

**Special Interest Group in Mathematical and Computational Biology of the MAA (BIO SIGMAA)**

**Newsletter**

**Spring 2019**

**Welcome from the BIO SIGMAA Chair**

**Dear BIO SIGMAA members:**

I am extremely honored to be serving as your Chair of BIO SIGMAA for the next two years, and I look forward to working with you to make these some of our best years yet!

In this, our first Newsletter of the year, we highlight several recent events, including an overview of our participation throughout this year's Joint Mathematics Meetings in Baltimore, Maryland. We also share a summary of results from our recent members survey, where we asked members to comment on various aspects of their membership. I would like to extend a huge thanks to those who have already responded. If you missed our initial response deadline, please do not hesitate to give us feedback anyway. We want to better serve our entire member base, and we need your feedback. You can find the survey at this link: <https://goo.gl/forms/dcE0V31SL6ICDFUF2>

I also want to take the opportunity to welcome two newly elected BIO SIGMAA officers—Bori Mazzag (Program Chair) and Bob Stolz (Secretary)—who are joining the Executive Committee. We give a heartfelt thank you to the outgoing officers Vandana Sharma and Alicia Prieto Langarica for their work and dedicated service to BIO SIGMAA. Finally, I wish to extend a special thanks to Tim Comar for his years of service to BIO SIGMAA, in a variety of forms. Tim's term as Program Chair ended in December 2018, and he has graciously volunteered to now serve as Electronic Communications Officer.

Our Executive Committee has already begun discussions on how we can improve BIO SIGMAA, and I believe we are in for an exciting next few years. Thank you all for all you do for this group and our community.

With warm regards,

Hannah Highlander

BIO SIGMAA Chair

**BIO SIGMAA Welcomes Newly Elected Officers**

***Borbala K. Mazzag, Program Chair***



Dr. Mazzag is Professor and Chair of Mathematics at Humboldt State University (HSU). Her broad professional interest is in creating interdisciplinary connections between mathematics and biology, and this is reflected in her teaching, research and service. She has taught many courses, including biocalculus and an upper division Introduction to Mathematical Modeling course for over ten years, and have developed, with the help of MAA's PIC Math Program, a project-based course that builds on industry collaborations. Currently, she is most passionate about giving students problem-solving and research experiences and mentoring them in how to translate these into marketable skills. Her own academic research has focused on biochemical and mechanical cell signaling, and she has also collaborated with an HSU neuroscience faculty member on creating a graph-theoretical representation of the zebrafish sensorimotor pathway. Most of her publications are with student co-authors, and she was the faculty advisor of six Master's theses in the (now extinct) Mathematical Modeling Option of the Environmental Systems Graduate program. In addition to various departmental and university-wide committees, she has been serving as a faculty advisory council member of the California State University-wide organization, "California State University Program for Education and Research in Biotechnology (CSUPERB)". She is excited to serve on the BioSigma and contribute to its mission with my professional experience.

***Robert Stolz, Secretary***



Robert Stolz received a PhD in Mathematics from Lehigh University, where his work was focused on stochastic processes, integration and measures in infinite dimensional vector spaces. His more recent and current mathematics research include application of mathematical and computational methods to proteomics, population biology, and study of coral diseases. Dr. Stolz is director of a number of STEM (Science, Technology, Engineering and Mathematics) undergraduate projects aimed at increasing the number of students from groups traditionally underrepresented in STEM who earn baccalaureate degrees, and ultimately increase the numbers that go on for advanced degrees in STEM.

**Communication from the BIO SIGMAA**

The BIO SIGMAA leadership and the MAA are aware that as communications and original invitations are being sent through Google Groups to university email addresses, many individuals are having trouble receiving these communications. The MAA is working on this, and it should be improving soon. Also, please look for updates soon on the BIO SIGMAA website, which is currently being updated. This link is:

<https://qubeshub.org/community/groups/biosigmaa/maa>

### **MAA Split from the Joint Mathematics Meetings**

As you may be aware the MAA is splitting from the Joint Mathematics Meetings after the 2021 Joint Mathematics Meetings. This was a difficult decision for the MAA but was necessary for the MAA's financial health and future directions of the MAA. For years, the BIO SIGMAA has conducted the majority of its MAA-wide activities at the Joint Mathematics Meetings, including the Annual Business Meeting, the Plenary Talk, Invited Paper Sessions, and Themed Contributed Papers Sessions. It is very likely that these activities will need to move to Mathfest as of 2022. (We already have been running contributed paper sessions at Mathfest for years.) We do understand that having all of these activities at Mathfest in the future may have impact on attendance, as there are other relevant meetings for the mathematical biology community during the summer. The BIO SIGMAA leadership is very interested knowing how we can continue to serve its membership most effectively at national meetings, at section meetings, and in other meaningful ways.

### **Anderson Award Winners**

The *Janet L. Andersen Award for Undergraduate Research in Mathematical or Computational Biology* was established by this special interest group in honor of our colleague and friend, Janet Andersen. Until her untimely death in November 2005, Janet Andersen was Professor of Mathematics at Hope College in Holland, Michigan. She joined the Hope faculty in 1991 after completing her master's and doctoral work in algebraic geometry at the University of Minnesota. At Hope, she pioneered an interdisciplinary course in mathematical biology, was a research mentor for students in the field, and worked through several organizations such as the [BioQuest Curriculum Consortium](#), the [MAA](#), and the [Society for Mathematical Biology](#), to broaden undergraduate exposure to mathematical biology. This prize honors her efforts.

Two undergraduate students were received the Anderson Award at Mathfest 2018.

#### ***Allison Gerk, St. Norbert College***



Allison Gerk grew up in Tinley Park, IL, and is a junior at St. Norbert College in De Pere, WI. Allison began college with a major in Biology and a love of mathematics. She grew passionate for the application of mathematics in biology and medicine. She has since picked up a major in mathematics, and hopes to merge her two passions and apply them to her pursuit of a Ph.D. and career in research. She was thrilled

to accept a summer research project with her mentor, Dr. Terry Jo Leiterman. Together they have been investigating the population dynamics of fish infected with columnaris disease. The research presented was built on modification to the Kermack-McKendrick SIR model of epidemics, where, in addition to the infected, the removed population affects the rate at which a susceptible fish becomes infected. Future steps will enhance the model by looking further into the transmission rate of the disease, vaccination and recovery of the fish, and in-house experimental data collection.

***BethAnna Jones, State University of New York at Geneseo***



BethAnna Jones grew up in the small town of Worcester, New York and is currently a senior Applied Mathematics major at the State University of New York at Geneseo. Her interest in applied mathematics drew her to Michigan State University's 2018 Summer Undergraduate Research in Experimental Mathematics program. Dr. Mark Reimers' project in tracking neural activity specifically drew BethAnna's attention for its programming aspects and biological application. After graduating, she plans to pursue a Ph.D in either Applied Mathematics or Computational Biology. BethAnna also enjoys flowers, cycling, bad puns, and riding rollercoasters.

***Amanda Stanley, Grand Valley State University***



Amanda Stanley, who grew up in the small town of Marcellus, MI, is a senior Mathematics major at Grand Valley State University. She began working with Dr. Mark Reimer in coordination with Michigan State University's 2018 Summer Undergraduate Research Institute in Experimental Mathematics REU. Amanda chose to be a part of the Tracking Neural Activity: Automated Image Analysis team to explore applied mathematics. Outside of school, Amanda enjoys actively participating as President of the National Honor Fraternity Phi Sigma Pi and working as a math tutor. After graduating from Grand Valley, Amanda plans to attend graduate school for applied mathematics or a related field.

**Activities at the 2018 International Symposium on Biomathematics Education and Research (BEER 2018)**

BIO SIGMAA once again sponsored a Plenary lecture at BEER 2018. The invited speaker was Carrie Diaz Eaton, Bates College. The title of her talk was Life After My BEER Intervention.

BEER 2019 will be held at the University of Wisconsin- La Crosse, October 4-6, 2019. For more information and registration, visit <https://about.illinoisstate.edu/biomath/beer/>.

### **Activities at the 2019 Joint Mathematics Meeting**

On Wednesday, January 16, 2019, BIO SIGMAA Sponsored the MAA Invited Paper Session, *Trends in Mathematical and Computational Biology*. The session was organized by Timothy D. Comar (Benedictine University), Alicia Prieto Langarcia (Youngstown State University), and Raina Robeva (Sweet Briar College). The session description follows:

Mathematical and computational biology encompasses a diverse range of biological phenomena and quantitative methods for exploring those phenomena. The pace of research at this junction continues to accelerate and substantial advancements in problems from gene regulation, genomics, phylogenetics, RNA folding, evolution, infectious disease dynamics, neuroscience, growth and control of populations, ecological networks, drug resistance modeling, and medical breakthroughs related to cancer therapies have increasingly ensued from utilizing mathematical and computational approaches. Our session on current trends will sample from this diversity of important questions from biology and medicine and their mathematical treatments, with a goal of maximizing the range of topics and research methods presented at the session. Mathematical approaches will include deterministic and stochastic continuous dynamical models, as well as finite dynamical systems and combinatorial and algebraic methods.

Speakers in the session included Kamel Lahouel (Johns Hopkins University), "A Mathematical Model of Tumorigenesis," Shelby N. Wilson (Morehouse College), "On the Collective Dynamics of Coupled Development," Anita T. Layton (University of Waterloo), "Modeling and Simulation for Drug Development", Jeff Knisely (East Tennessee State University), "Identifying Biologically Relevant Structures: From Clustering to Manifold Learning," Kimberlyn Roosa (Georgia State University), "Mathematical and Statistical Approaches for Forecasting Infectious Disease Epidemics Using Dynamic Modeling," and Mario Banuelos (California State University, Fresno), "Mathematical -Omics Models in Error-Prone Data Regimes."

On Thursday, January 17, 2019, BIO SIGMAA Sponsored the MAA Contributed Paper Session on Mathematics and the Life Sciences: Initiatives, Programs, and Curricula, which was organized by Timothy D. Comar (Benedictine University), Raina Robeva (Sweet Briar College), and Carrie Diaz Eaton (Bates College). The sessions description follows:

In the 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences, the life sciences were clearly identified as a key path through the mathematics major to graduate programs and the workforce. This account echoed many prior high-profile reports (e.g., Bio 2010 (2003), A New Biology for the 21st Century (2009), Vision and Change (2011), The Mathematical Sciences in 2025 (2013), and the SIAM white paper Mathematics: An Enabling Technology for the New Biology (2009)) that had previously discussed the changing landscape at the interface of mathematics and biology and had issued urgent calls for broadening students' exposure to mathematical methods for the life sciences. It appears that a wider array of curricular ideas, programs, and materials that can be scaled, modified, and assessed in a wide range of different institutions is still needed. Topics include scholarly contributions addressing initiatives, programs, curricula, and course materials at the interface of mathematics and the life

sciences that have been implemented and tested successfully at institutions of higher education. Speakers will be invited to submit their work for consideration in the upcoming *PRIMUS Special Issue: Mathematics and the Life Sciences: Initiatives, Programs, Curricula*.

Speakers included Hannah Highlander (University of Portland), Filippo Posta (Estrella Mountain Community College), Raina Robeva (Sweet Briar College), Melissa Stoner (Salisbury University), Andrew Belmonte (Penn State University, University Park), Yanping Ma (Loyola Marymount University), Jessica Oehrlein (Columbia University), Meghan M. De Witt (St. Thomas Aquinas College), Timothy D. Comar (Benedictine University), and Majid Mason (George Mason University).

On the evening of Thursday, January 17, 2019, BIO SIGMAA was happy to have Reinhard Laubenbacher of the University of Connecticut School of Medicine and the Jackson Laboratory for Genomic Medicine, Farmington as the plenary speaker following our annual business meeting. His well-received talk was titled "Mathematics and Medicine."

BIO SIGMAA's Annual Business meeting also took place on January 17, 2019. The Outgoing BIO SIGMAA Chair Raina Robeva introduced the new officers – Hannah Highlander (University of Portland), transitioning from BIO SIGMAA Chair Elect to BIO SIGMAA Chair, and the newly elected Program Chair, Bri Mazzag (institution) and Secretary Roobert Stoltz (Inst). The work that our outgoing Program Chair, Bori Mazzag (Humboldt State U), Timothy Comar (Benedictine U), and Robert Stoltz (U of the Virgin Islands). The work of Timothy Comar (Benedictine U) as outgoing Program Chair and Vandana Sharma (Arizona State U) as Secretary was recognized with appreciation. Raina Robeva presented the BIO SIGMAA Treasurer's Report for 2018 on behalf of Frank Lynch (EWU).

### **Upcoming Events at Mathfest 2019**

The BIO SIGMAA is again sponsoring the contributed paper session, *Mathematics and the Life Sciences: Initiatives, Programs, and Curricula*, was organized by Timothy D. Comar (Benedictine University), Raina Robeva (Sweet Briar College), and Carrie Diaz Eaton (Bates College).

This session will have the same focus and description as the session with the same name organized at JMM 2019 (see above). We encourage BIO SIGMAA members to submit abstracts for the session, as well as submit their work for consideration in the upcoming [PRIMUS Special Issue: Mathematics and the Life Sciences: Initiatives, Programs, Curricula](#).

The abstract submission deadline for MathFest 2019 is April 30, 2019. The link to submit is:

<https://www.maa.org/mathfest/abstracts>

### **Results of BIO SIGMAA Member Survey**

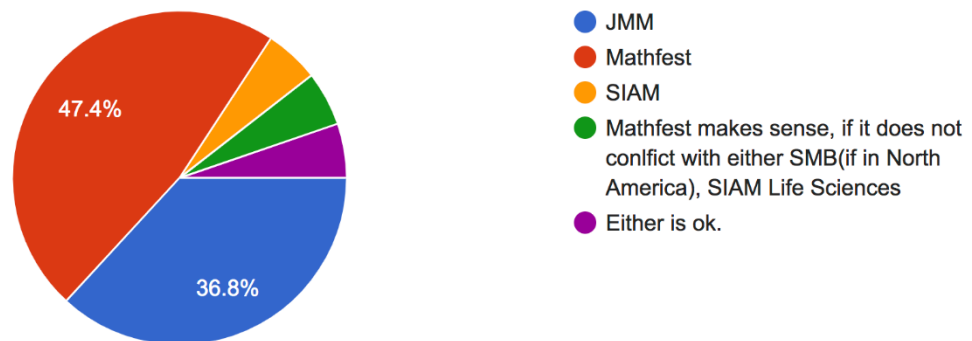
In February 2019, the BIO SIGMAA conducted an online survey of our members about the current and future impact of BIO SIGMAA on its membership. The summary of the survey is given below.

- 19 Total responses (we still welcome more)
- Why did you join?

- To connect with others interested in teaching and doing research in Mathematical Biology.
- To stay current in math bio issues (teaching and research)
- What do you feel are the main benefits of your membership?
  - Access to interesting talks
  - Networking opportunities
  - Increasing visibility of math bio to the wider community
  - Presentation opportunities
  - Information about conferences and related events in math bio
  - A means for sharing ideas/projects/courses
  - A way to meet new people and make lasting friendships
- Additional concerns about the MAA split with the Joint Mathematics Meetings (JMM)
  - If we do not hold our business meeting at JMM, it might be more challenging to find speakers for our sessions
  - Cannot afford both conferences; more likely to attend Mathfest
  - Not aware of this split until now; would like to know more about the reasoning behind this
  - I do not enjoy going to Mathfest and I'm concerned about the future of the MAA
  - Too many concerns to mention
  - I worry this will negatively affect our membership base as people will have to choose which meeting to attend; this could affect the diversity of our group
- Which meeting would you prefer we use for our business meeting?
  - I attached the pie chart below

As you may be aware, 2021 will be the last year the MAA will be part of JMM. Therefore, we need to begin discussions on where to host our annual business meeting after this split occurs. Please select your preference of location for our BioSIGMAA business meeting.

19 responses



- How can BIOSIGMAA be more involved at the sectional level?
  - Sponsor faculty and student talks about accessible modeling projects
  - Sponsor a social or a networking event
  - Special session on math bio
  - Perhaps a regional BIOSIGMAA meeting instead of participating in sectional meetings
  - To begin with, we can inform members of Bio SIGMAA and its mission. Many faculty attend only the sectional meetings, as it may be too expensive or time-consuming to go to JMM or Mathfest. The SIGMAAs appear on the MAA membership form (so every MAA member is presented with the opportunity to join when renewing their membership), but I have talked to MAA members who are not aware at all what the SIGMAAs do, so they just skip over those checkboxes. Further, it would be good to (partially) support student talks in mathematical biology at the sectional meetings. Bio SIGMAA could also sponsor math-bio talks at the sectional level.
  - Run short courses on math bio related topics
  - Provide funding for BIOSIGMAA sponsored sessions or invited speakers.
  - Encourage session submissions - actively recruit.
  
- What ideas do you have for improving the impact of BioSIGMAA on the biomath community?
  - I like the hour long lectures a lot when I go to JMM. I think the subject talks (as opposed to pedagogy sessions) are helpful. The topics can interest a wider audience and others can see the type of math getting used.
  - Organize minisymposia at SMB annual meetings.
  - Send information about existing bio-math programs, certificates, ... and other opportunities
  - Data science/big data seem to be important emerging fields. Perhaps thinking strategically about this would be good. For example, we could organize sessions/talks/mixers to discuss how data science programs relevant to math biology were created; collect ideas about related REUs.
  - Try to get survey articles in MAA or other journals showing how mathematics can be used in biology.
  - Create a website or similar device with easier interaction between the BioSIGMAA and other biomath communities.
  - Present medical schools with cogent argument for two semesters of calculus.
  - It would be nice if there were more articles related to math bio in MAA publications, including some about undergrad teaching approaches
  - Announcements in mathematical biology journals might attract notice
  - Keeping a list of resources for teaching math-bio courses or mathematics courses for biology majors would be very helpful. This can simply be a Google doc that all Bio SIGMAA members have access to with editing privileges. This way, any time a member uncovers a helpful resource, they will be able to post and also include notes, if appropriate.



- Keep a list of mathematical biology programs in the US -- both undergraduate and graduate. The SMB used to have a list, but it seems to have disappeared from the smb.org site (or perhaps I am unable to find it).
- Encourage students and mentors to use R in their research projects.
- I think it might be nice to have some discussion times for key issues at the joint meetings in a less formal way. What is the current state of Biocalc, what other classes are people offering? What else is going on? Should BioSIGMAA publish a summary of some of the innovative ideas?
- What ideas do you have for increasing our membership base?
  - Funding or subsidizing an invited speaker at the section level who would be invited to give a talk at institutions in the section. Maintain a (short) list of such speakers.
  - Reach out to math/biology department chairs at Universities across US to ask relevant faculty to join the group
  - I wonder if there are online meetings/webinars we could leverage to reach out to a wider audience. There may be topics (eg setting up successful cross-disciplinary collaborations; different models of teaching interdisciplinary courses, etc) that could attract a broader audience.
  - Spread the word about the BioSIGMAA to anyone you can, in particular the people in the MAA in general and other biomath communities as well; in addition, people in the AMS who enjoy mathematical biology especially those who marked it as a primary or secondary interest.
  - Connect with one or two of the biology organizations that Raina listed at our last meeting.
  - Include more graduate and undergraduate students; contact mathematics clubs frequented by students and start the fascination with mathematics and biology early. Show that this is a viable path for mathematicians and that there are a rich abundance of interesting problems to be tackled.
  - Have a forum that is not Google Groups, or make it more clear how to get information about what is going on with the SIGMAA. I received an invitation to join the Google Group, but it was sent to my university email, and thus I couldn't get in.
  - Promote more visibly Bio SIGMAA at all Invited, Contributed and Special Sessions that our interest group sponsors. The same applies to the BEER conference where Bio SIGMAA sponsors a keynote lecture every year. We should also do this at the sectional level. Further, we may want to look for ways to establishing closer ties with biology groups and organizations, whose members may benefit from connecting with mathematicians interested in collaborating on problems of interest to biologists.
  - Stress interdisciplinary projects with students from relevant disciplines
  - Increase visibility

- What other ideas, concerns, or questions do you have at this point? Please let us know how we can better serve you as a BioSIGMAA member.
  - Probably need to clarify our relationship with ENVSIGMAA. Make connections with SIAM, more with SMB, other professional groups such as ACUBE?
  - Better communication with members about BIOSIGMAA activities