

## **SIAM Activity Group Life Science 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 consistently thereafter.

The SIAG/LS had 854 members as of December 31, 2017; of those, 398 were students.

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.

### **Its purposed functions were:**

The SIAG/LS will organize activities in Life Sciences. The SIAG/LS is expected to:

1. Subject to the conditions of ARTICLES III and IV, the SIAM Activity Group on Life Sciences will conduct sessions at regular SIAM meetings, conduct special meetings, and participate in organizing publications in the areas of Life Sciences and its applications.
2. The SIAG/LS shall not present awards or otherwise recognize scientific achievement, professional service, or the like without prior approval by both the SIAM Major Awards Committee and the SIAM Council of the award criteria, the method of selection of recipient(s), the nature of the award, and all other aspects, if any, of each such award must have the prior approval of the SIAM Board of Trustees.

Other activities can include:

3. Organize minisymposia at the SIAM Annual Meeting in years where there is no SIAG conference.
4. At least once every five years either organize a track of at least six minisymposia at the SIAM Annual Meeting or have an activity group meeting held jointly with the annual meeting. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG/LS chair.
5. Organize a biennial SIAM Conference on Life Sciences. The SIAG will consider dovetailing specialized workshops and conferences with the SIAM Annual meeting or other SIAG conferences. The chair of the conference organizing committee shall be either the program director or the chairperson of the SIAG or their designee. The organizing committee must be approved by the VP for Programs at least 16 months before the conference.

6. With the approval of the SIAM Program Committee, the SIAG/LS may organize special sessions at SIAM meetings, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting. Other SIAG meetings may be organized only with the approval of the SIAM president and vice president for programs.

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. List all current officers of the activity group (including advisory board, if relevant).

Chair:	Mary Ann Horn	Case Western Reserve University
Vice Chair:	Paul J. Atzberger	University of California—Santa Barbara
Program Director:	Alla Borisyuk	University of Utah
Secretary:	Sarah Olson	Worcester Polytechnic Institute

2. 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 field of biomathematics continues to grow. The number of journals dedicated to this field is larger than ever, during the past two decades, there have been two NSF-funded institutes that focus on biomathematics (the Mathematical Biosciences Institute and NIMBioS), the NSF has a program within the Division on Mathematical Sciences on Mathematical Biology, and the NIH has a study section on Modeling and Analysis of Biological Systems. In addition, NSF and NIH have multiple programs that bridge their interests, including DMS/NIGMS, CRCNS (Collaborative Research in Computational Neuroscience), as well as others. There are also more graduate programs with a focus on biomathematics than ever before.

During the past year, the Division of Mathematical Sciences at NSF joined with the Simons Foundation to launch four new centers to bring mathematical perspectives to the biological search for the “Rules of Life.” The four centers, selected through NSF's merit review process and an additional review by the Simons Foundation, will be headquartered at the Georgia Institute of Technology, Harvard University, Northwestern University and the University of California, Irvine. Researchers will come together annually to share progress in meetings held at the Simons Foundation in New York City.

The range of mathematical applications within biology is enormous, and includes applications at the molecular level (e.g., structural biology and gene transcription pathways), the intracellular level (e.g., cell cycling and metabolic networks), intercellular level (e.g., neural networks and immune responses), tissue level (e.g., cardiac and respiratory systems), and at the level of organisms (e.g., epidemiology, ecology, and descriptions of social interactions). Evidence that mathematics is being used in these topics is clear from the titles of journal articles, and also from funded grant proposals. It is hard to know whether there is a shift of focus, but it is evident that the breadth of topics subject to mathematical modeling and analysis continues to grow

at a great rate. Importantly, there is an ever-growing emphasis in the field on collaboration with experimental biologists. This reflects the growing belief in the biological community that greater quantitation is needed, and that this is facilitated through interactions with mathematical scientists.

In addition, the range of mathematical approaches being applied to biological questions continues to grow. While more traditional mathematical approaches involving ordinary and partial differential equations, as well as statistics, continue to play an important role in many applications, techniques from other areas, including algebraic geometry, graph theory, probability, topology, etc., are now used to address wide ranging topics in the biological sciences.

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

The SIAG/LS has 854 members as of December 2017. This is up from the prior two years (748 in 2015 and 822 in 2016) and is once again approaching its peak of 870 in 2010. Of the current 854 members, 398 are students. This is again up from the previous two years (280 in 2015 and 337 in 2016) and has now surpassed the previous peak of 375 in 2010. Compared with other SIAGs we are doing quite well. There are only five other SIAGs with membership greater than ours (as of December 2017).

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

In 2016, the Life Sciences SIAG joined the annual meeting (AN16), which was held in Boston, Massachusetts. The total number of 1749 attendees well surpassed the numbers from the previous time that the SIAG joined with the annual meeting in 2010. There were 103 minisymposia sessions, far exceeding the previous high of 81 sessions in 2014.

In August 2018, the SIAM Conference on the Life Sciences will be held in Minneapolis, Minnesota. At this time, over 200 attendees have registered, with pre-registration closing on June 9. There will be 61 minisymposia, which is the second highest number that have been held when the SIAG meets separately from the SIAM Annual Meeting.

These data indicate that the SIAG/LS conferences are well attended both in terms of total attendance and number of minisymposia.

5. 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 track of minisymposia at an annual meeting or meet jointly with the SIAM Annual Meeting?

*\*Because of the number of Activity Groups, the current guidelines are that an Activity Group should organize a track about every seven (7) Annual Meetings or meet jointly with the Annual Meeting within a seven (7) meeting period.\**

In 2016 SIAG/LS meeting in Boston was held jointly with the SIAM Annual Meeting. In 2018 SIAM Annual Meeting there will be three minisymposia (MS140, MS160, and MS161) that were organized in response to a call from the SIAG earlier in the year. Many other minisymposia are clearly relevant to the field, including MS9, MS96, MS123, MS134, MS148, and MS168.

6. Indicate role of officers of SIAG/LS in other SIAM conferences.

None

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

The activity group sponsors a mailing list in which conferences, new software, new books, jobs, and other items of potential interest to the community are posted. This is used frequently, with 10 or more postings made each month and should therefore be considered successful.

The SIAG/LS web site continues to provide information on upcoming meetings, publications, archives of the mailing list posts, and a member list. It also includes a list of member research areas and links to their web sites. Other useful items are links to books related to biomathematics and links to other related scientific societies. This web site provides useful information for the SIAG/LS members and the biomathematics community in general, and we consider it to be successful.

The SIAM Activity Group on Life Sciences Early Career Prize, established in 2016, is awarded to an outstanding early career researcher in the field of mathematics applied to the life sciences, for distinguished contributions to the field in the three calendar years prior to the year of the award. The SIAM Prize committee consisted of the SIAG LS members:

- Paul J. Atzberger, University of California Santa Barbara (UCSB), Chair
- Nathan Baker, Pacific Northwestern National Laboratories (PNNL) and Brown University
- Casey Diekman, New Jersey Institute of Technology (NJIT)
- Maria D'Orsogna, California State University Northridge
- Laura Miller, University of North Carolina, Chapel Hill

The inaugural prize will be awarded at the August 2018 conference to Sean Lawley, University of Utah, “for his significant contributions to the analysis of stochastic phenomena in biology, particularly his recent fundamental work on diffusion processes subject to switching boundaries.”

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

The focus of the SIAG/LS is on the upcoming SIAM Life Sciences 2018 meeting in Minneapolis. This meeting runs for four days and participants have organized the second highest number of minisymposia in a SIAG/LS meeting that has not been held jointly with the annual meeting. Plans for the next meeting await the election of the new set of officers, however, the SIAG/LS has expressed interest in joining the SIAM Annual Meeting again in 2022.

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

The most important function of the SIAG/LS is running the SIAM Conference on the Life Sciences every other year. This meeting remains very popular, with continued growth in the number of minisymposia and registered participants. It is one of two meetings run by and for the mathematical biology community. The other, run through the Society for Mathematical Biology (SMB), is often held outside of the United States, making the SIAM Life Sciences meeting the only large conference geared towards biomathematics consistently held within the US or Canada.

The SIAG/LS may wish to consider occasionally joining the Society for Mathematical Biology to organize meetings, but this would likely require a shift in the timing of the SIAG/LS conference in order to match the years when SMB holds its meeting in North America.

10. How can the activity group help SIAM in its general role of promoting Life Sciences?

By renewing the Life Sciences charter, SIAM will be maintaining an important point of contact for mathematicians working in the life sciences.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two year operating period beginning January 1, 2019.

Mary Ann Horn, Chair  
SIAM Activity Group on the Life Sciences  
May 30, 2018