

## CHARTER RENEWAL APPLICATION

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Materials Science. The SIAG/MS was originally formed for a three-year period under the aegis of SIAM in July, 2008 by the SIAM Council and Board of Trustees. Its initial operating period began January 1, 2009 and ends December 31, 2011. This will be the first charter renewal for this activity group. SIAG/MS had 203 members as of December 31, 2010.

According to its Rules of Procedure, it is the purpose of the SIAM Activity Group on Materials Science to bring together mathematicians, engineers and scientists interested in the application of analysis and computation to problems in materials science. Because of the unifying nature of mathematics, the SIAG will serve as a meeting point for mathematicians, engineers and scientists from all areas of computational and materials science, thus fostering cross-fertilization between fields, and from diverse venues such as academia, industry and the national laboratories. In this manner, the SIAG will provide a unique opportunity for interaction between fields that would be greatly diminished in its absence. Within the framework of SIAM, the SIAG will conduct activities that implement its purposes.

Its purposed functions were to:

1. Organize minisymposia at the SIAM Annual Meeting in years where there is no SIAG conference.
2. 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 chair.
3. Organize the SIAM Conference on Mathematical Aspects of Materials Science series, with conferences taking place every three or four years. The chairs of the conference organizing committee shall be the program director and the chairperson of the SIAG or their designees.

\* \* \*

The SIAG 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.

- 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 two years?

The field of mathematics and materials sciences remains very active. It keeps thriving at the interdisciplinary front between mathematics and the many aspects of materials science. It is represented in a va-

riety of academic programs (pure, applied, numerical and computational mathematics, physics, biology, chemistry, engineering and industry), national laboratories and professional societies. For instance, in the recent years, there has been significant progress made in the application of methods of materials science in biology (modeling as well as device applications). There has also been significant research progress in the fields of renewable energies. The state of the art computational methods are also very well represented in the research carried out in the SIAG community.

2. 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?

This is a very young but highly active SIAG, with a very strong potential for growth. A goal of the current officers is to significantly increase the membership through a variety of channels, such as emphasizing the SIAG presence in conferences of related professional societies, conference and summer school organization, and the maintenance of a web page to help young researchers entering the job market. The programs of the SIAG conferences clearly reflect how this community keeps up with the changes in the field, as the previously mentioned strong presence of biological and renewable energy topics in the 2010 meeting.

The research represented in the SIAG community shows a very good balance between mathematical modeling and computing, and a strong trend in industrial and scientific applications, all within the broader interests of SIAM.

3. 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.

*The SIAG/MS organizes the SIAM Conference on Mathematical Aspects of Materials Science (which existed prior to the activity group). <http://www.siam.org/meetings/archives.php#MS>.*

The last conference of this series took place in Philadelphia, on May 23-26, 2010. It was a highly successful and very well attended meeting, with a very well balanced program, covering the different aspects at the interface between mathematics and materials sciences. Also, a panel on *Mathematics and Materials Science Education* took place during the conference. It addressed topics on teaching mathematics to engineering students, advising graduate students in materials science topics and internship opportunities. It was very well attended and generated lively discussions on the topics. Several issues of SIAM News after the conference reported on the education panel and also published features on plenary lectures.

The mathematics and materials activities were also represented at the meeting on *Emerging topics in Dynamical Systems and Partial Differential Equations*, Barcelona, May 31-June 3, 2010. (Joint SIAM/RSME-SCM-SEMA meeting). Calderer served in the organizing committee, organized a track of 4 minisymposia in materials sciences and also served as PI of a travel grant for young researchers.

Felix Otto is currently a member of the Scientific Program Committee of ICIAM 2011.

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

- 2009 SIAM Annual meeting: Minisymposium on "Cloaking and Invisibility" organized by R.V. Kohn.
- 2010 SIAM Annual meeting: Minisymposium on "Recent Advances in Calculus of Variations and Partial Differential Equations", with a focus in materials sciences. It was organized by I. Fonseca.
- ICIAM 2011: Minisymposia on "Analytical and Numerical Methods for Nonlocal Problems " a 3-part minisymposia with a focus on materials sciences applications. It is co-organized by R.P. Lipton.
- ICIAM 2011: Minisymposia on "Atomistic/Continuum Multiscale Models of Solids", a 4-part minisymposia with a focus on materials sciences applications. It is co-organized by M.Ortiz.
- ICIAM 2011: Minisymposia on "Modern Methods and Applications of the Calculus of Variations", a 5-part minisymposia that includes applications to materials sciences. It is co-organized by I.Fonseca.
- SES Technical Conference (Society of Engineering Science and Mechanics, October 12-14, 2011; Northwestern University): Organization of a minisymposia track:
  1. *Modeling and Simulation of Grain Boundary Motion in Polycrystals*, Selim Esedoglu (University of Michigan).
  2. *Defect Evolution in Materials*, Christopher Larsen (WPI).
  3. *Surface Structure and Dynamics: Mathematical and Computational Progress*, Jonathan Weare (University of Chicago).

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?

A proposal to organize the 2012 Gene Golub Summer School, entitled *Flow, Geometric Motion, Deformation and Mass Transport in Physiological Processes*, was submitted to SIAM on March 31, 2011. The speakers and lecture themes were selected according to the proposed line of activities of the current

SIAG officers to potentiate research at the interface of materials science and biology. Although the proposal was pre-selected as one of the two finalists, it was not funded for the 2012 session.

A wiki page was set up as a communication tool with the community. Work on its development is currently under way.

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

- The planning of the 2013 *Conference on Mathematical Aspects of Materials Science* is already under way. Greg Forest has agreed to serve as co-chair, together with Felix Otto. The likely site of the conference is Boulder (Colorado).

- Development and promotion of the web site to include following sections:

1. Employment information: links to organizational web sites, (e.g. AMS, SIAM, MRS), National Labs, and industry.

2. Posting of information submitted by graduate students and postdocs. This will include the name and a short description of the research work, with a link to the personal web page.

3. Posting of information on conferences and workshops relevant to SIAG materials community.

4. Links to the mathematical institutes in the US and abroad.

5. Posting of internship information for graduate students.

Work on this web site is currently in progress, and it is expected to be fully developed by August 15, 2011. It will be subsequently updated on a weekly basis.

- Organization of minisymposia tracks in the SEE conferences will continue, and similar cooperation agreements will be sought with the MRS and other societies.

- The proposal for the organization of the Gene Golub Summer School will be updated and re-submitted for the 2014 session. (The 2013 session will be devoted to numerical linear algebra, outside the scope of this SIAG). In this activity, current and upcoming officers will cooperate, following already established precedents (e.g., SIAG APDE Conference, 2007).

- We will further consider the organization of a workshop on mathematics and materials science for advanced undergraduate and graduate students. Further discussion on location and timing is pending.

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

- Providing resources to jump-start and maintain the web page would be greatly appreciated. We estimate 5 hours of work at the beginning and about one or two hours per week for updates. We have identified a postdoc (University of Maryland) who is ready to carry out the project.
- Provide information on companies about possible employment and internship opportunities for graduate students and/or postdocs.

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

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2012.

Signed

Maria-Carme Calderer

[July 13, 2011]