

## CHARTER

### SIAM Activity Group (SIAG) on Dynamical Systems (SIAG/DS)

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 980 members as of 12/31/14 and of those 318 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.

\*\*\*

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.

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/three] years?

Advances in dynamical systems most identified with the SIAG/DS, and its associated journal and conference, include fundamental advances in theory as well as dissemination of these ideas

in a wide range of application areas. Growth areas over the last few years include geophysical applications and mathematics of the planet Earth, coherent structures, network dynamics, applications to social sciences such as decision-making and crime hotspots, topological data analysis, dynamics of materials, stability and dynamics of power grids, especially due to future changes due to renewable energy generation, energy harvesting, multiscale and multiple time scale models in various science and engineering applications, complex networks, and dynamics of individualized medicine, among many others.

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 activity group is healthy and energetic. The nonstudent membership has remained stable, at about 700 since 2009. We have recently seen a drop in student memberships from over 600 at the peak in 2011 to about 300 now. This may be due to lack of information. Members were reminded at DS15 of the benefits to students of activity group membership, and that they are allowed to register two student members each.

Many members of the SIAG/DS are involved with broader SIAM activities. Hans Kaper is Editor-in-Chief of SIAM News, and Evelyn Sander is the SIAM News Representative from SIAG/DS. Sander is also the Research Spotlight Editor for SIAM Review. Mary Silber and Chad Topaz are Editorial Board members of the Education Section of SIAM Review. Tasso Kaper is a member of the SIAM Journals Committee.

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/DS has sponsored the SIAM Conference on Dynamical Systems in odd-numbered years since 1995, and has convened at Snowbird, UT since then. The 2015 Snowbird meeting DS15 had over 700 attendees. The meeting is highly successful and well-regarded in the discipline. Creative scheduling measures have been implemented to help manage growth in attendance over the years. There is a continuing discussion at the biannual business meeting concerning the future of the venue. The main problems are with the site, due to its limited size, relatively expensive dining options, and altitude for some attendees, but no better options have been presented despite some exploration with the help of SIAM.

4. Please indicate the number of minisymposia directly organized by the activity group at the two SIAM Annual Meetings. When did the SIAG last organize a track of minisymposia at an annual meeting?

Lennaert Van Veen was the SIAG/DS representative on the Organizing Committee for SIAM AN14 in Chicago. He was responsible for organization of the following sessions:

Tuesday, July 8:

MS 36: Experimental Nonlinear Dynamics I (organizer: Eberhard Bodenschatz)  
Low Energy Cardiac Defibrillation by Stefan Luther  
Capillary Fracture by Karen Daniels  
Nonlinear Waves and Wave Turbulence by Nicolas Mordant  
Inertial Particles in Turbulence, Caustics and Collisions by Gregory Bewley

Plenary: Pattern Recognition with Weakly Coupled Oscillatory Networks by Katharina Krischer

MS 52: Rigorous Computations for Nonlinear PDEs (organizer: Jean-Philippe Lessard)  
Rigorous Computations for Nonlinear PDEs: An Introduction by Jean-Philippe Lessard  
Rigorous Computation of Connecting Orbits by Jan Bouwe Van Den Berg  
Rigorous Computation: A Bifurcation Diagram for a Reaction Diffusion System and a New Framework for Tridiagonal Dominant Operators by Maxime Breden  
Rigorous Computation of a Bifurcation Diagram for the Ohta-Kawasaki Model by J.F. Williams

Wednesday, July 9:

MS 67: Equivariant Dynamics in Biological Systems (organizers: Luciano Buono and Yunjiao Wang)  
Network Symmetry and Binocular Rivalry Experiments by Casey Diekmann  
On the Effect of Pinwheels Network Symmetries on Orientation Tuning in Primary Visual Cortex by Pascal Chossat  
Spontaneous Symmetry-Breaking in Neural Morphology by Yuichi Sakumura  
Symmetry and Bifurcations in First-order PDEs with Nonlocal Terms Modelling Animal Aggregation by Pietro-Luciano Buono

MS 83: Application of Topological Ideas for Understanding Complex Dynamics (organizers: Hiroshi Kokubu and Konstantin Mischaikow)  
Reconstructing Manifolds and Functions from Point Samples by Vidit Nanda  
Word Representations of Structurally Stable Hamiltonian Flows in Multiply Connected Domains and its Applications by Takashi Sakajo  
Persistence Modules and their Applications to Material Sciences by Yasuaki Hiraoka  
Analyzing the Dynamics of Pattern Formation in the Space of Persistence Diagrams by Miroslav Kramar

Thursday, July 10:

MS 99: Stochastic Dynamical Systems and their Applications (organizers: Xingye Kan and Jinqiao Duan)  
A Multi-Time-Scale Analysis of Stochastic Chemical Reaction Network by Xingye Kan  
Deterministic Quantities for Understanding Stochastic Dynamics by Jinqiao Duan  
Fokker-Planck Equations for Stochastic Dynamical Systems with Symmetric Levy Motions by Xiaofan Li  
DiPaola-Falson Formula and Marcus Integral for Stochastic Dynamical Systems under non-Gaussian White Noise by Xu Sun

Friday, July 11:

MS 125: Computational Dynamical Systems Analysis (organizer: Willy Govaerts)

Recent Progress in MatCont Development by Iouri Kouznetsov  
(Parallel) Auto and Applications: Past, Present and Future by Bart E. Oldeman  
Numerical Analysis of Travelling Waves in Neural Fields by Hil Meijer  
Analysis of Nonsmooth Systems: Perspectives and Directions by Petri T. Piiroinen

MS136: Experimental Nonlinear Dynamics II (organizers: Eberhard Bodenschatz and Lennaert van Veen)

Honeybee Nest Ventilation: a Bio-robotic Study of Collective Flapping Wing Fluid Mechanics  
by Nick Gravish

The Eukaryotic Chemotaxis and the Actin System by Eberhard Bodenschatz

Propagating Waves Structure Spatiotemporal Activity in Visual Cortex of the Awake Monkey  
by Lyle Muller

Distribution of Directional Change as a Signature of Complex Dynamics by Stas Burov

In addition, there are several dynamical systems-related sessions planned for ICIAM 2015 in Beijing.

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 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. Book reviews and editorial opinion are also featured on the site.

The SIAG/DS gives out three awards at its biennial meeting.

- 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, recently increased to \$5000 with the help of SIAM. The 2015 Moser Lecture was given by John Guckenheimer of Cornell University.
- 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 2015 J.D. Crawford Prize was awarded to Florin Diacu of the University of Victoria.
- The Red Sock Award, elevated to the status of a recognized SIAM prize in 2012, is awarded for the best poster presentation in dynamical systems by a student or postdoc. Four winning posters are selected at the conference. The award consists of a pair of red socks and a cash prize. The Red Sock Award winners at DS15 were Veronica Ciocanel (Brown University), Ryan Goh (University of Minnesota), Lucas Lin (Thomas Jefferson High School, Fairfax, VA) and Glenn Young (University of Pittsburgh).

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

One of the important activities will be planning for DS17, the biennial Conference on Dynamical Systems. During 2016, committees will be organized for selection of the 2017 Moser and Crawford prizes, as mentioned above. Continuation of the high quality reputation of DSWeb will be an important priority.

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

The financial support for the monetary portions of the Moser and Crawford Prizes and the Red Sock Awards is very helpful.

The SIAG/DS relies on continuing technical support from SIAM for the DSWeb portal.

The assistance of SIAM will be appreciated in evaluating possible future alternatives to the Snowbird venue for the Conference on Dynamical Systems.

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

The SIAG/DS is one of the more interdisciplinary within SIAM, and supports exposure to outside disciplines through the choice of plenary speakers and minisymposium speakers at the Snowbird conference.

The DSWeb portal is a very successful ambassador of dynamical systems, and mathematics in general.

A tradition that began with the DS11 meeting and continues to date is the "In Memoriam" display, to commemorate the passing of important pioneers of the dynamical systems community. Past honorees included Jerold Marsden, Floris Takens, and Jaroslav Stark, and David Broomhead was so honored at DS15.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2016.

Signed

Timothy Sauer, SIAG Chair

May 26, 2015