

SIAM Activity Group on Nonlinear Waves and Coherent Structures Charter Renewal Application

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Nonlinear Waves and Coherent Structures. The SIAG/NWCS 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 with its initial operating period beginning January 1, 2003 and ending December 31, 2005. Its charter has been renewed by the Council and Board six times thereafter.

This SIAG had 289 members, including 131 student members and 158 non-student members as of 12/31/2019.

According to its Rules of Procedure, the purpose of the SIAG is to foster activity in the area of Nonlinear Waves and Coherent Structures. Its goals are:

- To foster collaborations among applied mathematicians, physicists, fluid dynamicists, engineers, biologists, and economists in those areas of research related to the theory, development, and use of nonlinear waves and coherent structures.
- To promote and facilitate Nonlinear Waves and Coherent Structures as an academic discipline.

The SIAG on NWCS will promote and facilitate research in the area through a variety of activities, including:

1. Organize a biennial SIAM Conference on NWCS. The SIAG also will consider dovetailing specialized workshops and conferences with the SIAM Annual meeting. In particular, it is planned to have the biennial meeting alternate loosely between university-style meetings, ones dovetailed with SIAM Annual Meetings, and joint meetings with other SIAGs.
2. Broker partnerships between academia, industry, and government laboratories. The SIAG will seek to facilitate the establishment of academic programs in NWCS to foster its development as an academic discipline. The SIAG also will facilitate the placement of undergraduate and graduate students in internships in industry and government laboratories.
3. The SIAG will work with other professional societies to promote NWCS. For example, SIAM and another society might organize a workshop on a topic of mutual interest. The SIAG also would attempt to increase government support for NWCS through various outreach activities.

Other activities may include:

4. Organize minisymposia at the SIAM Annual Meeting in years where there is no SIAG conference.
5. 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 SIAM meeting. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG chair.

6. 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.

7. Award of the biennial Martin Kruskal Lecture Prize, established in 2012.

8. Award of the biennial T. Brooke Benjamin Prize, established in 2016.

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,

Chair: Beatrice Pelloni

Vice Chair: Katie Oliveras

Program Director: Andre Nachbin

Secretary: Barbara Prinari

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 study of nonlinear waves and coherent structures, as a sub-discipline of applied mathematics, remains a very strong, diverse and active area with a wide range of relevant applications and deep mathematical foundations. The health of the field is testified by the large number of field-wide national and international conferences that, in addition to the biannual SIAM conference on Nonlinear Waves and Coherent Structures, regularly take place in the US and abroad. It is also worth mentioning the increasing number of special sessions organized by activity group members as part of larger professional meetings, such as the AMS sectional conferences or the ICIAM. An area that has been attracting more and more attention in the last couple of years is the field of dispersive hydrodynamics, which has emerged as a unified mathematical framework for the description of multiscale nonlinear wave phenomena in dispersive media, encompassing both dynamic and stochastic aspects of wave propagation. Some newer featured areas of interest at the 2020 SIAM Conference on Nonlinear Waves and Structures (Andre Nachbin and Jens Rademacher, co-chairs) include nonlinear waves in traffic flow, as well as the use of partial differential equations as models in climate and geoscience. Traditional areas of interest such as stability analysis of nonlinear waves, integrable systems and soliton theory, and applications in water waves, low temperature physics and Bose-Einstein condensation, granular media, and nonlinear optics remain of fundamental importance to the activity group.

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?

The size of the activity group is more or less stable around 300 members, growing some during the years of the biannual NWCS conference (at the end of 2018, for instance, it peaked at 330 members), and decreasing a bit in the off years (it was 289 at the end of 2019, and it might grow again a bit in 2020, if not impacted by the current worldwide health crisis). Although it is one of the smallest of the SIAGs by membership, a recent trend is an increase in the number of student members (from 100 to 141 between 2015 and 2017, and up to 152 in 2019). We have also made an effort to increase the number of members from developing countries, highlighting the benefits of the SIAM outreach membership in our 2019 newsletter.

The SIAG attempts to keep up with changes in the field primarily through soliciting plenary lectures or minitutorials at the biennial meeting that relate to new or emergent areas of interest. Another activity that aims to enhance the interest in nonlinear waves for young researchers and/or students is the organization of a “hot topics” session at the biennial meeting. Although the fraction of SIAG NWCS members from industry or government labs is low compared to other SIAGs, a deliberate attempt is made to have representation from these sectors in prominent roles of organization and/or presentation at the biannual meeting.

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 NWCS organizes the biennial conference on Nonlinear Waves and Coherent Structures.

Since 2004 the SIAG NWCS has been organizing the biannual conference on Nonlinear Waves and Coherent Structures. The complete list of NWCS conferences may be found at: <http://www.siam.org/meetings/archives.php#nonlinearwaves>.

The most recent conference sponsored by the SIAG was the 2018 SIAM NWCS (NW18), held from June 11 - 14 in Orange County California with 224 people attending. The co-chairs of the conference were Matt Johnson (University of Kansas, US) and Todd Kapitula (Calvin College, US). The meeting had 224 registered participants, which is close to the historical median and to the number of attendees of the previous one (253 at the Philadelphia meeting in 2016). The conference featured a poster session, the presentation of two awards (Michael Weinstein, from Columbia University received the Kruskal prize, and David Ambrose, from Drexel University, received the Benjamin prize), a panel on hot topics, as well as several mini-tutorials. A highlight of the conference was the Minitutorial “Phantom Jams and Nonlinear Waves in Traffic Flow - Theory and Practice”. The tutorial was organized by Benjamin Seibold (Temple University) and Daniel B. Work (Vanderbilt University) blending perspectives from applied mathematics and civil engineering. The mini-tutorial introduced various mathematical models in traffic flow theory, simulation tools, and many perspectives on data collection, traffic flow control in reality, traffic experiments, legal constraints, and cultural considerations. Audience members were able to download real data and simulate traffic flow using Matlab as part of the tutorial. Feedback received via 56 responses to the post-conference evaluation form included several suggestions for the improvement of future NWCS conferences. There were two recurring themes: avoiding similar topics during concurrent parallel sessions, and making the poster session more significant, possibly by increasing its size and appeal. The officers have discussed how to address increasing the number of participants during the poster session. Suggestions have ranged from creating an award for the best poster to encouraging presenters to also submit as poster as well.

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-NWCS maintains an email mailing list, which is moderated by SIAG Secretary Barbara Prinari. In 2018, the SIAG introduced a newsletter for members of the activity group which aimed at highlighting research and activities of members, as well as communicating upcoming opportunities. The second issue of the newsletter was distributed to the membership of the SIAG via the mailing list in December 2019. The current leadership would be very happy to assist in transferring the templates and other materials for preparing the newsletter to the next set of officers. The SIAG regularly awards the Martin J. Kruskal Prize/Lecture as well as (since 2016) the T. Brooke Benjamin prize, which is specifically targeted at honoring the achievements of mid-career researchers.

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

The biggest task of the SIAG is the sponsorship of the biannual SIAM Conference on Nonlinear Waves and Coherent Structures, and in the next period this will concern the 2022 meeting. The 2019 newsletter solicited members to propose a location for NWCS22, with a deadline of May 31, 2020. In the newsletter we stressed that since SIAM leadership has declared that no two consecutive SIAG meetings can be abroad, we will need a US location for NWCS22.

Unless the current extraordinary circumstances force SIAM to cancel or propose the upcoming NWCS conference in Bremen, Germany; at the business meeting in July, members will discuss proposals regarding NWCS22's location. In any case, it is important that the next location reflects the interest of the broader SIAG membership. The SIAG also wishes to continue with the production of a regularly published newsletter, which was already expanded compared to its first issue, and which we hope to enhance in the future with new features. Other ideas include the use of social media such as a Twitter feed to update and modernize the way the SIAG communicates with its members and/or advertises its services to potential members. Another idea that was also proposed previously would be the initiation of a SIAG blog, which could possibly absorb and enhance the function of the newsletter in the future.

The activity group will also organize a track of minisymposia at the 2021 SIAM Annual Meeting (AN21), which will likely be held in Spokane, WA, Jul 19-23. Tom Trogdon, University of Washington, will be the designated SIAG member of the AN organizing committee.

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

SIAM could sponsor a new SIAM journal on Nonlinear Waves and Coherent Structures. Such a journal with the SIAM masthead could help to further promote the scientific activity of the SIAG, which could in turn increase membership. There are other venues in the SIAM journal system for different types of papers written by SIAG members (e.g., SIAM Journal on Mathematical Analysis for more mathematically-oriented papers on partial differential equation models, or SIAM Journal on Scientific Computing for numerical simulations of nonlinear waves) but there is no coherent publication home for the SIAG within SIAM.

8. How can the activity group help SIAM in its general role of promoting nonlinear waves and coherent structures?

Members of the SIAG could help SIAM promote the general area of nonlinear waves research by writing and/or proposing articles for SIAM News, or in the case of longer and more detailed articles, SIAM Review. Otherwise, the SIAG could maintain its efforts to make the biennial conference and other SIAG activities relevant to student members so that they remain active in SIAM when they become professionals.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two year operating period beginning January 1, 2021.

Signed,

Beatrice Pelloni, SIAG/NWCS Chair

21 April 2020