Mathematical Biology Newsletter

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The Society for Mathematical Biology
http://www.smb.org

Edited by: Holly Gaff

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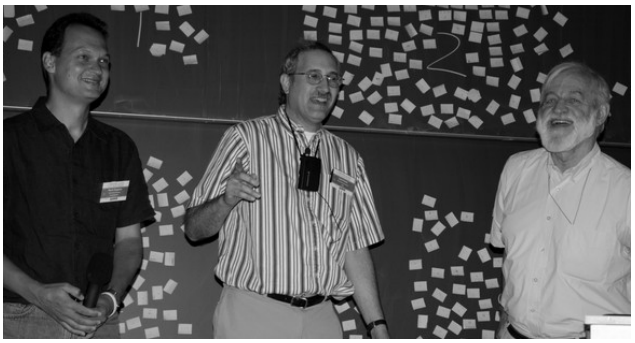
Pictures of ECMTB/SMB Meeting throughout newsletter are courtesy of the ECMTB-Team: Sebastian Hegler, Daniel Hackenberg, Siegfrid Schöne, Frank Demuth. Additional photos are available at: http://www.ecmtb05.org/ under souvenirs.

Save the date!
Joint SIAM-SMB Conference on the Life Sciences
July 31-August 4, 2006
North Carolina State University
Raleigh, NC, USA

ECMTB/SMB Meeting Photos

The "Black Shirt" Crew



Mark Chaplain (SMB President) and Lou Gross (SMB Past-President) present Jim Murray with the Okubo Prize

Many thanks to Andreas Deutsch (center, with his parents) for a great conference!

Letter from the President

Dear SMB Colleagues,

It is a great honour and pleasure to be writing in this Newsletter as the incoming President of the Society.

My first task as the new President is to formally thank our outgoing President, Lou Gross, for all the hard work, effort and time he has given to the Society over the past two years. Lou's energy, enthusiasm and commitment have been fantastic and the Society has benefited enormously from his vision, good nature and leadership skills over the last two years. I will work hard to continue the good work of Lou, and all the previous Presidents. Indeed, looking at the web-pages of the Society and the new link at http://www.smb.org/governance/history.shtml one is very aware of the history of the Society, how it came into being, how it has developed, where it is now and where it is heading in the near future. With the future in mind, it is perhaps useful to consider the words of wisdom of a past mathematical master:

"Who of us would not be glad to lift the veil behind which the future lies hidden; to cast a glance at the next advances of our science and at the secrets of its development during future centuries? What particular goals will there be toward which the leading mathematical spirits of coming generations will strive? What new methods and new facts in the wide and rich field of mathematical thought will the new centuries disclose?"

D. Hilbert, opening of his speech to the 1900 Mathematics Congress in Paris.

"He who seeks for methods without having a definite problem in mind seeks in the most part in vain. The further a mathematical theory is developed, the more harmoniously and uniformly does its construction proceed, and unsuspected relations are disclosed between hitherto separated branches of the science."

D. Hilbert

These words perhaps have particular resonance after the excellent meeting in July in Dresden (joint with our sister society, the European Society for Mathematical and Theoretical Biology, ESMTB). Having spent a week in the company of over 700 mathematical biology colleagues, listening to and watching wonderful talks it should be clear to all that mathematical biology as a discipline stands on the threshold of truly exciting, challenging and interdisciplinary times. The Life and Biomedical Sciences are producing many beautiful, challenging problems for mathematicians, statisticians, and computer scientists. The foreseeable future for the subject offers many new methods and new facts to be discovered, as yet unsuspected relations between mathematics and biology to be uncovered.

To quote the prophetic words of Hilbert once again:

"The tool which serves as intermediary between theory and practice, between thought and observation, is mathematics; it is mathematics which builds the linking bridges and gives the ever more reliable forms."

These are truly exciting times to be involved in mathematical biology research and education.

(By the way, sincerest thanks to Andreas Deutsch and all his hard-working crew in Dresden for a fantastic meeting!!!)

Of course, the growth in mathematical biology research may also be measured more quantitatively – the Society's official journal, the *Bulletin of Mathematical Biology*, under the editorship of Philip Maini, continues to go from strength to strength. The rate of submission of high quality papers to the *Bulletin* has doubled over the past three years, due in no small measure to the skill and efficiency of Philip. Additionally, thanks to the efforts of Lou Gross, Philip and Sharon Lubkin, a new contract for the *Bulletin* with Springer has just been signed, taking effect from 1 January 2006. Springer will also be undertaking marketing and promotional activities for the Society and helping out with recruitment via the new web-pages for the jour-

nal which will also appear in January 2006. Under Springer, the journal will increase the number of editorial pages published per year, as well as installing a manuscript tracking system to speed publication of important articles in the field. Articles will be published "Online First" in full text via SpringerLink, Springer's electronic journal platform.

In signing off this "Presidential letter", I leave you with further inspirational words of wisdom from a fellow Scot:

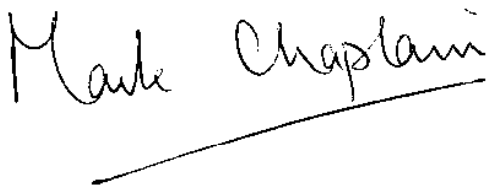
"Cell and tissue, shell and bone, leaf and flower, are so many portions of matter, and it is in obedience to the laws of physics that their particles have been moved, moulded and conformed. They are no exceptions to the rule that God always geometrizes. Their problems of form are in the first instance mathematical problems, their problems of growth are essentially physical problems, and the morphologist is, ipso facto, a student of physical science."

D'Arcy Wentworth Thompson**,**
"On Growth and Form", 1917

"I know that in the study of material things, number, order and position are the threefold clues to exact knowledge; that these three, in the mathematician's hands, furnish the 'first outlines for a sketch of the Universe'."

D'Arcy Thompson

While sketching the outlines for the Universe may take a little longer, mathematical, statistical and computational sciences are already furnishing outlines for sketches for the deeper understanding of and solution to significant biological problems. The Society and its members will continue to work to be at the forefront of such exciting scientific developments.



Official hand-over of presidency from Lou Gross (left) to Mark Chaplain

Biomathematics in the Commonwealth Workshop

K. Renee Fister & Maeve L. McCarthy

The first Biomathematics in the Commonwealth workshop was held at Murray State University on June 24-25, 2005. Sponsored by the Kentucky EPSCoR program, this event was part of an effort to increase communication between biologists and mathematicians in the Commonwealth of Kentucky. Participants included biologists and mathematicians, primarily from Kentucky. Featured speakers included Patricia Cerrito (Univ. of Louisville), Lisette dePillis (Harvey Mudd), Seth Oppenheimer (Mississippi State) and Brett Sandercock (Kansas State). The focus of the workshop was the discussion of open research problems during brainstorming sessions with a view towards the development of interdisciplinary collaborations. The organizers were very pleased with the response and look forward to hosting another workshop in 2008, and every 2-3 years thereafter.

Further information about the activities of the MSU Biomathematics group can be found at http://www.murraystate.edu/biomath.

Annual General Meeting of the Society for Mathematical Biology, Dresden, Germany

Rebecca Tyson

The annual meeting of the Society for Mathematical Biology (SMB) was held in conjunction with the European Conference for Mathematical and Theoretical Biology (ECMTB) in Dresden, Germany, July 18th-22nd, 2005. The conference was superbly organised by Andreas Deutsch and his team of "black shirt" officers who handled everything from coat checks to computer support. The ECMTB brought together more than 700 scientists and students from all over the world to discuss recent advances in mathematical and theoretical biology.

The meeting location, in the "Hoersaalzentrum" at the Dresden University of Technology, was ideal, and buzzed with activity from 9am until at least 10pm every day. The "Hoersaalzentrum" was built in 2000, and is a very interesting building decorated with large murals spanning the four floors on the inner walls. The East and West walls are made almost entirely of glass, providing a great deal of natural light and a pleasant setting for viewing the more than 250 posters, which were on display.

The conference organisers selected 12 key topics under which the talks and posters were organised. These were cellular biophysics, regulatory networks, development, evolution and ecology, epidemiology, neural systems and the brain, immune system, biomedical applications, biotechnology, innovative mathematical methods, data analysis and model validation, and inter-disciplinary education. Interesting talks and posters, which didn't fall under any of these broad categories, were reserved for a special section called cross-topics. The conference programme featured 15 invited talks, 37 mini-symposia (with 150 talks), 58 contributed sessions (with 275 talks) and two poster sessions. Prizes were awarded for the top three posters, and there was a draw for wine bottles among those conference participants who took the time to visit a few posters and nominate their favourites!

The keynote speakers were Andre M de Roos, who opened the scientific proceedings with his talk on Monday morning, Christine Jacob, Elly Tanaka, Attila Csikasz-Nagy, Avidan Neumann, Odo Diekmann, Hans Meinhardt, Svante Pääbo, Lou Gross, Christof Schütte, Kristin Swanson, Bernhard Palsson, Franziska Michor, Arjen van Ooyen and Hans Westerhoff. These talks covered all but two of the key conference topics. The Akira Okubo prize was awarded to Prof. James Murray. Due to difficulties en route, Prof Murray was unable to make it to Dresden in time to give his talk. He had, however, sent a copy to Philip Maini, and so Kristin Swanson was enlisted as a quick study! As she had collaborated with him on most of the research projects mentioned in the talk, she did an admirable job with Prof Murray's slides. We were all delighted to see Prof Murray a day later, and he addressed the conference briefly, with his usual wit and keen insight into the field of mathematical biology, at one of the general sessions later in the week.

The other highlight of the conference was Dresden itself. The city, heavily bombed by the allies toward the end of the Second World War, was part of East Germany. Considerable effort has gone toward rebuilding some of the most cherished historical buildings in the city, and Dresden is acknowledged by UNESCO as a world heritage site. The Elbe River flows through Dresden, on its way from the Elbe sandstone massif (Elbsandsteingebirge), known as Swiss Saxony, to the North Sea. On its travels it cut the Elbe River Valley, of which the conference attendees were given a glimpse during a boat ride up the river to Pillnitz Castle one afternoon. A special organ and violin concert beautifully performed in the restored country church "Zum Heiligen Geist" (of the Holy Spirit) on the castle grounds was part of the programme at Pillnitz. Some of us had been asking about the local music, and found that we were in the land where Bach and other baroque and classical masters wrote many of their compositions!

We owe many thanks to Andreas Deutsch and his team for a superbly organised conference. They thought of and took care of an abso-

lute myriad of details, from meals, to bus and tram tickets, to the conference layout. In every single room where talks were being given, there were two “black shirt” crew members in attendance, to deal with technical issues with equipment and other problems. In his welcome letter to all participants, Andreas wrote: “We wish all participants an enjoyable, fruitful, peaceful and interaction-rich time in Dresden!” Given how busy we were, I'm not sure anyone had a peaceful visit, but the organisation of the conference was so superb we had as hassle-free a visit as possible, and I'm sure that all of Andreas' other wishes were achieved!

Institute for Advanced Study/ Park City Mathematics Institute Summer Session in Mathematical Biology

Ruth Baker

The Institute for Advanced Study/Park City Mathematics Institute Summer Session was held from June 26 through July 16, 2005 at the Park City Resort, Utah. The IAS/Park City Mathematics Institute is part of an outreach program of the School of Mathematics at the Institute for Advanced Study. The PCMI Summer Session occurs every year, with the research focus for 2005 being Mathematical Biology. The 2005 session encompassed a number of core programs, including: a Graduate Summer School; a Secondary School Teachers Program; a Research Program; an Undergraduate Faculty Program and an Undergraduate Summer School. The total number of participants numbers over 200, with over 50 of those making up the Graduate Summer School.

The Graduate Summer School consisted of a series of lectures on a wide range of topics: “Introduction to Biological Dynamics” with Jim Keener and Mark Lewis; “Cell and Tissue Physiology” with Alex Mogilner; “Epidemiology and Disease” with David Earn; “Topological Approaches to Biological Dynamics” with Leon Glass; “Cancer” with Helen Byrne, “Ecological Dynamics” with Jim Cushing and “Neurobiology” with Paul Bressloff. Each lecture series was accompanied by a series of problem solving sessions and each graduate student worked on an open ended “group project” set by one of the lecturers. During the final sessions, each group presented their research to the rest of the summer school and research program participants.

Graduate students were able to attend seminars given by more senior researchers, as part of the research program. These included fascinating lectures by speakers such as John Tyson, who spoke on “Modelling the Eukaryotic Cell Cycle”, and Alan Perelson who spoke on “Modelling HIV Infection”.

There were also a number of cross program activities, which all summer session participants were encouraged to attend. These included public lectures by the Clay Senior Scholars in Residence, Simon Levin and Charles Peskin, an exploration of “Chaotic Music and Fractal Art: A Glimpse into the Neurophysiology of Aesthetics” by Leon Glass and the popular “Pizza and Problem Solving”. Simon Levin gave a talk entitled “Game Theoretic Problems in Evolutionary Ecology and Economics” which was followed up by a series of two seminars outlining the ideas behind his work, as part of the research program. Charles Peskin presented work on “Cardiac Mechanics and Electrophysiology by the Immersed Boundary Method” and also gave a lecture series as part of the undergraduate faculty program on “Medical Physiology from a Mathematical Point of View”.

I’m sure that all those who attended would agree that the Graduate Summer School, and the PCMI summer session as a whole, was an invaluable opportunity to learn from more experienced researchers and to meet colleagues working in the field. It benefited enormously from excellent organization and facilities and I would recommend it to anyone next time Mathematical Biology comes round again. The PCMI webpage can be found at http://www.admin.ias.edu-/ma/current/program.php. The author of this report gratefully acknowledges the Society for Mathematical Biology for funding to attend this event.

Simon A. Levin to receive Kyoto Prize in Basic Sciences

KYOTO, JAPAN -- June 10, 2005 -- The Inamori Foundation (President: Dr. Kazuo Inamori) today identified the laureates who will receive its 21st Annual Kyoto Prizes, the international awards it presents to individuals and groups worldwide who have contributed significantly to mankind's betterment.

Each laureate will receive a diploma, a Kyoto Prize Medal of 20-karat gold, and a cash gift of 50 million yen (approximately US$460,000) during a week of ceremonies beginning November 10, 2005, in Kyoto, Japan. In addition, the laureates will convene in San Diego, Calif. in early 2006 to participate in the fifth annual Kyoto Laureate Symposium.

"Today, we are rushing ahead with incredible scientific and technological achievements, while inquiry into our spiritual nature lags deplorably," said Dr. Kazuo Inamori, founder and president of the Inamori Foundation. "It is my hope that the Kyoto Prize will encourage balanced development of both our scientific progress and spiritual depth, and hence provide impetus toward the structuring of new philosophical paradigms."

Considered among the world's leading awards for lifetime achievement, the Kyoto Prize recognizes lifelong contributions in the categories of Advanced Technology, Basic Sciences and Arts and Philosophy.

Basic Sciences

The 2005 Kyoto Prize in Basic Sciences focuses on the field of Biological Sciences. Professor Simon A. Levin, 64, of Princeton University, will receive the award for establishing the field of "spatial ecology" and expanding scientific understanding of the biosphere as a "complex adaptive system."

Professor Levin's use of mathematical models to understand the complex patterns of the biosphere has made a substantial impact on environmental sciences and led to new methods of environmental protection. In 1974, with Dr. Robert T. Paine, he proposed the "patch dynamics model" that forms the basis of many current ecological models for marine and terrestrial ecosystems. He also demonstrated that high species diversity among competitors - as observed, for example, in rocky inter-tidal communities, or in tropical rain forests - can be maintained by recurrent disturbance. Professor Levin has actively collaborated with economists and environmental scientists to propose methods for dealing with environmental problems. His work has shown that ecosystems and the biosphere are not super-organisms, as previously suggested, but complex adaptive systems with apparent regularity emerging from self-organization processes. Among his primary concerns are the staggering losses in biodiversity worldwide that have resulted in the recent past from the mass production, consumption and waste disposal practices of human populations. His 1999 book, "Fragile Dominion," illustrates how the loss of biodiversity has created direct threats to human survival, and identifies a series of actions urgently necessary for maintaining biodiversity. In proposing many methods of biological conservation and ecosystem management, Professor Levin has made fundamental contributions to environmental science.

Simon Levin was President of the Society for Mathematical Biology 1987-9. He has been highly influential in ecology and in mathematical biology. Among his 37 PhD graduates are SMB past Presidents Lou Gross (2003-5) and Alan Hastings (2001-3) and past SMB Board member Stephen Ellner (1996-8). Dr. Levin's graduates in turn have altogether produced dozens of their own PhD graduates, including the Editor of this newsletter.

About the Inamori Foundation

The Inamori Foundation was established in 1984 by Dr. Kazuo Inamori, Founder and Chairman Emeritus of Kyocera Corporation (NYSE:KYO). The Kyoto Prize was founded in 1985, in line with Dr. Inamori's belief that man has no higher calling than to strive for the greater good of society, and that mankind's future can be assured only when there is a balance between our scientific progress and our spiritual depth. It is characteristic of the Kyoto Prize that it is presented to individuals or groups in appreciation not only of their outstanding achievements, but also of the excellence of the personal characteristics on which they have built their contributions to mankind. The laureates are selected through a strict and impartial process considering candidates recommended from around the world.

This year's other Kyoto Prize laureates will be

- Dr. George H. Heilmeier, 69, chairman emeritus of Telcordia Technologies, Inc., for his groundbreaking research in the field of liquid crystals and his direct contributions to the development of the liquid crystal display (LCD)
- Nikolaus Harnoncourt, 75, for his exceptional creativity as a conductor and performer who has contributed to the establishment of the "historically informed performance" of European early music, and who has extended his principles and interpretation to modern music as well.

Conference on Frontiers in Applied and Computational Mathematics at the New Jersey Institute of Technology

Robert M. Miura

On May 13-15, 2005, the Department of Mathematical Sciences and the Center for Applied Mathematics and Statistics at the New Jersey Institute of Technology (NJIT) hosted more than 250 applied mathematics researchers for the second annual conference on Frontiers in Applied and Computational Mathematics. The main themes of the conference, like last year, were Mathematical Biology and Mathematical Fluid Dynamics, two areas of research strength within the Department of Mathematical Sciences. Other themes included Nonlinear Waves, Electromagnetics, and Statistics Applied to Genetics and Genomics.

The Society for Mathematical Biology and the Mathematical Biosciences Institute provided travel funding for several students, postdocs, and junior faculty to attend the conference and present posters of their research. Major funding for the conference came from the National Science Foundation, the Air Force Office of Scientific Research, and an NJIT Strategic Initiative grant. NJIT's Department of Mathematical Sciences and Center for Applied Mathematics and Statistics organized the event, with the local organizing committee consisting of Daljit S. Ahluwalia, Manish Battacharjee, Denis Blackmore, Amit Bose, Gregory A. Kriegsmann, Jonathan Luke, Robert M. Miura, Demetri Papageorgiou, and Michael Siegel.

The Conference program consisted of six plenary speakers, including the mathematical biologists, Larry Abbott (Brandeis University), who spoke on Scale Invariant Adaptation, and Martin Golubistsky (University of Houston), who spoke on Coupled Cell Systems. The other plenary speakers were Joseph B. Keller (Stanford University), Leo Kadanoff (University of Chicago), John Ockendon (University of Oxford), and William Kath (Northwestern University). The Keynote Speaker was Avner Friedman (MBI, Ohio State University), whose talk

was titled “Mathematical Biology: A Newcomer to Applied Mathematics”.

There were minisymposia on each of the themes, which were complemented with almost 130 posters. The poster presentations were of high quality, and it was particularly gratifying that so many graduate students and postdocs participated in the conference in order to widen their research horizons.

Travel subsidies were given to at least 40 junior researchers from institutions other than NJIT. They were afforded opportunities to interact with leading experts in their fields. Some of the best minds in applied mathematics from around the nation and the world were in attendance, including mathematicians and statisticians from Novartis and Merck; top researchers from federal laboratories, such as Lawrence Livermore, Los Alamos, and others; and foreign researchers from the United Kingdom, Brazil, and Japan.

More information on the first two conferences on Frontiers in Applied and Computational Mathematics can be found at the URLs: http://m.njit.edu/Events/FACM04/ and http://m.njit.edu/Events/FACM05/.

The Department of Mathematical Sciences at NJIT has one of the largest groups of mathematical biologists in North America. There are presently 10 active researchers in mathematical biology, including six mathematical neuroscientists of whom two are focused on experimental research. More information on the Department, its academic and research programs, and its research faculty can be found at the URL: http://math.njit.edu/.

Open Postdoctoral Positions

Theoretical Nonlinear Chemical Dynamics, SMU

A one-year postdoctoral research associate position is available immediately in the group of Prof. Werner Horsthemke at Southern Methodist University to study pattern formation in chemical systems with nonstandard diffusive transport. The candidate will be involved in theoretical and numerical studies of the spatiotemporal dynamics of systems where Brownian motion is not an adequate model for transport. Please contact Prof. W. Horsthemke, Department of Chemistry, Southern Methodist University, Dallas, TX 75275-0314, e-mail: whorsthe@mail.smu.edu. See also: http://faculty.smu.edu/whorsthe.

Duke University Laboratory of Computational Immunology

The Duke University Laboratory of Computational Immunology in the Duke University Medical Center's Department of Biostatistics and Bioinformatics seeks applicants for a postdoctoral fellowship. Please contact Prof. Thomas B. Kepler at kepler@ duke.edu.

Virginia Bioinformatics Institute

The Virginia Bioinformatics Institute (VBI) invites applications for an AIDS Therapy Modeler Postdoctoral Associate to work in the research group of Dr. David C. Samuels on a project funded by NIH to study the mitochondrial toxicity of AZT (zidovudine or Retrovir) and other nucleoside analog drugs used in the treatment of HIV/AIDS. Interested candidates should submit a letter of interest and CV upon applying through http://www.jobs.vt.edu searching by posting number 042829. For a closer look, visit us at http://www.vbi.vt.edu.

Mathematical Biosciences Institute

The Mathematical Biosciences Institute (MBI) at The Ohio State University is accepting applications for postdoctoral positions to start September 2006, which are renewable for up to 3 years. The deadline for applications is January 18, 2006. To access the application form or for more information, visit the MBI website at http://mbi.osu.edu or call (614) 292-3648.