Society for Mathematical Biology

January 2013
Newsletter
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Inside this Issue

The Society for Mathematical Biology Annual Meeting and Conference

June 10 - 13, 2013

Location: Tempe Mission Palms Hotel and Conference Center

Host: Arizona State University, School of Mathematical and Statistical Sciences and the Mathematical, Computational & Modeling Sciences Center

Theme: Physiology, Disease, Ecology, and Sustainability

http://math.asu.edu/SMB2013

Dear SMB Members,

If all goes according to plan, this newsletter will arrive in your electronic mailbox. We have been hard at work behind the scenes to take the SMB into the twenty-first century. Moving to electronic delivery of the newsletter is one of several initiatives. Another is the recent move to a more efficient membership management system. I wish to thank the new Membership Chair, Heiko Enderling, for taking on this project. The user interface has been integrated seamlessly into our webpages. We hope you like the new way of maintaining your membership. With the new membership management system, we now have the ability to broadcast messages to the entire membership (this is how you are receiving this newsletter).

I wish to announce that Renee Fister will be the new SMB Treasurer. Renee has been very active in the SMB for many years, including most recently as a member of the Board of Directors. I want to thank Torcom Chorbajian for serving as Treasurer for almost 40 years. Torcom has been a member of the SMB since its inception in the 1970s and was appointed Treasurer two years later. Torcom has accepted the title of Honorary Treasurer of the SMB, as he continues to be involved in the management of our finances. However, Renee now manages the day-to-day transactions, and any inquiries should be directed to her (please see our website for contact information).

Thank you for voting on our proposals for changes to the Bylaws in Fall 2012. All proposals were accepted. The Bylaws now are written in gender-neutral language, we have updated the terms of reference for the Board of Directors for increased continuity in the governance of the SMB, and the SMB now can conduct all its business electronically.

I want to remind you that our next SMB Annual Meeting and Conference will take place June 10-13, 2013, in Tempe, Arizona. The deadline for submission of mini-symposium proposals is January 31, 2013. I want to encourage all of you, new and seasoned members of the SMB, to consider putting together a proposal. Details are available at math.asu.edu/SMB2013. I hope to meet many of you there.

Last but not least, I encourage you to take note of two calls for nominations in this newsletter. One is for the Akira Okubo Prize, and the other for the Arthur T. Winfree Prize. If you know of a worthy recipient for one of these prizes, please consider putting together a nomination package.

I wish all of you a peaceful and productive 2013.

Best wishes,

Gerda de Vries

Our First Electronic Newsletter!

Dear fellow SMB members,

This issue of the SMB newsletter is the first electronic version of our popular newsletter sent through our new membership platform, which is hosted on wildapricot.org, and embedded directly into our website http://www.smb.org. To join the Society or renew your membership and pay your annual membership dues, please visit http://www.smb.org/membership/index.shtml, where you will find links to the "Online application" and your "Member profile". If you are a renewing member and accessing the new platform for the first time, you will have to create a new password using your email address. To ensure delivery of important membership-related emails, please add "smb@wildapricot.org" to your address book. The new membership platform accepts a number of different payment options including credit card, paypal, and electronic check.

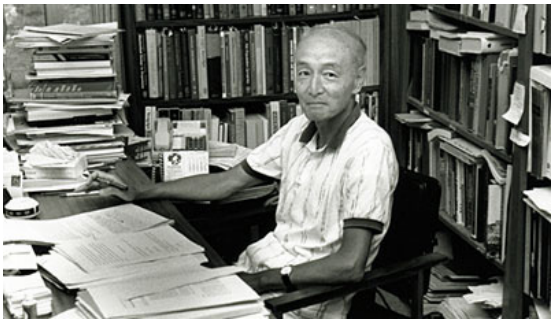
Keeping your "Member profile" up to date plays a vital role in running the SMB smoothly and efficiently, reducing administrative costs, and freeing up funds that can be used towards successful fulfilling of our missions. Please make sure that your email address is correct in order to receive all Society-related communications and, of course, future editions of our newsletter. If you are a renewing member but have not received any emails regarding your renewal please contact us at your earliest convenience at onlinemembership@smb.org. Please use this email address for any other online membership and membership platform related questions and concerns.

On behalf of the SMB membership committee and the SMB board of directors,

--Heiko Enderling

Call for Nominations

2014 Akira Okubo Prize



Nominations are requested for the Akira Okubo Prize which, for 2014, will be awarded to a living senior scientist whose lifetime achievements have been exemplary in developing innovative theory, in establishing superb conceptual ideas, in solving difficult theoretical problems, and/or in uniting theory and data to advance a biological subject. The areas of research are mathematical biology, bio-mathematics, theoretical biology, and biological oceanography. The prize was initiated in 1999 and the previous winners in the senior scientist category have been Simon A. Levin (2001), James D. Murray (2005) and Hans Othmer (2009). It is jointly awarded by the Society for Mathematical Biology (SMB) and the Japanese Society for Mathematical Biology (JSMB). The SMB and JSMB will invite the prize winner to deliver a lecture at the next joint annual meeting of JSMB and SMB which will be held in Osaka (Japan) in July 28-August 1, 2014.

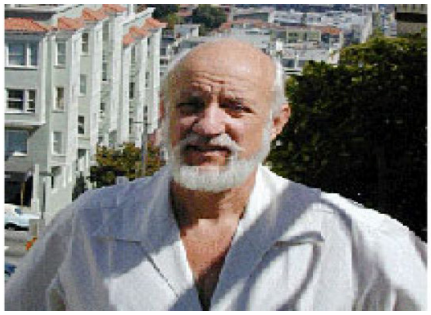
Rules for the prize can be found at http://www.smb.org/prizes/index.shtml. To nominate a person for the Akira Okubo Prize, the following Information should be submitted to Toshiyuki Namba VIA EMAIL (tnamba@b.s.osakafu-u.ac.jp).

1. Name, address, phone number, affiliation, and email address and/or fax number of the nominator and nominee
2. A detailed statement describing why the nominee should be considered for the award.
3. A CV for the nominee in some form.
4. Name and contact information, including email address, for four potential referees who are not current or recent collaborators of the nominee. Furthermore, the nomination package may include up to two additional letters of support which may be submitted by collaborators of the nominee.

Closing date for the nominations is March 31, 2013. The Akira Okubo 2014 prize selection committee is as follows:

- Prof. Toshiyuki Namba (Committee Chair): tnamba@b.s.osakafu-u.ac.jp
- Prof. Toru Sasaki: sasaki@ems.okayama-u.ac.jp
- Prof. Yoh Iwasa: yohiwasa@kyudai.jp
- Prof. Louis Gross: gross@NIMBioS.org
- Prof. Denise Kirschner: kirschne@umich.edu
- Prof. Jonathan Sherratt: J.A.Sherratt@hw.ac.uk

2013 Arthur T. Winfree Prize



The Society for Mathematical Biology is soliciting nominations for the 2013 Arthur T. Winfree Prize. The prize honors a theoretician whose research has inspired significant new biology. Nominations of individuals to be considered for the prize may focus on a single paper or series of papers that illustrate the close connection between theory and experiment, or may be based upon a larger body of theoretical work produced by the individual that has led to significant new biological understanding affecting observation/experiments. The prize winner will be invited to deliver a lecture at the 2013 Annual Meeting, to be held in Tempe, Arizona, June 10-13, 2013.

More details about the criteria for the Prize and about Art Winfree can be found on the SMB website, at http://www.smb.org/prizes/index.shtml. The deadline for nominations is February 28, 2013.

Nominations of candidates should consist of a nomination letter of no more than 2 pages, including a description of the nominee's key contributions and the experiments they inspired, contact information for the nominee, and the nominee's research CV.

These materials should be sent to Fred Adler by email (adler@math.utah.edu) or by regular mail (Fred Adler, Department of Mathematics, 155 South 1400 East, University of Utah, Salt Lake City, UT 84112-0090, USA).

Models in Population Dynamics and Ecology (MPDE) 2012
September, 10-13, 2012

Ulrike Schlägel

After five years in the UK, the MPDE left its birthplace and went international in 2012. About 80 junior and senior scientists from 13 countries travelled to Santa Maria, Brazil, to participate in a four day conference centred around mathematical modelling of ecological and evolutionary processes and infectious diseases. The conference took place at the Federal University of Santa Maria, located in the southernmost state of Brazil, Rio Grande do Sul, state of the "gauchos". Our local hosts were Diomar Mistro and Luiz Alberto Diaz Rodrigues, with organizational help from Sergei Petrovskii (Leicester, UK).

The conference was well organized throughout and presented an interesting and stimulating program. It started off with a plenary talk by Mark Lewis on the mathematics of biological invasions. Biological invasions were a recurring theme (e.g., plenary talks by Bernd Blasius, Horst Malchow, Sergei Petrovskii), highlighting the great interest in and importance of this topic. Further plenary speakers were Ulrike Feudel, Nick Britton, Vitaly Volpert and Alan Hastings, presenting on various aspects of population dynamics and adaptive dynamics. A historical talk by Wilson Castro Ferreira Jr. lead the audience through the discoveries of the extraordinary Biomathematician Frederico Müller in the 1800s. Three mini-symposia focused on advances in modelling animal movement, evolutionary dynamics and the dynamics of infectious diseases. The program was complemented by a diverse collection of contributed talks and posters, displaying many interesting and original ideas and a variety of mathematical modelling techniques such as ODEs, diffusion-reaction equations, stochastic processes and electrical network theory. Later, a special issue of the journal Ecological Complexity will showcase some of the presented work.

The friendly atmosphere fostered many continuing discussions and an active exchange of ideas during coffee breaks, lunch time, reception and the conference dinner. The task of allocating time to eating and conversing in the proper amounts was sometimes a hard one: conversations were lively and interesting but the food was excellent and deserved some attention too. The second last evening we were all invited to the conference dinner, where we enjoyed a traditional gaucho barbecue and were also entertained by traditional live music and dance performances.

I would like to thank the organizers for this great conference, their friendly welcome to the remarkable southern part of Brazil and their helpfulness in all matters. Many thanks also to their helping juniors Andreas and Juliana.

The next MPDE will take place at Osnabrück University, Germany, in late August 2013. I am looking forward to the continuation of this successful series of exciting conferences.

Sydney International Workshop on Math Models of Tumor-Immune System Dynamics
January 7-10, 2013

Peter Kim, Amina Eladdadi, and Dann Mallet

The US-Sydney International Workshop on Mathematical Modeling of Tumor-Immune System Dynamics was held at the University of Sydney, Australia. The meeting took place in a beautiful summer week of January 7-10, 2013 in Sydney, distinguished for its world-famous Harbor Bridge, Opera House, shimmering beaches, and inner-city precincts. The workshop was organized by Drs. Amina Eladdadi from the College of Saint Rose, NY, Peter Kim from the University of Sydney, and Dann Mallet from the Queensland University of Technology, Brisbane, Australia. This international meeting drew over 40 participants from the US, Australia, New Zealand, and countries in Africa, Asia, and Europe.

The gathering provided a forum for applied mathematicians, biologists, and medical doctors working in cancer and/or immunology to exchange ideas and to explore opportunities for collaborative exchange and education between the US, Australia, and other countries. The workshop included eight plenary lectures, two parallel sessions of fourteen contributed/invited talks by junior scientists, and three roundtable discussions.

On the first morning of the workshop, the Dean of Science, Trevor Hambley, welcomed participants and emphasized the interest of the University of Sydney in promoting interdisciplinary research and international collaborations. The first plenary talk, "Tumor-Immune Interactions and the Microenvironment: An Optimal Control Approach" was delivered by Urszula Ledzewicz of Southern Illinois University, Edwardsville, USA. The second plenary talk by Eddy Pasquier of the University of New South Wales in Sydney, Australia on "Metronomics As a Strategy to Turn Chemotherapy Into Effective Targeted Therapy" thoroughly complemented Urszula's introduction to metronomics by providing a clinical perspective and experimental evidence. Sarah Russell of the Peter MacCallum Cancer Centre and the Swinburne University of Technology in Melbourne, Australia gave the third plenary talk on "How important is asymmetric cell division to T cell fate and function?"

Prof. Doron Levy answering participants questions

Prof. Trachette Jackson during the AMSI Public Lecture

The second day of the workshop opened with the fourth plenary talk by Gib Bogle of the University of Auckland in Auckland, New Zealand on "Simulating some aspects of lymphocyte biology + tumor spheroids". Doron Levy of the University of Maryland gave the fifth plenary talk on "Mathematical models for tumor-immune interactions and their applications". The final plenary talk of the second day was given by Chae-Ok Yun of Hanyang University in Seoul, Korea on "Cytokine-Expressing Oncolytic Adenovirus for Cancer Gene Therapy".

The second evening of the workshop also

SMB travel grant recipients: Kelsey Gasior (3rd from left) and Rachid Ouifki (left most) with the organizers Amina Eladdadi (2nd) and Peter Kim (right)

featured a public lecture sponsored by the Australian Mathematical Sciences Institute (AMSI). This public lecture was given by Prof. Trachette Jackson on "Mathematical Biology: An Essential Part of 21st Century Science". Trachette's lecture was well received as she gave a broad overview of the field of Mathematical Biology, highlighted historical successes, and showcased specific examples from her work on cancer treatment to show new ways that mathematics has been applied to solve cutting-edge biological and medical problems (http://mathsofplanetearth.org.au/events/mathematical-biology-an-essential-part-of-21st-century-science/).

Marcello Delitala from Politecnico di Torino, Italy opened the third day with the seventh plenary talk on "Mutations, Immune Competition and Progression in Cancer Dynamics". On the fourth and final day, Christopher Schmidt of Cancer Immunotherapy Lab., Queensland Institute of Medical Research, Brisbane, Australia, gave the eighth plenary talk on "Durable, Complete Clinical Responses to Immunotherapy for Advanced Melanoma - Correlates, Confounders, Complexity, Questions".

The workshop schedule allowed for a multitude of informal discussions occurring over morning and afternoon coffee/tea breaks, which were generously sponsored by the School of Mathematics and Statistics at the University of Sydney. Conversations continued into lunch outings, the reception preceding the public lecture on the second evening of the workshop, and the workshop banquet. The organizers received very positive feedback from the participants, who expressed interest in a similar meeting in the future.

The organizers are very grateful to the University of Sydney, the Australian Mathematical Sciences Institute (AMSI), the US National Science Foundation (NSF), the Society for Mathematical Biology (SMB), and the College of Saint Rose for their generosity in supporting this workshop. The participation of two junior researchers Kelsey Gasior from NCSU, and Dr. Rachid Ouifki from Stellenbosch University was partly made possible by the travel grant from the SMB. We would like to acknowledge and thank Kelsey and Rachid for sharing some of their workshop notes with us.

A detailed description of the US-Sydney workshop including the plenary and contributed Lectures, and photos can be found at the following website: https://sites.google.com/site/sydneytumorimmune

Group picture at Sydney Harbor

Research Interview

Women Representation in Mathematical Biology

Denise Kirschner talks with Santiago Schnell about her work in mathematical biology, and the challenges facing women in applied mathematics

What inspired you to become a mathematical biologist?

For as long as I can remember I was always interested in biology, but I was also good at math. I was a math major in college and also a pre-med minor with all of the intentions of going to medical school. A mathematics professor of mine at Tulane University (Dr. Ed Conway) suggested to me that I could combine both interests. I had never heard of such a pairing or even considered a career in research- I had never even had a female professor at that point in the sciences! He had me do a senior thesis with him on pattern formation in Drosophila wing formation; I was hooked!

Tell us about your research. What are you working on?

My research for the past 20 years has focused on questions related to host-pathogen interactions in infectious diseases. My main focus has been to use systems biology approaches to explore persistent infections with pathogens such as *Helicobacter pylori*, *Mycobacterium tuberculosis* and HIV-1. We used "system biology approaches" before they were named such. Such pathogens have evolved strategies to evade or circumvent the host-immune response and my goal is to understand the complex dynamics involved, together with how perturbations to this interaction (via treatment with chemotherapy or immunotherapy) can lead to prolonged or permanent health. More recently, our research focus has been on the host immune response to *M. tuberculosis* using multi-scale modeling. Our work is aimed to examine the immune responses in the lymph nodes and lung also during infection over scales from molecules to organs. To date we have worked with cell, mouse, non-human primate and human data working heavily with experimental collaborators- we think collaborative science is the best approach and the most fun! We have spent a considerable effort to study unique structures, granulomas, that are involved in the immune response to M. tuberculosis. We apply a range of computational tools from deterministic mathematical models to more discrete stochastic ones such as Agent Based Models to examine spatial questions as well.

Why study host-pathogen interactions?

Diseases are incredibly fascinating. Bacteria (and likely viruses) outnumber us on our own bodies and cause most of the morbidity and mortality in the world today. Understanding how the immune system responds is exciting. The body, via the immune response, does a pretty good job of keeping us healthy. And even when we get sick, we get better rather quickly. The microbes I study are even more special- they are known as persistent pathogens. Once we acquire them we never (or rarely) clear them. So understanding why the immune system breaks down in these cases is really interesting to me.

How much applied mathematics research helped to combat infectious diseases?

Mathematical modeling has its longest impact in disease modeling, particularly at the epidemiology level. For example, the Centers for Disease Control in Atlanta uses results like "R_0" from mathematical modeling to help determine vaccine coverage in the USA. They also employ many modelers to help predict trends in epidemics and pandemics world-wide. At the in-host level, models developed for pathogens such as HIV-1 have helped us understand viral dynamics, and also aided protocols for treatment strategies that have been implemented in clinics.

What's the next big challenge?
Science is an open frontier and we have many exciting things we are pursuing in TB such as vaccines and also monkey models of disease since primates are so close to the human response. But our greatest hurdles are computational power for our very large multi-scale models and other resources. Luckily, NIH has recognized the importance of modeling and what it can do for science, but it is becoming more difficult to secure funds for everyone. I wonder how the next generation will respond in light of these challenges.

Have any people in particular inspired you?
Suzanne Lenhart at UTK has been a mentor of mine for over 20 years. Leah Edelstein-Keshet was an inspiration to me in many ways. These ladies are both outstanding mathematicians, academicians and leaders. Michael Savageau, Lee Segel and Glenn Webb all were mentors who inspired me to follow my instincts and think outside of the box. Carlos Castillo-Chavez taught me to be open to science (and scientists) outside the USA.

Is it difficult to be a woman scientist?
This is an interesting question. If you had asked me if it is difficult to be a woman mathematician I would have said "DEFINITELY". I remember being on the faculty at more than one institution where I was the only female, or attending a conference and being one of very few women in attendance. Even recently I have been on the organizing committee for 2 different meetings where not one woman was suggested as a keynote speaker. So we still have a long way to go in Mathematics. I have served the past decade as the first woman Editor-in-Chief of a mathematical biology journal and that has been an incredible experience, which sometimes has its gender-related moments. I laugh every time I get a submission addressed to "Dear Sir…". But in the biological sciences it is almost equal numbers with men and women and these types of things rarely happen. In fact, in my department of Microbiology and Immunology we have more women than men and more senior women than men.

What are the challenges facing women in academia and how could they be overcome?
I think the biggest challenge for women is finding the balance between career and family. With the tenure clock ticking, it is hard to figure out the best strategy to be successful at both. In addition, in math (and even math biology) there is still a glass ceiling that needs to be acknowledged and having strong female mentors can help overcome barriers.

What would your message to a young and aspiring female scientist be?
Find an awesome mentor (or mentors!) and make decisions that are best for your personal life FIRST and then for your career SECOND. If you are content and happy you will be the most productive at work. Do your best at each task daily and celebrate what you did achieve that day, not chastise yourself for what you didn't get done.

If you weren't a scientist, what would you be?
A CHEF!! Anyone who knows me knows one thing: it is all about food.

If you have any spare time, what do you do when you're not working?
Cooking, eating, biking (to burn off the calories!) and playing with my family—I have a 3 year old and a 13 year old and a fantastic and supportive husband of 22 years who is also a professor.

About Denise Kirschner

Denise Kirschner is Full Professor in the Department of Microbiology & Immunology at the University of Michigan Medical School. She is an expert in modeling host-pathogen interactions and multi-scale modeling. She has over 100 publications, in top journals including *Nature* journals and *PNAS*. She has served on the Board and has served the Society in several capacities and committees. Dr. Kirschner currently serves (and has for the past decade) as Editor-in-Chief of the *Journal of Theoretical Biology* the oldest and one of the top systems biology journals. She has also served on and chaired many study section review panels at the National Institutes of Health for applications that have modeling as part of their proposed science. These experiences give her an extensive knowledge and experience of the field and broad expertise in many areas of computational and mathematical biology. For further information visit her website: http://malthus.micro.med.umich.edu/.

Mathematical Biology: My Personal Journey

Urszula Ledzewicz

One of the amazing things I learned about mathematical biology is that one can join this friendly crowd of wonderful people at almost any stage of one's career. As long as you can bring to the table some tools, which can help in understanding the problems that the discipline is struggling with, you will be welcomed with open arms. My good friend, Antonio Fasano from the University of Florence who joined mathematical biology from physics once said (a phrase I often like to quote) that we all have our "toys", which we like to play with and apply to the biological models.

In my case, it took a long time before my toys were used. I came to the United States from Poland known to be "the land of Banach", where most Ph. D.'s in mathematics are very abstract and theoretical. I would still be working on Banach spaces today, had I not met a smart German guy from my field, Heinz Schaettler. Once I realized how much I can learn from him and how much time we will have to spend together to accomplish it, marriage was the only reasonable option!

Thus we became spouses/ collaborators and it is hard to believe that it still is working twenty years later. Now, where is the mathematical biology? you ask? Be patient, the best is still yet to come. And it came in the person of our colleague Andrzej Swierniak. In 1996, already established in our field, Heinz and I organized a session at the Second World Congress of Nonlinear Analysts in Athens and invited Andrzej as one of the speakers. He brought a fresh breeze of biology into our highly abstract session by talking about compartmental models for chemotherapy. What attracted us to these problems was that they were not fully solved and the tools of the geometric optimal controls seemed to be particularly a good fit to answer some of these questions. Once we got started, there was no way out and the rest was history.

The next stepping-stone was a workshop on cancer modeling in 2003 organized by Avner Friedman and Marek Kimmel at the then newly founded MBI at Ohio State University in Columbus. The workshop was a great eye opener for us, aside from the embarrassment of being the only speakers with handwritten slides; we had a great time and learned a lot! We saw how mathematicians and biologists interact (and "fight" in a positive sense). The heated discussions were sometimes longer than the talks, something we have never seen at our optimal control meetings. Overall, the excitement of that crowd was absolutely contagious. I loved it and I wanted to be "in". Heinz had no choice but to follow along!

Now, more than 100 workshops /conferences/ seminars (hard to believe, but I just counted), over 80 publications and numerous NSF grants later (many thanks to the NSF for all the support!), we reflect back on some of the more special moments. Like in 2009 during the workshop on cancer modeling organized in the beautiful Estoril by Adélia Sequeira over the fish dinner, I got an idea to put together a similar workshop in Tel Aviv with Eugene Kashdan. Heinz's shy comments - that it would be somewhat crazy to organize an event in a country I have not been to, with the guy I have only just met - convinced me to go ahead! With the help of some friends like Avner Friedman and Aziz Yakubu it worked out great. When Avner and Aziz told me shortly after about this amazing scientific and educational place in Muizenberg, South Africa called AIMS on the beach I knew that we just found a place for the sequel. Again I was working in an unknown territory (thanks Google Earth!), but with the help of my co-organizer Jacek Banasiak, placing the workshop in South Africa turned out to be very rewarding.

While involved in the bio-math events, we still remain quite active in our original field of optimal control and try to recruit some of our colleagues to mathematical biology by showing them how much we enjoy it, but also that there are interesting problems out there waiting to be resolved. We can report some success here like recruiting our friend Helmut Maurer, a numerical guru, whose simulations of our results were found particularly attractive by graduate students. Work with them on the bio-math topics has

been particularly rewarding and we think we managed to "infect" a number of them with the enthusiasm for continuing the research in this field.

Working on the boundary of two disciplines has a lot of advantages. You have twice as many collaborators and friends (hopefully not twice more enemies), twice more conference invitations (hopefully with all expenses covered) and it is easier to impress people (not a weak point). We have been extremely fortunate with all the categories, particularly with collaborators who became friends and the other way around. Some collaborations could make a full story by themselves. I still recall waiting in the hotel in Milan for Alberto d'Onofrio from the European Institute of Oncology with whom we had collaborated earlier through e-mails for a couple of years and wondering how he looked like which felt like a blind date (no Facebook at that time). On the other hand, Ami Radunskaya, whom I invited to a conference in Marrakech in 2006, on the way to Morocco, picked me from a huge crowd of people while connecting through Heathrow airport saying, "the way you are dressed, you must be Urszula!" Till today, I still wonder how I should read this. My friendship with Ami led to a workshop in Dunedin, the most southern tip of New Zealand, in 2007 where we were lured by the promise to see penguins on the beach. But any time we went, we were far too noisy… Finally we saw them five years later during our Cape Town workshop!

As for our research in math biology, it actually also had its own interesting journey. Our very first result was to show that for the cell-cycle specific chemotherapy model it is optimal to apply the drug protocols following so called "bang-bang controls", i.e., apply what in medical terms is called MTD (maximum tolerable dose) with rest-periods. We were very proud of this little, but very nice result, which, in principle, confirmed what is the common medical practice. Later, when we started working on more complex models that involved drug resistance, angiogenic signaling and combination treatments including radio-, chemo or immunotherapy, etc., more complicated solutions started appearing where the drug is given differently than as MTD and followed analytically or numerically calculated protocols of varying lower doses, which, in control theory, are called "singular controls". Although these were nice mathematical results, we were not very convinced about their medical relevance, since we did not think that anybody would administer drugs this way. Then it happened! We were both invited to a medical workshop on Tumor Metronomics to Tufts Medical School organized by Philip Hanhfeldt and his MD collaborator Giannoula Klement. We were included precisely because they thought that our low dose solutions could shed some light on the Metronomic chemotherapy, which is becoming more and more of interests to the medical community. In a heartbeat we joined the amazing crowd of biologists, MDs and mathematicians who fight for the chance to develop low cost therapies that can be of crucial importance in providing treatments in many underdeveloped countries where fancy, expensive, new drugs are simply not an option. I am writing this story here in Sydney (as you see from my photo, it is summer down here!) a day after Eddy Pasquier, from the Children Cancer Institute Australia, and I jointly held a lively discussion panel on Metronomics at the Workshop on Tumor Immune System Dynamics organized by our friends Amina Eladdadi, Peter Kim, and Dann Mallet. We have even made plans for a full Metronomics workshop in some nice country, which I will still keep as a secret since we do not want to scare our friends in the funding agencies. So the journey continues and it is becoming more exciting than ever with more new friends and more challenges lying ahead…

Selected Publications

(Full list: www.siue.edu/`uledzew)

- (with H.Schaettler), Geometric Optimal Control, Theory, Methods and Examples, *Springer-Verlag*, 2012 (640 pages).
- (with H. Schaettler), Optimal and suboptimal protocols for a class of mathematical models of tumor anti-angiogenesis, *J.Theor. Biol.*, 252, 2008, pp.295-312
- (with A. d'Onofrio and H. Schaettler), Tumor Development under Combination Treatments with Anti-Angiogenic Therapies, in *Mathematical Methods and Models in Biomedicine*, Springer-Verlag, (editors: U. Ledzewicz, H. Schaettler, A.Friedman, E.Kashdan), October 2012, pp.311-337.
- (with H. Schaettler), Multi-Input Optimal Control Problems for Combined Tumor Anti-Angiogenic and Radiotherapy Treatments, *J. Opt. Theor. Appl.*, (2012), Vol.153, pp.195-224, 10.1007/s10957-011-9954.
- (with M. Faraji and H. Schaettler), Optimal Controls for Mathematical Model of Tumor Immune Interactions under Targeted Chemotherapy with Immune Boost, special issue of *Discrete and Continuous Dynamical Systems*, Series B (A. Eladdadi et al. editors), Vol.18, June 2013, to appear.

The Future of Math Biology

Lennart Hilbert, Ph. D. Student, Dept. of Physiology, McGill University, Montréal, Québec, Canada

Ph. D. Supervisors:
Michael C. Mackey and Anne-Marie Lauzon

What attracted you to mathematical biology?
After my slim physics education (3 year B.Sc. Bremen University), I wished to apply my knowledge, travel the world, so I took a year off of regular studies. Michael Mackey's support allowed me to stay at McGill and Oxford University for a total of half a year, after which I took all my courage to ask if I could start Graduate Studies with him.

What is your current research project?
Reverse engineering smooth muscle contractile proteins from in vitro motility assays – it integrates my own wet lab experiments, video analysis software development, and modelling and simulation of mechanically coupled myosin protein motors.

What specific areas are you interested in investigating?
My thesis topic; higher hierarchical levels of muscle; generally, the emergence of macroscopic phenomena from coupled, microscopic units, e.g. evolutionary, regulatory, informational, or societal phenomena.

What do you hope to do after graduation?
Academically reconnect with Germany and Europe, to keep open my academic perspectives on both sides of the Atlantic Ocean.

What advice will you give to an undergraduate interested in a mathematical biology career?
Start approaching faculty in your field of interest from the get-go, and you will be working with them sooner than you might ever think. Don't let the fear of mistakes stop you from great work; If you genuinely care, you will fix them and learn an incredible lot. Try out different topics, read papers and attend talks that are new to you.

What inspires you scientifically?
For my motivation – figuring out a problem using my training and intuition feels great. My best inspiration is probably my experimental lab mates. Their pragmatic ideas and criticism demand simple and clear answers, which frequently push me to explore new, difficult quantitative approaches.

Why did you join the Society for Mathematical Biology?
To attend an Annual Meeting – a highly rewarding experience.

Michael Mackey and Anne-Marie Lauzon, Lennart's PhD advisor, say:
Lennart, with his training in physics and mathematics from the University of Bremen, has taken to his research in Montréal like a duck to water. He is working collaboratively between my group and the laboratory of Anne-Marie Lauzon on problems related to actin-myosin interactions. The challenge of doing real experiments, analyzing the data, and then trying to construct realistic mathematical and physical models that are consistent with the known physiology and the data he collects is giving him a wonderful introduction into the excitement and complexities of modern mathematical biology. Additionally Lennart has proved to be a very positive addition to the Montréal and McGill scene, and has been one of the focal points for organizing his fellow students into all sorts of interesting scientific activities as well as some non-science events that have all proved to be a big hit with all concerned. His passion for music and art and science, combined with his native curiosity for all manner of other things, mark him as someone with a future to be watched.

Positions Available

PhD Position in Computational Neuroscience at the ISRC, U. of Ulster

The Intelligent Systems Research Centre (ISRC) at the University of Ulster, UK, invites applications for 3-year Ph.D. studentships. The application process for the Ph.D. studentship is opened with a closing date for applications on the 8th March 2013. A list of studentships offered for the academic year 2013-2014 and the projects? Details can be found at: http://www.compeng.ulster.ac.uk/rgs/showPhDProposals.php?ri=3.

PhD Position in Evolutionary Biology, Developmental Biology and Systems Biology, U. of Helsinki

We are looking for a student, preferably a biologists, to start a grant for a PhD on the interrelationship between the evolution of gene networks, development and the phenotype: simulation of the evolution of the genotype-phenotype map of complex; organs based on development, and/or; quantitative study of the patterns of phenotypic variation across ontogeny and phylogeny, and/or computational models of pattern formation and morphogenesis in animal development. The project involves spending some time with collaborators in Barcelona and close collaboration with Jukka Jernvall's group (http://www.biocenter.helsinki.fi/bi/evodevo/index.shtml).
For an outline of the groups' research: http://www.biocenter.helsinki.fi/bi/evodevo/group_isaac.shtml

PhD Position in the Development of Probabilistic Models for Quantitative Pathway and Response Analysis of Human Intestinal and Immune Responses to Food, the Netherlands

The homeostasis of the small intestine and its lining immune system can be modulated by various food-products. To efficiently study and, ultimately, predict the effects of food-products on homeostasis, we resort to systems biology-based mathematical models. The details of these positions can be found on our website: http://www.wageningenur.nl/en/vacancy/Modeling-life-exciting-PhD-positions-in-Systems-Biology.htm. For more information about this position, please contact dr. Jurriaan Mes telephone number +31 317 481174, e-mail jurriaan.mes@wur.nl.

PhD Position in Systems Biology of Microalgae as Photosynthetic Platform for Tailored Production of Chemical Building Blocks and Biomass, the Netherlands

This computational Systems Biology project aims to develop an experimentally tested modeling framework for the understanding of the metabolic and regulatory wiring of selected microalgae as photosynthetic platform for 'a la carte' production of chemical building blocks and biomass in sustainable value chains. The project will be tightly intertwined with research activities in matching projects in the scope of a broader initiative on microalgae for innovative bio-refinery, as summarized in www.AlgaePARC.com and www.algae.wur.nl.

Postdoc Position in Disease Modeling at the University of Georgia

The Park lab in the Ecology School, University of Georgia is seeking to recruit a postdoctoral associate with interests in the evolutionary ecology of infectious diseases and a strong background in modeling/computation applied to population biology. Interested applicants are first encouraged to familiarize themselves with the research interests of lab members (geospiza.ecology.uga.edu/parklab). As the successful applicant will be given freedom to develop their own research questions, applicants are asked to submit (1) CV, (2) short statement of intended research plan (1-2 pages) by email to Dr Andrew Park (awpark@uga.edu). Applicants are also requested to arrange for 3 letters of reference to be emailed to Dr Park. Salary will be commensurate with experience and the position includes health and retirement benefits. Informal enquiries by email are welcome. Start date could be as early as 1st March, 2013 and applications received by 11th February, 2013 will be given full consideration.

Postdoc Position: Computational Biology/ Bioinformatics, IAC-CNR, Rome

Applications are invited for a bioinformatics/ mathematical modeling position to work within the Digital Biology Unit (DBU) at the IAC-CNR. The DBU is an interdisciplinary group of researchers devoted to the use of mathematical and computational methods to understand biological processes. The appointment will be at the Italian postdoctoral level ("assegno di ricerca"). The salary range will be 22-26k

Eur (after taxes) per annum. The post is initially for one year extendible to three years. Informal enquiries can be addressed to Filippo Castiglione and/or Paolo Tieri ({f.castiglione|p.tieri}@iac.cnr.it). To apply: send email containing a cover letter with motivations and your CV. Please be prepared to provide two-three letters of references. Closing Date: 20 February 2013.

Faculty Position: Mathematical and Computational Biology at the University of Dundee

The University seeks to make a number of permanent faculty appointments in Mathematical and Computational Biology through its Dundee Fellows Scheme. Full details (including how to apply) may be found at the websites: http://www.dundee.ac.uk/dundeefellows/. Salary from £37,012 - £52,706 (Grades 8/9)

Support Available for Activities at the National Institute for Mathematical and Biological Synthesis

March 1, 2013 is the deadline for requests for support* for Working Groups, Investigative Workshops, Sabbaticals, and Short-term Visitors for activities beginning Fall 2013 at the National Institute for Mathematical and Biological Synthesis (NIMBioS). All areas of research at the interface of biology and mathematics will be considered. NIMBioS, located at the University of Tennessee-Knoxville, is an NSF-sponsored initiative to foster interdisciplinary research at the interface between mathematical and biological sciences. The institute's mission is to cultivate cross-disciplinary approaches in mathematical biology and to develop a cadre of researchers who address fundamental and applied biological problems in creative ways. Other NIMBioS sponsors include DHS and USDA, with additional support from the University of Tennessee-Knoxville. More details are posted at http://www.nimbios.org

*The next deadline for requests for support for postdoctoral
fellowships is September 1, 2013.

Related Links:
NIMBioS Working Groups http://www.nimbios.org/workinggroups/
NIMBioS Investigative Workshops http://www.nimbios.org/workshops/
Postdoctoral Fellowships http://www.nimbios.org/postdocs/
Sabbaticals http://www.nimbios.org/visitors/sabbatical
Short-term Visits http://www.nimbios.org/visitors/

To join the Society or renew your membership and pay your annual membership dues, please visit http://www.smb.org/membership/index.shtml, where you will find links to the "Online application" and your "Member profile".

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.

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