

SIAM Activity Group Uncertainty Quantification Pro Forma Charter Renewal Application

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on **Uncertainty Quantification**. The SIAM Activity Group (or SIAG UQ) to which this renewal applies was originally formed under the aegis of SIAM in December 2010 by the SIAM Council and by the SIAM Board of Trustees with its initial operating period beginning December 11, 2010 and ending December 31, 2012. Its charter has been renewed by the Council and Board 2 times thereafter. This SIAG has 599 members, including 235 student members, as of December 31, 2015.

According to its Rules of Procedure, the objective(s) of the SIAG are:

It is the purpose of the SIAM Activity Group on Uncertainty Quantification to foster activity and collaboration on all aspects of the effects of uncertainty and error on mathematical descriptions of real phenomena. It seeks to promote the development of theory and methods to describe quantitatively the origin, propagation, and interplay of different sources of error and uncertainty in analysis and predictions of the behavior of complex systems including biological, chemical, engineering, financial, geophysical, physical, and social/political systems. The SIAG serves to support interactions between mathematicians, statisticians, engineers, and scientists working in the interface of computation, analysis, statistics, and probability. Together with its partner UQ Interest Group in ASA, the SIAG organizes a biennial conference, sponsors minisymposia at conferences, publishes a newsletter biannually, and maintains an electronic discussion group.

Within the framework of SIAM, the SIAG will conduct activities that implement its purposes.

The SIAG on Uncertainty Quantification will organize activities in uncertainty quantification. The SIAG is expected 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 a biennial SIAM Conference on Uncertainty Quantification. 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.
4. With the approval of the SIAM Program Committee, the SIAG 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

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**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.*

organized only with the approval of the SIAM president and vice president for programs.

SIAG meetings, workshops, and conferences may be organized only with the approval of the SIAM president and the SIAM vice president for programs.

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

Chair: Andrew Stuart

Vice-Chair: Serge Guillas

Program Director: Clayton Webster

Secretary: Youssef Marzouk

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 two years?

The field of Uncertainty Quantification is growing at considerable pace, worldwide. This reflects a variety of driving forces: (i) the wish to model increasingly complex phenomena, resulting in the use of models which contain uncertainty; (ii) the wish to integrate increasing amounts of data, which itself is often noisy, into the model; (iii) the understanding that improved decision making may be undertaken by allowing for uncertainty in predictions. This is evidenced, for example, by the recent DARPA funding of its program EQUiPS, and the significant funding within Europe of UQ related research. Important advances in the field in the last two or three years are both a) methodological and b) application-domain led. Under a) there have been substantial developments, for example, in the use of model-reduction methodologies, in Bayesian inversion and in the development of closure methodologies that go beyond polynomial chaos; under b) there has been a broadening of applicability from the physical sciences and out into the biological, medical and social 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?

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The SIAG is keeping up with the changes in the field, as described under #2, primarily through evolution of the scientific foci of the meetings it runs (see #4) and the recruitment that this leads to. The broader interests of SIAM are reflected in the SIAG because of its focus on a broad range of methodological and domain-specific activities, and impact on fundamental science, engineering and technology.

4. 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 SIAG UQ organizes the biennial conference on Uncertainty Quantification. This list of conferences may be found at:
<http://www.siam.org/meetings/archives.php#UQ>.

- The 2016 SIAM Conference on Uncertainty Quantification (5–8 April 2016) is the third in the series; it has registered 751 attendees, including 518 paid non-students and 202 paid students.
- 2014 UQ meeting in Savannah, Georgia: 552 registrants.
- 2012 UQ meeting in Raleigh, NC: 506 registrants.

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 at an annual meeting or meet jointly with the SIAM Annual Meeting?

The SIAG UQ will organize its first track at the 2017 SIAM Annual Meeting.

While the activity group has not *directly* organized minisymposia at the 2014 and 2016 SIAM annual meetings, or at ICIAM 2015, there have been a considerable number of minisymposia focused on uncertainty quantification at all of these meetings. The vast majority of these minisymposia are co-organized by UQ SIAG members.

6. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful? What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

The SIAG runs an electronic news-service that advertises jobs and scientific meetings in the field of UQ. There are currently 632 people subscribed to the associated email list. List activity totals roughly 80 messages per year.

The SIAG is in the process of establishing a prize. This will be similar to the Dahlquist Prize, in terms of career-service profile of the nominees, but will also be linked directly to the biennial meeting.

The activity group will continue the highly successful biennial meetings. A notable feature of the three held so far is that they have evolved considerably, both in terms of methodologies represented, and applications. The early domination of polynomial chaos methods has been balanced by new emerging methodologies, and the decision to focus each meeting on a new application domain has been very successful (geosciences in 2014, life sciences in 2016); the SIAG will consider focussing the next meeting in social science applications. The

activity group will also continue its electronic news service, which has helped to engender a sense of community, and it will promote the new prize and will aim to grow its presence at the annual meeting (see #5).

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

The support of SIAM in running the biennial meetings, in promoting the activity group through its website, in supporting the UQ journal (joint with ASA) and in supporting the prize currently under development has been enormously helpful in creation of the UQ community. A new direction where SIAM could help is through book publishing and ensuring that it takes a lead, internationally, in publishing books in this area (it already has some relevant titles such as the books of Constantine, Smith, and Tarantola).

8. How can the activity group help SIAM in its general role of promoting uncertainty quantification?

The SIAG UQ is already helping SIAM by creating a worldwide, networked community in the area of Uncertainty Quantification. As individual scientists, scientific bodies, companies, government laboratories and funding agencies realize the importance of UQ in all of predictive science, the SIAG can play a major role not only in representing the importance of mathematics and computation to these stakeholders, but also in demonstrating the role that SIAM has played in creating the relevant underpinning community.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2017.

Signed by
[SIAG Chair]
[Date]