

SIAG LIFE SCIENCES CHARTER RENEWAL APPLICATION

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on the Life Sciences (hereafter called SIAG/LS). In the fall of 1999, the SIAM Council and the SIAM Board of Trustees, under the aegis of SIAM, formed the SIAG/LS by electronic mail vote with an initial operating period between January 1, 2000 and December 31, 2002. The Council and Board have renewed the SIAG/LS charter three times thereafter. The SIAG/LS had 811 members as of December 31, 2008.

According to its Rules of Procedure, the objective of the SIAG/LS is to foster applications of mathematics to the life sciences and research in mathematics that leads to new methods and techniques useful in the life sciences. Its proposed functions were to organize minisymposia at the SIAM Annual Meetings with scheduling coordinated by the SIAM VP for Programs and the SIAM VP at Large with the SIAG/LS Chair. Furthermore, a major function of the SIAG/LS is to organize a biennial SIAM Conference on Life Sciences.

The SIAG/LS has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG/LS.

1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last three years?

The recent growth in different areas of mathematical biology continues to be explosive. New Ph.D. programs in mathematical biology have been springing up all over the globe (~20 undergraduate and >20 graduate programs in the US alone, and programs in Canada, Sweden, Belgium, Holland, the UK, and Israel, to name a few). Biologists are becoming more accepting of the contributions mathematics can make to the life sciences, and more theoretical mathematicians are addressing the interesting and challenging mathematical problems arising in models from the life sciences. The acquisition of biological data, particularly in the general area of genetics but also in areas such as neuroscience, has continued to accelerate, posing a range of challenges in algorithm development, statistical analysis, parameter estimation, and model development and analysis, as can be seen from the program of our last conference, LS08 (see below). Significant recent advances have included the implementation of simulations approaching the scale of the whole brain, a new algorithm that combines and manipulates data from "gene chips" to more easily detect certain cancer genes, interdisciplinary projects of multi-scale modeling of the immune system, and the use of advanced molecular biology techniques coupled with advanced mathematical models to isolate the components of noise from identical cells that are involved in development, evolution, and some genetic conditions.

Further evidence of the expanding interest in quantitative research in the life sciences comes from the increased number of conferences and workshops largely devoted to the life sciences. The SIAM Life Science Conference, LS08 in Montreal in August 2008, was a great success – see below. The Society for Mathematical Biology Annual Meeting was held in Toronto in 2008, and the 2009 meeting will be held in Vancouver jointly with the Japanese

Society for Mathematical Biology. The European Society of Mathematical and Theoretical Biology held its tri-annual meeting in the summer of 2008 in Edinburgh, and SIAM also sponsored the Conference on Mathematics in Industry, which had a focus on biomedical and life sciences research, in early October 2007 in Philadelphia. Mathematical biology will be the focus in June 2009 of the annual conference on the Foundations of Applied Mathematics and Computation that is held in Newark, New Jersey. There will also be a Life Sciences subject track at the 2009 SIAM annual meeting, with an Invited Lecture and two minisymposia in mathematical neuroscience. New regional societies, such as the African Society for Math Biology, are being founded.

The NSF/DMS-funded Mathematical Biosciences Institute (MBI) in Columbus, Ohio received extended funding in 2007, and the new Director began his term in September 2008. Also in September 2008, the Biological Sciences Directorate at NSF announced the establishment of a National Institute for Mathematical and Biological Synthesis (NIMBioS) at the University of Tennessee.

Most of the graduate training programs in the Interfaces Program funded by the Howard Hughes Medical Institute will continue to receive graduate student funding from the National Institute of Biomedical Imaging and Bioengineering.

2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG/LS stable or increasing? How is the SIAG/LS keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG/LS?

The SIAG/LS remains dedicated to its role as a catalyst for improving the state of research and education in mathematical biology. Its membership numbers are:

Year	2002	2003	2004	2005	2006	2007	2008
Number	423	512	511	509	641	687	811

As shown, the membership number swelled to 811 members, of which 313 were students, at the end of the last calendar year. The membership increase corresponds to a significant growth over the past year, presumably as a result of the Conference on Life Sciences in Montreal in August 2008 and the fact that SIAM offered students two free SIAG memberships in 2008.

3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

The main activity of the SIAG/LS group is the organization of the biennial SIAM Conferences on the Life Sciences. The first conference was held in 2002 meeting in Boston, held jointly with the SIAM Conference on Imaging Science, with 209 SIAG/LS attendees. The second was held in 2004 in Portland, joint with the SIAM Annual Meeting, with 159 SIAG/LS attendees.

In 2006, the SIAG/LS held its third conference in Raleigh, North Carolina, run jointly with the Society for Mathematical Biology (SMB). It attracted 547 attendees, of which 131 were students. The 2006 Conference was very successful in terms of the broad range of topics represented in the Life Sciences and the level of attendance. The themes were Ecology, Environmental and Evolutionary Biology, Genomics, Imaging, Neuroscience, Structural

Biology, Modeling Diseases, Biomathematics in Industry, Biology, Toxicology, Stochastic Effects in Biology, and Cell Motility. Two specific problems that arose were the physical size limitations of the venue and the extreme heat and humidity at that time of year in North Carolina.

Our most recent meeting was held in Montreal on August 4–7, 2008. It was our first stand-alone conference that was not held jointly with another SIAG or society. Although our meeting was very close in space and time to the 2008 SMB meeting and the 2008 Gordon Conference on Theoretical Biology, we attracted 365 attendees. Items worthy of note at the Montreal Conference: (1) Significant cooperation with IMAG (Interagency Modeling and Analysis Group) lead by Grace Peng at NIBIB, (2) the resulting large population of representatives of funding agencies and the associated panels on funding and model sharing, (3) the Public Lecture of Stuart Kauffman, and (4) a poster session with an absence of sessions devoted to “contributed presentations.”

The 2008 Conference featured themes on Imaging, Biomechanics, Cell Signaling, Evolutionary Dynamics, Regulatory Networks, Systems Biology, and Neuroscience. The plenary talks and minisymposia in these areas were well received. Several special features of the meeting, namely a public lecture by Stuart Kauffman, a suite of minisymposia on other topics, a panel discussion on the future of model sharing coordinated by the NIH Interagency Modeling and Analysis Group, and the Lee Segel Forum on training programs in mathematical biology, were very well attended and elicited significant positive feedback. The decision was made to replace Contributed Talks with a more prominent poster session featuring student prizes, and this also worked out reasonably well. Unfortunately, a hotel staff strike coincided with the meeting, which limited hotel services somewhat but did not seem to compromise the features of the meeting, and the relative strengthening of the Canadian dollar made the meeting more expensive than anticipated for U.S. attendees. While the level of undergraduate participation in the poster session and the diversity of poster presenters were outstanding, we hope that more visible promotion of the poster session, earlier in the planning process, will increase the number of graduate student participants for the next SIAG/LS Conference.

One difficulty with the planning of the SIAG/LS Conferences in 2006 and 2008 was that there seemed to be little flexibility in terms of moving the conference dates back to late May/early June, as a result of the temporal proximity of several other SIAM conferences and the number of SIAM staff available to handle these conferences. This led to time conflicts with other meetings, particularly the Society for Mathematical Biology Annual Meeting.

4. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a tract of minisymposia at an annual meeting?

There were no minisymposia directly organized by the SIAG/LS at the 2006 SIAM annual meeting in Boston or at the 2008 SIAM annual meeting in San Diego. However, there were numerous minisymposia on life sciences organized by individuals and multiple invited presentations on biomathematics topics. There will be a tract of minisymposia organized by past SIAG/LS Program Director Jon Rubin at the 2009 SIAM annual meeting in Denver. Rubin is on the Organizing Committee, and SIAG/LS member Steve Coombes will give a plenary talk.

Since the LS10 Conference will coincide with the 2010 SIAM annual meeting, there will be substantial life sciences activity there (see below).

5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and Web sites. Have each of these been active and successful?

Detailed discussions have taken place among the officers, led by Ramit Mehr, on the development of a more comprehensive website. The website has been thoroughly revised. The pages describing Member Research Areas and Websites, Upcoming Meetings and Workshops, Research Journals and Articles, Books & Reviews, and Other Societies of interest, were not only added and updated, but now also include forms for submission of new updates – and such updates are constantly being submitted.

The SIAG/LS mailing list, which has been created and is now functional, presently has approximately 800 members and includes several SIAM staff members interested in SIAG/LS communications. There are only a few SIAG/LS members who do not have email addresses on file with SIAM. SIAM uses the mailman program to manage our lists, so individuals and list owners can manage subscriptions and messages through a web-based interface. Jim Parker of SIAM and Ramit Mehr have been assigned as administrators of the list, and Ramit Mehr has been assigned as list moderator. The list is currently set for all members to be moderated. In order to avoid duplication of messages, we decided not to use this list for meeting and job announcements that also would be submitted to the SMBnet. We encouraged all members to sign up for the (free) SMBnet electronic digest.

6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

The SIAM Conference on the Life Sciences (LS10) will coincide with the 2010 SIAM Annual Meeting in Pittsburgh, PA. Jon Rubin and Tim Lewis will organize this meeting. At LS10, the Lee Segel Forum will be continued, and career-life balance or interdisciplinary funding opportunities have been discussed as possible topics. Additional planning will occur during the first half of 2009.

7. How can SIAM help the activity group achieve its goals?

We appreciate the dedication of SIAM staff to the support of SIAM/LS conferences. Assistance in advertising the SIAM LS10 to SIAM members as well as the world-wide mathematical biology community would be highly valuable.

Students and young researchers form the renewal phase of Life Sciences, and SIAM can encourage their participation in LS10 and future conferences by setting aside funds to help pay for their travel and accommodation expenses. This is an investment in the younger generation that will reap rewards for SIAG/LS and for SIAM in the future.

One way to encourage more SIAG/LS members to publish papers in SIAM journals is to get some of those journals indexed in PubMed. This is the site where most biologists look for previously published results, and thus researchers who want to have an impact in the field want to publish in journals that appear in PubMed. Likely candidates for this are SIADS and SIAP as there are many biological papers in these journals.

SIAM also can help the SIAG/LS achieve its goals by directly telling us what services SIAM can offer the SIAG/LS. What administrative, logistical, and financial support is available to the SIAG/LS and where are these resources/guidelines listed? SIAM also can provide lobbying support and contact information for the discipline in terms of research grants from NIH, NSF, NASA, DOE, DOD, Howard Hughes, etc.

8. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

The 21st Century is being called the Century of Biology. Certainly biology and medicine are the most active and exciting fields of science at the present time, and this situation is expected to continue over the next several decades. New experimental methods such as imaging and genetic manipulation allow (and force) biologists to become much more quantitative. SIAM will greatly benefit from these directions as more and more applied mathematicians and computational scientists focus their research in the life sciences.

In the 2009 dynamical systems conference, three of the plenary talks will describe work in or motivated by biology and medicine. Furthermore, mathematical biology researchers have organized or will give papers in almost 40 minisymposia and contributed paper sessions. As more mathematicians enter biology, SIAM through the SIAG/LS will be in a good position to represent them.

The SIAG/LS requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2010.

Signed

Robert M. Miura
Chair, SIAM Activity Group on Life Sciences (2007-2008)
March 22, 2009