

**SIAG Dynamical Systems (DS)**  
**Charter Renewal Application**

The SIAG/DS was formed under the aegis of SIAM by the SIAM Council on December 2, 1988, and by the SIAM Board of Trustees on December 3, 1988. Its initial operating period began January 1, 1989, and ended December 31, 1991. Its charter has been renewed by the Council and Board every two years thereafter.

In accordance with the Rules of Procedure, the SIAG/DS aims to bring together researchers interested in the theory and applications of dynamical systems. Interests can range from fundamental mathematics of dynamical systems to the development of software for use in the study of dynamics, to applications in disciplines such as physics, chemistry, engineering, and the life sciences. The activities of the SIAG are designed to foster interactions between the academic community and researchers in industry and government laboratories, and to stimulate cross-disciplinary activities among people with similar interests but often different backgrounds. The SIAG had 1354 members as of 12/31/22 and of those 631 were students.

The SIAG/DS is currently responsible for the following activities:

- Organize a biennial Activity Group meeting (SIAM Conference on Applications of Dynamical Systems);
- Sponsor the Jürgen Moser Lecture at the biennial Activity Group meeting by an individual who has made distinguished contributions to nonlinear science;
- Award the J.D. Crawford Prize at the biennial Activity Group meeting to an individual for a recent outstanding publication on a topic in dynamical systems and nonlinear science;
- Award the "Red Sock" Prize at the biennial Activity Group meeting for up to four poster presentations in dynamical systems by students or postdocs at the meeting;
- Organize minisymposia at the SIAM Annual Meeting in years when there is no Activity Group meeting;
- 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; and
- Maintain and enhance the Dynamical Systems Web portal DSWeb (<http://www.dynamicalsystems.org/ap/ca/>) for members of the Activity Group and the public at large.

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The SIAG complements SIAM's activities and supports its 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, Emily Stone  
Vice Chair, Andrew Bernoff  
Program Director, Margaret Beck  
Secretary, Robert Marangell

Advisory Board  
Elizabeth Bradley  
Barbara Gentz  
Aric Hagberg  
Christian Kuehn  
Yasumasa Nishiura

- **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 program for DS21 gives a good overview of research done by those in the SIAG, which is very diverse and ranges from pure mathematics to engineering applications and everything in between. The traditional topics are well represented, including, but not limited to: multiple scale and perturbation analysis, nonlinear waves, stochastic systems, non-smooth dynamics, spatially extended systems: lattices, networks and PDEs, self-organization, applications in the life sciences (e.g. cardiac dynamics, dynamics at the cellular level and neuroscience), topological data analysis, bifurcation analysis, Hamiltonian systems, and chaos.

New areas are constantly being explored and developed. On the SIAG meeting program, COVID 19 models and infectious disease dynamics feature prominently, as might be expected.

A significant move into the modeling of climate and ecosystems is evident and also timely. Another thread throughout the meeting is the development of the interaction between data science and dynamical systems, e.g. use of data science techniques on analyzing dynamical systems, the theory of machine learning, reservoir computing, to name a few. Another interesting track for the future is the use of computer-assisted proofs for infinite dimensional dynamical systems. As usual, this SIAG and Dynamical Systems, in general, is very multi-disciplinary and applications driven, with the development of the theoretical and applied areas intertwined, each one informing the other.

- **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?**

SIAG/DS is the third largest of the SIAM activity groups, and it forms a strong and vibrant community that is fostered by the SIAM infrastructure for meetings and publications, and communication. Its membership is stable with over 700 non-student members and more than 600 student members. Dynamical systems by its very nature is inherently interdisciplinary, and our membership has strong ties with other activity groups including Life Sciences, Nonlinear Waves and Coherent Structures,

Mathematics of Planet Earth, Analysis of Partial Differential Equations, and most recently Data Mining and Analytics. Our membership is international and spans industry, government, and academia.

- **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.**

This SIAM conference is generally accepted to be the most important international conference in applied dynamical systems. Attendance has grown steadily over the years since its inception in 1988, with DS19, with 1009 in attendance, was our largest meeting ever.

The location of the conference in Snowbird, UT, has been a source of perennial debate. Size limitations, lack of dining option and high elevation, vs. secluded setting, and visibility of having the conference repeatedly at the same and well-known location, were the main points of the argument. At DS19, it was decided to move the conference to an urban setting, namely Portland, Oregon. However, COVID-19 has postponed that move.

We have organized DS 21 under the extraordinary circumstances of the covid-19 pandemic, and it will be operating fully virtually on the SIAM-chosen vFairs conference platform. In addition to the usual activities of invited presentations, minisymposia, contributed talks, contributed posters, the business meeting, Red Sock Awards, and the Crawford and Moser Prizes, the conference will include several unique features. First, the daily activities will take place during time blocks that rotate throughout the week to allow for as many participants as possible around the globe to participate synchronously in the events. All events will be recorded for later viewing for those who are not able to attend in real-time. In addition, the meeting will contain a panel discussion on applying for NSF grants and two mentoring sessions scheduled at separate times to ensure that anyone who wants can participate in real-time, regardless of time zone. We hope that the structure and content of DS 21 reflects the commitment of the SIAG leadership and the conference organizers to promote both research and community during these very difficult times.

- **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?**

The SIAG last organized a track at SIAM AN18, with six minisymposium comprising 8 sessions. In the past 2 years, while the SIAG had no formal participation, the membership was well represented through conference attendance.

- **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 DSWeb portal, which includes the periodical Dynamical Systems Magazine, has been highly successful as a promoter of dynamical systems, and as a site to advertise open positions and upcoming workshops, as well as report on research groups and important

conferences and provide tutorials. Book reviews, editorial opinions, and vignettes of members, graduate students, and early career researchers are also featured on the site.

- There is an active @DynamicsSIAM twitter account, with more than 5,700 followers as of May 2021.
  - An active Facebook group with over 800 followers (up from ~630 in Jan 2020) is maintained.
  - The SIAG/DS has a strong and healthy relationship with SIAM News; Hans Kaper is its editor-in-chief and is a long-standing active member of our activity group.
  - The SIAG/DS gives out three awards at its biennial meeting:
    1. The Jürgen Moser Lecture, established in 2000, is awarded to a person who has made distinguished contributions to dynamical systems or nonlinear science. The prize consists of a special lecture along with a cash prize. The 2019 Moser Lecture will be given to Lai-Sang Young for sustained and deep contributions to the theory of non-uniformly hyperbolic systems.
    2. The J.D. Crawford Prize, also established in 2000, is awarded to a person for a recent outstanding publication on a topic in dynamical systems and nonlinear science, as evidenced by a publication (in English) in a peer-reviewed journal within the last four years. The 2021 J.D. Crawford Prize will be awarded to Professor Igor Mezic for his outstanding work on the development of theory, tools, techniques and applications based on the Koopman operator.
    3. The Red Sock Award, elevated to the status of a recognized SIAM prize in 2012, is awarded for the best poster presentations in dynamical systems by a student or postdoc. This award contributes to the success of the poster sessions at the conference, which are engaging, very well attended, and a positive experience for all those involved. The poster sessions are where networking occurs, and collaborations are built.
- **What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.**

With the uncertainty in holding public events imposed by COVID, no additional activities have been planned for the period of this charter. Organizing DS23, with its move to Portland, Oregon (postponed from DS21), with potentially a hybrid format, will make up the bulk of the work for the officers during the period.

We would like to organize a track at the Annual Meeting soon, with a focus on the overlapping areas of dynamical systems and data science. This track could lead to further interaction between industry, and the different SIAGs, with our group.

Continued support and expansion of our social media presence is part of our commitment to be an information nexus for the dynamical systems community around the world. Beyond

Facebook and Twitter, we hope to move into more social media platforms such as Instagram and TikTok, and suggest below the creation of a Social Media officer position for the SIAG.

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

As of right now, SIAM Engage only allows for dues-paying members of the SIAG to post directly. We would like to request that members of other activity groups also be allowed. This would reduce some redundant steps for the moderator of the discussion board.

The officers also believe that going to an unmoderated discussion board is not a good idea and request that the secretary be retained as moderator.

We would also like SIAM to consider adding another officer to the group; dedicated to maintaining and expanding our social media presence. The current secretary is in charge of overseeing the existing DSWeb portal with its periodical Dynamical systems magazine, as well as moderating SIAM Engage. Another position in charge of overseeing, coordinating, and expanding our social media accounts would lend stability to that side of the operation.

Feedback from the Moser prize selection committee:

It was requested that the creation of a nomination committee be considered. This would be separate from the prize selection committee and would actively solicit nominations. The committee felt that this would be very valuable, and they noted that such a nomination committee exists in other SIAGs.

The committee also suggests that the letter writers be given more direction on the Moser webpage. Several letter writers didn't understand what the prize was about (e.g. some thought they were asked if the nominee was good enough to give a lecture at SIAM) and didn't understand that letters should discuss the merits of the research of the individuals in details, citing evidence where possible (some letters were extremely brief). Finally, the committee recommends that self-nominations not be allowed.

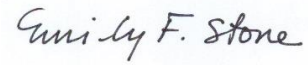
- **How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?**

We will continue to promote dynamical systems and more broadly applied and computational sciences through DSWeb, our presence in social media, and through our contributions to SIAM news. Our large biannual meeting hosts members from all over the country, and the world. It is a melting pot of different application areas and mathematical techniques, leading to a great cross-fertilization of ideas that can, in turn, generate innovative collaborations and projects. The interdisciplinary nature of dynamical systems naturally makes our SIAG a community of ambassadors to the mathematical world. Through our events and publications, we are committed to building and supporting these bridges to other areas of mathematics and the sciences.

We are also committed to supporting students and early career researchers with special events at our meeting (red sock award, mentor sessions, special panel discussions). Developing the expertise of our membership, as well as increasing the size, is part of our mission. In the future, we will explore more ways to encourage the participation of underrepresented groups in our field, and continue to develop diversity in our membership and our leadership.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2022.

Signed

A handwritten signature in cursive script that reads "Emily F. Stone". The signature is written in black ink on a white background.

Emily Stone, Chair of the SIAG on Dynamical Systems

Date: 5/13/2021