

## **SIAM Activity Group Geometric Design Renewal Application**

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Geometric Design. The SIAM Activity Group (SIAG/GD) to which this renewal applies was originally formed under the aegis of SIAM in 1989 by the SIAM Council and by the SIAM Board of Trustees with its initial operating period beginning July 1, 1989 and ending December 31, 1992. Its charter has been renewed by the Council and Board fourteen times thereafter.

This SIAG has 118 members, including 32 student members, as of December 31, 2023.

According to its rules of procedure, the objective of the SIAG is to provide an environment for interaction between researchers and practitioners in the subjects of computer aided geometric design, curve and surface design, solid modeling and manufacturing, volumetric representations, computer graphics, supercomputing and graphics, and related topics.

Its purposed functions:

1. Organize minisymposia at the SIAM Annual Meeting and ICIAM in years where there is no SIAG conference.
2. 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.
3. Organize a biennial SIAM Conference on Computational Geometric Design. 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. Other SIAG meetings may be organized only with the approval of the SIAM president and 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 (including advisory board, if relevant).

Chair: Hendrik Speleers  
Vice Chair: Lucia Romani  
Program Director: Yongjie Zhang  
Secretary: Daniel Gonsor

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?

Geometric Design (GD) focuses on the development of methods and algorithms for modeling, analyzing, and manipulating complex geometric shapes, surfaces, and objects. It offers fundamental tools to a wide range of scientific and engineering applications. Traditional application areas are computer graphics (creating realistic 3D models used in movies, games, and simulations), robotics (path planning and obstacle avoidance), and computer-aided design and manufacturing (developing 2D and 3D models of objects used in engineering, manufacturing, and product design). It also finds its way in other emerging areas such as biomedical applications (analyzing medical data, designing personalized medical devices, and simulating surgical procedures). These applications continue to provide fertile grounds for cultivating new research directions as could be witnessed at the GD conference in 2023. Examples of recent trends within GD are additive manufacturing (modeling of micro-architected materials), isogeometric analysis (streamlining geometric modeling and structural analysis), and geometric deep learning (machine learning for non-euclidean data).

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?

When looking over the last 15 years, the widespread use of geometric design and shifts towards new application areas led to a fragmentation of the field and this had a negative effect on the SIAG/GD membership. However, the membership has remained relatively stable over the past few years, with about 30% student members. The activity group has a diverse membership working in mathematics, engineering, and computer science departments. A relatively high portion is active in industry, which shows the real-world relevance of the field. This variety is beneficial for the interplay and the mutual exchange of ideas between academia and industry.

The latest GD conference in 2023 was part of the International Geometry Summit in Genoa, Italy, which was a joint venture between five major conferences (GD23, GMP23, SGP23, SMI23, SPM23) to showcase the breadth and the impact of applied geometry. Konrad Polthier, a former SIAG/GD chair, launched the first geometry summit in 2016, feeling the need to bring together various close and overlapping applied geometry conferences. With over 300 attendees, the symbiosis of the third edition of the geometry summit in 2023 was again successful. It helped increase conference attendance and visibility of the activity group within the wider applied geometry community. In the GD23 track, there were 3 invited speakers, 9 minisymposia, and several contributed sessions.

3. 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 Geometric Design organizes the biennial conference on Geometric Design.

The 2021 SIAM Conference on Geometric and Physical Modeling (GD/SPM21) was held virtually due to travel and contact restrictions. The different time zones in which the participants lived and missing social contacts during lunch and other breaks posed new challenges, but the excellent technical organization by SIAM staff helped to make the best out of it.

The 2023 SIAM Conference on Computational Geometric Design (GD23) was part of the International Geometry Summit (IGS23) in Genoa, Italy, with over 300 attendees and a large portion of young participants. This successful event invites repetitions in the future. However, it was not always easy to coordinate the different organizations involved in the geometry summit.

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?

*\*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. \**

The 2017 SIAM Conference on Industrial and Applied Geometry (GD17) was co-located with the 2017 SIAM Annual Meeting (AN17) in Pittsburgh, PA. In the GD17 track, there were 13 minisymposia.

A minisymposium on Automated Finite Element Analysis was organized at the 2018 SIAM Annual Meeting (AN18) in Portland, OR.

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 SIAG/GD has a webpage and a wikipage, which are maintained by the SIAM staff and the SIAG/GD officers, respectively: <https://www.siam.org/membership/activity-groups/detail/geometric-design> and [http://wiki.siam.org/siag-gd/index.php/Main\\_Page](http://wiki.siam.org/siag-gd/index.php/Main_Page). As with all SIAM activity groups, the SIAG/GD can be communicated with through the SIAM Engage portal, which is monitored and used to distribute and collect information.

An Early Career Prize has been set up in 2018 and has been awarded twice, to Mina Konaković Luković from MIT at the GD/SPM21 conference and to Martin Skrodzki from TU Delft at the GD23 conference.

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

The activity group is preparing for the forthcoming SIAM Conference on Computational Geometric Design in 2025, which will be co-located with the Third Joint SIAM/CAIMS Annual Meetings (AN25) in Montreal, Canada. Moreover, building further on the successful formula of the previous geometry summits (see item #2 above), we plan to let the GD conference to again be part of it in the 2027 edition.

We will continue to support junior members and award the SIAG/GD Early Career Prize. To stimulate their engagement in the SIAG/GD community, we are considering awarding SIAM membership as part of the award package. In addition, we would like to establish a SIAG/GD prize for senior researchers with outstanding lifetime achievements in the field of geometric

design and processing. One option to be explored more is placing the John A. Gregory Memorial Award (which currently has no institutional affiliation) under the umbrella of SIAM.

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

The GD conferences strongly profit from the financial management and organizational experience of SIAM, and its help in promoting the events. The SIAM Engage portal simplifies and encourages communication and collaboration among the SIAG/GD members and also interaction with other activity groups. We hope that SIAM can keep improving these resources. Further support for the continuation of the existing SIAG/GD Early Career Prize and the possible activation of a new prize would be welcome.

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

By maintaining a viable, vibrant SIAG with a healthy balance between academia, industry, government members and a strong student population.

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,

A handwritten signature in black ink, appearing to read 'H. Speleers', with a long horizontal flourish extending to the right.

Hendrik Speleers, SIAG/GD Chair

May 3, 2024