

SIAG Algebraic Geometry (AG) Charter Renewal

This CHARTER RENEWAL applies to the SIAM Activity Group on Algebraic Geometry (SIAG/AG). The SIAM Activity Group (or SIAG/AG) to which this renewal applies was originally formed under the aegis of SIAM on July 2009 by the SIAM Council and by the SIAM Board of Trustees with its initial operating period beginning January 1, 2010 and ending December 31, 2011. This charter was renewed by the Council and Board four times with the fourth term ending 12/31/17. As of 12/31/16 this SIAG had 333 members, including 150 student members.

According to its Rules of Procedure, the objective(s) of the SIAG are to provide a research community gathering point for research in applications of algebra and geometry. The activity group will welcome participation from both theoretical mathematical areas and application areas not on this list which fall under these broadly interpreted notions of algebraic geometry and its applications.

Its purposed functions were:

- (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 Algebraic Geometry. 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 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.

- 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/three] years?

Applied Algebraic Geometry is a growing field exploring new application areas where algebraic, geometric or topological techniques were successfully used. The core topic in our fields, including Numerical Algebraic Geometry, Algebraic Statistics and Biology, Applied Algebraic Topology,

Polynomial Optimization, and Multilinear Algebra, witness increasing interest from new application areas such as smart grid networks, chemical reaction networks, phylogenetics, quantum and string theory, neuroscience, genetics, machine learning.

Besides the core areas, we are also seeing a rapid expansion of new areas where significant development has been made during the past few years. The list of minisymposia at the next SIAM Algebraic Geometry Conference in 2017 shows a wide selection of new applications where algebraic/geometric/topological methods have been emerging, including:

Algebraic Computer Vision; Random Algebraic Geometry; Biological Interaction Networks; Rigidity Theory; Cryptology; Frame Theory in Signal Processing; Geometry of Materials.

- 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?

Presently, the SIAG/AG has around 333 members, steadily growing, starting from 250 in 2010; 281 in 2012, and 238 in 2014. Our membership includes 150 student members. High participation at our bi-annual conferences show vibrancy of our community. At the 2017 SIAM AG Conference in Atlanta we will have 106 minisymposia sessions on 41 topics, plus 4 sessions for contributed presentations, and we expect around 450 participants. This is up from 2015 (34 topics and 259 participants), 2013 (44 topics, 386 participants) and 2011 (29 topics, 307 participants). SIAG/AG keeps up with changes in the field by selecting a diverse group of researchers as plenary speakers at our conferences that reflect emerging trends in the field. Moreover, we are organizing thematic semesters at national research institutes and shorter workshops at various meetings that allow the exploration of new directions. The broader interests of SIAM are reflected in the variety of minisymposia organized by SIAG/AG members at the Annual SIAM Meetings that attracted wide interest from other groups within SIAM, breaking down the boundaries between disciplines and fostering multidisciplinary interactions.

- 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/AG organizes the biennial conference on Applied Algebraic Geometry.

- **SIAM Conference on Applied Algebraic Geometry (AG17)**, Georgia Tech, Atlanta GA, USA, July 31- August 4, 2017. 106 minisymposia sessions on 41 topics, plus 4 sessions for contributed presentations, and poster sessions. We expect around 450 participants and a very successful conference.
- **SIAM Conference on Applied Algebraic Geometry (AG15)**, NIMS, Daejeon, Korea, August 3-7 2015. 34 topics and 259 participants, slightly lower than previous years, yet considered a success given its location outside North America. The conference was a satellite of the International Congress on Industrial and Applied Mathematics (ICIAM 2015) held in Beijing on the following week, and some participants attended both conferences.

A list of past and future conferences, workshops and special programs that our members were/are involved in can be found at http://wiki.siam.org/siag-ag/index.php/Current_events

The list below shows meetings where our SIAG/AG members played significant organizational roles during the past 2 years:

- ***Polynomials, Kinematics, and Robotics: A conference honoring Charles Wampler***, University of Notre Dame, South Bend, IN, USA, June 5-7, 2017. A conference organized by members of the group on core areas of SIAG/AG
- ***Applied Algebra Days***, University of Wisconsin, Madison, April 29-May 1, 2016. This free NSF sponsored meeting was organized by some of our members, and presented topics in our core areas.
- ***Algebraic Vision***, American Institute of Mathematics, San Jose, California, May 2-6, 2016. This was a kick off meeting of an emerging new field co-organized by some of our members, a great success.
- ***Hausdorff Summer School on Economics and Tropical Geometry***, Bonn, Germany, May 9-13, 2016. This interdisciplinary summer school, organized by our members, had more than 40 participants, mostly students.
- ***AMS Mathematics Research Communities Program on Algebraic Statistics***, Snowbird, Utah, June 12 – 18, 2016. Our members organized a very successful one week conference on one of the core topics of the group.
- ***Summer School on Algebra, Statistics, and Combinatorics***, Aalto University, Helsinki, Finland, June 27-July 2, 2016. Our members co-organized and gave mini courses and invited lectures in the summer school.
- ***2016 Summer School on Real Algebraic Geometry and Optimization***, Georgia Tech, Atlanta, Georgia, July 11-15, 2016. This summer school was organized in one of our core areas and organized by our members. They had over 30 students.
- ***Chip Firing and Tropical Curves Summer Graduate School***, MSRI, Berkeley, California, July 25-August 5, 2016.
- ***Joint Statistics Meeting, Algebraic and geometry methods in inference - two decades of algebraic statistics***, Chicago, July 30-August 4, 2016. Session organized and chaired by our members featured several talks representing our group
- ***Computational Algebra and Applications of Algebra***, Buenos Aires, Argentina, July 25-29, 2016.
- ***Computational Algebra, Algebraic Geometry and Applications, A Conference in honor of Alicia Dickenstein***, Buenos Aires, Argentina, August 1-3 2016 Our core members organized and participated in this meeting.
- ***Applied Algebraic Geometry***, AMS Southeastern Sectional Meeting, North Carolina State University, Raleigh, NC, November 12-13, 2016. This special session represented our SIAG?AG at the AMS meeting, and was accompanied by one of the related plenary talks.
- ***Foundations of Numerical Algebraic Geometry***, AMS Western Sectional Meeting, University of Denver, Denver, CO, October 8-9, 2016. Core topic of our group, organized by our members.
- ***Combinatorial Algebraic Geometry Graduate Summer School***, Fields Institute, Toronto, Ontario, Canada, July 18-22, 2016. This was an introductory summer school followed by a thematic semester organized by some of our members.

- **Combinatorial Algebraic Geometry**, Fields Institute, Toronto, July-December 2016. This thematic semester was a great success, many of our members were long term participants, and the program hosted 10 postdocs and over 20 graduate students.
- **Joint Mathematics Meetings**, Atlanta GA, January 4, 2017. Our group organized 4 special sessions in our core areas:
 - o **Gaussian Graphical Models and Combinatorial Algebraic Geometry**,
 - o **Theory and Applications of Numerical Algebraic Geometry**,
 - o **Applications of Algebra, Geometry, and Topology**,
 - o **Algebraic Statistics** (AMS Mathematics Research Communities Session)

- 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?

At the 2016 SIAM Annual Meeting and the SIAM Conference on the Life Sciences our group organized minisymposia on 6 topics. Furthermore, 2 of the invited plenary talks were given by our members on topics that are part of our core areas.

At the 2015 ICIAM, SIAG/AG members organized 4 minisymposia sessions on 1 topic, and an 8 sessions workshop embedded in the conference. Note that in 2015, SIAG/AG also had its biannual conference.

- 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/AG sponsors the following activities:

- *SIAM Journal on Applied Algebra and Geometry*, established in 2016. The first issue was published in 2017.
- *Early Career Prize*, established in 2016, is awarded every 2 years. The first prize will be awarded at SIAM AG 2017.
- *Newsletter*, delivered every month
- *Wiki page* listing all current events, job postings and books by our members.
- *We published the following articles in the SIAM News:*
 - *3-part series article in the SIAM news, in the April, May and June 2016 issues, entitled "Applied Algebra and Geometry: A SIAGA of Seven Pictures", by Anna Seigal*
 - *Front page story in the October 2015 issue of the SIAM News, entitled "Biologically inspired linkage design: Computing form from function", by J.D. Hauenstein and J.M. McCarthy*

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

- **International Congress on Mathematical Software (ICMS 2018)**, University of Notre Dame, South Bend, IN, USA, July 24-27, 2018. The conference is organized by some of our members.
 - **SIAG/AG Track at SIAM AN18 in Algebraic Geometry**
 - **Nonlinear Algebra**, Thematic Program, Institute for Computational and Experimental Research in Mathematics (ICERM), Providence, RI, Fall 2018. The program will coversome of our core areas, will have students and postdocs participating, and our members are the organizers and some of the long term participants.
 - **SIAM Conference on Applied Algebraic Geometry (AG19)**. We are presently soliciting proposals for a location for the conference.
- How can SIAM help the activity group achieve its goals?

SIAM has been very supportive with our activities, and we hope that our charter renewal application will be successful.

For the future, our community would like to have more presence in the general SIAM governance. We have a diverse and vibrant community of top notch researchers who are ready to volunteer in various roles throughout SIAM. Our increased participation in SIAM governance would build connections between our community and other SIAM groups and would allow our group to be an integral and contributing part of the general SIAM initiative.

- How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?
 - *Increase visibility via high quality publications in SIAM's new journal, the SIAM Journal on Applied Algebra and Geometry, which features exceptional research at the interface of pure mathematics (algebra, geometry and topology) and applied sciences (statistics, biomath, computer science, optimization, etc.)*
 - *Promote an application oriented view in foundational mathematical research. Our group's founding principle is to harness the rich algebraic structures that are discovered while trying to solve problems in various application areas.*
 - *Raise new generations of researchers who can converse between various fields of mathematics and other areas of science and engineering. Our community has a strong commitment of graduate student training and postdoc mentoring that integrates pure mathematical education with interdisciplinary research, breaking communicational barriers between different fields of sciences.*

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two year operating period beginning January 1, 2018-December 31, 2019.



Agnes Szanto, Chair of the SIAG on Algebraic Geometry

April 7th, 2017.