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 ended December 31, 2011. The first renewal for this activity group was approved for the period January 1, 2012 through December 31, 2013. As of December 31, 2010 SIAG/MS had 203 members. As of January 1, 2012 SIAG/MS had 221 members.

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.

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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 thrives at the interdisciplinary front between mathematics and the many aspects of materials science. It is represented by a variety 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 and informing the community of current developments including the recent Materials Genome Initiative from the Whitehouse Office of Science and Technology Policy. Membership numbers show the group is increasing.

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 most recent conference in this series took place in Philadelphia, on June 9-12, 2013. Gregory Forest and Felix Otto were the conference chairs. The conference was successful and well attended. There were 436 registered participants. It featured a balanced program, covering many different aspects at the interface between mathematics and materials sciences including metamaterials, biological materials, complex fluids, composite materials and phase transformations. The twelve invited plenary speakers were drawn from both academia and national laboratories and represented SIAG/MS members from both North America and Europe. There were a total of 39 minisymposia at the conference. Eleven minisymposia had featured lectures recorded on the SIAM website. This year the conference also featured a poster session with 26 poster presentations.

The SIMA/MS organized the IMA Special Workshop 2012: Mathematics and the Materials Genome Initiative September 12-15, 2012. The purpose of this workshop was to mobilize the mathematical sciences community to respond to the opportunities created under the Materials Genome Initiative

(MGI). The workshop program included presentations by program officers of the NSF Division of Mathematical Sciences and Division of Materials Research, panel discussions, and informal discussions. An educational component of the workshop explored modes of collaboration with community colleges in developing curricula to prepare future workforce to meet the employment opportunities brought about by the MGI.

The SIAM/MS organized the recent summer 2013 PI Summer Graduate Program Flow, Geometric Motion, Deformation, and Mass Transport in Physiological Processes University of Minnesota, Minneapolis, MN July 15 – August 2, 2013. The program provided graduate students exposure to the fundamentals of mathematical and computational studies in mechanisms that underlie physiological and materials processes, including the motion of biomembranes, solid-fluid interaction, and the morphogenesis of growing tissues. The course involved the participation of four principle lecturers, Qiang Du, Marta Lewicka, Ricardo Nochetto, and Mark Peletier. Together with 13 guest lecturers. http://www.ima.umn.edu/2012-2013/PISG7.15-8.2.13/

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?

- 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): The SIAG/MS recruited 3 younger SIAG/MS members to organize 3 separate minisymposia at the 48th annual SES Technical meeting:

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).

- SIAM Annual Meeting 2012: Minisymposium on ``The Materials Genome Initiative,'' a 2-part minisymposia with a focus on The MGI initiated by the Whitehouse Office of Science and

Technology Policy and related open problems in materials science of interest to SIAG/MS and SIAM. It is co-organized by M. C. Calderer, R. P. Lipton and D. Margetis.

- SIAM Annual Meeting 2012: Minisymposium on: Surface and Thin Film Evolution: Self-Assembly, Instability, Pattern Formation. It is co-organized by J. Evans and D. Margetis

- The SIAM MS organized the very successful IMA Summer School 2013: 2013 PI Summer Graduate Program ``Flow, Geometric Motion, Deformation, and Mass Transport in Physiological Processes University of Minnesota, Minneapolis, MN, July 15 - August 2, 2013. It was a 3 week long summer school with four distinguished Lecturers running the school and 13 distinguished guest lectures. The list of invited speakers includes experts in applied and numerical analysis, mathematical modeling, computational mathematics, and experimental science. The program provided lectures, tutorials, and hands-on lab demonstrations by senior and junior researchers.

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 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.

We are currently working on the 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.

- We have contacted the Materials Research Society on cooperation agreements and reciprocal membership agreements.

- We are currently working on organizing a SIAG MS special symposia at the Fall 2014 Materials Research Society Meeting.

- A tentative plan of starting an annual "Math/Materials Science Circus" series, following the model of the "Finite Element Circus". There are specific plans to start a "tryout" with three editions: CMU, U. Minnesota and Akron/Kent(LCI).

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 three-year operating period beginning January 1, 2014.

Signed

Maria-Carme Calderer

[August 20, 2013]