coupled cilia through computational fluid dynamics to problems in RNA folding, highlighted the vast variety of mathematical and biological areas addressed by the current field. We hope to see many of the NExT fellows among the BioSIGMAA members in the future!

### ***Coming Soon: MAA Connect***

**MAA Connect** is a new member engagement and communication platform offered as a part of your MAA membership. MAA members and math enthusiasts can use it to discuss engaging topics that are

important and relevant to the math community. Members are automatically enrolled in the Section and SIGMAA(s) groups tied to their membership on MAA Connect. More information about MAA Connect will be shared in the near future.

### *Other News*

A special issue devoted to education of the *Bulletin of Mathematical Biology* is in the works (Editors Lou Gross, John Jungck, and Raina Robeva). The issue is planned to appear in the second half of 2020.

A special issue of PRIMUS titled “Mathematics and the Life Sciences: Initiatives, Programs, Curricula” is also in the works (Editors: Raina Robeva, Tim Comar, Carrie Eaton).

Stayed tuned for both of these issues...

Recently, some BIO GIMSS members have expressed interest in discussing how to incorporate elements from data science into mathematical/computational biology courses and programs. The [Teach Data Science](#) blog by [Hunter Glanz](#) (Cal Poly), [Jo Hardin](#) (Pomona), and [Nick Horton](#) (Amhesrt) started at the beginning of this past summer with the ambitious goal to add a new entry on a given topic, along with a short overview of *why* it is interesting and *how* it can be applied to teaching. With the summer now over, the authors have delivered on their promise: they have created a good collection of entries that are short, succinct, and easy to comprehend with the goal that they will motivate readers to dive deeper. Each piece would take 20 or 30 minutes to digest and would leave instructors in a position to decide whether to explore more or integrate the material into their own classes. The authors have also included suggestions for next steps and additional readings to allow instructors to explore more based on their interest and time. The focus is on the R environment (e.g., tidyverse and RStudio) although other tools are also mentioned. The link to the site is <https://teachdatascience.com/about/>

### *News from Partner Organizations*

The International Symposium on Biomathematics Ecology Education and Research (BEER) 2019 took place October 4-6, 2019 at the University of Wisconsin La Crosse. The BIO SIGMAA Speaker was **Meredith Greer**. Her talk was titled “Oscillation in Mathematical Epidemiology.”



Save The Date! We are pleased to announce the BioQUEST/QUBES 2020 Summer Workshop will be at the University of Pittsburgh, June 22-27. Visit [the website](#) to sign up for more information as it becomes available, and save the dates for a great working meeting with colleagues next summer!

We didn't have too many other things from BioQUEST (or QUBES) right now, but we do have two blog posts about NSF education focused programs if you would like to share those with your community:

The National Science Foundation has issued a new solicitation for its Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR) program as part of its Foundation-wide effort to accelerate improvement in the quality and effectiveness of undergraduate education in all STEM fields. The first proposal deadline is December 4. [Read more on the BioQUEST Blog.](#)

NSF has also seeking both full and incubator proposals for its Research Coordination Networks in Undergraduate Biology Education (RCN-UBE) program, which supports the formation of networks of educators, researchers, and other stakeholders that improve undergraduate biology education. Proposals are due January 21. [Read more on the BioQUEST Blog.](#)

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The [Intercollegiate Biomathematics Alliance](#) is a consortium created to promote research and education in biomathematics. The IBA strives to bring together institutions both academic and non-academic to build a collaborative academic community in the pursuit of advancing biomathematics, ecology, and related areas for the researchers, educators of the mathematical and biological sciences, and active scholars. In doing so, the IBA provides a wide range of expertise, resources, and opportunities that are only available when we work together as a community. For more information, visit: <https://about.illinoisstate.edu/iba/pages/default.aspx>

Some of the highlighted programs of the IBA are as follows:

[BEAM](#): Biomathematics Education with Applications and Methods Grant,

[BEER](#): Biomathematics and Ecology Education and Research Symposium,

CLOUD: Cloud for Layering, Organizing, and Utilizing Data.

[CURE](#): Cross-institutional Undergraduate Workshop Experience Workshop,

OUR-BEST: Outstanding Undergraduate Research in Biomathematics Education, Scholarship, and Teaching Prize,

[PEER](#): Partners in Extending Education and Research,

[IBA-GCP](#): IBA Graduate Certificate Program,

[LiB](#): the journal *Letters in Biomathematics*,

Spora: a journal dedicated to research conducted by graduate or undergraduate students.

Please contact the IBA Outreach Coordinator, Hannah Highlander at [highland@up.edu](mailto:highland@up.edu), for more information.

## Have you heard about QUBES?

- Kate Loughlin and Carrie Diaz Eaton, QUBES and Bates College

QUBES is a community of math and biology educators who share resources and methods for preparing students to tackle real, complex, biological problems. Qubes includes professors, mentors and researchers, all looking to improve the learning capacity of their students.



QUBES-BioQUEST just finished its annual Summer Workshop at Williamsburg, VA with the theme “From data to data science.” The speakers and workshops were amazing - from Open Education Pedagogy and Inclusive Pedagogy to Bioinformatics initiatives for the indigenous community and Data Science curriculum. Next year will be at the University of Pittsburgh. If you need a week away with great inspiration, fun collaborators, and dedicated work time in what is dubbed “the best interdisciplinary curriculum development summer camp,” plan to join us in 2020!

QUBES is also collaborating with [EDSIN](#) (an NSF INCLUDES funded conference) to name their OEC Fellows. These Fellows have committed to building an Open Education Community around an inclusive biological and environmental data science education. Everyone from all disciplines are invited. Warning - [BUILDS](#) is still under construction, so please excuse the mess, but if you join the group, you’ll get an announcement when we have rolled out the new look for our new Open Education Community!

One of most our popular (AND FREE) services is our Faculty Mentoring Networks (FMNs). FMNs use community based sharing to discuss practices from the classroom others have used to improve certain aspects of math and science education. Last year alone, we 200 instructors from all over the country (and world!) implement high quality mathematical biology curriculum. While our Fall FMNs (such as agent-based modeling) are closed for application, our Spring FMNs applications will be opening soon. We also offer FMNs, web design, and conference websites as a contract services to help you meet your research projects broader education impacts. Just email [qubeshub@gmail.com](mailto:qubeshub@gmail.com) for more information.

[Subscribe to our newsletter](#) today to keep updated on all of our FMN offerings and deadlines! Our monthly newsletter highlights featured partners, interesting stories of inclusivity within the science classroom and a multitude of resources. Check out QUBES on our facebook and twitter, @QUBEShub, and our website, [qubeshub.org](http://qubeshub.org). We look forward to hearing from you!

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