

## **SIAG Analysis of Partial Differential Equations Charter Renewal Application**

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Analysis of Partial Differential Equations. The SIAM Activity Group APDE was originally formed under the aegis of SIAM on March 26, 2003 by the SIAM Council and on December 7, 2002 by the SIAM Board of Trustees. Its initial operating period began April 2003 and ended December 31, 2004. Its charter has been renewed by the Council and Board ten times thereafter.

This SIAG has 738 members, including 427 student members, as of December 31, 2023.

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

It is the purpose of the SIAM Activity Group on Analysis of APDE to foster activity in the analysis of partial differential equations (APDE) and to enhance communication between analysts, computational scientists and the broad APDE 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 APDE;
- To increase conference activity in APDE;
- To enhance connections between the applications and analysis communities. In particular, to foster interdisciplinary research that stems from analysis of PDE.

Within the framework of SIAM, the SIAG will conduct activities that implement its purposes. The SIAG on APDE will undertake a number of activities, including:

1. **Organize a biennial SIAM Conference on Analysis of 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, Materials Science, Nonlinear Waves and Coherent Structures, and Computational Science and Engineering). 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. **Disseminate information.** The SIAG will maintain a website to facilitate the exchange of information (conferences, summer schools, job announcements) among its members and other interested parties
3. **Award the SIAG Analysis of PDEs Best Paper Prize** (established in 2005), awarded every two years to the author(s) of the most outstanding paper, as determined by the prize committee, on a topic in partial differential equations published in the four calendar years preceding the award year
4. **Award the SIAG Analysis of PDEs Early Career Prize** (established in 2020), awarded every two years to an early career researcher who has made outstanding, influential, and potentially

long-lasting contributions within six years of receiving the Ph.D. or equivalent degree as of January 1 of the award year. At least one of the papers containing this work must be published in English in a peer-reviewed journal or conference proceedings.

5. **Organize minisymposia at the SIAM Annual Meeting** in years where there is no SIAG conference.
6. At least once every seven 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.
7. 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. 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.

List all current officers of the activity group.

Chair: Björn Sandstede

Vice Chair: Marta Lewicka

Program Director: Donatella Danielli

Secretary: Sara Daneri

**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 SIAG APDE includes a diverse community whose members represent a range of fields related to partial differential equations. The SIAG fosters interactions between theory, computations, and applications. The field of PDEs continues to have huge scientific impact and visibility in the mathematical community. This can be seen also in the large number of papers on PDEs that appear in the *SIAM Journal on Mathematical Analysis*, and the recent advances on weak solutions of the Navier–Stokes equations for realistic pressure laws, for instance, for which Bresch and Jabin received the 2021 APDE Best Paper Prize further attest to the vitality of the field. The recent establishment of the APDE Early Career Prize demonstrates the continued influx of early-career researchers in this field. There have been many significant advances in recent years, especially through increased connections between PDEs and probability theory, the development of methods for hybrid (nonlocal) PDEs, in kinetic theory, and in applications to biology.

**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?**

The SIAG remains vibrant and very active. We have seen a slight decline of membership from a peak of 1056 in 2020 to 738 in 2023, but similar swings occurred in earlier years, and the SIAG remains the fifth largest across all SIAGs. It is exciting that the majority of members are students, which indicates that the subject remains active and timely. The SIAG is keeping up with changes in the field primarily through the conferences we organize: the invited speakers usually cover a broad range of topics, from applications to analysis and theory, and the minisymposia and contributed sessions are driven by submissions from the PDE community, thus ensuring broad participation. The SIAG APDEs reflects the broader interests of SIAM by connecting theoretical advances in the analysis of PDEs with a diverse range of application areas, thus ensuring that theoretical innovation finds its way to applications and, conversely, new questions emerging from applications are disseminated to applied mathematicians working on the analysis of PDEs.

**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 organized the PD22 as a virtual meeting during March 14-18, 2022. This meeting was attended by 522 participants, which is the largest number of attendees since the first APDE meeting in 2006, which was held jointly with the SIAM annual meeting. The conference was a huge success with 106 minisymposia centered around a broad range of topics.

**4. 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?**

We have not organized any minisymposia during the last three annual meetings, and the last APDE track at an annual meeting was organized during the AN16 meeting in Boston. Our plan is to organize an APDE track for the SIAM Annual Meeting in 2026.

*\*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. \**

**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?**

The two prizes awarded by the SIAG APDEs have been very active and successful. The 2021 Best Paper Prize was awarded to Didier Bresch and Pierre-Emmanuel Jabin for their work on weak solutions on the Navier–Stokes equations under more realistic pressure laws. The 2021 Early Career Prize was awarded to Giacomo Canevari for their work on the calculus of variations with applications to the mathematical modeling of liquid crystals.

Our other flagship activity (organized jointly by the SIAG and the SIAM J Math Anal) is the very active monthly SIAG APDE Webinar (see <https://sinews.siam.org/Details-Page/seminar-in-the-analysis-and-methods-of-pde>), which provides virtual talks from experts in PDE applications and their theory.

We also have an active website through which we disseminate information, though much of its function has now been moved to the SIAM Engage platform.

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

Our next conference is planned for Fall 2025. When the current officers assumed their positions in 1/2023, the plan was to hold the next meeting in Berlin (to make up for the fact that the PD22 meeting was envisioned as an in-person meeting in Berlin before it moved to virtual). However, we encountered numerous delays with obtaining a viable proposal from the Berlin organizers and now shifted (on the advice of Richard Moore) pursuing locations in the US or Canada for the Fall 2025 meeting. We also plan to organize an APDE track at the SIAM Annual Meeting in 2026 and will begin its organization once the location and dates for the AN26 meeting have been finalized. We also plan to continue the APDEs Webinar: we are currently in discussions with the Webinar Organizing Committee to decide whether we want to change the format and frequency of the webinar or keep the current format.

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

The main obstacle we faced was the back and forth with the Berlin proposers for the next APDE conference. Richard Moore facilitated these discussions and kept us well informed throughout the process: he did a great job! In the end, however, due to scheduling constraints and delays in getting concrete commitments from the universities in Berlin, the next conference will now be delayed by 6 months, which is not ideal. In hindsight, we could have changed to a different location earlier, but this was not clear at the time.

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

As mentioned above, the SIAG on APDEs connects applied mathematicians working on theoretical advances in the analysis of PDEs with those in the SIAM community who utilize PDEs in application areas.

The SIAG therefore facilitates knowledge dissemination by ensuring that theoretical innovations find their way to applications and, conversely, new questions emerging from applications are disseminated to applied mathematicians working on the analysis of PDEs. More generally, applied mathematics relies on the synergy between rigorous analysis, modeling, and computations: the analysis of PDEs is one of the classical areas where such synergy unfolds.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two- year operating period beginning January 1, 2025.

Signed,



Björn Sandstede