

CHARTER RENEWAL
SIAM Activity Group on Analysis of Partial Differential Equations (SIAG/APDE)

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Analysis of Partial Differential Equations (SIAG/APDE). The SIAG/APDE was originally formed under the aegis of SIAM on December 7, 2002, by the SIAM Board of Trustees and on March 26, 2003, by the SIAM Council. Its initial operating period began April 1, 2003, and ended December 31, 2004. Its charter has been renewed by the council and board four times thereafter. This SIAG has 796 members as of December 31, 2011.

According to its Rules of Procedure, it is the purpose of the SIAM Activity Group on Analysis of PDE to foster activity in the analysis of partial differential equations (PDE) and to enhance communication between analysts, computational scientists, and the broad PDE community. Its goals are:

- To provide a forum where researchers in the area, theoretical and applied, can meet;
- To be an intellectual home for researchers in the analysis of PDE;
- To increase conference activity in PDE;
- To enhance connections between the applications and analysis communities.

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

Its proposed functions were to undertake a number of activities, including:

- 1 Organize minisymposia at the SIAM Annual Meeting in years when 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.

Other activities can include:

- 1 Organize a biennial SIAM Conference on PDE. Because of connections between PDE and the topics of many of the other SIAGs, the SIAG/APDE will also solicit opportunities to run joint meetings with other SIAGs and with other periodic SIAM meetings (for example, Combustion, Materials Science, or the SIAG on Nonlinear Waves and Coherent Structures). 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.
- 2 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 organized only with the approval of the SIAM President and Vice President for Programs.
- 3 Disseminate information. The SIAG will publish a newsletter and maintain a website to facilitate the exchange of information among its members and other interested parties.
- 4 Award the *SIAG/Analysis of Partial Differential Equations Prize*.

To these have been added:

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The SIAG/APDE 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: Robert L. Pego Vice Chair: Konstantina Trivisa Program Director: Edriss Titi Secretary: Jerry Bona

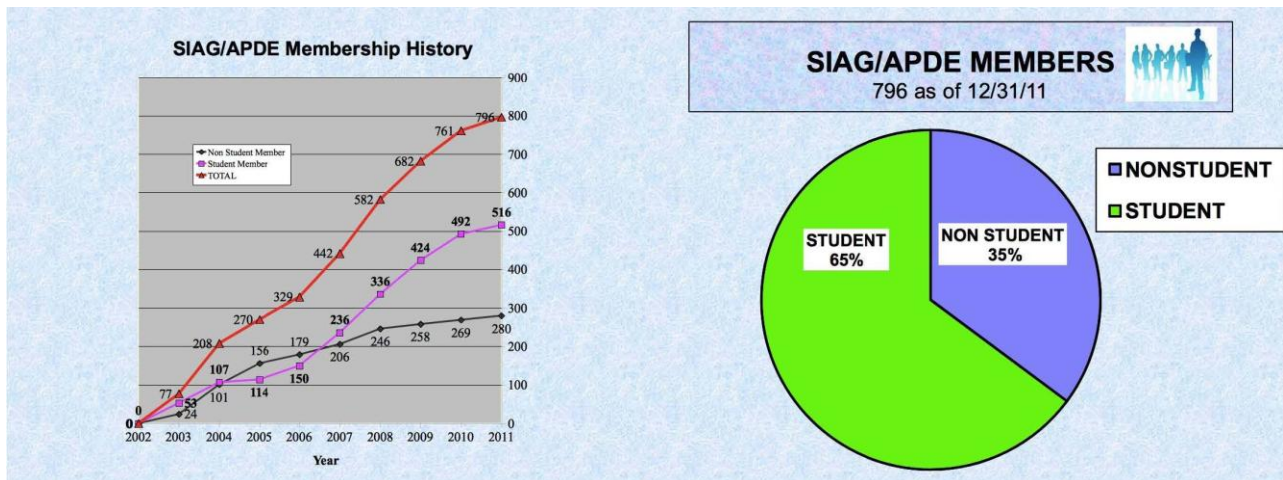
2. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last three years?

The SIAG/APDE is growing in developing activities, broadening its scope, and this should continue. Its scope comprises the applied analysis associated to modeling by Partial Differential Equations and related systems from several areas from the physical, life and social sciences. The wide variety of topics for the 110 minisymposia in its November 2011 meeting testifies to its breadth and continuous growth.

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?

As of last December, SIAG/APDE had 796 members, including 516 (about 65%) student members (see charts as of December 31, 2011, below). It represents a vibrant group with a strong participation in planned activities. Membership numbers have continuously increased since the creation of the SIAG. Total membership has grown by about 17% in the last 2-year period. For comparison, the increase was about 54% in the period December 2008-2009 and 64% in the period December 2005-2007.

In order to keep up with changes in the field, we strongly encouraged participation and organization of minisymposia in our November 2011 meeting, emphasizing as conference themes a number of highly active areas of applied analysis: PDEs in

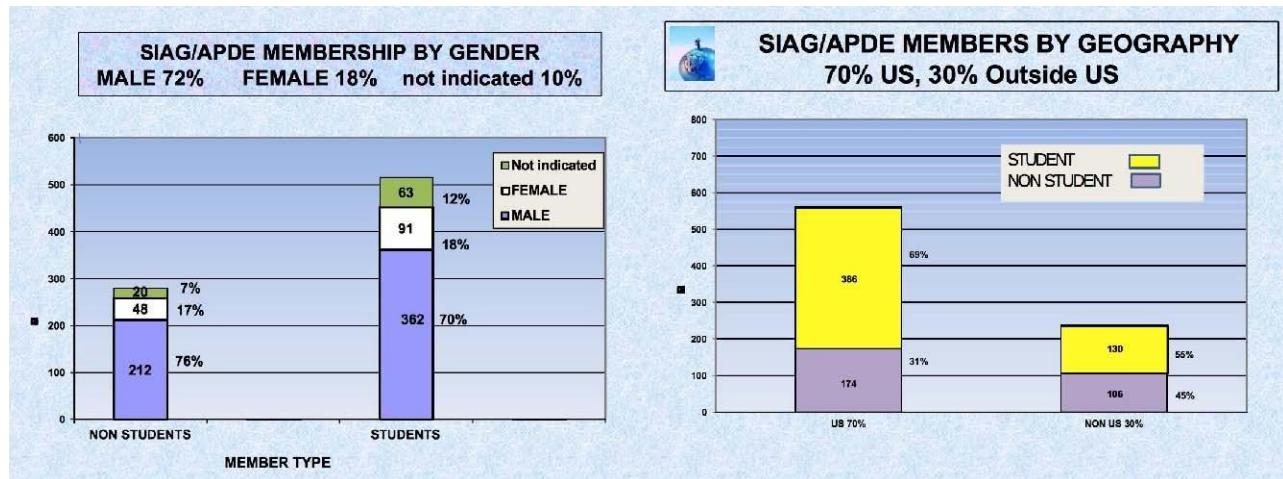


biological systems; Fluid mechanics and geophysical dynamics; Conservation laws; Kinetic theory; Nonlinear waves; Optimal control; Elasticity; Dispersive equations; Geometric PDEs; Stochastic PDE and financial math; Image processing; Numerical analysis and computations; Variational methods and applications in material sciences. Furthermore, the conference ran a forward-looking session with a panel of leaders in the field who provided an excellent perspective on emerging opportunities.

The SIAG/APDE serves a section of the SIAM membership that did not have a clear role in SIAM in the previous decade or so before the creation of the SIAG. Bringing this community into the mainstream of SIAM activities has benefited broader SIAM interests in connecting with the areas of mathematics that interface with applications.

SIAG/APDE has achieved membership numbers in the middle range of SIAM activity groups, comparable to SIAG groups LA, CST, DM and IS, with a significant student membership percentage second only to FME.

The following two charts show the current distribution of membership by gender and by geography, which show a healthy



membership support amongst academically junior people.

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/APDE organizes the biennial conference on Analysis of Partial Differential Equations. This list of conferences may be found at: <http://www.siam.org/meeting/archive.php#pde>.

- The 4th SIAM Conference on APDE was held December 7-10, 2009 in Miami, Florida, with more than 280 paid attendees, 9 plenary lectures including the Prize lecture, one Minututorial course offered by Luis Caffarelli, and 88 concurrent sessions in 3.5 days. Due to enthusiastic demand for minisymposia and contributed presentations, the originally planned 3-day conference was extended to 3.5 days. The meeting was a great success with truly high scientific quality.
- The SIAG/APDE jointly organized the *Joint SIAM/RSME-SCM-SEMA Meeting on Emerging Topics in Dynamical Systems and Partial Differential Equations (DSPDEs'10)*, May 31-June 4, 2010, in Barcelona, Spain. This conference was devoted to fostering the interaction between the SIAG/APDE and SIAG/DS with the Catalan and Spanish mathematical societies and RSME, SCM, and SEMA and the European applied mathematical community in general.
- The 5th SIAM Conference on APDE was held November 14-17, 2011 in San Diego, California, with a record 420 paid registrants, 8 plenary lectures include the Prize lecture, two Minututorials offered by Felix Otto and Benoit Perthame, and 110 minisymposia, over 4 days. The community responded exceptionally well to calls for participation by the conference organizers, resulting in a very successful conference.

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?

The SIAG/APDE organized a track of minisymposia for the 2010 SIAM Annual Meeting. There were 7 minisymposia directly organized by the activity group for the 2010 SIAM Annual Meeting.

More than a dozen minisymposia at ICIAM 2011 were organized by members of the SIAG/APDE (by Bauman, Baydil, Bocea, Choksi, Fonseca, Hauck, Kaper, Lipton, Meir, Muite, Neilan, Pego, Phillips, Shearer, Vixie, Zarnescu), although there was no coordination by the SIAG.

6. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and websites. Have each of these been active and successful? In the past three years, there have been two newsletters, in April 2009 and in February 2011.

The third *SIAG/Analysis of Partial Differential Equations Prize* was awarded at the 2009 SIAM Conference on Analysis of Partial Differential Equations in Miami, Florida, to **Chongsheng Cao** (Florida International University) and **Edriss Titi** (University of California-Irvine and Weizmann Institute of Science), for their paper “*Global Well-Posedness of the Three-Dimensional Viscous Primitive Equations of Large Scale Ocean and Atmosphere Dynamics*,” *Ann. Math.* 166 (2) (2007) 245-367. The prize was received by both Chongsheng Cao and Edriss Titi, and Edriss Titi delivered the prize lecture at a plenary session on Wednesday, December 9, 2009. The prize committee included Chair Patricia Bauman (Purdue University); Fang-Hua Lin (New York University); Ricardo Nochetto (University of Maryland); Michael Shearer (North Carolina State University); and Vladimir Sverak (University of Minnesota). More information can be found at <http://www.amsc.umd.edu/siam/prizes.html>

The fourth *SIAG/Analysis of Partial Differential Equations Prize* was awarded at the 2011 SIAM Conference on Analysis of Partial Differential Equations in San Diego, California, to **Gui-Qiang G. Chen** (Oxford University) and **Mikhail Feldman** (University of Wisconsin, Madison), for their paper “*Global solutions of shock reflection by large-angle wedges for potential flow*,” *Ann. Math.* 171 (2010) 1067-1182. Both recipients were present to receive the prize, and they jointly delivered the prize lecture at a plenary session on Wednesday, November 16, 2011. The prize committee included Chair Craig Evans (University of California, Berkeley), Acting Chair Stuart Antman (University of Maryland, College Park), Helge Holden (Norwegian University of Science and Technology), David Jerison (Massachusetts Institute of Technology), and Mary Pugh (University of Toronto). Craig Evans recused himself due to conflict of interest.

The current SIAG website is jointly maintained by SIAM administration and the group. It maintains a linked website <http://www.amsc.umd.edu/siam> at the University of Maryland at College Park, under the supervision of the current Vice Chair.

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

It is proposed that the SIAG/APDE meetings remain biannual, with the next one planned for **December 7-10, 2013**. The location is soon to be finalized in consultation with SIAM staff --- locations which have been suggested are Puerto Rico, Tampa, Orlando, Atlanta and Baltimore.

A track of minisymposia will be organized at the 2014 SIAM Annual Meeting. Chairs or Program Directors of the SIAG should contact the Annual Meeting organizers to ask about sponsorship of minisymposia by the SIAG/APDE, and should use the newsletter or email to solicit minisymposia from the membership.

Newsletters should be coordinated between the Chair and Secretary of the SIAG/APDE.

There has been considerable discussion at the 2011 SIAG Business Meeting and among SIAG officers in favor of establishing an additional SIAG/APDE prize or prize lecture. A number of proposals for named lectures or lecture series have been put forth: one in Fluid Mechanics and Applications (after Jean Leray); an Olga Ladyzhenskaya Lecture in PDE and Applications (by a female speaker); a series named after De Giorgi in elliptic PDE and applications; and a lecture on conservation laws and kinetic theory (after Ronald Diperna).

Continued communication with the SIAM membership to emphasize the benefits and low cost of joining the APDE/SIAG. Given the large number of student members of this SIAG, there could be a special officer for student relations. Moreover, officers should encourage Directors of Graduate Studies to alert students to SIAM and APDE membership possibilities. For example, it may not be well known to advisors in PDE style departments that there is funding available for student travel to conferences.

Continue to promote international joint meetings for one or more SIAGs together in order to foster joint international activities. The last two SIAG/APDE conference in December 2009 and November 2011 had significant participation from foreign institutions (about 28% in 2009). Several of these participants are already SIAG/APDE members. The SIAG/APDE successfully organized the Joint SIAM/RSME-SCM-SEMA Meeting on Emerging Topics in Dynamical Systems and Partial Differential Equations (DSPDEs' 10), May 31-June 4, 2010, in Barcelona, Spain. Similar efforts should be continued at reasonable intervals.

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

A great majority of the SIAG consists of academic members (85%), and the great majority of these are in departments of mathematical sciences (80%). SIAM may help by promoting the SIAG/APDE membership to its non-academic members and members who are from non-mathematical sciences departments. That would make the group more diverse in scope and goals, and may help their members to keep focus on innovations from emerging technologies from life and social sciences and statistical modeling.

A further avenue for promoting growth is through linkages to international organizations with whom SIAM maintains reciprocal agreements. Many such organizations have substantial numbers of members whose interests are closely aligned with SIAG/APDE, and perhaps a SIAG membership could be added as a free perk of Reciprocal Membership.

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

The APDE/SIAG does this by remaining an active organization, showcasing exciting new developments in the field. Awarding prizes is an important activity of our professional organization, and the SIAG/APDE prize has played its part in promoting SIAM interests. It will be very helpful to establish another SIAG/APDE prize as described above to achieve the goals.

The SIAG/APDE contributes an analytical vision to SIAM that focuses on the interactions of analysis with modeling and scientific computing. It comprises a broad group of active research scientists, 85% in academia, fostering the understanding of fundamental analytical issues for nonlinear models in the natural and social sciences. An attainable goal for SIAG/APDE is to nurture fruitful engagement between academics in applied analysis and numerical mathematics and innovative developing technologies at industry and research labs. Such interactions have the potential to increase the support of our community in terms of funding and also good will in favor of research and SIAM activities as a whole.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2013.

Signed Robert L. Pego, SIAG/APDE Chair, 2011-2012

On behalf of SIAG/APDE officers
Vice Chair: Konstantina Trivisa
Program Director: Edriss Titi
Secretary: Jerry Bona

May 25, 2012

Acknowledgments. We would like to thank Nancy Snell, Linda Thiel, and Susan Whitehouse for their contributions to this application, specifically the data graphics that were available to us for the Business meeting of November 2011, and the records of our activities available to us for the purpose of this application.