Society for Mathematical Biology

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Newsletter
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Dear SMB Members,

This newsletter marks a changeover in the governance of the Society, as a result of the recent elections. I am very pleased to welcome Fred Adler (University of Utah) as President-Elect, and Sandy Anderson (Moffitt Cancer Center), Meghan Burke (Kennesaw State University), and Eric Cytrynbaum (University of British Columbia) as members of the Board of Directors. I look forward to working with all of you.

Welcoming new members to the Board unfortunately also means saying goodbye to members whose terms have ended. On behalf of the entire SMB membership, I would like to thank our Past-President Michael Mackey (McGill University) and former Directors, Renee Fister (Murray State University), Mary Myerscough (University of Sydney), and Santiago Schnell (University of Michigan), for their dedication and passionate contributions to the Society. It was a pleasure working with all of you.

I also would like to thank all of the members who serve on our committees for their work for the Society. There will be a few changes in committee chairs over the next few months. You can always find up-to-date information on the Governance page of our website at www.smb.org.

In July, many of our members attended our annual meeting in the vibrant city of Knoxville, Tennessee. Over 400 attendees enjoyed a full program with stimulating plenary talks, a wide variety of parallel sessions, panel discussions, and ample opportunity to socialize with friends and meet new colleagues. Many thanks to the team of conference hosts, from both NIMBioS and the University of Tennessee Conference Centre, headed by former SMB President Lou Gross, for running a superbly organized conference. This annual meeting marked the second time that Lou organized an SMB meeting in Knoxville. I am sure that many of us would love to return a third time sometime in the future.

Plans are well underway for the next SMB meeting, hosted by Arizona State University, in Tempe, AZ and chaired by Prof. Hal Smith. Please note that the meeting will take place approximately one month earlier than usual, namely June 10-13, 2013. Details are available at http://math.asu.edu/SMB2013.

Best wishes,

Gerda de Vries

Third Advanced Study Institute's Workshop on Quantitative Landscape Ecology and Environmental Sustainability

James MacCarthy, Mia Comeros-Raynal, Addis Teshome, Annalie Melin, Penelope Mograbi, 'Oluwa Gbenga, and Immaculate Halleberry

A workshop on Quantitative Landscape Ecology and Environmental Sustainability (QLEES) was held at the University of KwaZulu-Natal in Durban, South Africa from the 2nd-7th of July, 2012. The main goal of the workshop was to address a broad range of questions from a landscape perspective through an expansion of collaborative efforts between countries with attention paid to the importance of integrating multiple disciplines as varied as mathematical modeling, ecology, and social science. Specifically, the workshop was designed to attend to regional issues in Africa with broader, global implications. In particular, it addressed problems pertaining to sustainability, ecosystem functions, and ecosystem services as well as efforts related to mitigating and adapting to the effects of global climate change and other anthropogenic pressures.

The sun was shining for the entirety of the workshop as students and researchers with diverse backgrounds from nine countries (Gabon, Ethiopia, Kenya, Nigeria, Tanzania, Uganda, Zimbabwe, United States, and South Africa) gathered for seven days of lectures and interactive problem solving sessions. The QLEES workshop created a platform for students, researchers, conservation managers, and professors to engage in constructive discussions on current research and research methodologies.

A variety of topics, ranging from the development of new home range estimation methods to early warning systems for dengue fever and everything in between were presented at the workshop, including a thought-provoking lecture on the importance of meaningful statements as viewed through measurement theory. Pre-workshop lectures were a vital factor in providing participants with the necessary background to take full advantage of the workshop sessions and lectures planned for the week.

Lectures every morning by established researchers offered hands on experiences with many new and innovative techniques such as agent-based modeling, GIS, space-time analysis, and systems-based approaches, which are being used to shape our understanding of ecosystem interactions. In addition, stimulating 1-hour didactic talks on diverse themes provided participants the opportunity to learn about new research tools useful for expanding their current research as well as filling in critical knowledge and methodological gaps in their work. Not only did these lectures provide students and researchers exposure to quantitative landscape-level ecological methods used across a wide range of fields, but they also presented the researchers who designed the tools an opportunity to share their work. Audience members walked away equipped with new methods to incorporate temporal dimensions into home-range analysis as well as new software to classify fragmentation statistics using object-based image analysis.

One of the highlights of the workshop was the filming of pilot for a documentary featuring

Participants listening to lectures every morning

Nancy Barker, a PhD student from the University of Pretoria and the world's first female deaf zoologist. Nancy presented her master's research on competition between spotted and brown hyenas in the Madikwe Game Reserve in South Africa. On the fifth day of the workshop, students were given the opportunity to present their research to workshop participants in a 2-minute poster preview talk, paving the way for more robust discussions when showcasing their posters. A banquet after the poster session provided an informal venue for junior and senior researchers to continue their dialog over some delicious food and South African wine.

Organizers of the event scheduled two fantastic field trips for workshop participants, including an afternoon at uShaka Marine World on July 4th and a 3-day safari through the bush at

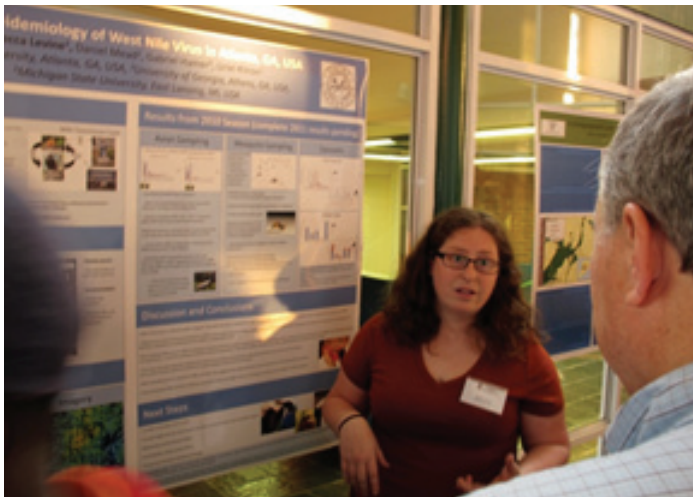
Hluhluwe-iMfolozi and Mkuze Game Reserves at the conclusion of the workshop from July 8th-11th. While an afternoon at the aquarium provided participants with glimpses of the diversity and amazing endemism of South Africa's marine life, the 3-day safari allowed students and researchers to experience and appreciate the magnificent size and tusks of the elephant as well

Group photo of workshop participants

as the grace of the impala first-hand (as well as many other mammals and birds). Participants on the safari were also lucky to chance upon an aggressive display between two hippopotamuses when stopping for lunch one day. Both trips reinforced the topics covered by the workshop and reminded participants of some successful conservation efforts.

This workshop not only expanded our understanding of mathematical biology and its applications to conservation, but also imparted upon the participants a sense of commitment to establishing collaborative efforts as well as to continue fostering and developing relationships with students and researchers from other cultures and continents. In addition, the workshop has had a ripple effect, empowering researchers to spread information within their own circles of colleagues.

Special thanks are much deserved for the organizers of the conference: Fred Roberts, Director Emeritus and Special Advisor of the Center for Discrete Mathematics and Theoretical Computer Science, Rutgers University; Kesh Govinder, Dean and Head of the School of Mathematics, Statistics, and Computer Science, University of KwaZulu-Natal; Bidisha Nag, Rutgers University, Prenisha Rajdev, University of Kwazulu-Natal; Bruce Page, University of KwaZulu-Natal; Holy Gaff, Old Dominion University; Sadie Ryan, State University of New York-College of Environmental Science and Forestry; Wayne Getz, University of California-Berkeley; Victoria Goodall, South African Environmental Observation Network; as well as all of the wonderful students and researchers who presented their work. Organizers of the event would also like to thank the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), the Mathematical Biosciences Institute at The Ohio State University



Poster presentation at the workshop

(MBI), the Society for Mathematical Biology (SMB), and the U.S. National Science Foundation (NSF) for their generous and continued support of these efforts. Other acknowledgements go to Orion Weldon (orion.weldon@gmail.com) for graciously providing his professional-quality photographs throughout the conference.

Lastly, it should be noted that this article is a true reflection of the purpose of the conference and has brought together researchers from the United States to South Africa and places in between. Many thanks go to the people that helped contribute their comments and thoughts on this article.

Participants had the pleasure of field trips to see African wildlife

Upcoming Workshops:

MBI Emphasis Year on Mathematical Neuroscience July 2012 – June 2013.
http://www.mbi.osu.edu/2012/scientific2012.html

2012 Workshop for Young Researchers in Mathematical Biology August 27-30, 2012
http://www.mbi.osu.edu/wyrmb/wyrmb2012.html

Math Biology: Looking into the Future (MBI's 10th Anniversary meeting) September 19-21, 2012
http://www.mbi.osu.edu/2012/10thdescription.html

Workshop 1: Mathematical Challenges in Neural Network Dynamics October 1-5, 2012
http://www.mbi.osu.edu/2012/ws1description.html

Current Topic Workshop: Mathematical and Computational Challenges in Cilia- and Flagella-Induced Fluid Dynamics October 15-18, 2012
http://www.mbi.osu.edu/2012/mccdescription.html

Current Topic Workshop: Statistics of Time Warpings and Phase Variations November 13-16, 2012
http://www.mbi.osu.edu/2012/stwdescription.html

Workshop 2: Cognitive Neuroscience December 10-14, 2012.
http://www.mbi.osu.edu/2012/ws2description.html

Mathematical Biosciences Institute (MBI) is accepting applications for Postdoctoral Fellows to start September 2013: MBI postdoctoral fellows engage in a three-year integrated program of tutorials, working seminars or journal clubs, and workshops, and in interactions with their mathematical and bioscience mentors. These activities are geared toward providing the tools to pursue an independent research program with an emphasis on collaborative research in the mathematical biosciences. MBI facilitated activities are tailored to the needs of each postdoctoral fellow.

Mathematical Biosciences Institute (MBI) is accepting applications for Early Career Awards for the 2013-2014 emphasis semesters on Ecosystem Dynamics and Management and Frontiers in Imaging, Mathematics, and the Life Sciences: Early Career Awards enable recipients to be in residence at the Mathematical Biosciences Institute for stays of at least three months during an emphasis program. Details of the 2013-2014 programs can be found at http://mbi.osu.edu/annual_programs.html. Early Career Awards are aimed at non-tenured scientists who have continuing employment and who hold a doctorate in any of the mathematical, statistical and computational sciences, or in any of the biological, medical, and related sciences. An Early Career Award will be for a maximum of $7,000 per month of residency and for a maximum of nine months during the academic year. The award may be used for salary and benefits, teaching buyouts, and/or local expenses (restrictions apply). Applications for an MBI Postdoctoral Fellowship and Early Career Award should be submitted online at: http://www.mathjobs.org/jobs/mbi. Applications for an Early Career Award completed before December 3, 2012 will receive full consideration. Applications for a postdoctoral fellowship completed before December 13, 2012 will receive full consideration. The applicant should state the period that he or she would like to be in residence. For additional information please contact Rebecca Martin (rebecca@mbi.osu.edu or 614-292-3648) or visit http://www.mbi.osu.edu/postdoctoral/postdoctoral.html.

Organize an MBI Emphasis Program

MBI seeks researchers to organize semester or yearlong emphasis programs at MBI for Fall 2015 and beyond. Emphasis programs consist of either three or six weeklong workshops and related activities. For details see: http://www.mbi.osu.edu/organize_ey.html Before submitting a proposal, please discuss ideas with MBI Director Martin Golubitsky (mg@mbi.osu.edu). The research goals of MBI are: Apply mathematical, statistical, and computational methods to resolve significant problems in the biosciences and develop new areas in the mathematical sciences motivated by important questions in the biosciences. The deadline for pre-proposals is Monday, October 8, 2012 and the deadline for full proposals is Monday, March 4, 2013.

Recent Events
Research Experience for Undergraduates (REU), June 11-August 3. Eighteen undergraduates recently completed the 2012 NIMBioS REU program. Participants lived on campus and worked in teams with NIMBioS postdocs and University of Tennessee faculty to conduct research at the interface of mathematics and biology. This year's program included six different projects, ranging from evolution to viruses. For a full listing of all REU participants in the 2012 program, as well as detailed profiles of some participants, visit http://www.nimbios.org/reu/reu_profiles2012

Investigative Workshop: Modeling Dengue Fever, Jul 23-24. More than one-third of the world's population lives in areas at risk for the transmission of dengue, a vector-transmitted disease that is one of the leading causes of death and illness in the tropics and subtropics. This workshop brought together public health officials as well as mathematicians, biologists and epidemiologists to identify important modeling issues and to establish possible new collaborations on modeling dengue disease dynamics and control. More information is available at http://www.nimbios.org/workshops/WS_dengue

Investigative Workshop: Communication in Collaboration: Leading Collaborative Groups, July 29-30. Major advances in research are made through collaborations across traditional disciplines, yet, students and faculty in interdisciplinary research often confront obstacles to healthy collaboration, including differences in personal and professional values, differences in research practices, use of language, and undeveloped listening and conflict resolution skills. This workshop provided hands-on training to help researchers better communicate across disciplines. More information is available at http://www.nimbios.org/workshops/WS_communication

Upcoming Events:
Requests for Support. December 11, 2012, is the next deadline for submitting applications for postdoctoral fellowships at NIMBioS. NIMBioS is particularly interested in requests to support research that integrates diverse fields, requires synthesis at multiple scales, and/or makes use of or requires development of new mathematical/computational approaches. Fellowships are for two years. Apply at http://www.nimbios.org/postdocs/

Undergraduate Research Conference at the Interface of Mathematics and Biology, Nov. 17-18. The fourth annual conference, to be held at the Univ. of Tennessee Conference Center, in Knoxville, TN, provides undergraduates with the opportunity to present their research, Student talks and posters will be featured, as well as a plenary speaker and a panel discussion on career opportunities. Application deadline to request funding for the conference is Oct. 5, 2011. For more information about the conference and details about the funding request, visit http://www.nimbios.org/education/undergrad_conf2012

Teacher Collaboration Program. NIMBioS is accepting applications from math and biology/science teachers for the Teacher Collaboration Program, which provides links between teachers, scientists, and educators with an interest in making connections between mathematics and biology. NIMBioS pairs teachers with an interest in mathematics and biology with active researchers in the math biology community. For more information about the program and an online application to request a collaborator, visit http://www.nimbios.org/education/teacher_collaboration

SMB Newsletter is going green!

In the spirit of becoming more environment friendly, SMB Newsletter is going paperless starting January 2013. All members will receive a printed copy as well as electronic pdf version of September 2012 newsletter. We request all the members who received the printed copy but not the pdf version of September 2012 issue, to notify us at newsletter@smb.org. Please register your e-mail addresses with us to continue receiving the pdf version starting January 2013. We will continue to provide the same great service and support for our members.

SMB 2012 Perspectives

Alexis White, Robyn Nadolny, Carrie Manore and Carrie Diaz Eaton

Editor's Note: The 2012 Annual Meeting of the Society for Mathematical Biology was held in Knoxville, Tennessee, USA, hosted by NIMBioS. It was a wonderful success. We recruited four individuals to give perspectives on the meeting from four different phases of an academic career. Here is their joint report.

Undergraduate student
Alexis White, Unity College

New to the world known as Mathematical Biology, the annual meeting for SMB in Knoxville was just what I needed. As an undergraduate my goal for the conference was to listen to talks and meet a variety of people to gain a better understanding of research and possibilities. Although some of the talks were beyond my grasps in quantitative ability and content, many of the speakers presented in a manner that allowed me to take away bits and pieces, providing me with a familiarity for later use.

The atmosphere of the conference was very comfortable. Everyone was approachable, welcoming, inquisitive of my interests and open to giving advice and suggestions for my future. I absolutely loved hearing everyone talk about what they were interested in. You could tell when someone truly loved what they were working on because the energy they brought to the conversation just made me smile and in many ways inspired me. The connections that can be made at these meetings are priceless. Especially through things such as dancing! Contra dancing was very entertaining and allowed for a greater chance to meet new people and just enjoy everyone's company as we giggled and attempted to follow the patterns of the dance.

Simply being in Knoxville for this conference has opened up a new world for me. Working with mathematical models allows one to ask questions I had never quite imagined before. So as I step into the work of quantitative analysis and research, I will begin to ask my own questions. Keep your eye out; the next time I am at an SMB meeting, I hope to be among the presenters to report my own findings within the realm of mathematical biology.

Graduate student
Robyn Nadolny, Old Dominion University

Being a PhD student is in some ways an exercise in tunnel vision - you are so focused on your own work and on immersing yourself in closely related topics that it can be easy to forget that there is a wider world of research out there. This year's SMB meeting was a refreshing reminder of the plethora of fascinating questions being asked in mathematical biology! It was a chance to deepen my understanding of the tools that I am using in my own research, but equally valuable was the chance to explore unrelated fields and unfamiliar tools. Meetings like SMB are invaluable because they give us all the chance to share our own interests with people across disciplines, and pick up new ideas in the process of sharing. I came away from the meeting inspired and invigorated to be a part of such a remarkable research community.

This was my second SMB meeting, and there was a world of difference between what I took away from last years' meeting in Krakow and what I took away from this years' Knoxville meeting. The content of both meetings was stellar, but last year I had just finished my masters, which involved no mathematical biology at all, and I was naive to the world of modeling and simulation. The talks last year seemed awe-inspiring, fascinating, but were largely over my head. This year I have a solid year of modeling classes under my belt, and have been working more closely with my advisor, a mathematical ecologist. Shockingly, the talks have begun to make sense! While I am still far more a "biologist" than a "mathematician", I recognize much more of the math; I can follow the arguments, can ask better questions, and can see the tremendous biological applications of the mathematical tools we are all using. And (I say this as a former math-o-phobe) the math is really exciting!

Where last year was slightly overwhelming, this year was energizing. I cannot begin to count the excellent talks that I was able to catch, and was sad to miss so many others which looked equally enthralling. I enjoyed giving my own talk, and was pleased when it raised relevant questions which could lead to new

avenues of work. This year I was able to relax a little bit more, and was able to enjoy networking with other graduate students, with undergrads, and with faculty. This was an incredibly friendly meeting, and I feel as though I am making lifelong friends and research connections with people who are spread across the globe in disparate fields. I count myself lucky to be exposed to such a welcoming group of individuals who are committed to making math and research accessible and biologically relatable. Perhaps, if I attend enough SMB meetings, I might someday be able to consider myself as much a "mathematician" as a "biologist". One can only hope!

Postdoc

Carrie A. Manore, Tulane University

SMB is a place to find kindred spirits. I attended the meeting in Krakow, so Knoxville was my second SMB annual meeting. It is so stimulating and interesting to interact with people who are excited about mathematical biology. At both meetings, I met early career and established scientists with similar research interests to mine. Conversations have led to invitations to speak, valuable suggestions about other programs and conferences to apply to, and to potential collaborations, not to mention new friendships. I always learn from the talks and they are a great way to keep up with the newest research. I particularly enjoyed learning about modeling tuna, new ideas for teaching mathematical biology, and trypanosomiasis in African cattle. My only suggestion: find a way for us to be two (or three) places at once so I don't have to decide between equally interesting talks!

As a postdoc applying for jobs this fall, I think the SMB meeting was also a good opportunity to meet with and present my research to potential employers and to get tips about upcoming job openings. I appreciated the jobs panel, mentoring program, and the talk by Robert Smith? about finding a tenure track position--I'll take all the advice I can get. I'll let you know once it's over, but I suspect that the networking opportunities and advice gleaned from the SMB meetings will prove valuable in my job search.

The attendees and staff were friendly and helpful, the food and snacks good, the requisite amount of coffee was available, and I think it was a success. Knoxville was a good host city. Plenty of choices for good food, a nice campus and cool city park, and the expanding downtown area made the stay very pleasant. I hope to see you all again next year!

Faculty member

Carrie Diaz Eaton, Unity College

The Annual meeting for the Society of Mathematical Biology was a pleasure to attend as a new faculty member anxious to share ideas. I reconnected with former colleagues from the University of Tennessee and met up with my undergraduate student, Alexis White, who was working with Dr. Holly Gaff for the summer. I recognized lots of familiar faces from other meetings and was finally putting faces to names I've known from conversations and print.

There were two major highlights at this conference for me. The first was to see my student realize a whole new world out there in Mathematical Biology. I have loved reading her perspective above, as I hope you have. The best part was that it was not just about the interesting research, but about the community behind it.

The other highlight for me was meeting new people who are just as energetic and enthusiastic about Mathematical Biology Education as I am. My session on First-year Course Reform was well attended with lots of participation. Dr. Erin Bodine started a quickly growing email list which was soon adopted by the SMB education committee. Speaking of which, what a wonderful group of colleagues at the SMB Education Committee meeting. Who knew committee meetings at the wee morning hours would be so exciting?! I was pleasantly surprised at the representation of education talks and jumped between those and the ecology, evolution, and networks rooms.

A big thank you to the organizers of a fantastic SMB conference in Knoxville.

Alexis White (left) and Carrie Diaz Eaton (right) at the SMB Meeting in Knoxville.

My Career in Mathematical Biology

Abdul-Aziz Yakubu

I was born in Accra, the capital city of Ghana. My interests in mathematics and its applications were shaped by my mentors and professors at the University of Ghana- Legon. My first research experience was at North Carolina State University when I started working on my PhD dissertation with John Franke. The dissertation project started with a specific discrete-time pioneer species competition model of John Bishir, a mathematician, and the late Gene Namkoong, a leading authority in forest genetics. The initial task was to develop a global understanding of the dynamics of the model. Thanks to the generous support and encouragement of my PhD dissertation advisor, John Franke, and his colleague and friend, James Selgrade, despite initial rejections of our first set of manuscripts on the model, persistence led to our first publications in the *Journal of Mathematical Biology*, the *Journal of Mathematical Analysis and Application*, and the *Nonlinear Analysis Theory, Methods and Applications* [1-3]. The referees' comments on the quality of the accepted revised manuscripts as well as an encouraging letter from Robert May on the publications cemented my interest in interdisciplinary research.

My first faculty position was at Howard University in the Department of Mathematics, a nurturing and supporting research environment. Early on in my time at Howard, I spent about a year as a long-term visitor at the Institute for Mathematics and its Application (IMA) at the University of Minnesota. During my visit, I participated in several IMA programs on "Mathematics in Biology". In particular, I benefited immensely from an IMA tutorial entitled "Introduction to Epidemiology and Immunology". The two-day tutorial provided an overview to a follow-up IMA workshop on "Mathematical Approaches for Emerging and Reemerging Infectious Disease: Models, Methods and Theory". The IMA programs allowed me to connect with a diverse group of scientists, engineers and mathematicians interested in collaborative interdisciplinary research. I went away from the IMA knowing that I could use mathematics to make positive contributions to the world, especially contributions to the forgotten infectious diseases of Africa. Two years after my IMA visit, I took a two-year leave from my tenured professor position at Howard to visit the Center for Applied Mathematics and the Department of Biological Statistics and Computational Biology (formerly, Biometrics Department) at Cornell University. During this visit, I worked with Carlos Castillo-Chavez and the Mathematical and Theoretical Biology Institute (MTBI) group of Cornell University on various projects in ecology and epidemiology. I also interacted with several leading scientists and mathematicians.

After the Cornell experience, I returned to Howard with a more focused research agenda in mathematical biology. As a result, I have had successful collaborations which resulted in scholarly work on the sustainability of exploited fisheries with scientists at the North East Fisheries Science Center of Woods Hole, Massachusetts. With Avner Friedman of the Mathematical Bioscience Institute (MBI) at the Ohio State University and my graduate students at Howard, I currently work on projects that investigate biodiversity and infectious diseases (such as malaria, cholera, anthrax and bovine babesiosis). My research in mathematical biology has made it possible for me to connect with students and researchers internationally. I have attended and given talks at several research conferences and workshops in Europe and Asia. Over the last five years, the NSF funded DIMACS-MBI Africa initiative, led by Avner

Friedman, Marty Golubitsky and Fred Roberts as well as the NSF funded Masamu project of Overton Jenda, have made it possible for me to give lectures at several institutions in Cameroon, Ghana, Morocco, South Africa, Uganda and Zambia. Last spring, I was on a sabbatical leave at MBI. DIMACS in Piscataway, New Jersey, MBI in Columbus, Ohio, NIMBioS in Knoxville, Tennessee, and similar mathematical biology institutes, and the Society for Mathematical Biology continue to provide excellent introductory and advanced programs that continue to inspire my career. I consider myself fortunate because I am still finding a plethora of interesting and exciting problems at the interface of mathematics and biology.

Selected Publications

1. (with J. Franke) Global attractors in competitive systems, *Nonlinear Anal.: Theory, Methods and Appl.*, Vol. 16, 111-129, 2 (1991).
2. (with J. Franke) Mutual exclusion versus coexistence in discrete competitive systems, *J. Math. Biol.,* Vol. 30, 161-168 (1991).
3. (with J. Franke) Geometry of exclusion principles in discrete competitive systems, *J. Math. Anal. Appl.*, Vol. 168, 385-400, 2 (1992).
4. (with C. Castillo-Chavez) Dispersal, disease and life history evolution, *Math. Biosc*., 173, 35-53 (2001).
5. (with C. Castillo-Chavez and C. Castillo-Garsow), Mathematical models in Isolation and Quarantine, *Journal of American Medical Association,* 290 (21), 2876-2877 (December 3, 2003).
6. (with R. Sienz, J. Stein and L. Jones) Monarch Butterfly Spatially Discrete Advection Model, *Math. Biosc.,* 190, 183-202 (2004).
7. Asynchronous and synchronous dispersals in spatially discrete population models, S*IAM J. Applied Dynamical Systems*, 7 (no.2), 284-310 (2008).
8. (with B. Dembele and A. Friedman), Mathematical Model for Optimal Use of Sulfadoxine Pyrimethane as a Temporary Malaria Vaccine (with Dembele and Friedman), *Bulletin of Mathematical Biology,* 72 (4), 914-930 (2009).
9. (with N. Li, J. Conrad, M.L. Zeeman) Constant and Periodic Harvest Policies: Dynamic Implications of the Pacific Halibut and Cod Fisheries, *Mathematical Biosc.,* 232, 66-77 (2011).

MBI Seeking New Associate Director

The Mathematical Biosciences Institute has an opening for a 2-3 year rotator as Associate Director. The position will be 25% research and 75% administrative.

The Associate Director will be an integral part of the MBI Directorate having primary responsibility for program organization. Other responsibilities could include postdoctoral fellow mentoring, outreach, and educational programs, among other possibilities, depending on the interests of the candidate.

The position will include OSU benefits and the salary will be competitive. Interested candidates should contact the MBI Director Marty Golubitsky (mg@mbi.osu.edu). The start date is negotiable but could be as soon as January 1, 2013.

To build a diverse workforce Ohio State encourages applications from women, minorities, veterans, and individuals with disabilities. Flexible work options available. EEO/AA employer. Ohio State is an NSF Advance Institution.

The mission of MBI is:

- To foster innovation in the application of mathematical, statistical, and computational methods in the resolution of significant problems in the biosciences;
- To foster the development of new areas in the mathematical sciences motivated by important questions in the biosciences;
- To engage mathematical and biological scientists in these pursuits; and
- To expand the community of scholars in mathematical biosciences through education, training, and support of students and researchers.

Research Interviews

From Mathematics to Biology and back again: Paul Kulesa

Paul Kulesa talks with Santiago Schnell about next the big challenge at the interface between mathematical and experimental biology

What initially inspired you to become a mathematical biologist? My undergraduate training was in aerospace engineering and I always enjoyed problem solving. I spent my first couple of post-graduate years working on the space shuttle program in Houston, calculating propulsion requirements for the on-board orbital maneuvering and reaction control systems, and payload operations.

I was an aggressive young engineer not satisfied with the day-to-day standard calculations of running large computer programs, so I went to talk with different people at the space center and find out what they did. I spoke with Gene Kranz, the famous mission control flight director, had a few minutes of tense discussion with George Abby, the head of the Astronaut office, and other folks who were discussing emerging designs of the space station. It quickly became clear that the more complex missions that included orbital rendezvous or station-keeping, such as for the Hubble space telescope preparation, required advanced mathematics. So, I decided to go back to school and get a master's degree in applied mathematics. During my first summer in grad school, I attended the complex systems summer school at the Santa Fe Institute, where I heard a wide range of really great lectures from people like Murray Gell-Mann and Stuart Kauffman that were thought-provoking and included applications of mathematics to different phenomena, including biology.

I then became convinced that the next frontier was not orbital mechanics of a low Earth orbiting space station, but the wildly unpredictable and adventurous world of biology, with its multiscale levels from tissue to cell and protein to molecule. So, I did a literature search of the top 10 applied mathematicians working on biological problems and wrote a letter to each asking for a few of their papers and potential PhD projects. One of those people was Prof. J.D. Murray, FRS, who wrote me a personal note saying that he was happy to hear of my enthusiasm for mathematical biology and it was an emerging field he found profoundly exciting. I was very fortunate to join the University of Washington Applied Math department and Jim's group. Jim ran a lab full of really bright, fun students and equally unique postdocs and visiting professors. I remember meeting world-class math biologists like Philip Maini and experimentalists like Howard Berg and Scott Fraser and being amazed by the complexity of their model systems in bacterial chemotaxis and embryogenesis. This all provided me with a wonderful environment to train and explore the field. I remember finding that the UW library had an archive of time-lapse movies on Dictyostelium and I sat and watched the streaming phenomena over and over again and asked what mechanisms could possibly underlie these behaviors? I would watch these movies into the wee hours and then go talk with Prof. Mark Kot (a consummate night owl!) who would always take a few minutes to chat or pull a book off his shelf and say, 'if you thought that was cool, you should look at this'.

Jim, of course had wonderfully colorful projects that included alligator stripe patterning, tooth formation, and wound healing. Because Jim so strongly believed that the biology should drive the mathematical modeling, I was able to organize a PhD thesis committee of a developmental biologist, physiologist, and applied mathematicians. Jim paired me up with Gerhard Cruywagen who was an extremely bright postdoc from South Africa, who's idea of inviting you for a bbq was first sending you out to gather sticks and brush to start an outdoor fire over which he cooked meat on a stick! So, I was off and running on a project of the spatio-temporal patterning of tooth formation, using the alligator model developed by Mark Ferguson.

Why did you decide to become an experimental developmental biologist after your PhD? The simple answer is that I wanted to have control over both experiment and modeling. During my PhD work, I thought that our tooth formation model had come up with some wonderful predictions. For example, if we moved the position of the initial tooth primordium to a more distal location in the

simulated growing jaw, it would dramatically affect the subsequent spatio-temporal tooth pattern. Unfortunately, our collaborator-experimentalist had discovered factors that minimized scarring during wound healing and their lab decided to pursue this vigorously and not continue the tooth patterning work. Well, I was a bit crestfallen to hear this and decided it would be fun to work on a biological problem and model system that I could simultaneously probe for biological insights and computationally simulate.

What are you working on? We are really excited to study cell migration in development and cancer. Our lab is interested in learning about the mechanisms that underlie how cells navigate through complex microdomains and communicate position information with each other. We study this question using the neural crest (NC), a multipotent stem cell-like population that travel long distances throughout the vertebrate embryo. NC cells give rise to bone and cartilage of the face, neurons and glia of the peripheral nervous system (PNS), and pigment cells. Some NC cell guidance factors have been identified, yet limitations of observing in vivo cell behaviors and deciphering signal relay between cells has left this question unresolved. We use in vivo microscopy, fluorescence cell labeling and gene profiling to analyze NC cell behaviors in normal and molecularly perturbed chick embryos. Defects in NC cell migration lead to craniofacial, heart and PNS congenital malformations, and thus provide us with our motivation.

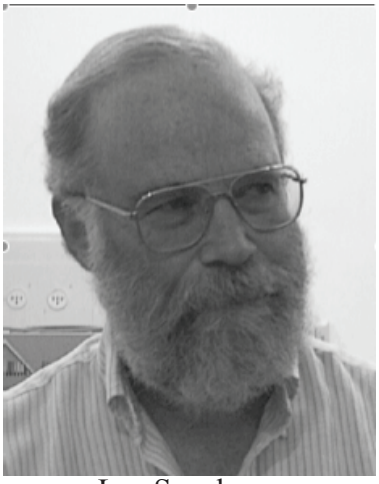
A second project in the lab works at the interface between development and cancer. Melanoma and neuroblastoma are two very aggressive cancer cell types that are derived from the NC. We explore whether signals in the embryonic NC microenvironment that so beautifully choreograph the embryonic NC cell invasion pattern can reprogram these highly aggressive cancer cell types to a less metastatic phenotype. By transplanting human metastatic melanoma or neuroblastoma cells into the chick embryo NC microenvironment and using our in vivo imaging techniques, we are able to observe single cancer cell behaviors and profile gene expression changes during progressive stages of cell invasion. This approach overcomes two major roadblocks to current cancer studies and moves us towards a goal to identify signals common to embryonic and tumorigenic cell invasion that may be relevant to the human condition. In both projects, our biological data provide input for mathematical models of cell invasion, the predictions of which have been wonderfully insightful and help guide our experiments.

What's the next big challenge at the interface between the dry and wet lab? I see two major challenges. First, there are emerging imaging technologies in super-resolution microscopy that allow us to collect subcellular information in living cells below the traditional diffraction barrier of 200nm. This will shed light on intercellular dynamics and details of the cell-to-cell communication by touch. New fluorescent reporters designed to allow observation with dual imaging modalities, such as light microscopy and MRI, will provide a means to continually observe a biological phenomenon during progressive developmental stages of the embryo. As these techniques are worked out in living cells and then embryos, we truly will be able to collect multiscale data in the same embryo! For example, in the same 1-2 cell stage embryo, we could fluorescently mark and observe complex cell dynamics with nanometer precision using light microscopy, then transfer the culture chamber into the MRI and observe anatomical differences within the micrometer range that are produced when normal cell behaviors are disrupted.

Second, we need to provide a means for young people interested in quantitative biology to have better access to wet labs and interdisciplinary training. I think that exposing undergraduates to complex biological phenomena and teaching them state-of-the-art tools to quantitatively measure properties of the phenomena will help them develop a scientific intuition. The state-of-the-art tools could include aspects of genomics, proteomics, mathematical modeling, and imaging. This early training may help to relieve fears about being imbedded within a wet/dry lab and communicating with people across disciplines. I very much support the philosophy that future inroads into the complex multiscale mechanisms of biological phenomena will require students to seamlessly integrate multiple disciplines into their research program.

If you weren't a scientist, what would you be? I never aspired to be a scientist as a young kid and don't quite know how I arrived here with simply a curiosity about the natural world and how things work.

(continued on page 15)



Lee Segel

2012 Lee Segel Prizes

To honor the enormous contribution that Lee Segel made to the Bulletin of Mathematical Biology and the field of mathematical biology as a whole, Springer, in partnership with the Society of Mathematical Biology, funds a series of prizes for the best papers published in the Bulletin of Mathematical Biology. Every two years, the Lee Segel Prize Committee selects the Lee Segel Best Paper Prize ($5000 USD) and the Lee Segel Best Student Paper Prize ($3000 USD). ***Congratulations to the winners of the 2012 Lee Segel Prizes:***

2012 Best Paper

Selecting Against Antibiotic-Resistant Pathogens: Optimal Treatments in the Presence of Commensal Bacteria, **Rafael Peña-Miller, David Lähnemann, Hinrich Schulenburg, Martin Ackermann, and Robert Beardmore,** *Bull Math Biol.,* (2012) 74:908–934, DOI 10.1007/s11538-011-9698-5

This paper brings together significant mathematics to bear on the urgent biomedical problem of selecting against antibiotic resistant pathogens. The model couples ecological and evolutionary dynamics in an innovative structure. When analyzed mathematically, the model provides new insights regarding optimal treatment strategies. The mathematical analysis involves a broad spectrum of methods from dynamical systems, control theory and numerics. The simultaneous breadth and depth of the paper makes it an outstanding contribution to mathematical biology.

2012 Best Student

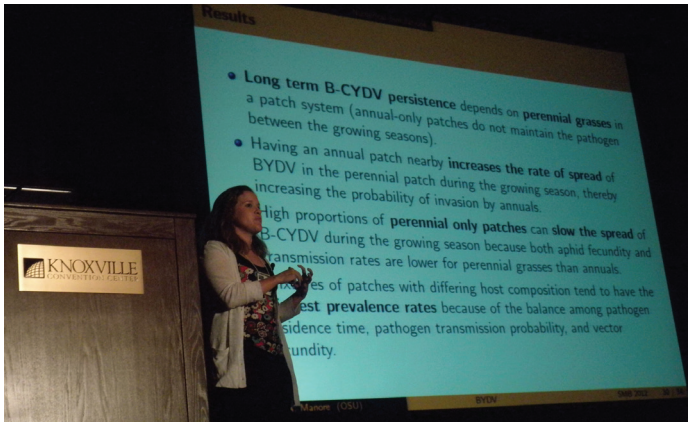
Spatiotemporal Model of Barley and Cereal Yellow Dwarf Virus Transmission Dynamics with Seasonality and Plant Competition**, Sean Moore, Carrie Manore, Vrushali Bokil, Elizabeth Borer, and Parviez Hosseini,** *Bull Math Biol.,* (2011) 73:2707–2730, DOI 10.1007/s11538-011-9654-4

This paper is a complete mathematical study of a devastating plant disease that is an economic problem. The modelling approach was innovative, including competition, spatial dynamics and disease, carefully tailored to the problem at hand. The results highlight the effects of synergies between spatial and temporal heterogeneity in plant disease outbreaks. The connection to the biological problem was strong and well explained.

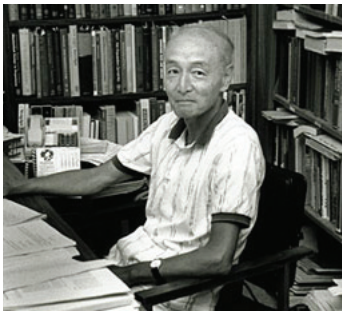
Carrie Manore gave an invited presentation representing the Best Student Paper at the recent annual meeting in Knoxville. Rafael Peña-Miller will give an invited presentation representing the Best Paper at the annual meeting in Tempe next year.

We express our sincere thanks to the members of the 2012 Lee Segel Prize Committee for their difficult task of selecting the best papers published in 2010 and 2011: Daniel Coombs (University of British Columbia), Mark Lewis (University of Alberta), and Ramit Mehr (Bar-Ilan University).

Lee Segal Prize Winnder Carrie Manore (left) and SMB President Gerda deVries (right)



Carrie Manore presented her paper at the SMB 2012 meeting



Akira Okubo

2011 Akira Okubo Prize

The Society for Mathematical Biology and the Japanese Society for Mathematical Biology are pleased to announce that the 2011 Akiro Okubo Prize has been awarded to Dr. Michio Kondoh, Associate Professor in the Department of Environmental Solution Technology, Faculty of Science and Technology, Ryukoku University, Japan. The Prize was awarded this year to a junior scientist whose outstanding research efforts demonstrate the advantages of developing theory based upon mathematical models and linking this theory to observations. Professor Kondoh's scholarship is very much in the spirit of the research of Professor Akira Okubo, in whose memory the Prize was established.

In the ten years since completing his Ph.D., Professor Kondoh has established an exemplary publication record in high quality scientific journals. He has published important papers dealing with central questions in community ecology, including the maintenance of biodiversity. He pointed out through theoretical analyses how species foraging adaptation can lead to food-web structures with sufficient flexibility to lead to stability of complex food-webs. He also carried out seminal work on the nested interaction structure and associated networks of food webs and through careful empirical analysis of marine ecosystems showed how community stability is maintained though interacting and overlapping sub-webs. Beyond this, he has been actively involved in an expansive array of international collaborations between theorists and empirical researchers, and has used a variety of theoretical tools, including game theory, network analysis, complex systems and nonlinear dynamics to investigate interesting questions in a wide range of ecological and evolutionary topics. His ability to unite theory and data to advance our understanding of natural systems led the Award Committee to choose Dr. Kondoh as the recipient of this Prize.

Akira Okubo 2011 Prize Committee: Louis Gross (Chair), Thomas Hillen, Hisashi Inaba, Denise Kirschner, Toshiyuki Namba, Norio Yamamura.

Springer and SMB

Springer is proud to be the publishing partner of the Society for Mathematical Biology. The Springer benefits that come with membership to the Society of Mathematical Biology include free online access to the Bulletin of Mathematical Biology, a hard copy version of the Bulletin for only $25, free Table of Content Alerts and a 30% discount on Springer books. Additionally, there are a number of free services and online tools that Springer offers that might be of interest to SMB members. Below, please just find a few highlights

• Author Academy: A guide from Springer and Edanz on writing and publishing. The Author Academy online contains dozens of pages (and videos) in multiple languages offering detailed advice on how to publish a journal article, how to prepare a book manuscript, Peer Review and what it means to an Author. Additionally, topics covered include writing a book proposal, publication ethics, overcoming language barriers, working with the publisher and online tools and social media. Springer.com/authoracademy

• AuthorMapper – Integrating Content and Mapping Technology: A free service Springer provides to the scientific community, AuthorMapper is a powerful visualization and intelligence tool that can tell you: what institutions your authors come from, who your most prolific authors are, your article output over time, the keywords most used in your articles… or any combination of the above. authormapper.com

• Springer Realtime – Get More Insights: We show you what people around the world are reading and downloading. Realtime.springer.com is a special service that gives you insights into what content is being read by the scientific community, all over the world, as it is happening. Live and in real time! Find breaking topics, popular keywords and see how often your book is downloaded. realtime.springer.com

• exemplar – Your Free Linguistic Tool: We support the publishing process for authors, editors and the scientific community. Put words in context with springerexemplar.com, which searches over 200,000 full-text Springer articles to provide a snapshot of how a particular term or phrase is used in context. springerexemplar.com

Springer

Systems Biology of Tumor Metronomics Workshop, Tufts University, Boston USA, July 17-20, 2012

Group photo with invited lecturers and workshop participants

The Center of Cancer Systems Biology at Steward Research & Specialty Projects Corp. / Tufts University School of Medicine, Boston, MA, USA recently held its second Annual Workshop on Cancer Systems Biology. This year's workshop focused on the topic of 'Tumor Metronomics: Timing and Dose Level Dynamics.' Metronomic chemotherapy is a novel concept of delivering drugs that departs from the traditional maximum tolerable dose paradigm and is instead centered around continuous low dose treatments to maintain a tumor in a non-advancing state. With a metronomic concept, the side effects on normal tissues are reduced and the often-observed selection for resistant tumor sub-populations and ultimate aggressive recurrence is avoided. This workshop addressed the problem of evaluating the metronomic concept from a quantitative, 'systems' perspective. We focused on tumor context — how do cell-cell interactions modify cancer dynamics, and how might we render our responses in quantitative terms that are testable, and most importantly, predictive. This workshop brought mathematicians and quantitative modelers together with biologists and clinicians to integrate interdisciplinary thinking and develop novel models of treatment response in small working groups. A number of the developed models and concepts are currently being prepared for publication. The organizers wish to thank the NCI Integrative Cancer Biology Program, Steward Research & Specialty Projects Corp., the Society for Mathematical Biology, and Springer US for supporting this workshop.

Positions Available

Postdoc: Tissue Mechanics Modeling
Applications are invited for a postdoctoral research position modeling morphogenesis. The NIH-funded research project aims to construct tissue-level models of the biomechanical aspects of development of the embryonic lung. The postdoctoral fellow will participate in a vibrant interdisciplinary research group involving collaborations between modelers, biomedical researchers, and numerical analysts. The position is available immediately with a competitive salary and benefits. The initial appointment will be for one year, with renewal contingent upon the availability of continuing funding and satisfactory performance. Applications should be emailed to Prof Sharon Lubkin, lubkin@eos.ncsu.edu and consist of a cover letter describing your interest and suitability for the position, the names and contact information for at least three references, and a CV. Applications will be reviewed immediately, and continue until filled.

Post-doc: Epidemiological Modeling
We are looking for a mathematical modeler to develop state-of-the-art epidemiological models of the transmission and control of the zoonotic pathogen E. coli. Ideally, you will have some knowledge of stochastic modeling and parameter estimation. A background in epidemiology or mathematical biology and enthusiasm for learning new approaches would be helpful. The project is part of a Scottish Government funded Strategic Partnership for Animal Science Excellence (SPASE), and will involves close collaboration with statisticians, veterinarians, and biologists at BioSS (Biomathematics and Statistics Scotland), SAC (Scottish Agricultural College) and MRI (Moredun Research Institute).

Post-doc: Mathematical Oncology
Applications are sought for the position of Postdoctoral Research Fellow to work under the supervision of Dr. Alexander R. A. Anderson on an exciting inter-disciplinary research project concerning the modeling of Cancer progression, development and treatment. We seek a talented individual with a PhD and background in applied mathematics, physics or a computational discipline to work in the unique research environment of the Integrated Mathematical Oncology (IMO) Department. The successful candidate will have experience in modelling

biological systems, with a preference for those with knowledge of cancer, as well as demonstrated creativity, high motivation, good communication skills and importantly, experience in developing/ writing publications in quality peer reviewed scientific journals. Further details on the type of research being carried out in the Anderson lab can be found at labpages.moffitt.org/andersona/research.html. Please send CV and cover letter directly to Alexander. Anderson@Moffitt.org. Also apply online through the Moffitt recruitment system: Req ID Number 9269

PhD Positions: Comp Neuroscience
Two funded PhD positions in Computational Neuroscience are available as part of a Marie Curie Initial Training Network, Neural Engineering Transformative Technologies, www.neural-engineering.eu. Early Stage Researcher position in Computational Neuroscience - Synthetic cognition in spiking neural networks. Informal enquiries may be addressed to Prof S Coombes: stephen.coombes@nottingham.ac.uk. Early Stage Researcher position in Computational Neuroscience - Artificial recognition of sounds in complex scenes from auditory neuronal activity. Informal enquiries may be addressed to Dr Chris Sumner (chris@ihr.mrc.ac.uk), Prof S Coombes (stephen.coombes@nottingham.ac.uk), or Dr Aristodemos Pnevmatikakis (apne@ait.edu.gr) Please note that applications sent directly via email will not be accepted. For information about the School of Mathematical Sciences, see: www.nottingham.ac.uk/mathematics/index.aspx. Applications will be received online at my.nottingham.ac.uk/pgapps/welcome/. Closing date: 5 October 2012.

Postdoc: Neuroscience
Bard Ermentrout (http://www.pitt.edu/~phase) in the Mathematics Department at the University of Pittsburgh is seeking applicants for a three-year postdoctoral research position. The project is concerned with (1) the interactions between correlated inputs and spatio-temporal patterns ; (2) the origin and analysis of spatio-temporal patterns in mean-field and spiking models of neurons; (3) relationship between population oscillations and their mean-field approximations. The ability to do simulations and some perturbation analysis is desirable and knowledge of XPPAUT or Matlab is also a plus. The salary is competitive and there are full benefits. Please contact Bard Ermentrout at bard@pitt.edu.

(Research Interviews - continued from page 11)

Let's see, I started off in high school wanting to be an airline pilot. I graduated from college having learned aerospace engineering and aspects of the Russian language. I really enjoyed working and learning about space travel and the space shuttle program from launch to landing. Graduate school brought me into mathematical biology and now an experimentalist. So, since I've changed fields three times, maybe I could combine all the fun things I enjoy into one position. That is, I think I would find a position where I could do experiments and write models of cell behaviors in space with Russian and English speaking kids using imaging technology. Oh, and I'd like to have a view of the ocean and mountains. Yep, that's what I would do.
If you have any spare time, what do you do when you're not working? Well, a couple of years ago I got my wife hooked on surfing so that now she is convinced that any vacation time we take is near an ocean. But, I really enjoy playing with my two sons, Eli (2.5 years) and Wesley (7 months) and sharing in their unique perspective of the world, where toy cars can leave the ground, climb vertically along walls and float through the air. There is something special about watching yourself grow up and wondering whether you too communicated with other kids using growling sounds! I have fun following how they observe the natural world, like seeing a grasshopper for the first time and realizing the grasshopper is much smarter at avoiding their outstretched hands than they thought. Maybe this is because I moved to Kansas City where the oceans and mountains are not close by, but it certainly is a wonderful place to raise a family.

Editor's Notes:

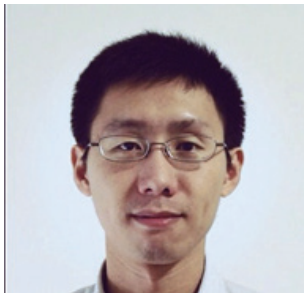
We invite submissions including summaries of previous mathematical biology meetings, invitations to upcoming conferences, commentaries, book reviews or suggestions for other future columns. The deadline is the 15th of the month prior to publication.

The SMB Newsletter is published in January, May and September by the Society for Mathematical Biology for its members. The Society for Mathematical Biology is an international society that exists to promote and foster interactions between the mathematical and biological sciences communities through membership, journal publications, travel support and conferences. Please visit our web site: http://www.smb.org for more information.

Holly Gaff, Editor, editor@smb.org

The Future of Mathematical Biology

Yun Lee, **Georgia Institute of Technology**



What attracted you to mathematical biology? As an electrical engineer by training, I have always been intrigued by the ability of a single cell to achieve so many different tasks in an ever-changing environment. So when I had a chance to take an introductory course in systems biology while studying for my Master's degree, I was immediately attracted by the power of mathematical modeling in describing and predicting the behavior of biological systems and decided to pursue a Ph.D. in Bioengineering. Even now, I am still amazed by the countless examples of how a complex biological problem can be solved with mathematics in an elegant way.

What is your current research project? My current research project is focused on understanding the regulation of lignin biosynthetic pathway in bioenergy crops. Specifically, I developed models of this pathway in wild-type and genetically engineered plants and inferred from the modeling results new, experimentally testable mechanisms of metabolic regulation.

What specific areas are you interested investigating? I am interested in developing new computational methods that integrate distinct types of data into multi-scale, dynamic models.

What do you hope to do after graduation? I hope to get a postdoc position that would not only allow me to learn new computational skills but also offer the opportunity to interact and collaborate with experimentalists.

What advice will you give to an undergraduate interested in a mathematical biology career? There are many alternative paths to becoming a mathematical biologist. My very personal advice for people with a mathematical or engineering background like me is to take or audit as many biology courses as you can and, as early as possible, engage in projects that involve both experimental and theoretical components.

What inspires you scientifically? I am most inspired by the prospect that mathematical models with predictive power would soon become an indispensable tool for suggesting treatment of various diseases or for designing microbial factories with optimal yield of fuels and chemicals.

Why did you join the Society for Mathematical Biology? The Society of Mathematical Biology offers a tremendous platform for exchanging scientific ideas and networking with other students who share similar research interests.

Eberhard Voit, Yun Lee's PhD advisor, says: Yun Lee is neither a biologist nor a mathematician. Yet, he is poised to become an outstanding member of the growing cadre of systems biologists and mathematical biologists. Yun started in electrical engineering, took a wide spectrum of courses in control theory, pattern recognition, and optimization, and then developed an interest in biology. With an undergraduate background in C and Python, he taught himself to become a masterful Matlab coder. For his dissertation research on biofuels, he immersed himself in plant science, forestry, methods of feedstock advancement, the interpretation of genomic and metabolic data and, last not least, metabolic pathway modeling. He explored the ins and outs of the sketchy bit of information on lignin synthesis and on the recalcitrance of cell walls and their polymer meshes to enzymatic digestion, which is the key stumbling block for cost-effective biofuel production from inedible plant sources. More than anything else, his education as an engineer taught him how to parse and solve complex problems. Combining this trait with a solid foundation in advanced math, systems thinking, algorithm development, and expertise in a biological niche, he managed to develop methods and solutions for assessing the control and regulation of lignin dynamics in a clarity and detail neither achieved nor achievable with traditional biological experiments. Future teams of systems biologists will depend on interdisciplinary computational wizards like Yun.

Nominate your student!

"The Future of Math Biology" is a new column intended to highlight graduate students in mathematical biology. Do you want to nominate a student from your research group? Please send your nomination to: schnells@umich.edu.

Proposed Changes to Society for Mathematical Biology Bylaws

At the annual meeting of the Board of Directors of the Society for Mathematical Biology, the members of the Board agreed to three sets of amendment to the Bylaws of the Society. These changes must be presented to members and ratified by two thirds of members who vote.

A short description of these changes with the reasons that the Board is proposing them is given below. The amended text with annotations is included in this package and the current Bylaws are available at http://www.smb.org/governance/bylaws.shtml

Proposal 1. Removal of mention of postal correspondence and voting by post which will allow the Society to conduct all its business electronically. According to the present Bylaws, the Society must conduct its ballots and send notices about dues and other matters by post. This is cumbersome, expensive and time consuming compared to electronic services that are now available. Removing mention of postal services will allow the Society to conduct more of its business electronically.

Proposal 2. Allowing members of the Board of Directors to serve two consecutive terms. At present, Directors (including the President) may serve more than one term but must take a break of at least one year between terms. Directors on the current Board feel that more continuity would improve the governance of the Society. In particular, this amendment would allow a member of the Board to be elected as President immediately following his/her term on the Board so that, as President, they are familiar with current issues facing the Society and with current Society business. In the amended Bylaws, Directors would be able to serve no more than two consecutive terms including a term as President. Some changes are also proposed for the tenure of Committee chairs to reflect current practice and to help with continuity in the Committees' work.

Proposal 3. Gender-neutral language The Board of Directors have proposed minor changes throughout the Bylaws to make them gender neutral.

Society for Mathematical Biology

BY-LAWS CHANGE
BALLOT

Please check the box for your vote. Then mail to Holly Gaff, Department of Biological Sciences, MGB 110, Old Dominion University, Norfolk, VA 23529, USA.

	Yes	No
1. I agree with the proposed amendments to eliminate the requirement for postal correspondence and allow the Society to conduct all its business electronically.	☐	☐
2. I agree with the proposed amendments to allow Directors to serve two consecutive terms on the Board of the Society for Mathematical Biology and to change the terms of tenure of the Chairs of the Committees.	☐	☐
3. I agree with the proposed amendments to incorporate gender-neutral language throughout the Bylaws of Society for Mathematical Biology.	☐	☐