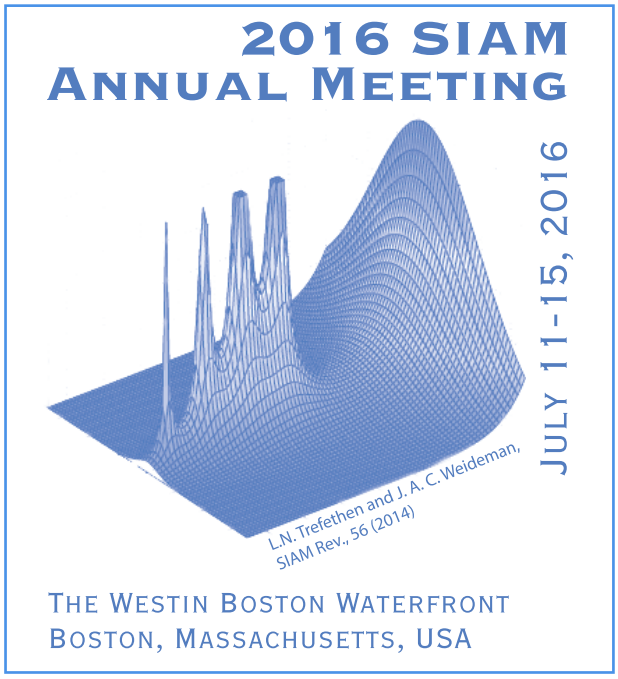
Final Program



Art courtesy of Bourouiba, Gourley, Liu and Wu, SIAP 71-2

The SIAM Conference on the Life Sciences is

sponsored by the SIAM Activity Group on Life Sciences (SIAG/LS)

The SIAM Activity Group on the Life Sciences was established to foster the application of mathematics to the life sciences and research in mathematics that leads to new methods and techniques useful in the life sciences.

The life sciences have become quantitative as new technologies facilitate collection and analysis of vast amounts of data ranging from complete genomic sequences of organisms to satellite imagery of forest landscapes on continental scales. Computers enable the study of complex models of biological processes. The activity group brings together researchers who seek to develop and apply mathematical and computational methods in all areas of the life sciences. It provides a forum that cuts across disciplines to catalyze mathematical research relevant to the life sciences and rapid diffusion of advances in mathematical and computational methods.

AN16/LS16 Mobile App

Scan the QR code with any QR reader and download the TripBulder EventMobile™ app to your iPhone, iPad, iTouch, or Android devices. You can also visit ***www.tripbuildermedia.com/apps/siam2016events***

Society for Industrial and Applied Mathematics

3600 Market Street, 6th Floor

Philadelphia, PA 19104-2688 USA

Telephone: +1-215-382-9800 Fax: +1-215- 386-7999

Conference E-mail: meetings@siam.org

Conference Web: www.siam.org/meetings/

Membership and Customer Service: (800) 447-7426 (US & Canada)
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www.siam.org/meetings

General Information

Table of Contents

Annual Meeting Organizing Committee

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Purdue University, USA

Mary Silber
University of Chicago, USA

Organizing Committee

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Sandia National Laboratories, USA

Carlos Castillo-Chavez
Arizona State University, USA

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Microsoft Research, USA

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The University of Manchester, United Kingdom

Life Sciences Organizing Committee

Organizing Committee Co-chairs

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Samuel Isaacson
Boston University, USA

Organizing Committee

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(AN16 liaison)

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John Tyson
Virginia Tech, USA

Guo-Wei Wei
Michigan State University, USA

SIAM Registration Desk

The SIAM registration desk is located on the Concourse Level of the Westin Boston Waterfront. It is open during the following hours:

Sunday, July 10
2:00 PM - 8:00 PM

Monday, July 11
7:00 AM - 4:30 PM

Tuesday, July 12
7:30 AM - 4:30 PM

Wednesday, July 13
8:00 AM - 4:30 PM

Thursday, July 14
8:00 AM - 4:30 PM

Friday, July 15
8:00 AM - 4:30 PM

Conference Location

All technical sessions for the Life Sciences conference will be held at the Westin Boston Waterfront. Technical sessions for the Annual Meeting will be held at the Westin Boston Waterfront and the Boston Convention & Exhibition Center (BCEC). The BCEC is connected to the Westin by skywalk.

The Westin Boston Waterfront
425 Summer Street
Boston, Massachusetts, 02210
USA
Phone Number: +1-888-627-7115
Toll Free Reservations (USA and Canada): 1-800-937-8461
Fax: +1-617-532-4630
Website: http://www.westinbostonwaterfront.com/

Boston Convention and Exhibition Center (BCEC)

415 Summer St, Boston, MA 02210

Phone: +1-617-954-2000

Website: https://signatureboston.com/bcec/

Hotel Check-in and Check-out Times

Check-in time is 3:00 PM.
Check-out time is 12:00 PM.

Childcare

For local child care information, please contact the concierge at the Westin Boston Waterfront for up-to-date recommendations: +1-617-532-4600.

Corporate Members and Affiliates

SIAM corporate members provide their employees with knowledge about, access to, and contacts in the applied mathematics and computational sciences community through their membership benefits. Corporate membership is more than just a bundle of tangible products and services; it is an expression of support for SIAM and its programs. SIAM is pleased to acknowledge its corporate members. In recognition of their support, non-member attendees who are employed by the following organizations are entitled to the SIAM member registration rate.

Corporate/Institutional Members

The Aerospace Corporation

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Amazon

Aramco Services Company

Bechtel Marine Propulsion Laboratory

The Boeing Company

CEA/DAM

Department of National Defence (DND/CSEC)

DSTO- Defence Science and Technology Organisation

Hewlett-Packard

Huawei FRC French R&D Center

IBM Corporation

IDA Center for Communications Research, La Jolla

IDA Center for Communications Research, Princeton

Institute for Defense Analyses, Center for Computing Sciences

Lawrence Berkeley National Laboratory

Lawrence Livermore National Labs

Lockheed Martin

Los Alamos National Laboratory

Max-Planck-Institute for Dynamics of Complex Technical Systems

Mentor Graphics

National Institute of Standards and Technology (NIST)

National Security Agency (DIRNSA)

Naval PostGrad

Oak Ridge National Laboratory, managed by UT-Battelle for the Department of Energy

Sandia National Laboratories

Schlumberger-Doll Research

U.S. Department of Energy

U.S. Army Corps of Engineers, Engineer Research and Development Center

U.S. Naval Research Labs

List current June 2016.

SIAM Communication Doctors

Stop by this booth and chat with representing mathematicians, science communicators and educators about how to turn your complex research into a story that appeals to the public. "Doctors" will offer feedback and advice on how to craft an effective message about your research for future employers, outreach events, or the press. Stop by with a short pitch or summary of your work and let's make it media ready!

Funding Agency

SIAM and the Conference Organizing Committee wish to extend their thanks and appreciation to the U.S. National Science Foundation. The U.S. National Science Foundation supports the SIAM Conference on Life Sciences and the Workshop Celebrating Diversity (WCD). Both events are being held in conjunction with the 2016 SIAM Annual Meeting.

Leading the applied mathematics community . . .

Join SIAM and save!

SIAM members save up to $130 on full registration for the 2016 SIAM Annual Meeting! Join your peers in supporting the premier professional society for applied mathematicians and computational scientists. SIAM members receive subscriptions to *SIAM Review*, *SIAM News*, and *SIAM Unwrapped*, and enjoy substantial discounts on SIAM books, journal subscriptions, and conference registrations.

If you are not a SIAM member and paid the Non-Member or Non-Member Mini Speaker/Organizer rate to attend the conference, you can apply the difference between what you paid and what a member would have paid ($130 for a Non-Member and $65 for a Non-Member Mini Speaker/Organizer) towards a SIAM membership. Contact SIAM Customer Service for details or join at the conference registration desk.

Free Student Memberships are available to students who attend an institution that is an Academic Member of SIAM, are members of Student Chapters of SIAM, or are nominated by a Regular Member of SIAM.

Join onsite at the registration desk, go to *www.siam.org/joinsiam* to join online or download an application form, or contact SIAM Customer Service:

Telephone: +1-215-382-9800 (worldwide); or 800-447-7426 (U.S. and Canada only)
Fax: +1-215-386-7999
E-mail: membership@siam.org
Postal mail: Society for Industrial and Applied Mathematics, 3600 Market Street, 6th floor, Philadelphia, PA 19104-2688 USA

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Revamped SIAM News Online

siam news

HOME | HAPPENING NOW | GET INVOLVED | RESEARCH | CAREERS | ANNOUNCEMENTS | CURRENT ISSUE

Stay up-to-date on leading applied math research and SIAM happenings

This new one-stop shop will keep you connected. Get in the know!

The newly revamped SIAM News Online consolidates all SIAM news channels, bringing you *SIAM News* articles plus online-exclusive blog posts, important announcements, concise updates on cutting-edge research, and in-depth articles on new discoveries and applications. Article submissions from members of the community are welcome for consideration!

FEATURED SECTIONS:

Nuggets
Select articles from SIAM journals are boiled down to a popular science level, making current high-level research more accessible to a larger audience.

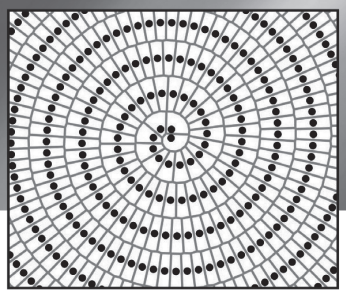
sinews.siam.org/nuggets

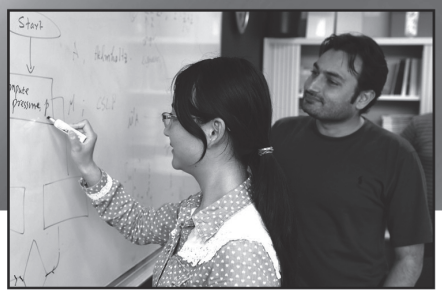
Unwrapped
SIAM's free monthly member e-newsletter provides timely updates and announcements of interest to our computational communities.

sinews.siam.org/unwrapped

SIAM Presents
This unique audio, slide, and video archive of 1,800+ presentations, plus other video clips from SIAM conferences, paints a picture of important work being done in the fields we serve.

www.siam.org/meetings/





sinews.siam.org

Society for Industrial and Applied Mathematics
3600 Market Street, 6th Floor • Philadelphia, PA USA
Phone: +1-267-350-6383 • Fax: +1-215-386-7999 • sinews@siam.org

Standard Audio/Visual Set-Up in Meeting Rooms

SIAM does not provide computers for any speaker. When giving an electronic presentation, speakers must provide their own computers. SIAM is not responsible for the safety and security of speakers' computers.

The Plenary Session Room will have two (2) screens, one (1) data projector and one (1) overhead projector. The data projectors support VGA connections only. Presenters requiring an HDMI or alternate connection must provide their own adaptor.

All other concurrent/breakout rooms will have one (1) screen and one (1) data projector. The data projectors support VGA connections only. Presenters requiring an HDMI or alternate connection must provide their own adaptor.

If you have questions regarding availability of equipment in the meeting room of your presentation, please see a SIAM staff member at the registration desk.

Internet Access

Attendees staying within the SIAM room block at the Westin Boston Waterfront will receive complimentary Internet access. Additionally, complimentary wireless Internet access will be available in the conference meeting space within the Westin. This service is being provided at no additional cost to attendees.

A limited number of computers with Internet access will also be available in the exhibit area (Galleria Level).

Registration Fee Includes

- Access to email facilities
- Admission to all AN16 and LS16 technical sessions
- Coffee breaks daily
- Exhibit Hall Admission
- Poster Session and Dessert Reception
- Room set-ups and audio/visual equipment
- SIAG/LS Business Meeting *(for SIAG/LS members)*
- SIAM Business Meeting *(for SIAM members)*
- Welcome Reception

In addition, the following events are available to attendees at no additional cost. The events are subsidized by SIAM and are not covered by the registration fees.

- Electronic Posters
- Career Fair, Graduate Student Reception, and Industry Member Reception
- Community Reception
- Prizes and Awards Luncheon
- Professional Development Evening

Job Postings

Please check with the SIAM registration desk regarding the location of the job postings board or visit *http://jobs.siam.org*.

SIAM Books and Journals

Display copies of books and complimentary copies of journals are available on site. SIAM books are available at a discounted price during the conference. If a SIAM books representative is not available, completed order forms and payment (credit cards are preferred) may be taken to the SIAM registration desk. The books table will close at 4:00 PM on Thursday, July 14.

Important Notice to Poster Board Presenters

The poster session is scheduled for Tuesday, July 12 at 8:00 PM in Galleria. Poster presenters may set up their poster material on the provided 4' x 8' poster boards in the Galleria beginning Sunday, July 10 at 3:00 PM. All materials must be posted by 8:00 PM on Tuesday, July 12, the official start time of the session. Posters will remain on display through Thursday, July 14. **Poster displays must be removed by 3:30 PM.**

Important Notice to Electronic Poster Presenters

The poster session is scheduled for Tuesday, July 12 at 8:00 PM in Galleria. Poster presenters may use their own computers to connect to the electronic display or they may use the computers provided by connecting a pre-loaded flash drive. Electronic poster displays will be available for testing beginning 12:00 PM on Tuesday, July 12. ******CEY TO CONFIRM TIME******

Name Badges

A space for emergency contact information is provided on the back of your name badge. Help us help you in the event of an emergency!

Comments?

Comments about SIAM meetings are encouraged! Please send to:

Cynthia Phillips, SIAM Vice President for Programs (vpp@siam.org).

Special Events

Sunday, July 10

- Welcome Reception

Monday, July 11

- Career Fair, Graduate Student Reception, and Industry Member Reception

Tuesday, July 12

- Prizes and Award Luncheon
- SIAM Business Meeting (for SIAM members)

  Complimentary beer and wine will be served.
- Poster Session and Dessert Reception

Wednesday, July 13

- Community Reception

Thursday, July 14

- SIAG/LS Business Meeting (for SIAG/LS members)

  Complimentary beverages will be served.
- Professional Development Evening

  (See page 17 for additional details about these Special Events)

Statement on Inclusiveness

As a professional society, SIAM is committed to providing an inclusive climate that encourages the open expression and exchange of ideas, that is free from all forms of discrimination, harassment, and retaliation, and that is welcoming and comfortable to all members and to those who participate in its activities. In pursuit of that commitment, SIAM is dedicated to the philosophy of equality of opportunity and treatment for all participants regardless of gender, gender identity or expression, sexual orientation, race, color, national or ethnic origin, religion

General Information

or religious belief, age, marital status, disabilities, veteran status, field of expertise, or any other reason not related to scientific merit. This philosophy extends from SIAM conferences, to its publications, and to its governing structures and bodies. We expect all members of SIAM and participants in SIAM activities to work towards this commitment.

Please Note

SIAM is not responsible for the safety and security of attendees' electronic devices. Do not leave your devices unattended. Please remember to silence your electronic device(s) prior to entering a session.

Recording of Presentations

Audio and video recording of presentations at SIAM meetings is prohibited without the written permission of the presenter and SIAM.

Social Media

SIAM is promoting the use of social media, such as Facebook and Twitter, in order to enhance scientific discussion at its meetings and enable attendees to connect with each other prior to, during and after conferences. If you are tweeting about a conference, please use the designated hashtag to enable other attendees to keep up with the Twitter conversation and to allow better archiving of our conference discussions. The hashtag for the 2016 SIAM Annual Meeting is #SIAMAN16. The hashtag for the SIAM Conference on Life Sciences is #SIAMLS16.

Mobile App

A mobile app for the SIAM Annual Meeting and the SIAM Conference on the Life Sciences is available for download. Plug *www.tripbuildermedia.com/apps/siam2016events* into your browser. The link will automatically detect the type of device and take you to the right place to download the app. It can also be viewed in HTML5 if you connect using your computer. You will be requested to set up an account to use the mobile app. This will allow you to share your calendar of show events across devices. You can then select AN/LS16 from the list of 2016 SIAM events on the app or mobile site to view the schedule, browse speakers, attendees and exhibitors, view maps and building layouts, sync events with your mobile calendar, create your own show by selecting specific sessions, and more!

Use the filter tool to select sessions from AN16 or LS16.

Can't make it to AN/LS16 or missing a talk at the meeting? Tune into the conversation on the SIAM events app. Just go to the sessions that interest you and click on the "Discuss" button to read what attendees are saying about the talks.

Exhibit Information

Please talk to company representatives about exhibitor information products and services that are important to you!

Enjoy free coffee during coffee breaks. Visit the exhibits during these hours:

Exhibit Hall Hours

Monday 7/11	9:30 AM -4:30 PM
Tuesday 7/12	9:30 AM -4:30 PM
Wednesday 7/13	9:30 AM -4:30 PM
Thursday 7/14	9:30 AM -4:30 PM

Booths

American Mathematical Society (AMS)

COMSOL, Inc.

MathWorks

Oxford University Press

SIAM

Princeton University Press

Springer

Tabletop Exhibitors

Association for Women in Mathematics (AWM)

ICIAM 2019

Registration Inserts

ICIAM 2019

SIMIODE

Julia Computing

Conference Sponsors:

Partial Bag Sponsor:

Julia computing

SIAM Advocate:

IBM Research

This exhibitor list is current at press time.

More information about exhibitors can be accessed in the conference app.

Exhibitor Information

Visit the Exhibits!

The Westin Boston Waterfront, Boston, Massachusetts, USA

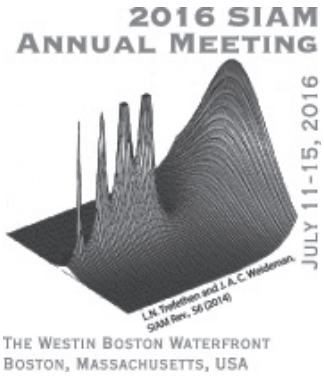


Exhibit Hall Hours

Monday, July 11
9:30 AM–4:30 PM

Tuesday, July 12
9:30 AM–4:30 PM

Wednesday, July 13
9:30 AM–4:30 PM

Thursday, July 14
9:30 AM–4:30 PM

The Exhibits are located on the Galleria Level

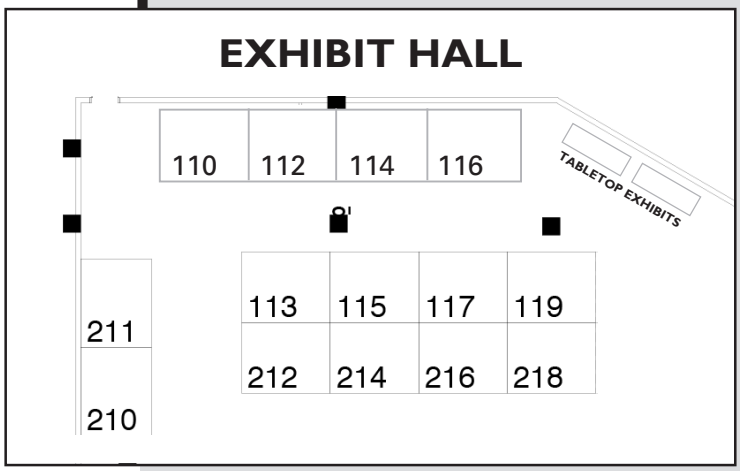
Booth Exhibitors — Booth

American Mathematical Society (AMS) ... 212-214
Cambridge University Press 117
COMSOL, Inc. 113
MathWorks 211
Oxford University Press 216
Princeton University Press 210
SIAM 110-112-114-116-119
Springer 115
Wolfram Research 218

Tabletop Exhibitors

Association for Women in Mathematics (AWM)
ICIAM 2019
University of Pennsylvania Press

This exhibitor list is current at press time.



Coffee breaks will be served in the exhibit hall.

SIAM-NSF Workshop

Monday, July 11

SIAM-NSF Workshop on Optics and Photonics

Organizer: **Shari Moskow,** *Drexel University, USA*

Advances in our understanding of the behavior of light are necessary both for improvements in current technologies and for the realization of new and envisioned technologies. Due to recent advances in computational tools, material science and nanostructure fabrication, mathematicians have a larger role than ever to play in this field. This workshop will be an opportunity for leaders in the field to present their vision of the future of this field. The goals are to familiarize a wide range of researchers with the NSF call for proposals "Optics and Photonics" and encourage collaborations among researchers in this field. The Optics and Photonics (OP) program is an NSF-wide activity that involves multiple Divisions within the Directorate for Mathematical and Physical Sciences (MPS).

Funding for this program is provided by a grant to Drexel University by the US. National Science Foundation.

Workshop Program

MS1 NSF-SIAM Workshop on Optics and Photonics - Part I of III

MS12 NSF-SIAM Workshop on Optics and Photonics - Part II of III

MS28 NSF-SIAM Workshop on Optics and Photonics - Part III of III

PIC Workshop

Monday, July 11

PIC Math Student Recognition Conference: Student Presentations

Organizers: Suzanne L. Weekes, *Worcester Polytechnic Institute, USA*
Michael Dorff, *Brigham Young University, USA*

The PIC Math (Preparation for Industrial Careers in Mathematical Sciences) program aims to prepare mathematical sciences students for industrial careers by engaging them in research problems that come directly from business, industry, or government. During the spring 2016 semester, mathematical sciences undergraduate students at 50 U.S. universities and colleges were enrolled in a PIC Math industrial mathematics and statistics research course. Each student team worked on a research problem and submitted a written report and video solution to the problem to the PIC Math student research competition. Several student teams will give presentations of their problems and solutions during this session.

PIC Math is a program of the MAA and SIAM supported by NSF funding (DMS-1345499).
See http://www.maa.org/picmath

Workshop Program

MS17 PIC Math Student Recognition Conference: Student Presentations

MS18 PIC Math Student Recognition Conference: Industry Speakers

PIC Math Student Recognition Conference: Poster Session

AWM Workshop

Monday, July 11 - Tuesday, July 12

Association for Women in Mathematics (AWM) Workshop

Association for Women in Mathematics (AWM) Workshop for Women Graduate Students and Recent PhDs
Held in conjunction with the 2016 SIAM Annual Meeting.

The Association for Women in Mathematics (AWM) plans a workshop from Monday mid-day through Tuesday, July 12. AWM and SIAM welcome your participation.

There is no additional registration fee for this AWM workshop. The minisymposia, poster session and award lecture are open to all SIAM meeting attendees.

AWM is grateful to SIAM and their Conference Department for all their efforts on behalf of the workshop and all AWM activities. AWM also wishes to express its gratitude to the National Science Foundation for the support of the AWM workshop.

Monday, July 11

MS5 Research Talks by Recent Ph.D.s & Invited Speakers -
Dynamical Systems with Applications to Biology and Medicine
10:30 AM - 12:30 PM
Room: BCEC Room 253A

SP1 AWM-SIAM Sonia Kovalevsky Lecture
Biofluids of Reproduction: Oscillators, Viscoelastic Networks and Sticky Situations
2:45 PM - 3:30 PM
Room: Grand Ballroom - Concourse Level
Presenter: **Lisa J. Fauci**, *Tulane University, USA*

MS20 Research Talks by Recent Ph.D.s & Invited Speakers -
Dynamical Systems with Applications to Biology and Medicine
4:00 PM - 6:00 PM
Room: BCEC Room 253A

AWM Workshop

Tuesday, July 12

MS52 Career Panel:
Addressing the Challenges Facing Female Scientists and Mathematicians

4:00 PM - 6:00 PM

Room: BCEC Room 253A

PP2: AWM Poster and Dessert Reception
(in conjunction with AN16 and LS16 Poster and Dessert Reception)

8:00 PM - 10:00 PM

Room: Galleria

Workshop Celebrating Diversity

Organizers:
Erica J. Graham, Bryn Mawr College, USA
Raegan Higgins, Texas Tech University, USA
Susan Minkoff, University of Texas, Dallas, USA

This annual event provides a chance for students to listen to technical talks presented by minority graduate students and researchers. The workshop is intended to accomplish several goals:

- To send a clear, explicit message of enthusiastic welcome and support from SIAM to members of under-represented groups. The workshop is deliberately held as part of a regular SIAM meeting so that the participants can combine the experiences of attending a regular scientific meeting and a special occasion dedicated to them.
- To bring together a mixture of people from different levels of age and professional experience, ranging from undergraduate students to senior scientists.
- To provide an opportunity for minority graduate students to present their research.
- To provide an informal, comfortable setting (a lunch) where all the students can meet applied and computational mathematicians with a wide variety of jobs in academia, national laboratories, industry, and government.

See the following sessions, all part of the Workshop Celebrating Diversity.

MS47 Showcasing Diversity: Women in Mathematical Biology

MS64 Some Biological and Physical Models in Applied Mathematics

MS79 Applications of Image Analysis and Optimization in Applied Mathematics

MS88 Modeling Biological and Physical Phenomena in a Fluid Environment

MS100 Diverse Mathematicians in Diverse Settings

MS114 Computational Science and Statistics for Complex Models

Student Days

Finding Jobs for You

Students - Activities just for you at the 2016 SIAM Annual Meeting in Harbor Ballroom II/III – Conference Level

Student Days at the 2016 SIAM Annual Meeting is a day for students and about students. Organizers have got it all covered this year, with activities and sessions where students can meet with both peers and professionals in their field, participate in a career fair, attend an information session on hot areas for jobs and research, and network with SIAM Student Chapters from all over the world.

Goals

Organized by the SIAM Education Committee, Student Days are designed to encourage student participation in SIAM, to help students learn more about applied mathematics and computational science as both fields of study and as careers, and to provide a forum for emerging mathematicians to learn about their field from the professionals who know the answers. Organizers also hope to encourage those in the learning community to establish new student chapters of SIAM and to promote interaction between students and SIAM leadership.

Events and Happenings

Student Days sessions include presentations by student chapter representatives and the winners of the SIAM Award in the Mathematical Contest in Modeling (MCM) and the SIAM Student Paper Prizes. In addition, students can attend plenary sessions from the SIAM Annual Meeting (AN16) or the SIAM Conference on Life Sciences (LS16). Other activities that will enhance the meeting for students include a special orientation prior to Sunday's Welcome Reception, a Student Lounge, and a session for students with selected conference invited speakers. Other activities that will be of interest to students include the industrial panel and career fair on Monday, the Poster Session and Dessert Reception on Tuesday, the community lecture on Wednesday, and the book giveaway and professional development activities on Thursday.

Meeting with Leaders and Influencing SIAM (*by invitation only*)

Student Days 2016 will also feature the Student Chapter Meeting with SIAM Leadership. This meeting gives faculty advisors and student chapter representatives the opportunity to meet with key decision makers to discuss ideas for improving student chapters and ways that SIAM can meet the needs of current and future student members all over the world. Each chapter selects one student to attend the event as its chapter representative.

Finding Jobs for You

Monday, July 11, features events to help you find a job and develop your career. An Industry Panel will offer insights into what it's like to work in industry. The panel will be followed by a reception for industry representatives and graduate students. The Career Fair, held during two time slots, 10:30 AM – 12:30 PM and 4:00 PM – 6:00 PM, provides students the opportunity to interact with prospective employers from government and industry who are specifically interested in SIAM's unique community. Find out what prospective employers are looking for and what each has to offer. A Career Fair student guide will be available online. Professional development evening is Thursday, July 14. In addition to panel discussions, there will be an opportunity to network with professionals in the field. You might also be interested in attending the Association for Women in Mathematics (AWM) workshop for graduate students and recent PhD's.

Student Days Schedule

and other Activities of Interest to Students

Sunday, July 10

5:00 PM - 6:00 PM **Student Orientation**
Commonwealth Ballroom BC - Concourse Level

6:00 PM - 8:00 PM **Welcome Reception**
Grand Ballroom Prefunction – Concourse Level

Monday, July 11

9:30 AM - 4:30 PM **Visit the student lounge in the Exhibit Hall**
Galleria

10:30 AM - 12:30 PM **MS6 Career Fair**
Pavilion - Concourse Level

10:30 AM - 12:30 PM **MS16 Undergraduate Sessions**
Commonwealth B - Concourse Level

2:45 PM - 3:30 PM **SP1 Kovalevsky Prize Lecture**
Grand Ballroom - Concourse Level

4:00 PM - 6:00 PM **MS21 Career Fair**
Pavilion - Concourse Level

6:15 PM - 7:15 PM **Panel on Careers in Business, Industry and Government**
Grand Ballroom AB- Concourse Level

7:15 PM - 9:15 PM **Career Fair, Graduate Student and Industry Reception**
Pavilion - Concourse Level

Student Days Schedule

and other Activities of Interest to Students

Tuesday, July 12

9:30 AM - 4:30 PM	**Visit the Student Lounge in the Exhibit Hall** *Galleria*
7:00 AM - 8:15 AM	**Student Chapter meeting with SIAM Leadership (by invitation only)** *Marina - Lobby Level*
10:30 AM - 12:30 PM	**MS48 SIAM Student Chapter Presentations** *Commonwealth B - Concourse Level*
12:30 PM – 2:30 PM	**Prizes and Awards Luncheon** *BCEC Room 253ABC*
2:30 PM - 3:30 PM	**SP2 The John von Neumann Lecture** *Grand Ballroom - Concourse Level*
4:00 PM - 6:00 PM	**MS63 Students Informal Meeting with Invited Speakers** *BCEC Room 253B*
8:00 PM - 10:00 PM	**Poster Session and Dessert Reception** *Galleria*

Student Days Schedule

and other Activities of Interest to Students

Wednesday, July 13, 2016

9:30 AM - 4:30 PM — **Visit the Student Lounge in the Exhibit Hall**
Galleria

10:30 AM - 12:30 PM — **MS77 SIAM Student Chapter Presentations**
Commonwealth B - Concourse Level

10:30 AM - 12:30 PM — **MS78 Student Paper Prize Winner Presentations**
Commonwealth C - Concourse Level

3:00 PM - 3:30 PM — **Reid Prize Lecture**
Grand Ballroom - Concourse Level

4:00 PM – 6:00 PM — **MS95 MCM Prize Winner Presentations**
Commonwealth B - Concourse Level

6:15 PM - 8:15 PM — **I.E. Block Community Lecture & Reception**
Grand Ballroom - Concourse Level

Thursday, July 14, 2016

4:30 PM – 5:00 PM — **SIAM Book Giveaway - Exhibit Hall STUDENTS ONLY**
Galleria

6:15 PM - 9:15 PM — **Professional Development Evening: Landing Your Dream Job**
Grand Ballroom AB- Concourse Level

Special Events

Sunday, July 10

5:00 PM - 6:00 PM
Commonwealth Ballroom BC – Concourse Level

Student Orientation

This event on the Annual Meeting calendar is intended to enhance students' experience at the meeting by providing an introduction to some of the meeting organizers, to Harbor Ballroom II/III – Conference Level, and to the program. There are several new events and facilities to help students get the fullest benefit from the meeting. A few very short presentations will be followed by an opportunity to network with both fellow students and other attendees prior to the general welcome reception.

6:00 PM - 8:00 PM
Grand Ballroom Prefunction – Concourse Level

Welcome Reception

The welcome reception is open to all attendees and their guests. Light hors d'oeuvres will be served. One drink ticket is included with each registration. A cash bar will be available for those who wish to purchase additional beverages.

Monday, July 11

6:15 PM - 7:15 PM
Grand Ballroom AB – Concourse Level

Panel: Careers in Business, Industry and Government

7:15 PM - 9:15 PM
Pavilion and Grand Ballroom Prefunction– Concourse Level

Career Fair, Graduate Student and Industry Reception

Complimentary light hors d'oeuvres, beer and wine will be served.

Special Events

Tuesday, July 12

12:30 PM - 2:30 PM
BCEC Room 253ABC (The Convention Center is connected to the Westin via Skywalk. Follow the red board signs.)

Prizes and Awards Luncheon

This luncheon will recognize and honor this year's award recipients. The luncheon is open to all meeting attendees and is included in the registration fee, however, a reservation is required in advance. If you do not have a ticket, please see a SIAM representative at the registration desk. Tickets can be obtained through noon on Monday. See page 28 for the list of prizes and awards being presented.

6:15 PM - 7:15 PM
Grand Ballroom AB-Concourse Level

SIAM Business Meeting

Open to SIAM members;complimentary beer and wine will be served.

Class of 2016 Fellows will be recognized at the SIAM Business Meeting, followed by a short reception for the new Fellows.

8:00 PM - 10:00 PM
Exhibit Hall

Poster and Dessert Reception

Poster presentations are in an informal setting, allowing presenters to discuss their research with individual attendees. NEW this year, electronic posters! These are large electronic displays to show rich, interactive material at the poster session.

Wednesday, July 13

6:15 PM - 8:15 PM
Grand Ballroom - Concourse Level

I. E. Block Community Lecture and Reception

This event is open to all attendees, their guests and the local community. Tadashi Tokieda, University of Cambridge and Stanford University, will deliver the community lecture from 6:15 PM to 7:15 PM, followed by the Community Reception from 7:15 PM to 8:15 PM. Complimentary light hors d'oeuvres, beer and wine will be served.

Thursday, July 14

2:00 PM - 2:45 PM

SIAG/LS Business Meeting (open to all SIAG/LS Members complimentary beverages will be served)

Invited Speakers: 2016 SIAM Annual Meeting

Monday, July 11

8:30 AM - 9:15 AM

IT1 Privacy and Validity in the Land of Plenty

Cynthia Dwork, *Microsoft Research, USA*

Grand Ballroom AB - Concourse Level

9:15 AM - 10:00 AM

IT2 Eigenvectors of Tensors

American Mathematical Society (AMS) Invited Presentation

Bernd Sturmfels, *University of California, Berkeley, USA*

Grand Ballroom AB - Concourse Level

2:00 PM - 2:45 PM

JP1 Spatio-temporal Dynamics of Childhood Infectious Disease: Predictability and the Impact of Vaccination

Bryan Grenfell, *Princeton University, USA*

Joint speaker with the Conference on Life Sciences

Grand Ballroom AB - Concourse Level

Tuesday, July 12

8:30 AM - 9:15 AM

IT3 Deep Learning: A Cornucopia of Applications and Mathematical Mysteries

Yann LeCun, *New York University, USA*

Grand Ballroom AB - Concourse Level

9:15 AM - 10:00 AM

IT4 Computational Behavioral Ecology

Tanya Y. Berger-Wolf, *University of Illinois, Chicago, USA*

Grand Ballroom AB - Concourse Level

Invited Speakers: 2016 SIAM Annual Meeting

Wednesday, July 13

8:30 AM - 9:15 AM

IT5 Beyond the Black Box in Derivative-Free and Simulation-Based Optimization

Stefan Wild, *Argonne National Laboratory, USA*

Grand Ballroom AB - Concourse Level

9:15 AM - 10:00 AM

IT6 First Order Methods for Well Structured Optimization Problems

Marc Teboulle, *Tel Aviv University, Israel*

Grand Ballroom AB - Concourse Level

2:00 PM - 2:45 PM

IT7 Ecological Collapse and the Phase Transition to Turbulence

Nigel Goldenfeld, *University of Illinois at Urbana-Champaign, USA*

Grand Ballroom AB - Concourse Level

Thursday, July 14

8:30 AM - 9:15 AM

IT8 Mathematical Sciences Education: What Is Wrong and Why Should You Care?

Karen Saxe, *Macalester College, USA*

Grand Ballroom AB - Concourse Level

2:00 PM - 2:45 PM

IT10 Implementing Reproducibility in Computational Science

Victoria Stodden, *University of Chicago at Urbana-Champaign, USA*

Grand Ballroom AB - Concourse Level

2:45 PM - 3:30 PM

IT11 Large Deviation Theory Applied to Climate Physics,
A New Frontier of Statistical Physics and Applied Mathematics

Freddy Bouchet, *ENS Lyon, France*

Grand Ballroom AB - Concourse Level

Invited Speakers: 2016 SIAM Annual Meeting

Friday, July 15

8:30 AM - 9:15 AM

IT12 The Life Cycle of An Eigenvalue Problem: From Data to Numerics

Mark Embree, *Virginia Tech, USA*

Grand Ballroom AB - Concourse Level

8:30 AM - 9:15 AM

IT13 On the Mathematical Study of Defects in Liquid Crystals

Lia Bronsard, *McMaster University, Canada*

Grand Ballroom CDE - Concourse Level

9:15 AM - 10:00 AM

IT14 Dynamics, Mixing, and Coherence

Gary Froyland, *University of New South Wales, Australia*

Grand Ballroom AB - Concourse Level

2:00 PM - 2:45 PM

IT15 Social Science in the Age of Big Data

Matthew Salganik, *Princeton University, USA*

Grand Ballroom AB - Concourse Level

2:45 PM - 3:30 PM

IT16 Anatomy of MERS Epidemic

Vittoria Colizza, *Inserm, France*

Grand Ballroom AB - Concourse Level

Invited Speakers: SIAM Conference on the Life Sciences

Monday, July 11

8:30 AM - 9:15 AM

IC1 Beating in Fluid: Hearts and Cilia by the Immersed Boundary Method

Charles S. Peskin, *Courant Institute of Mathematical Sciences, New York University, USA*

Harbor Ballroom II/III – Conference Level

9:15 AM - 10:00 AM

IC2 Mathematical Models for Cell Polarization and Gradient Sensing

Timothy C. Elston, *University of North Carolina at Chapel Hill, USA*

Harbor Ballroom II/III – Conference Level

2:00 PM - 2:45 PM

JP1 Spatio-Temporal Dynamics of Childhood Infectious Disease: Predictability and the Impact of Vaccination

Bryan Grenfell, *Princeton University, USA*

Joint speaker with the 2016 SIAM Annual Meeting

Grand Ballroom AB - Concourse Level

Tuesday, July 12

8:30 AM - 9:15 AM

IC3 Qualitative Features of Transient Responses A Case Study: Scale-Invariance

Eduardo Sontag, *Rutgers, The State University of New Jersey, USA*

Harbor Ballroom II/III – Conference Level

9:15 AM – 10:00 AM

IC4 Rational Design of Tissue Engineered Heart Valves

Frank Baaijens, *Technische Universiteit Eindhoven, The Netherlands*

Harbor Ballroom II/III – Conference Level

Invited Speakers: SIAM Conference on the Life Sciences

Wednesday, July 13

8:30 AM - 9:15 AM

IC5 The Turbulent Life of Plankton

Roman Stocker, *ETH Zürich, Switzerland*

Harbor Ballroom II/III – Conference Level

9:15 AM – 10:00 AM

IC6 Follow the Yellow Brick Road: Mathematical Insights into Virus Structure enable Discovery in Virus Assembly and Evolution

Reidun Twarock, *University of York, United Kingdom*

Harbor Ballroom II/III – Conference Level

Thursday, July 14

8:30 AM - 9:15 AM

IC7 Title Not Available at Time of Publication

Sandy Allerheiligen, *Merck Research Laboratories, USA*

Harbor Ballroom II/III – Conference Level

9:15 AM – 10:00 AM

IC8 Parkinsonian Oscillations: A Computational View

Jonathan E. Rubin, *University of Pittsburgh, USA*

Harbor Ballroom II/III – Conference Level

Prizes and Special Lectures: 2016 SIAM Annual Meeting

Monday, July 11

2:45 PM - 3:30 PM

AWM-SIAM Sonia Kovalevsky Lecture

Biofluids of Reproduction: Oscillators, Viscoelastic Networks and Sticky Situations

Lisa J. Fauci, *Tulane University, USA*

Grand Ballroom AB - Concourse Level

Tuesday, July 12

2:30 PM - 3:30 PM

The John von Neumann Lecture

Satisfiability and Combinatorics

Donald E. Knuth, *Stanford University, USA*

Grand Ballroom AB - Concourse Level

Wednesday, July 13

3:00 PM - 3:30 PM

W. T. and Idalia Reid Prize in Mathematics Lecture

Ioannis Kevrekidis, *Princeton University, USA*

Grand Ballroom AB - Concourse Level

6:15 PM - 7:15 PM

I. E. Block Community Lecture

Toy Models

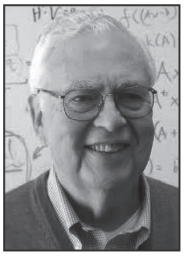
Tadashi Tokieda, *University of Cambridge, United Kingdom and Stanford University, USA*

Grand Ballroom AB - Concourse Level

Gene Golub g2s3 2017 SIAM Summer School

May 29-June 9, 2017
Akademie Berlin-Schmöckwitz
Germany

Data Sparse Approximations and Algorithms



The eighth Gene Golub Summer School will take place at the Akademie Berlin-Schmöckwitz in Germany and will be held in conjunction with the 2017 SIAM Activity Group in Linear Algebra (SIAG/LA) International Summer School on Numerical Linear Algebra.

The summer school is intended for Master and PhD students in mathematics and related programs who would like to learn about the state-of-the-art in the area of data sparse approximations and algorithms.

The lecturers are

- Bernhard G. Bodmann, University of Houston, USA
- Lars Grasedyck, RWTH Aachen, Germany
- Serge Gratton, CERFACS, France
- Rachel A. Ward, University of Texas, USA

The courses will focus on the following topics:

- theory of sparse representation and approximation
- tensor based methods and computation
- algorithms for sparse numerical linear algebra
- sparsity in optimization

The school will be held in the spirit of Gene Golub, with lots of interactions between the lecturers and the participants. All courses will have a strong computational component. A poster session during the summer school will give participating students the opportunity to present their own work to the whole group.

The summer school is being organized by Gitta Kutyniok, Jörg Liesen, and Volker Mehrmann, all from the Institute of Mathematics, Technische Universität Berlin, Germany.

Applicants selected to participate pay no registration. Funding for local accommodations and meal expenses will be available for all participants. Limited travel funds are also available.

Application deadline: February 1, 2017

As information is available on the courses and on how to apply, it will be posted at:
http://www.siam.org/students/g2s3/

Sponsored by SIAM through an endowment from the estate of Gene Golub.
For more information about prior summer schools and Professor Gene Golub go to ***http://www.siam.org/students/g2s3/***

siam

Society for Industrial and Applied Mathematics
3600 Market Street, 6th Floor • Philadelphia, PA 19104-2688 USA • +1-215-382-9800 • *siam@siam.org* • *www.siam.org*

SIAM Activity Group on Life Sciences (SIAG/LS)

www.siam.org/activity/life-sciences

A GREAT WAY TO GET INVOLVED!

Collaborate and interact with mathematicians and applied scientists whose work involves the application of mathematics to the life sciences and research that leads to new methods and techniques useful in the life sciences.

ACTIVITIES INCLUDE:

- Special sessions at SIAM Annual Meetings
- Biennial conference
- Talks about topics in the life sciences available online via "SIAM Presents"

BENEFITS OF SIAG/LS membership:

- Free electronic subscription to *SIAM Journal on Applied Dynamical Systems*
- Listing in the SIAG's online membership directory
- Additional $10 discount on registration at the SIAM Conference on Life Sciences (excludes student)
- Electronic communications about recent developments in your specialty
- Eligibility for candidacy for SIAG/LS office
- Participation in the selection of SIAG/LS officers

ELIGIBILITY:

- Be a current SIAM member.

COST:

- $10 per year
- Student members can join two activity groups for free!

2015-16 SIAG/LS OFFICERS

- Chair: Richard Bertram, Florida State University
- Vice Chair: Sue Ann Campbell, University of Waterloo
- Program Director: Samuel Isaacson, Boston University
- Secretary: Andrea Barreiro, Southern Methodist University

TO JOIN:

SIAG/LS: *my.siam.org/forms/join_siag.htm*

SIAM: *www.siam.org/joinsiam*

Prizes and Awards Luncheon

The Prizes and Awards Luncheon will be held in the Boston Convention & Exhibition Center (BCEC). It is connected to the Westin Boston Waterfront Hotel by skywalk. The luncheon begins at 12:30 PM and the awards ceremony shortly thereafter.
Please be sure to bring the ticket provided in your registration packet.

If you do not have a ticket but wish to attend the luncheon, be sure to see a SIAM staff member at the registration desk no later than noon on Monday, July 11.

The following Prizes and Awards will be recognized:

The John von Neumann Lecture
Donald E. Knuth, *Stanford University, USA*

AWM-SIAM Sonia Kovalevsky Lecture
Lisa Fauci, *Tulane University, USA*

SIAM Prize for Distinguished Service to the Profession
Linda Petzold, *University of California, Santa Barbara, USA*

Richard C. DiPrima Prize
Blake H. Barker, *Brown University, USA*

George Pólya Prize in Combinatorics
Jozsef Balogh, *University of Illinois at Urbana-Champaign, USA*
Robert Morris, *IMPA, Brazil*
Wojciech Samotij, *Tel Aviv University, Israel*
David Saxton, *University of Cambridge, United Kingdom*
Andrew Thomason, *University of Cambridge, United Kingdom*

W. T. and Idalia Reid Prize in Mathematics Lecture
Ioannis G. Kevrekidis, *Princeton University, USA*

SIAM Outstanding Paper Prizes
Boaz Barak, Xi Chen, Mark Braverman and Anup Rao
Xiaochuan Tian and Qiang Du

SIAM extends its thanks to the following authors
who have helped maintain the Student Travel Fund
through the generous donation of all or part of their royalties.
Total royalties donated to the fund through 12/31/2015 are $249,797.

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Anonymous
Uri M. Ascher
Greg Astfalk
N. Balakrishnan
Venkataramanan Balakrishnan
Michael Baldea
Thomas Berger
Michael W. Berry
John T. Betts
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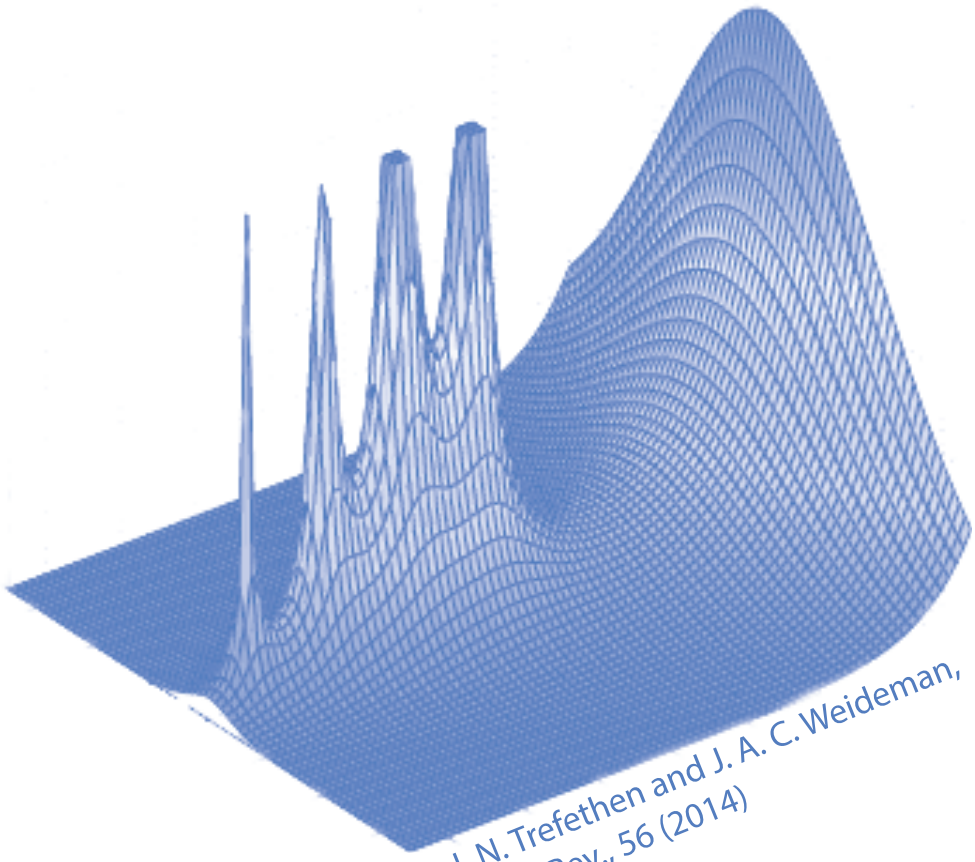
2016 SIAM Annual Meeting



L.N. Trefethen and J. A. C. Weideman, SIAM Rev., 56 (2014)

July 11-15, 2016

The Westin Boston Waterfront
Boston, Massachusetts, USA

Sunday, July 10

Registration
2:00 PM-8:00 PM

Room:Concourse Level

Student Days: Student Orientation
5:00 PM-6:00 PM

Room:Commonwealth Ballroom BC - Concourse Level

Chair: Rachel Levy, Harvey Mudd College, USA

Welcome Reception
6:00 PM-8:00 PM

Room:Grand Ballroom Prefunction

Monday, July 11

Registration
7:00 AM-4:30 PM

Room:Concourse Level

Committee on Committees & Appointments Meeting
7:00 AM-8:30 AM

Room:Executive Board Room - Mezzanine Level

Education Committee Meeting
7:00 AM-8:30 AM

Room:Faneuil - Mezzanine Level

Monday, July 11

MS1

NSF-SIAM Workshop on Optics and Photonics - Part I of III

8:00 AM-10:00 AM

Room:BCEC Room 252B

For Part 2 see MS12

Advances in our understanding of the behavior of light are necessary both for improvements in current technologies and for the realization of new and envisioned technologies. Due to recent advances in computational tools, material science and nanostructure fabrication, mathematicians have a larger role than ever to play in this field. This workshop will be an opportunity for leaders in the field to present their vision of the future of this field. The goals are to familiarize a wide range of researchers with the NSF call for proposals "Optics and Photonics" and encourage collaborations among researchers in this field. The Optics and Photonics (OP) program is an NSF-wide activity that involves multiple Divisions within the Directorate for Mathematical and Physical Sciences (MPS). Funding for this program is provided by a grant to Drexel University by the US. National Science Foundation.

Organizer: Shari Moskow
Drexel University, USA

8:00-8:25 Reconstructing Optical and Acoustic Properties in PAT/TAT from Multiple Illumination Data
Kui Ren, University of Texas at Austin, USA

8:30-8:55 Photonic Graphene and Properties
Mark Ablowitz, University of Colorado, USA

9:00-9:25 On the Homogenization of a Transmission Problem in Scattering Theory for Highly Oscillating Periodic Media
Fioralba Cakoni, Rutgers University, USA

9:30-9:55 Waves in Honeycomb Structure—Quantum and Electromagnetic
Michael I. Weinstein, Columbia University, USA

Monday, July 11

MS17

PIC Math Student Recognition Conference: Student Presentations

8:00 AM-10:00 AM

Room:Harbor Ballroom I - Conference Level

The PIC Math (Preparation for Industrial Careers in Mathematical Sciences) program aims to prepare mathematical sciences students for industrial careers by engaging them in research problems that come directly from business, industry, or government. During the spring 2016 semester, mathematical sciences undergraduate students at 50 U.S. universities and colleges were enrolled in a PIC Math industrial mathematics and statistics research course. Each student team worked on a research problem and submitted a written report and video solution to the problem to the PIC Math student research competition. Several student teams will give presentations of their problems and solutions during this session. PIC Math is a program of the MAA and SIAM supported by NSF funding (DMS-1345499). See http://www.maa.org/picmath

Organizer: Suzanne L. Weekes
Worcester Polytechnic Institute, USA

Organizer: Michael Dorff
Brigham Young University, USA

8:00-9:55 Student Presentations TBA

Monday, July 11

Opening Remarks and Recognition of SIAM Student Paper Prize Winners and SIGEST Authors

8:00 AM-8:30 AM

Room:Grand Ballroom AB- Concourse Level

IT1

Privacy and Validity in the Land of Plenty

8:30 AM-9:15 AM

Room:Grand Ballroom - Concourse Level

Chair: Jennifer Chayes, Microsoft Research, USA

The rise of "Big Data" has been accompanied by an increase in the twin risks of spurious scientific discovery and privacy compromise. A great deal of effort has been devoted to the former, from the use of sophisticated validation techniques, to deep statistical methods for controlling the false discovery rate in multiple hypothesis testing. However, there is a fundamental disconnect between the theoretical results and the practice of data analysis: the theory of statistical inference assumes a fixed collection of hypotheses to be tested, selected non-adaptively before the data are gathered, whereas in practice data are shared and reused with hypotheses and new analyses being generated on the basis of data exploration and the outcomes of previous analyses. Privacy-preserving data analysis also has a large literature, spanning several disciplines. However, many attempts have proved problematic either in practice or on paper. "Differential privacy" – a recent notion tailored to situations in which data are plentiful – has provided a theoretically sound and powerful framework, giving rise to an explosion of research. We will review the definition of differential privacy, describe some basic algorithmic techniques for achieving it, and see that it also prevents false discoveries arising from adaptivity in data analysis.

Cynthia Dwork
Microsoft Research, USA

Monday, July 11

IT2

Eigenvectors of Tensors

9:15 AM-10:00 AM

Room:Grand Ballroom - Concourse Level

Sponsored by the American Mathematical Society

Chair: Zhilan Feng, Purdue University, USA

Eigenvectors of square matrices are central to linear algebra. Eigenvectors of tensors are a natural generalization. The spectral theory of tensors was pioneered by Lim and Qi a decade ago, and it has found numerous applications. We discuss the use of orthogonal tensor decompositions in data analysis, and we present work with Abo and Seigal aimed at characterizing which configurations of vectors arise as the eigenvectors of some tensor. This lecture also serves an invitation to applied algebraic geometry. This lecture is the American Mathematical Society (AMS) Invited Presentation.

Bernd Sturmfels
University of California, Berkeley, USA

Monday, July 11

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

MT1

Minitutorial: The Mathematics of Verbal Autopsy - How to Track the Leading Causes of Death Globally, From Face-to-Face Interviews to Reproducible Machine Learning Methods

10:30 AM-12:30 PM

Room:Grand Ballroom B - Concourse Level

Chair: Abraham Flaxman, University of Washington, USA

This minitutorial will present a "full-stack" application of mathematical thinking to measuring the causes of death in populations globally, with a focus on the pitfalls of messy data, the benefits of reproducible research, and some hands-on experience with machine learning in Python using scikits-learn.

Abraham Flaxman, University of Washington, USA

Monday, July 11

MS2

Advances in Computational Methods for Plasma Physics

10:30 AM-12:30 PM

Room:BCEC Room 257A

Plasma physics finds a wide range of applications in areas including astrophysics, confined fusion, and semiconductor manufacture. The simulation of plasmas remains a challenging problem due to the great range of temporal and spatial scales encompassed by plasma phenomena. This minisymposium addresses recent advances in numerical methods for fluid and kinetic models of plasmas.

Organizer: Xiao Feng
Michigan State University, USA

Organizer: James A. Rossmanith
Iowa State University, USA

10:30-10:55 Locally Implicit Discontinuous Galerkin Methods with Application to the Vlasov-Maxwell System
Pierson Guthrey and James A. Rossmanith, Iowa State University, USA

11:00-11:25 Solving Fluid and Continuum Kinetic Equations in Plasma Physics Using the Discontinuous Galerkin Method
Bhuvana Srinivasan, Virginia Tech, USA; Ammar Hakim, Princeton Plasma Physics Laboratory, USA; Yang Song and Petr Cagas, Virginia Tech, USA

11:30-11:55 Monolithic Multigrid for Incompressible, Resistive Magnetohydrodynamics
James H. Adler and Tom Benson, Tufts University, USA; Scott Maclachlan, Memorial University, Newfoundland, Canada; Eric C. Cyr and Raymond S. Tuminaro, Sandia National Laboratories, USA

12:00-12:25 High Order Finite Difference WENO Scheme for Ideal Magnetohydrodynamics on Curvilinear Meshes
Xiao Feng, Andrew J. Christlieb, and Yan Jiang, Michigan State University, USA

Monday, July 11

MS3

Advances in Large-Scale Optimization

10:30 AM-12:30 PM

Room:BCEC Room 254B

Organized by SIAG/OP

The recent years have witnessed a huge resurgence of methods of large-scale optimization, spanning deterministic and stochastic algorithms as well as parallel and distributed variants. This minisymposium focuses on presenting cutting-edge theoretical and algorithmic progress in both large-scale convex and nonconvex optimization (e.g., for deep learning), with particular emphasis on problem structures that give rise to speedups and scalability.

Organizer: Suvrit Sra
Massachusetts Institute of Technology, USA

10:30-10:55 Global Convergence Rate of Proximal Incremental Aggregated Gradient Methods
Asuman Ozdaglar, Massachusetts Institute of Technology, USA

11:00-11:25 Stochastic Variance Reduction for Nonconvex Optimization
Sashank Reddi, Carnegie Mellon University, USA

11:30-11:55 A Variational Perspective on Accelerated Methods in Optimization
Andre Wibisono, University of California, Berkeley, USA

12:00-12:25 First-order Methods for Geodesically Convex Optimization
Suvrit Sra, Massachusetts Institute of Technology, USA

Monday, July 11

MS4

Algebraic Statistics - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 259A

For Part 2 see MS19

Algebraic statistics is concerned with applying commutative algebra, algebraic geometry, and combinatorics to problems arising from statistics. This exchange across disciplines has resulted in statistical methods for a variety of data types, including categorical data, network data, and high- dimensional biological data, while also driving theoretical development in fields such as combinatorial commutative algebra and real algebraic geometry. This minisymposium will focus on several current themes in algebraic statistics including applications of algebraic geometry and polyhedral geometry to hierarchical models, graphical models, Gaussian mixtures, and network models.

Organizer: Elizabeth Gross
San Jose State University, USA

Organizer: Jose I. Rodriguez
University of Chicago, USA

10:30-10:55 Conditional Independence Ideals with Hidden Variables
Fatemeh Mohammadi, Technische Universität Berlin, Germany; Johannes Rauh, York University, Canada

11:00-11:25 Skeletal Structure in the Enumeration of Markov Equivalence Classes
Adityanarayanan Radhakrishnan, Massachusetts Institute of Technology, USA; *Liam Solus*, Institute of Science and Technology, Austria; Caroline Uhler, Massachusetts Institute of Technology, USA

11:30-11:55 Algebraic Regression
David Kahle, Baylor University, USA

12:00-12:25 Combinatorial Properties of Hierarchical Models
Daniel I. Bernstein and Seth Sullivant, North Carolina State University, USA

Monday, July 11

MS5

AWM Meeting - Workshop: Research Talks by Recent Ph.D.s & Invited Speakers - Dynamical Systems with Applications to Biology and Medicine

10:30 AM-12:30 PM

Room:BCEC Room 253A

For Part 2 see MS20

Sponsored by Association for Women in Mathematics (AWM)

This minisymposium will feature research talks by female recent Ph.D.s & invited speakers, and will focus on Dynamical Systems with Applications to Biology and Medicine.

Organizer: Laura Ellwein
Virginia Commonwealth University, USA

Organizer: Trachette Jackson
University of Michigan, USA

Organizer: Ami Radunskaya
Pomona College, USA

Organizer: Eva M. Strawbridge
James Madison University, USA

10:30-10:55 Diabetes Susceptibility and Sleep: Modeling Glucose Metabolism under Circadian Disruption
Erica J. Graham, Bryn Mawr College, USA

11:00-11:25 Modeling the Diffusion of Prion Aggregates in Budding Yeast
Karin Leiderman, University of California, Merced, USA

11:30-11:55 Flow Induced by Bacterial Carpets and Transport of Microscale Loads
Amy Buchmann, Tulane University, USA

12:00-12:25 Synchronization of Tubular Pressure Oscillations by Vascular and Hemodynamic Coupling in Interacting Nephrons
Hwayeon Ryu, St. Olaf College, USA

Monday, July 11

MS6

Career Fair: Careers in Business, Industry and Government - Part I of II

10:30 AM-12:30 PM

Room:Pavilion - Concourse Level

For Part 2 see MS21

For Career Fair Attendees

The career fair will feature employers from business, industry and government. These representatives will be prepared to discuss with you the opportunities for internships, postdoctoral appointments and full-time jobs at their organizations.

Organizer: William G. Kolata
SIAM, USA

Organizer: Kristin O'Neill
SIAM, USA

SIAM is pleased to share the list of organizations that will participate. This list is current at time of printing. The most up to date list of participants can be found at *http://www.siam.org/meetings/an16/career.php.*

Aerospace Corporation
Argonne National Laboratory
AstraZeneca
Bayer AG, Applied Mathematics
Bechtel Marine Propulsion Laboratory
Bell Labs Nokia
D.E.Shaw & Company
Exxon Mobil Upstream Research Company
IBM Research
Institute Defense Analyses
Hewlett-Packard
Lawrence Berkeley National Laboratory
MathWorks
Merck
Metron, Inc.
Microsoft
Mitsubishi Electric Research Laboratories
MIT Lincoln Laboratory
National Institute of Standards and Technology
NOKIA Bell Labs
QuantLab
Sandia National Laboratories
Sanofi
Schlumberger
Takeda
United Technologies Research Center

Monday, July 11

MS7

Data and Dynamical-System Models - Part I of II: Improving Model Accuracy

10:30 AM-12:30 PM

Room:BCEC Room 252A

For Part 2 see MS22

Computational models of dynamical systems are essential for analyzing, controlling, and designing complex engineering systems. The explosion of data---both from experimental measurements and computer simulations---brings new opportunities to leverage these data to improve such models in a variety of ways. This minisymposium explores a range of approaches for doing so, including reducing simulation costs, improving model accuracy, constructing models without first-principles information, and enabling extreme-scale computation.

Organizer: Kevin T. Carlberg

Sandia National Laboratories, USA

Organizer: Karthik Duraisamy

University of Michigan, USA

10:30-10:55 Data-Driven Methods for Nonintrusive Model Reduction

Benjamin Peherstorfer and Karen E. Willcox, Massachusetts Institute of Technology, USA

11:00-11:25 Filtering Large-Scale Dynamical Systems Using Transport Maps

Youssef M. Marzouk, Massachusetts Institute of Technology, USA

11:30-11:55 Density Estimation Framework for Model Error Quantification

Khachik Sargsyan and Habib N. Najm, Sandia National Laboratories, USA

12:00-12:25 A Model Reduction Approach to Structural Health Monitoring

Tommaso Taddei, James Penn, and Anthony T. Patera, Massachusetts Institute of Technology, USA

Monday, July 11

MS8

GraphBLAS: Graph Algorithms in the Language of Linear Algebra - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 256

For Part 2 see MS23

Organized by SIAG/DMA

The Basic Linear Algebra Subprograms (BLAS), introduced over 30 years ago, had a transformative effect on software for linear algebra. With the BLAS, researchers spend less time mapping algorithms onto specific features of hardware platforms and more time on interesting new algorithms. Our goal is to define an analogous set of basic building blocks for graph algorithms. In this minisymposium, we will explore the mathematical foundations, the interaction of mathematics with the data structures used in graph algorithms, and potential linear-algebraic APIs the graph algorithms research community could support.

Organizer: Aydin Buluc

Lawrence Berkeley National Laboratory, USA

10:30-10:55 Developing a PGAS Graph Library using GraphBLAS Primitives

Ariful Azad and *Aydin Buluc*, Lawrence Berkeley National Laboratory, USA

11:00-11:25 The Graph Programming Interface and Its Evolution Towards GraphBLAS

Jose Moreira and Manoj Kumar, IBM Research, USA

11:30-11:55 Design Considerations for a GraphBLAS Compliant Graph Library on Clusters of GPUs

Carl Yang, University of California, Davis, USA; Aydin Buluc, Lawrence Berkeley National Laboratory, USA; John Owens, University of California, Davis, USA

12:00-12:25 GraphBLAS Template Library (GBTL): Implementing Graph BLAS on GPU

Andrew Lumsdaine, Peter Zhang and Marcin Zalewski, Indiana University, USA

Monday, July 11

MS9

Hierarchical Structure and Randomness in Linear Algebra - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254A

For Part 2 see MS24

Hierarchical structures and randomness have led to many efficient linear algebra subroutines that make large-scale problems feasible. This minisymposium introduces recent advances in high performance algorithms for fast linear algebra based on hierarchical structure and randomization techniques. These techniques result in linear or quasi-linear time methods for matrix operation, e.g., matrix multiplication, factorization, and inversion (or preconditioner). The fields of applications include fast solvers for PDEs, applied harmonic analysis, inverse problems, machine learning, etc.

Organizer: Haizhao Yang

Duke University, USA

Organizer: Yingzhou Li

Stanford University, USA

10:30-10:55 Butterfly Factorization for a Class of Transforms in Harmonic Analysis

Haizhao Yang, Duke University, USA; Yingzhou Li, Stanford University, USA

11:00-11:25 Hierarchical and Multigrid Solvers

Eric Darve, Stanford University, USA

11:30-11:55 STRUMPACK: Preconditioning Using Incomplete Factorization with Hierarchically Semi-Separable Matrices

Pieter Ghysels and Xiaoye Sherry Li, Lawrence Berkeley National Laboratory, USA

12:00-12:25 A Superfast Multi-Rank Eigenvalue Update: Algorithm, Analysis, and Applications

James Vogel and Jianlin Xia, Purdue University, USA

Monday, July 11

MS10

Hybridizable Discontinuous Galerkin Methods - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253B

For Part 2 see MS25

Since the first hybridizable discontinuous Galerkin (HDG) method was developed for elliptic problems in the late 2000s, HDG methods have quickly gathered attraction from researchers in several disciplines due to their advantages over other discontinuous Galerkin methods. This minisymposium is dedicated to the latest developments in hybridizable discontinuous Galerkin methods, including theoretical and computational issues such as stability, optimal order convergence, sparse discretization, parallel implementation, (hp)-adaptivity, and application of the methods to physical problems.

Organizer: Cuong Nguyen

Massachusetts Institute of Technology, USA

Organizer: Bernardo Cockburn

University of Minnesota, USA

10:30-10:55 The HDG Methods for Diffusion Problems

Guosheng Fu and Bernardo Cockburn, University of Minnesota, USA

11:00-11:25 Parallel Iterative Solvers for Hybridized DG Methods with Application to Large-Eddy Simulation

Pablo Fernandez, Cuong Nguyen, and Jaime Peraire, Massachusetts Institute of Technology, USA

11:30-11:55 An Exponentially Convergent Iterative Solver for HDG Discretization of Partial Differential Equations

Sriramkrishnan Muralikrishnan, University of Texas at Austin, USA; Binh Tran, University of Wisconsin, USA; Tan Bui-Thanh, University of Texas at Austin, USA

12:00-12:25 H-to-P Efficiently: Solving HDG Systems via AMG Within The Nektar++ Framework

Hari Sundar and Robert Kirby, University of Utah, USA; Spencer Sherwin, Imperial College London, United Kingdom

Monday, July 11

MS11

Mathematical Models for Topological Phases of Matter - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 257B

For Part 2 see MS27

Topological phases of matter are recently discovered exotic materials which exhibit topological degrees of freedom and lead to high-T_c superconductors and fault-tolerant quantum computers. Topological phases are encoded algebraically through modular categories. With applications to topological phases, knot theory, and representation theory, these categories sit at the intersection of computer science, physics, and mathematics. An example of this intersection is the Property-F conjecture which relates algebraic properties of modular categories to the computational power of the quantum computers that they describe. Our minisymposium will bring together mathematicians and physicists to discuss the classification of topological phases, property-F, and related concepts.

Organizer: Paul Bruillard

Pacific Northwest National Laboratory, USA

Organizer: Daniel Creamer

Texas A&M University, USA

Organizer: Julia Y. Plavnik

Texas A&M University, USA

10:30-10:55 On Gauging Symmetry of Modular Categories

Xingshan Cui, University of California, Santa Barbara, USA; César Galindo, Universidad de los Andes, Colombia; *Julia Y. Plavnik*, Texas A&M University, USA; Zhenghan Wang, Microsoft Research, USA

11:00-11:25 Exact Sequences of Tensor Categories with Respect to a Module Category

Pavel Etingof, Massachusetts Institute of Technology, USA; Shlomo Gelaki, Technion, Israel

11:30-11:55 Modular Extensions of Braided Fusion Categories and their Group Structure--- from the Categorical Classification of 2+1D SETs

Tian Lan, Perimeter Institute For Theoretical Physics, Canada; Liang Kong, University of New Hampshire, USA; Xiao-Gang Wen, Massachusetts Institute of Technology, USA

12:00-12:25 G-Crossed Braided Fusion Categories and (3+1)-TQFTs

Xingshan Cui, University of California, Santa Barbara, USA

continued in next column

Monday, July 11

MS12

NSF-SIAM Workshop on Optics and Photonics - Part II of III

10:30 AM-12:00 PM

Room:BCEC Room 252B

For Part 1 see MS1
For Part 3 see MS28

Advances in our understanding of the behavior of light are necessary both for improvements in current technologies and for the realization of new and envisioned technologies. Due to recent advances in computational tools, material science and nanostructure fabrication, mathematicians have a larger role than ever to play in this field. This workshop will be an opportunity for leaders in the field to present their vision of the future of this field. The goals are to familiarize a wide range of researchers with the NSF call for proposals "Optics and Photonics" and encourage collaborations among researchers in this field. The Optics and Photonics (OP) program is an NSF-wide activity that involves multiple Divisions within the Directorate for Mathematical and Physical Sciences (MPS). Funding for this program is provided by a grant to Drexel University by the US. National Science Foundation.

Organizer: Shari Moskow

Drexel University, USA

10:30-10:55 Analytic Properties of the Dirichlet to Neumann Map for Electromagnetism

Graeme W. Milton and Maxence Cassier, University of Utah, USA; Aaron Welters, Florida Institute of Technology, USA

11:00-11:25 Nonlinear Optics with Balanced Gain and Loss

Jianke Yang, University of Vermont, USA

11:30-11:55 Radiative Transport and Scattering of Entangled Two-Photon States

John Schotland, University of Michigan, USA

Monday, July 11

MS13

Numerical Methods for Wave Propagation Problems - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom CDE - Concourse Level

For Part 2 see MS29

The mathematical properties of models with a wavelike nature share a common ground across disciplines. As a result, so do corresponding methods for numerical simulations. In this symposium we bring together researchers active in the development or the analysis of modern numerical methods for wave problems. A common goal is to reduce the required number of degrees of freedom, especially at high frequencies, by using high-order or spectral methods, or by incorporating asymptotic features of the problem at hand.

Organizer: Daan Huybrechs

KU Leuven, Belgium

Organizer: Mark Lyon

University of New Hampshire, USA

10:30-10:55 Non-Polynomial Discretization Schemes for Wave Problems Are Often Ill-Conditioned: Why?

Daan Huybrechs, KU Leuven, Belgium

11:00-11:25 Generalized Plane Waves for Inhomogeneous Media Wave Propagation

Lise-Marie Imbert-Gerard, Courant Institute of Mathematical Sciences, New York University, USA

11:30-11:55 BEM/FEM Coupling for Transient Acoustic Scattering by Piezoelectric Obstacles

Tonatiuh Sanchez-Vizuet and Francisco Javier Sayas, University of Delaware, USA

12:00-12:25 Fast Algorithms for Oscillatory Integral Operators

Yingzhou Li and *Lexing Ying*, Stanford University, USA

Monday, July 11

MS14

Robust Low Rank Models and Applications

10:30 AM-12:30 PM

Room:Grand Ballroom A - Concourse Level

Low rank structure of matrices and tensors is pervasive in a variety of application areas ranging from medical informatics to social science to partial differential equations. Using low rank structure can aid in compression, predicting missing values, or correcting errors in large scale data sets. This minisymposium collects a few modern perspectives on low rank modeling and methods for fitting low rank models, with a particular eye towards robust methods that reliably recover low rank structure from complex data sets.

Organizer: Madeleine R. Udell

Cornell University, USA

Organizer: Tamara G. Kolda

Sandia National Laboratories, USA

10:30-10:55 Generalized Low Rank Models

Madeleine R. Udell, Cornell University, USA

11:00-11:25 Sparse Hierarchical Tucker Factorization and its Application to Healthcare

Jimeng Sun and Ioakeim Perros, Georgia Institute of Technology, USA

11:30-11:55 Successive Rank-One Approximations of Nearly Orthogonally Decomposable Symmetric Tensors

Cun Mu, Daniel Hsu, and Donald Goldfarb, Columbia University, USA

12:00-12:25 On the Complexity of Low-Rank Matrix Approximations

Nicolas Gillis, Universite de Mons, Belgium

Monday, July 11

MS15

State Dependent Delays and PDE's - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253C

For Part 2 see MS33

State-dependent delays pose challenging infinite-dimensional problems appearing in a wide range of applications and for which the theory is only partially developed. In practical applications one usually goes about using a combination of numerical analysis and functional analytic techniques. This minisymposium coordinates some recent studies on state-dependent delays. In particular we will seek to develop the relations to the theory of PDE's, fluid dynamics, the neutral differential-delay equations of variational electrodynamics and numerical analysis.

Organizer: Jayme V. De Luca

Universidade Federal de Sao Carlos, Brazil

10:30-10:55 State Dependent Delays in the Biological Sciences: Where Do They Come From?
Michael Mackey, McGill University, Canada

11:00-11:25 A PDE of Variational Electrodynamics
Jayme V. De Luca, Universidade Federal de Sao Carlos, Brazil

11:30-11:55 Pilot-Wave Hydrodynamics
John W. Bush, Massachusetts Institute of Technology, USA

12:00-12:25 Delay ODE's and PDE's in Classical and Quantum Electrodynamics
Dirk Deckert, Ludwig-Maximilians-Universität München, Germany

Monday, July 11

MS16

Student Days: Undergraduate Session

10:30 AM-12:30 PM

Room:Commonwealth B - Concourse Level

For Part 2 see MS34

Student Days session organized by the SIAM Education Committee.

Organizer: Peter R. Turner

Clarkson University, USA

10:30-10:45 On an Empirical Analysis of the Kidney Allocation System
Khizar Qureshi, Massachusetts Institute of Technology, USA

10:50-11:05 Bounds for Bond Percolation Thresholds of Archimedean Lattices
Vittorio Loprinzo, Johns Hopkins University, USA

11:10-11:25 Transcriptomics of Bleaching and Recovery in the Alcyonacean Octocoral Sympodium Sp.
Adam He, Pomona College, USA

11:30-11:45 Analysis of Individual Greensboro Police Officers' Stopping Patterns Using Propensity Score Weighting
Neil Pritchard, Brandon Joyce, Ivanti Galloway, and Ashley Jones, University of North Carolina at Greensboro, USA

11:50-12:05 Dynamics of Atomtronic Battery
Hongji Yu, Worcester Polytechnic Institute, USA

12:10-12:25 Integrating Fish Movement in Multispecies Population Modeling
Cody Fitzgerald, University of New Hampshire, USA

SIAM Presents

Since 2008, SIAM has recorded many Invited Lectures, Prize Lectures, and selected Minisymposia from various conferences. These are available by visiting SIAM Presents (*http://www.siam.org/meetings/presents.php*).

Monday, July 11

MS18

PIC Math Student Recognition Conference: Industry Speakers

10:30 AM-11:30 PM

Room:Harbor Ballroom I - Conference Level

The PIC Math (Preparation for Industrial Careers in Mathematical Sciences) program aims to prepare mathematical sciences students for industrial careers by engaging them in research problems that come directly from industry, and to facilitate exposure to mathematics and statistics professionals who work in business, industry, and government. In this session, industrial mathematicians will make presentations about their paths to a career in business, industry, and government, and will talk about the sort of work that they do. Representatives from student research teams will make presentations and present posters in affiliated sessions. PIC Math is a program of the MAA and SIAM supported by NSF funding (DMS-1345499). Visit http://www.maa.org/picmath

Organizer: Suzanne L. Weekes
Worcester Polytechnic Institute, USA

Organizer: Michael Dorff
Brigham Young University, USA

10:30-10:55 PIC Math Industry talk 1 - To Be Announced

11:00-11:25 PIC Math Industry talk 2 - To Be Announced

Monday, July 11

CP1

Numerical Linear Algebra

10:30 AM-12:10 PM

Room:BCEC Room 251

Chair: Brendan Gavin, University of Massachusetts, Amherst, USA

10:30-10:45 Neighbor Discovery for Algebraic Multigrid and Matrix Migration
Christopher Siefert, Sandia National Laboratories, USA

10:50-11:05 A Feast Eigenvalue Algorithm Without Solving Linear Systems
Brendan Gavin and Eric Polizzi, University of Massachusetts, Amherst, USA

11:10-11:25 Analysis of Block Methods for Toeplitz Matrices
Matthias Bolten, Universität Kassel, Germany

11:30-11:45 Combining Krylov Subspace Recycling with Recycling Preconditioners for Sequences of Linear Systems
Arielle K. Grim-McNally and Eric De Sturler, Virginia Tech, USA

11:50-12:05 Heavy Ball Minimal Residual Method for Least-Squares Problem
Mei Yang and Ren-Cang Li, University of Texas at Arlington, USA

Monday, July 11

CP2

Probability, Statistics, and Stochastic Models

10:30 AM-12:30 PM

Room:Commonwealth C - Concourse Level

Chair: Leila Setayeshgar, Providence College, USA

10:30-10:45 Large Deviations for a Stochastic Burgers' Equation
Leila Setayeshgar, Providence College, USA

10:50-11:05 On a Storage Allocation Model with Finite Capacity
Eunju Sohn, Columbia College Chicago, USA; Charles Knessl, University of Ilinois at Chicago, USA

11:10-11:25 Optimizing Radioactive Contamination Monitoring Using Utility Functions in a Bayesian Network
Leila Gharsalli, Mathilde Vincent, Estelle Davesne, Eric Chojnacki, and Eric Blanchardon, IRSN, France

11:30-11:45 New Insights into Scaling Laws: The Lavalette Distribution and Its Properties
Oscar Fontanelli, Pedro Miramontes, and Germinal Cocho, Universidad Nacional Autónoma de México, Mexico; Wentian Li, The Feinstein Institute for Medical Research, USA

11:50-12:05 Modeling Extreme Weather Events
Mintaek Lee, Boise State University, USA

12:10-12:25 Gaussian Approximation for Transition Paths in Molecure Dynamics
Yulong Lu, University of Warwick, United Kingdom

Monday, July 11

CP3

Computational Science and Applications

10:30 AM-12:10 PM

Room:Commonwealth A - Concourse Level

Chair: David Trebotich, Lawrence Berkeley National Laboratory, USA

10:30-10:45 Efficiency of Stochastic Simulations in Chemical Kinetics
Des Higham, University of Strathclyde, United Kingdom; David F. Anderson, University of Wisconsin, Madison, USA

10:50-11:05 Fast Multipole Preconditioner for Direct Numerical Simulation of Flows Past An Airfoil
Huda Ibeid, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Rio Yokota, Tokyo Institute of Technology, Japan; David E. Keyes, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

11:10-11:25 High Resolution Simulation of Coupled Pore-Continuum Flow and Transport in Fractured Subsurface Materials
David Trebotich, Lawrence Berkeley National Laboratory, USA

11:30-11:45 Numerical Algorithms for Scalable High-Performance Electronic Structure Calculations
James Kestyn and Eric Polizzi, University of Massachusetts, Amherst, USA

11:50-12:05 Experiences with SeeMore: A 256-Node Kinetic Parallel Computing Cluster
Kirk Cameron, Virginia Tech, USA

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Monday, July 11

Mathematics in Industry Book Series Editorial Board Meeting

12:30 PM-2:00 PM

Room:Faneuil - Mezzanine Level

Major Awards Committee Meeting

12:30 PM-2:00 PM

Room:Executive Board Room - Mezzanine Level

PIC Math Student Recognition Conference: Poster Session

12:30 PM-2:00 PM

Room:Harbor Ballroom I and Foyer - Conference Level

Suzanne L. Weekes, Worcester Polytechnic Institute, USA

Michael Dorff, Brigham Young University, USA

During the spring 2016 semester, mathematical sciences undergraduate students at 50 U.S. universities and colleges were enrolled in a PIC Math (Preparation for Industrial Careers in Mathematical Sciences) industrial mathematics and statistics research course. Each student team worked on a research problem, which came directly from industry, and submitted a written report and video solution to the problem to the PIC Math student research competition. Students will give poster presentations of their research work and solutions PIC Math is a program of the MAA and SIAM supported by NSF funding (DMS-1345499). See http://www.maa.org/picmath

PIC Math Student Industrial Math Posters - Presenters To Be Announced

Monday, July 11

JP1

Spatio-temporal Dynamics of Childhood Infectious Disease: Predictability and the Impact of Vaccination

2:00 PM-2:45 PM

Room:Grand Ballroom - Concourse Level

Chair: Zhilan Feng, Purdue University, USA

Violent epidemics of childhood infections such as measles provide a particularly clear illustration of oscillatory 'predator-prey' dynamics. We discuss limits on the predictability of these systems, both in the era before vaccination and at present, where vaccine hesitancy limits the effectiveness of vaccination programs in many countries. We also discuss the impact of viral evolution on predictability and the design of vaccination programs, with particular reference to influenza and rotavirus.

Bryan Grenfell
Princeton University, USA

Monday, July 11

SP1

Biofluids of Reproduction: Oscillators, Viscoelastic Networks and Sticky Situations

2:45 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Ami Radunskaya, Pomona College, USA

From fertilization to birth, successful mammalian reproduction relies on interactions of elastic structures with a fluid environment. Sperm flagella must move through cervical mucus to the uterus and into the oviduct, where fertilization occurs. In fact, some sperm may adhere to oviductal epithelia, and must change their pattern of oscillation to escape. In addition, coordinated beating of oviductal cilia also drives the flow. Sperm-egg penetration, transport of the fertilized ovum from the oviduct to its implantation in the uterus and, indeed, birth itself are rich examples of elasto-hydrodynamic coupling. We will discuss successes and challenges in the mathematical and computational modeling of the biofluids of reproduction. In addition, we will present reduced models that evoke intriguing questions in fundamental fluid dynamics.

Lisa J. Fauci
Tulane University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Monday, July 11

MS19

Algebraic Statistics - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 259A

For Part 1 see MS4

Algebraic statistics is concerned with applying commutative algebra, algebraic geometry, and combinatorics to problems arising from statistics. This exchange across disciplines has resulted in statistical methods for a variety of data types, including categorical data, network data, and high- dimensional biological data, while also driving theoretical development in fields such as combinatorial commutative algebra and real algebraic geometry. This minisymposium will focus on several current themes in algebraic statistics including applications of algebraic geometry and polyhedral geometry to hierarchical models, graphical models, Gaussian mixtures, and network models.

Organizer: Elizabeth Gross
San Jose State University, USA

Organizer: Jose I. Rodriguez
University of Chicago, USA

4:00-4:25 Algebraic Statistics of Gaussian Mixtures
Carlos Amendola Ceron, Technische Universität Berlin, Germany

4:30-4:55 Positive Semidefinite Rank and Nested Spectrahedra
Kaie Kubjas, Aalto University, Finland; *Elina Robeva*, University of California, Berkeley, USA; Richard Robinson, University of Washington, USA

5:00-5:25 What Is the Shell Distribution of a Graph Telling Us?
Vishesh Karwa, Harvard University and Carnegie Mellon University, USA

5:30-5:55 Tensor Completion in the Probability Simplex
Thomas Kahle, Otto-von-Guericke University, Magdenburg, Germany; *Kaie Kubjas*, Aalto University, Finland; Mario Kummer, Universität Konstanz, Germany; Zvi Rosen, University of Pennsylvania, USA

Monday, July 11

MS20

AWM Meeting - Workshop: Research Talks by Recent Ph.D.s & Invited Speakers - Dynamical Systems with Applications to Biology and Medicine

4:00 PM-6:00 PM

Room:BCEC Room 253A

For Part 1 see MS5

Sponsored by Association for Women in Mathematics (AWM)

This minisymposium will feature research talks by female recent Ph.D.s & invited speakers, and will focus on Dynamical Systems with Applications to Biology and Medicine.

Organizer: Laura Ellwein
Virginia Commonwealth University, USA

Organizer: Trachette Jackson
University of Michigan, USA

Organizer: Ami Radunskaya
Pomona College, USA

Organizer: Eva M. Strawbridge
James Madison University, USA

4:00-4:25 Modeling Autoregulation in the Kidney
Elizabeth J. Makrides, Brown University, USA

4:30-4:55 Modeling Respiratory Dynamics in the Premature Infant
Laura Ellwein, Virginia Commonwealth University, USA

5:00-5:25 A Mathemaical Model of the Effects of Temperature on Human Sleep Patterns
Selenne Banuelos, California State University, Channel Islands, USA

5:30-5:55 Using Delayed Feedback to Avoid Neural Synchrony
Shelby Wilson, Morehouse College, USA

Monday, July 11

MS21

Career Fair: Careers in Business, Industry and Government - Part II of II

4:00 PM-6:00 PM

Room:Pavilion - Concourse Level

For Part 1 see MS6

For Career Fair Attendees

The career fair will feature employers from business, industry and government. These representatives will be prepared to discuss with you the opportunities for internships, postdoctoral appointments and full-time jobs at their organizations.

Organizer: William G. Kolata
SIAM, USA

Organizer: Kristin O'Neill
SIAM, USA

SIAM is pleased to share the list of organizations that will participate. This list is current at time of printing. The most up to date list of participants can be found at *http://www.siam.org/meetings/an16/career.php.*

Aerospace Corporation
Argonne National Laboratory
AstraZeneca
Bayer AG, Applied Mathematics
Bechtel Marine Propulsion Laboratory
Bell Labs Nokia
D.E.Shaw & Company
Exxon Mobil Upstream Research Company
IBM Research
Institute Defense Analyses
Hewlett-Packard
Lawrence Berkeley National Laboratory
MathWorks
Merck
Metron, Inc.
Microsoft
Mitsubishi Electric Research Laboratories
MIT Lincoln Laboratory
National Institute of Standards and Technology
NOKIA Bell Labs
QuantLab
Sandia National Laboratories
Sanofi
Schlumberger
Takeda
United Technologies Research Center

Monday, July 11

MS22

Data and Dynamical-System Models - Part II of II: Constructing and Analyzing Models

4:00 PM-6:00 PM

Room:BCEC Room 252A

For Part 1 see MS7

Computational models of dynamical systems are essential for analyzing, controlling, and designing complex engineering systems. The explosion of data---both from experimental measurements and computer simulations---brings new opportunities to leverage these data to improve such models in a variety of ways. This minisymposium explores a range of approaches for doing so, including reducing simulation costs, improving model accuracy, constructing models without first-principles information, and enabling extreme-scale computation.

Organizer: Kevin T. Carlberg

Sandia National Laboratories, USA

Organizer: Karthik Duraisamy

University of Michigan, USA

4:00-4:25 Data-Driven Coarse-Graining for Multiscale Problems

Eric Parish and *Karthik Duraisamy*, University of Michigan, USA

4:30-4:55 Data-Driven Identification of Nonlinear Dynamical Systems with Control using Sparse Regression

Steven Brunton, University of Washington, USA

5:00-5:25 Inferring Interaction Rules from Observations of Evolutive Systems

Massimo Fornasier, Mattia Bongini, and *Markus Hansen*, Technische Universität München, Germany; Mauro Maggioni, Duke University, USA

5:30-5:55 In-Situ Analytics in Extreme Scale Combustion Simulations

Jacqueline Chen, Sandia National Laboratories, USA; Sean Treichler, Stanford University, USA; Mike Bauer, NVIDIA, USA; Alex Aiken, Stanford University, USA; Chris Ye and Kwan-Liu Ma, University of California, Davis, USA

Monday, July 11

MS23

GraphBLAS: Graph Algorithms in the Language of Linear Algebra - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 256

For Part 1 see MS8

Organized by SIAG/DMA

The Basic Linear Algebra Subprograms (BLAS), introduced over 30 years ago, had a transformative effect on software for linear algebra. With the BLAS, researchers spend less time mapping algorithms onto specific features of hardware platforms and more time on interesting new algorithms. Our goal is to define an analogous set of basic building blocks for graph algorithms. In this minisymposium, we will explore the mathematical foundations, the interaction of mathematics with the data structures used in graph algorithms, and potential linear-algebraic APIs the graph algorithms research community could support.

Organizer: Aydin Buluc

Lawrence Berkeley National Laboratory, USA

4:00-4:25 Mathematical Foundations of the GraphBLAS

Jeremy Kepner, Hayden Jansen, Karia Dibert, and Vijay Gadepally, Massachusetts Institute of Technology, USA

4:30-4:55 Design and Implementation of the GraphBLAS Template Library (GBTL)

Scott McMillan and Samantha Misurda, Carnegie Mellon University, USA

5:00-5:25 GraphMat: Increasing Productivity and Performance for Large Graph Problems using Distributed Primitives

Narayanan Sundaram, Michael Anderson, Nadathur Satish, and Mostofa Patwary, Intel Labs, USA

5:30-5:55 Task Parallel Approach to the Linear Algebra-Based Implementation of miniTri

Michael Wolf, Sandia National Laboratories, USA

Monday, July 11

MS24

Hierarchical Structure and Randomness in Linear Algebra - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 254A

For Part 1 see MS9

Hierarchical structures and randomness have led to many efficient linear algebra subroutines that make large-scale problems feasible. This minisymposium introduces recent advances in high performance algorithms for fast linear algebra based on hierarchical structure and randomization techniques. These techniques result in linear or quasi-linear time methods for matrix operation, e.g., matrix multiplication, factorization, and inversion (or preconditioner). The fields of applications include fast solvers for PDEs, applied harmonic analysis, inverse problems, machine learning, etc.

Organizer: Haizhao Yang

Duke University, USA

Organizer: Yingzhou Li

Stanford University, USA

4:00-4:25 Distributed-Memory Hierarchical Interpolative Factorization

Yingzhou Li and Lexing Ying, Stanford University, USA

4:30-4:55 Preconditioning from a Single Matvec

Jiawei Chiu, Google, Inc., USA; Laurent Demanet, Massachusetts Institute of Technology, USA

5:00-5:25 Fast Likelihood Evaluation Using Hierarchical Matrices in Bayesian Inverse Problems

Arvind Saibaba, North Carolina State University, USA

5:30-5:55 Approximate Cholesky Factorization for Laplacians – Fast, Sparse, and Simple

Rasmus Kyng and Sushant Sachdeva, Yale University

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5/16

Monday, July 11

MS25

Hybridizable Discontinuous Galerkin Methods - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 253B

For Part 1 see MS10

Since the first hybridizable discontinuous Galerkin (HDG) method was developed for elliptic problems in the late 2000s, HDG methods have quickly gathered attraction from researchers in several disciplines due to their advantages over other discontinuous Galerkin methods. This minisymposium is dedicated to the latest developments in hybridizable discontinuous Galerkin methods, including theoretical and computational issues such as stability, optimal order convergence, sparse discretization, parallel implementation, (hp)-adaptivity, and application of the methods to physical problems.

Organizer: Cuong Nguyen

Massachusetts Institute of Technology, USA

Organizer: Bernardo Cockburn

University of Minnesota, USA

4:00-4:25 Hybridizable Discontinuous Galerkin Methods for Coastal Ocean Dynamics

Pierre Lermusiaux, Chris Mirabito, and Patrick Haley, Massachusetts Institute of Technology, USA

4:30-4:55 Construction and Analysis of Hybridized Discontinuous Galerkin Methods for the Magnetohydrodynamics Equations

Stephen Shannon, The University of Texas at Austin, USA; Jeonghun Lee, University of Oslo, Norway; Tan Bui-Thanh, University of Texas at Austin, USA; John Shadid, Sandia National Laboratories, USA

5:00-5:25 Hybridizable Discontinuous Galerkin Methods for Elastodynamics

Allan R. Hungria, Universität Münster, Germany; Francisco-J Sayas, University of Delaware, USA; Daniele Prada, Indiana University - Purdue University Indianapolis, USA

5:30-5:55 High order exactly Divergence-Free HDG Methods for Incompressible Flows

Christoph Lehrenfeld, Universität Münster, Germany; Joachim Schoeberl, Technische Universitaet Wien, Austria

Monday, July 11

MS26

Large Scale Variational Methods

4:00 PM-5:30 PM

Room:BCEC Room 254B

Organized by SIAG/OP

Contemporary "big data" problems have caused a broad reevaluation of nonsmooth optimization techniques. Numerous ideas, after laying dormant for decades, have reemerged in new contexts. Examples include conditional gradient, fast gradient, splitting, and variable projection. The session will focus on such promising techniques for nonsmooth problems, illustrated on structured large scale applications.

Organizer: Aleksandr Aravkin

University of Washington, USA

4:00-4:25 Variable Projection in Nonsmooth Applications

Aleksandr Aravkin, University of Washington, USA

4:30-4:55 Expanding the Reach of Optimal Methods

Dmitriy Drusvyatskiy, University of Washington, USA

5:00-5:25 SMART: The Stochastic Monotone Aggregated Root-Finding Algorithm

Damek Davis, Cornell University, USA

SIAM Presents

Since 2008, SIAM has recorded many Invited Lectures, Prize Lectures, and selected Minisymposia from various conferences. These are available by visiting SIAM Presents *(http://www.siam.org/meetings/presents.php).*

Monday, July 11

MS27

Mathematical Models for Topological Phases of Matter - Part II of II

4:00 PM-5:00 PM

Room:BCEC Room 257B

For Part 1 see MS11

Topological phases of matter are recently discovered exotic materials which exhibit topological degrees of freedom and lead to high-T_c superconductors and fault-tolerant quantum computers. Topological phases are encoded algebraically through modular categories. With applications to topological phases, knot theory, and representation theory, these categories sit at the intersection of computer science, physics, and mathematics. An example of this intersection is the Property-F conjecture which relates algebraic properties of modular categories to the computational power of the quantum computers that they describe. Our minisymposium will bring together mathematicians and physicists to discuss the classification of topological phases, property-F, and related concepts.

Organizer: Paul Bruillard

Pacific Northwest National Laboratory, USA

Organizer: Daniel Creamer

Texas A&M University, USA

Organizer: Julia Y. Plavnik

Texas A&M University, USA

4:00-4:25 Constraints on Multiparticle Entanglement

David A. Meyer, University of California, San Diego, USA

4:30-4:55 Classical Spin Models with Global Symmetries and Quantum Models with Local Symmetries

Jeongwan Haah, Massachusetts Institute of Technology, USA

Monday, July 11

MS28

NSF-SIAM Workshop on Optics and Photonics - Part III of III

4:00 PM-6:00 PM

Room:BCEC Room 252B

For Part 2 see MS12

Advances in our understanding of the behavior of light are necessary both for improvements in current technologies and for the realization of new and envisioned technologies. Due to recent advances in computational tools, material science and nanostructure fabrication, mathematicians have a larger role than ever to play in this field. This workshop will be an opportunity for leaders in the field to present their vision of the future of this field. The goals are to familiarize a wide range of researchers with the NSF call for proposals "Optics and Photonics" and encourage collaborations among researchers in this field. The Optics and Photonics (OP) program is an NSF-wide activity that involves multiple Divisions within the Directorate for Mathematical and Physical Sciences (MPS). Funding for this program is provided by a grant to Drexel University by the US. National Science Foundation.

Organizer: Shari Moskow

Drexel University, USA

4:00-4:25 Embedded Eigenvalues in Electromagnetic Structures

Shipman Shipman, Louisiana State University, USA

4:30-4:55 Free Form Optical Design and Monge-Ampere Type Equations

Cristian Gutierrez, Temple University, USA

5:00-5:25 The Fascinating Optics of Metamaterials and Plasmonics

Andrea Alu, University of Texas at Austin, USA

5:30-5:55 Discussion of the NSF Activity in Optics and Photonics

Michael Vogelius, NSF Division of Mathematical Sciences, USA

Monday, July 11

MS29

Numerical Methods for Wave Propagation Problems - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom CDE - Concourse Level

For Part 1 see MS13

The mathematical properties of models with a wavelike nature share a common ground across disciplines. As a result, so do corresponding methods for numerical simulations. In this symposium we bring together researchers active in the development or the analysis of modern numerical methods for wave problems. A common goal is to reduce the required number of degrees of freedom, especially at high frequencies, by using high-order or spectral methods, or by incorporating asymptotic features of the problem at hand.

Organizer: Daan Huybrechs

KU Leuven, Belgium

Organizer: Mark Lyon

University of New Hampshire, USA

4:00-4:25 Breaking the O(N) Barrier for High-Frequency Helmholtz Equation

Leonardo Zepeda-Núñez and Laurent Demanet, Massachusetts Institute of Technology, USA

4:30-4:55 High-Frequency Asymptotic Compression of Dense BEM-Matrices

Peter Opsomer and Daan Huybrechs, KU Leuven, Belgium

5:00-5:25 A Fast Hierarchical Direct Solver for Singular Integral Equations Defined on Disjoint Boundaries and Application to Fractal Screens

Richard M. Slevinsky, University of Oxford, United Kingdom; Sheehan Olver, University of Sydney, Australia; David Hewett, University of Oxford, United Kingdom

5:30-5:55 Advances in Optimized Fourier Continuation Methods

Mark Lyon, University of New Hampshire, USA

Monday, July 11

MS30

Parallel Computing on Hybrid Nodes with Multiple CPUs, GPUs, and Intel Xeon Phi

4:00 PM-6:00 PM

Room:BCEC Room 257A

Modern parallel computing architectures including multi-core CPUs, massively parallel GPUs, and many-core accelerators such as the 60-core Intel Xeon Phi accelerator offer great opportunities for speeding up computations. Hybrid compute nodes pose significant challenges to porting and tuning code due to the combination of different programming models that need to be used, ranging from distributed-memory computing with MPI, multi-threading with OpenMP, CUDA on GPUs, and combined MPI+OpenMP on the Phi, for instance. This minisymposium will share experiences with parallel code and numerical algorithms from fundamental test problems to specialized research code. The minisymposium will start with a basic overview and contrast of the architectures.

Organizer: Matthias K. Gobbert

University of Maryland, Baltimore County, USA

4:00-4:25 Overview and Contrast of Modern Computer Architectures Including the Intel Phi

Jonathan Graf, Ryan Day, and Xuan Huang, University of Maryland, Baltimore County, USA; Samuel Khuvis, Paratools Inc., USA; *Matthias K. Gobbert*, University of Maryland, Baltimore County, USA

4:30-4:55 Heterogeneous and Vectorized Computation for Quantum Chemistry

Edmond Chow, Georgia Institute of Technology, USA

5:00-5:25 Improving Performance of Sparse Triangular Solution on GPUs and CPUs for Irregular Matrices

Humayun Kabir, Guillaume Aupy, and Padma Raghavan, Pennsylvania State University, USA

5:30-5:55 Porting and Tuning Numerical Kernels to Many-Core Intel Xeon Phi Accelerators

Samuel Khuvis, Paratools Inc., USA

Monday, July 11

MS31

Recent Advances in Nonnegative Matrix Factorization

4:00 PM-6:00 PM

Room:Grand Ballroom A - Concourse Level

In the last years nonnegative matrix factorization (NMF) has grown to a widely used dimensionally reduction technique applicable to many intriguing problems in applied mathematics, machine learning and data science (e.g., image processing, blind source separation or clustering). Despite the intrinsic computational difficulty of NMF, numerous efficient optimization schemes continue to emerge and many important structured subproblems relating to NMF, such as near-separable NMF or symmetric NMF, continue to be explored both theoretically and algorithmically. In this mini symposium we gather experts having diverse backgrounds in order to exchange the recent exciting developments surrounding NMF and foster future collaborations across disciplines.

Organizer: Robert Luce

EPFL, Switzerland

Organizer: Nicolas Gillis

Universite de Mons, Belgium

4:00-4:25 A Projected Gradient Scheme for Separable NMF

Nicolas Gillis, Universite de Mons, Belgium; *Robert Luce*, EPFL, Switzerland

4:30-4:55 Exact NMF and Compact Extensions of N-Gons

Arnaud Vandaele, Universite de Mons, Belgium

5:00-5:25 Coordinate Descent Methods for Matrix Factorization

Arnaud Vandaele and Nicolas Gillis, Universite de Mons, Belgium; *Qi Lei*, Kai Zhong, and Inderjit S. Dhillon, University of Texas at Austin, USA

5:30-5:55 LP vs SDP Lifts of Polytopes

Hamza Fawzi, James Saunderson, and Pablo A. Parrilo, Massachusetts Institute of Technology, USA

Monday, July 11

MS32

Reduced Order Modeling Techniques in Uncertainty Quantification - Part I of II

4:00 PM-6:00 PM

Room:Grand Ballroom B - Concourse Level

For Part 2 see MS46

Uncertainty quantification is a modern mainstay in computational science, with several outstanding challenges. For example, coping with simulations and experiments of varying fidelities and representing physics at different scales is exacerbated by the high-dimensional nature of models. Recent advances in reduced order modeling techniques allow practitioners nowadays to successfully tackle some of these pressing problems using computationally tenable algorithms. The purpose of this minisymposium is to bring together researchers who have contributed to the advancement of reduced order modeling strategies in UQ, to present novel and promising methods, and to discuss future trends for research.

Organizer: Yanlai Chen

University of Massachusetts, Dartmouth, USA

Organizer: Andrea Manzoni

École Polytechnique Fédérale de Lausanne, Switzerland

Organizer: Akil Narayan

University of Utah, USA

4:00-4:25 A Unified, Goal-Oriented, Hybridized Reduced Basis Method and Generalized Polynomial Chaos Algorithm for Partial Differential Equations with Random Inputs

Jiahua Jiang and Yanlai Chen, University of Massachusetts, Dartmouth, USA; Akil Narayan, University of Utah, USA

4:30-4:55 Gaussian Functional Regression for Model-Data Assimilation

Ngoc Cuong Nguyen and Jaime Peraire, Massachusetts Institute of Technology, USA

5:00-5:25 The Certified Reduced-Basis Method for Darcy Flows in Porous Media

Riad Sanchez, IFP Energies nouvelles, France; Sebastien J. Boyaval, École des Ponts ParisTech, France

5:30-5:55 Proper Orthogonal Decomposition in Uncertainty Quantification of Complex Fluid Flows

Zhu Wang, University of South Carolina, USA

Monday, July 11

MS33

State Dependent Delays and PDE's - Part II of II

4:00 PM-5:30 PM

Room:BCEC Room 253C

For Part 1 see MS15

State-dependent delays pose challenging infinite-dimensional problems appearing in a wide range of applications and for which the theory is only partially developed. In practical applications one usually goes about using a combination of numerical analysis and functional analytic techniques. This minisymposium coordinates some recent studies on state-dependent delays. In particular we will seek to develop the relations to the theory of PDE's, fluid dynamics, the neutral differential-delay equations of variational electrodynamics and numerical analysis.

Organizer: Jayme V. De Luca

Universidade Federal de Sao Carlos, Brazil

4:00-4:25 Periodic Solutions and Their Bifurcations in a Singularly Perturbed Differential Equation with Two State-Dependent Delays

Tony Humphries, McGill University, Canada; Daniel Bernucci, Georgia Institute of Technology, USA; Renato Calleja, Universidad Nacional Autónoma de México, Mexico; Namdar Homayounfar, University of Toronto, Canada; Michael Snarski, Brown University, USA

4:30-4:55 Galerkin Finite-Element Method with Discontinuous Velocity Applied to the Two-Body Electromagnetic Variational Problem

Daniel C. De Souza, McGill University, Canada

5:00-5:25 Resonance Phenomena of a Delay Differential Equation with Two State-Dependent Delays

Calleja Renato, IIMAS - UNAM, Mexico; Antony Humphries, McGill University, Canada; Bernd Krauskopf, University of Auckland, New Zealand

Monday, July 11

MS34

Session Cancelled

4:00 PM-6:00 PM

Room:Commonwealth B - Concourse Level

Monday, July 11

CP4

Imaging Science

4:00 PM-5:20 PM

Room:Commonwealth A - Concourse Level

Chair: James Vogel, Purdue University, USA

4:00-4:15 Constrained Smoothing Splines on Unit Balls with Application to Optical Coherence Tomography
Farzana Nasrin, Ram V. Iyer, and Eltonzsee See, Texas Tech University, USA; Steven Mathews, West Texas Eye Associates, USA

4:20-4:35 A Partially Collapsed Gibbs Sampler for Computing the Point Spread Function of An X-Ray Imaging System
Aaron B. Luttman, National Security Technologies, LLC, USA; Kevin Joyce and Johnathan M. Bardsley, University of Montana, USA

4:40-4:55 Nonconvex Algorithms for Geosounding Inversion
Hugo Hidalgo-Silva and Enrique Gomez-Trevino, CICESE, Mexico

5:00-5:15 Real-Time Computing of Touch Topology via Poincare-Hopf Index
Keiji Miura, Tohoku University, Japan; Kazuki Nakada, University of Electro-Communications, Japan

Monday, July 11

CP5

Machine Learning and Data Science

4:00 PM-6:00 PM

Room:Commonwealth C - Concourse Level

Chair: Cesar A. Uribe, University of Illinois at Urbana-Champaign, USA

4:00-4:15 Rigorous Model Validation and Certification Via the Ouq Algorithm in 'mystic'
Michael McKerns, California Institute of Technology, USA

4:20-4:35 Nonasymptotic Rates in Distributed Learning
Cesar A. Uribe, University of Illinois at Urbana-Champaign, USA

4:40-4:55 Leveraging Computationally-Predicted Adverse Outcome Pathways for Optimizing Alternatives to Animal Testing
Shannon M. Bell, Agnes Karmaus, Neal Cariello, and David Allen, Integrated Laboratory Systems, Inc., USA; Warren Casey, National Institute of Environmental Health Sciences, USA; Lyle Burgoon, US Army Engineer Research and Development Center, USA

5:00-5:15 The Benefits of Applying Data Mining Algorithms on Medical Data
Najah Al-Shanableh, New Mexico State University, USA

5:20-5:35 A Nearest-Neighbor Approach for Fast, Accurate Selection of the Scale Parameter in Gaussian-Kernel Support Vector Machines
Guangliang Chen, Wilson Florero-Salinas, and Dan Li, San Jose State University, USA

5:40-5:55 Mode Reduction Methods for Data Assimilation: Subspace Projection using Koopman Operators
Humberto C. Godinez, Los Alamos National Laboratory, USA

Monday, July 11

CP6

Numerical Analysis

4:00 PM-6:00 PM

Room:BCEC Room 251

Chair: Ali Mehdizadeh Rahimi, Northeastern University, USA

4:00-4:15 Chopping a Chebyshev Series
Nick Trefethen and Jared Aurentz, University of Oxford, United Kingdom

4:20-4:35 Numerical Computing with 3D Functions in Chebfun
Behnam Hashemi, University of Oxford, United Kingdom

4:40-4:55 Numerical Computing in Polar and Spherical Geometries
Heather D. Wilber, Boise State University, USA

5:00-5:15 Spectral Methods for Fractional Differential Equations on the Half-Line with Tunable Accuracy
Anna Lischke, Brown University, USA; Mohsen Zayernouri, Michigan State University, USA; George Em Karniadakis, Brown University, USA

5:20-5:35 Numerical Solution of Boundary-Integral Equations for Nonlocal Models of Molecular Electrostatics Using Bem++
Ali Mehdizadeh Rahimi and Jaydeep Bardhan, Northeastern University, USA

5:40-5:55 Approach to Model Acoustic Wave Scattering Using Time Domain Boundary Integral Equations
Michelle Pizzo and Fang Hu, Old Dominion University, USA

Intermission

6:00 PM-6:15 PM

Monday, July 11

PD1

Panel: Careers in Business, Industry and Government

6:15 PM-7:15 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Lalitha Venkataramanan, Schlumberger-Doll Research, USA

Chair: Rachel Levy, Harvey Mudd College, USA

Chair: William G. Kolata, SIAM, USA

Interested in exploring opportunities outside academia? Mathematics plays a pivotal role in many industries including financial, pharmaceutical, oilfield, defense, software and IT. Within each company, applied mathematics is widely used in various aspects of research, engineering, manufacturing as well as sustaining. This discussion will feature panelists from different industries who will share their experiences of working and using applied mathematics in their companies. Following their introductions, the moderators will lead a discussion on how students interested in BIG careers might wish to broaden their educational experience and prepare for careers in industry.

Penny Anderson
The MathWorks, Inc., USA

Dean Bottino
Physiome Sciences, Inc., Israel

Gary Green
The Aerospace Corporation, USA

Tamara Kolda
Sandia National Laboratories, USA

Amy Sliva
Charles River Analytics, USA

Membership Committee Meeting

7:15 PM-9:15 PM

Room:Executive Board Room - Mezzanine Level

Monday, July 11

Career Fair, Graduate Student and Industry Reception

7:15 PM-9:15 PM

Room:Pavilion - Concourse Level

Meeting of the SIAM Editors in Chief

7:30 PM-9:30 PM

Room:Faneuil - Mezzanine Level

Tuesday, July 12

Student Days: Chapter Breakfast with SIAM Leadership (by invitation)

7:00 AM-8:15 AM

Room:Marina - Lobby Level

Registration

7:30 AM-4:30 PM

Room:Concourse Level

Tuesday, July 12

IT3

Deep Learning: A Cornucopia of Applications and Mathematical Mysteries

8:30 AM-9:15 AM

Room:Grand Ballroom - Concourse Level

Chair: Jeremy Kepner, Massachusetts Institute of Technology, USA

Deep learning is at the root of revolutionary progress in visual and auditory perception by computers, and is pushing the state of the art in natural language understanding, dialog systems and language translation. Deep learning systems are used everywhere now from self-driving cars to social networks content filtering to search engines ranking and medical image analysis. A deep learning system is typically an "almost" differentiable function, composed of multiple highly non-linear steps, parametrized by a numerical vector of 10^8 to 10^9 dimensions, and whose evaluation of one sample requires 10^9 to 10^{10} numerical operations. They are trained to minimize an objective function that measures the discrepancy between the output of the system and a desired output, averaged over 10^8 to 10^9 training samples. Training such a system can be seen as minimizing a highly non-convex objective function of 10^8 to 10^9 variables and whose evaluation of the gradient takes 10^{17} to 10^{19} operations. How can that possibly work? The fact that it does work is one of the theoretical mysteries of deep learning. Another one is why these particular multilayer architectures are so efficient. How can we improve the performance of deep learning systems? Many of these questions constitute interesting challenges for the Applied Mathematics community.

Yann LeCun
New York University, USA

Tuesday, July 12

IT4

Computational Behavioral Ecology

9:15 AM-10:00 AM

Room:Grand Ballroom - Concourse Level

Chair: Cynthia Phillips, Sandia National Laboratories, USA

Computation has fundamentally changed the way we study nature. New data collection technology, such as GPS, high definition cameras, UAVs, genotyping, and crowdsourcing, are generating data about wild populations that are orders of magnitude richer than any previously collected. Unfortunately, in this domain, our ability to analyze data lags substantially behind our ability to collect it. In this talk I will show how computational approaches can be part of every stage of the scientific process of understanding animal sociality, from intelligent data collection to hypothesis formulation and provide scientific insight into collective behavior of zebras, baboons, and humans.

Tanya Y. Berger-Wolf
University of Illinois, Chicago, USA

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Tuesday, July 12

MS35

Advances in Numerical Linear Algebraic Techniques for Inverse Problems - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254B

For Part 2 see MS49

Organized by SIAG/LA

Inverse problems appear in several prominent applications, such as image deblurring, medical image reconstruction, baggage screening and imaging the subsurface of the earth. Due to the scale of the forward problems and the sensitivity of the reconstruction/restoration to noise in the data, sophisticated numerical linear algebraic techniques need to be employed to recover quality images. The talks in this minisymposium focus on developing and using these techniques to combat various computational bottlenecks associated with solving inverse problems.

Organizer: Misha E. Kilmer

Tufts University, USA

10:30-10:55 Iterative Methods for Multi-Parameter, Multi-Data X-Ray Tomography

Eric Miller, Hamideh Rezaee, Brian Tracey, and Misha E. Kilmer, Tufts University, USA

11:00-11:25 Estimating Singular and Generalized Singular Value Bases Using Noise Revealing Techniques

Anthony Helmstetter and Rosemary A. Renaut, Arizona State University, USA

11:30-11:55 A Learning Approach for Computing Regularization Parameters for Tikhonov Regularization

Malena I. Espanol, University of Akron, USA; Julianne Chung, Virginia Tech, USA

12:00-12:25 Weighted Least Squares for an Image Deblurring Inverse Problem

James G. Nagy, Emory University, USA; Marie Kubinova, Czech Academy of Sciences, Czech Republic

Tuesday, July 12

MS36

Advances in Uncertainty Quantification for Industrial Applications - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom A - Councourse Level

For Part 2 see MS50

The importance of uncertainty quantification (UQ) for reliable predictions, system performance and risk assessment, decision-making is widely recognized and remains an active area of research. Substantial progress has been made in adopting and combining various approaches including model reduction, surrogate modeling, Bayesian inference, data assimilation and compression, variance- based decomposition, to address practical challenges across different domains. This minisymposium focuses on recent advances in UQ approaches and covers a wide range of their industrial applications including geosciences, climate modeling and computational fluid dynamics.

Organizer: Khachik Sargsyan

Sandia National Laboratories, USA

Organizer: Nikita Chugunov

Schlumberger-Doll Research, USA

10:30-10:55 Global Sensitivity Analysis for Large Eddy Simulation Models

Cosmin Safta, Michael S. Eldred, Xun Huan, Zachary Vane, Guilhem Lacaze, Joseph C. Oefelein, Khachik Sargsyan, and Habib N. Najm, Sandia National Laboratories, USA

11:00-11:25 Probabilistic Evaluation of Downhole Fluid Sampling via Fast Proxy Modeling

Morten Kristensen and Nikita Chugunov, Schlumberger-Doll Research, USA

11:30-11:55 Multifidelity Uncertainty Quantification With Application to CFD

Alireza Doostan, University of Colorado Boulder, USA; Gianluca Geraci, Stanford University, USA; Hillary Fairbanks, University of Colorado Boulder, USA; Gianluca Iaccarino, Stanford University, USA

12:00-12:25 Quantifying the Impacts of Parametric Uncertainty in Biogeochemistry in the ACME Land Model

Daniel Ricciuto, Oak Ridge National Laboratory; Khachik Sargsyan, Sandia National Laboratories, USA; Peter Thornton, Oak Ridge National Laboratory, USA

Tuesday, July 12

MS37

Applications of Algebraic Geometry - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom CDE - Councourse Level

For Part 2 see MS51

Problems from various application areas can be pitched as polynomial systems. Recent examples include problems from string theory, optimization, systems biology, and kinematics. Algebraic geometry is the mathematical area devoted to the study of polynomial systems and their solution sets. This minisymposium brings together speakers representing several areas of applications of algebraic geometry, particularly those making use of numerical methods. Topics vary from specific applications (e.g., synchronization of coupled phase oscillators) to general computational techniques (e.g., certification of numerical results and parallel computation).

Organizer: Dan Bates

Colorado State University, USA

Organizer: Daniel A. Brake

Colorado State University, USA

Organizer: Jon Hauenstein

North Carolina State University, USA

10:30-10:55 Symbolic-Numeric Certification of Algebraic Sets

Tulay Akoglu, North Carolina State University, USA; Jonathan Hauenstein, University of Notre Dame, USA; Bernard Mourrain, Inria Sophia Antipolis, France; *Agnes Szanto*, North Carolina State University, USA

11:00-11:25 Parallel Mixed Volume Computation Revisited

Tianran Chen, Michigan State University, USA

11:30-11:55 Equivariant Gröbner bases of Symmetric Toric Ideals

Robert Krone, Queen's University, Canada

12:00-12:25 Numerical Algebraic Geometry and Synchronization of Coupled Phase Oscillators

Noah S. Daleo, Worcester Polytechnic Institute, USA

Tuesday, July 12

MS38

Chaotic High-Fidelity Simulations and Design - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 252A

For Part 2 see MS53

High fidelity simulations can revolutionize technology. Relying on first-principle physics, not empirical laws, they let innovators explore designs that differ from existing technologies. When predictive high-fidelity simulations become widely available, it will greatly accelerate technology innovation. Great mathematics can originate from high-fidelity simulations and design. Particularly interesting is chaotic behavior in many large- scale simulations, including turbulent flows and flow-induced vibrations. For example, these simulations can break conventional way of sensitivity analysis, offering opportunity for new analysis and new methods. This, and other mathematical problems in large-scale, chaotic simulations for design and optimization, is the theme of his minisymposium.

Organizer: Qiqi Wang

Massachusetts Institute of Technology, USA

Organizer: Jason E. Hicken

Rensselaer Polytechnic Institute, USA

10:30-10:55 Chaos in High-Fidelity Simulation and Design

Qiqi Wang, Massachusetts Institute of Technology, USA

11:00-11:25 Mathematical and Computational Challenges in High-Fidelity Aero-Thermal Design

Gregory Laskowski and James Kopriva, GE Aviation, USA

11:30-11:55 Adjoint-Based Sensitivity Analysis for Large-Scale Unsteady and Chaotic Aerodynamic Simulations

Eric Nielsen, NASA Langley Research Center, USA; Boris Diskin, National Institute of Aerospace, USA; Qiqi Wang and Patrick Blonigan, Massachusetts Institute of Technology, USA

12:00-12:25 A Krylov-Inspired Optimization Method for Noisy Derivatives

Jason E. Hicken and Anthony Ashley, Rensselaer Polytechnic Institute, USA

Tuesday, July 12

MS39

Computational Method for Waves in Inhomogeneous Media with Applications - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 259A

For Part 2 see MS54

Many modern micro/nano scale devices such as solar cells, diffraction gratings, surface plasmons, as well as classical geological prospecting, rely on wave scattering in inhomogeneous media. Therefore, robust and fast computational methods play an important role optimizing and developing such technology. However, because of added complexity in both structures and material properties, accurate and robust numerical simulation is challenging in all aspects, from the formulation of the problem to the numerical solver. This minisymposium will discuss recent advances and challenges in both computational methods and applications.

Organizer: Min Hyung Cho

University of Massachusetts, Lowell, USA

Organizer: Jun Lai

Courant Institute of Mathematical Sciences, New York University, USA

Organizer: Carlos C. Borges

Courant Institute of Mathematical Sciences, New York University, USA

10:30-10:55 Direct Scattering by Penetrable Media

Sivaram Ambikasaran, Indian Institute of Science, Bangalore, India; Carlos C. Borges, Courant Institute of Mathematical Sciences, New York University, USA; *Leslie Greengard*, Simons Foundation and Courant Institute of Mathematical Sciences, New York University, USA; Lise-Marie Imbert-Gerard, Courant Institute of Mathematical Sciences, New York University, USA; Felipe Vico, Universidad Politecnica de Valencia, Spain

11:00-11:25 A Multi-modes Monte Carlo Method for Wave Scattering in Random Media

Junshan Lin, Auburn University, USA; Cody Lorton, University of West Florida, USA; Xiaobin Feng, University of Tennessee, USA

continued in next column

11:30-11:55 Fast Huygens Sweeping Method for Helmholtz Equation in High Frequency Regime

Songting Luo, Iowa State University, USA; Jianliang Qian, Michigan State University, USA; Robert Burridge, University of New Mexico, USA

12:00-12:25 The Method of Polarized Traces for the Helmholtz Equation

Laurent Demanet, Massachusetts Institute of Technology, USA; Leonardo Zepeda-Nunez, University of California, Irvine, USA; Russell Hewett, Total E&P, USA; Matthias Taus, University of Texas, USA; Adrien Scheuer, Universite Catholique de Louvain, Belgium

Tuesday, July 12

MS40

Computational Modeling and Numerical Simulation of Nonlocal Problems - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 257B

For Part 2 see MS55

Numerical solution of nonlocal problems remains a challenge, and requires new approaches to design robust, efficient and predictive numerical methods. The goal of this minisymposium is to bring together researchers working on different applications related to nonlocal models and present approaches for their numerical solution. This minisymposium will be organized in two parts; the first session is focused on mathematical models and the second session on numerical methods for their solution.

Organizer: Marta D'Elia
Sandia National Laboratories, USA

Organizer: Pavel Bochev
Sandia National Laboratories, USA

10:30-10:55 Nonlocal Modeling and Computations for Diffusion and Mechanics
Max Gunzburger, Florida State University, USA

11:00-11:25 Non-Local Approximations of Boundary Value Problems
Alexandre M. Tartakovsky, Pacific Northwest National Laboratory, USA

11:30-11:55 Adding More Realistic Solvent Structure to Nonlocal Electrostatics
Baihua Ren, Spencer Goossens, and Jaydeep Bardhan, Northeastern University, USA

12:00-12:25 Classical Density Functional Theory of Electrolyte Solutions
Amalie Frischknecht, Sandia National Laboratories, USA

Tuesday, July 12

MS41

Dynamic Data Driven Applications Systems - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 252B

For Part 2 see MS56

Dynamic Data Driven Applications Systems (DDDAS) is a paradigm whereby the computation and instrumentation aspects of a system are dynamically integrated in a feedback control loop. Sensor data can be dynamically incorporated to affect the system's operation, and in reverse, the executing model can control the instrumentation. The minisymposium presents advances in DDDAS methods, which draw on fields such as sensor fusion, reduced modeling, inverse problems, data assimilation, uncertainty quantification, and decision support.

Organizer: Karen E. Willcox
Massachusetts Institute of Technology, USA

Organizer: Kamran Mohseni
University of Florida, USA

10:30-10:55 Proper Symplectic Decomposition for Model Reduction of Forced and Dissipative Hamiltonian Systems
Liqian Peng and *Kamran Mohseni*, University of Florida, USA

11:00-11:25 Dynamic Data-Driven Decisions for Real-Time Adaptive Aircraft Path Planning
Victor Singh and Karen E. Willcox, Massachusetts Institute of Technology, USA

11:30-11:55 A Closed-Loop Context Aware Data Acquisition and Resource Allocation Framework for Dynamic Data Driven Applications Systems (DDDAS) on the Cloud
Mohammad Maifi Hasan Khan, University of Connecticut, USA

12:00-12:25 A Non-Parametric Framework for Inference Using Dynamically Deformed and Targeted Manifolds
Sai Ravela, Massachusetts Institute of Technology, USA

Tuesday, July 12

MS42

Mining in Graph Data - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 256

For Part 2 see MS59

Organized by SIAG/DMA

Graphs and networks are abundant in real world data, e.g., computer networks, the nation's electric grid, and shipping data from around the world. All of these sources of data can be written in terms of entities (vertices) and relationships (edges). Mining this kind of data for patterns or using machine learning and classification algorithms is an increasingly difficult task due to the size and complexity of the graphs.

Organizer: Jennifer B. Webster
Pacific Northwest National Laboratory, USA

Organizer: Mahantesh Halappanavar
Pacific Northwest National Laboratory, USA

Organizer: Emilie Hogan
Pacific Northwest National Laboratory, USA

10:30-10:55 Understanding Data – Graphs and Their Uses
Jennifer B. Webster, Pacific Northwest National Laboratory, USA

11:00-11:25 Finding Reliable Communities in Complex Networks
Sanjukta Bhowmick, University of Nebraska, Omaha, USA

11:30-11:55 Mining Citation Networks in the Scholarly Literature
Jevin West, University of Washington, USA

12:00-12:25 A Combinatorially-Interpretable Matrix Factorization for Network Community Structure Evaluation
Hongyuan Zhan and *Kamesh Madduri*, Pennsylvania State University, USA

Tuesday, July 12

MS43

Novel Numerical Methods for PDEs - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 257A

For Part 2 see MS60

Approximation of the solutions associated with PDEs has been one of the major research interests in the computational/ applied science. This is because of the rapid growth of the complexity in engineering/ scientific problems involving PDEs in recent years. Thus, to a large extent, a major thrust in these communities has been to improve the collective ability to develop new novel numerical approaches to solve complicated PDEs. Traditionally, a set of PDEs is solved numerically by such approaches as FDM, FEM, FVM, BEM, etc. In this minisymposium, we aim to introduce a few novel numerical methods for solving various kinds of PDEs.

Organizer: Guangming Yao

Clarkson University, USA

10:30-10:55 High-Order Time-Stepping for Nonlinear PDEs Through Componentwise Approximation of Matrix Functions

James V. Lambers, University of Southern Mississippi, USA

11:00-11:25 Numerical Simulation of Turing Pattern Formation by Edge-Based Smoothed Radial Point Interpolation Method (ES-RPIM)

Wen Li and Guangming Yao, Clarkson University, USA; G.R. Liu, University of Cincinnati, USA

11:30-11:55 Solving Differential Equations Using Chebyshev Inner Products

Joseph Kolibal, University of New Haven, USA; Jame Quinlan, University of New England, USA

12:00-12:25 A Localized Radial Basis Function Method for Solving Diffusion Equations

Guangming Yao and Wen Li, Clarkson University, USA

Tuesday, July 12

MS44

Numerical Methods for Plasmonics and Optics - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 255

For Part 2 see MS61

The main purpose of this minisymposium is to bring together specialists in the fields of plasmonics and optics. The last decades have seen an impressive advance in the understanding of electromagnetics and acoustics. In particular, algorithm design, analysis, application and implementations of mathematical models in the area are now at the heart everyday technologies such as seismic imaging, underwater acoustics, and biomathematics; nevertheless some very important issues still remain open. This mini symposium is meant to be a platform to exchange ideas on these problems.

Organizer: Youngjoon Hong

University of Ilinois at Chicago, USA

Organizer: David P. Nicholls

University of Ilinois at Chicago, USA

10:30-10:55 A High-Order Perturbation of Surfaces/Asymptotic Waveform Evaluation (HOPS/AWE) Method for Two-Dimensional Grating Scattering Problems

David P. Nicholls, University of Ilinois at Chicago, USA

11:00-11:25 Simulation of Dispersive Effects in Dielectric-Metal Structures in the Time Domain

Michael Jenkinson, Rensselaer Polytechnic Institute, USA

11:30-11:55 The Windowed Green Function Method

Oscar P. Bruno, California Institute of Technology, USA

12:00-12:25 Efficient Algorithms for the Simulation of Wave Propagation in Periodic Media

Catalin Turc and *Yassine Boubendir*, New Jersey Institute of Technology, USA

Tuesday, July 12

MS45

Recent Advances in High-Order Discontinuous Galerkin Methods - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254A

For Part 2 see MS62

Discontinuous Galerkin (DG) methods have attracted considerable attention in computational science and engineering community because they possess a number of desirable properties for solving partial differential equations such as local conservation, high-order accuracy easy parallelization, and enabling adaptivity, to name a few. In this minisymposium, the speakers will address theoretical and computational issues such as stability, optimal convergence order, sparse discretization, (hp)-adaptivity, application of DG methods to real-world problems, and their efficient implementations.

Organizer: Jaime Peraire

Massachusetts Institute of Technology, USA

Organizer: Pablo Fernandez

Massachusetts Institute of Technology, USA

10:30-10:55 Adaptive HDG Schemes on Near-Optimal Meshes

Georg May and Ajay Rangarajan, RWTH Aachen, Germany

11:00-11:25 HDG Methods for Nonlinear Elasticity

Jiguang Shen and Bernardo Cockburn, University of Minnesota, USA

11:30-11:55 Superconvergent Hdg Methods for Third-Order Linear Equations in One-Space Dimension

Bo Dong and Yanlai Chen, University of Massachusetts, Dartmouth, USA; Bernardo Cockburn, University of Minnesota, USA

12:00-12:25 Analysis of the HDG Method for the Stokes-Darcy Coupling

Filander A. Sequeira, Universidad Nacional de Costa Rica, Costa Rica; Gabriel Gatica, Universidad de Concepcion, Chile

Tuesday, July 12

MS46

Reduced Order Modeling Techniques in Uncertainty Quantification - Part II of II

10:30 AM-12:30 PM

Room:Grand Ballroom B - Councourse Level

For Part 1 see MS32

Uncertainty quantification is a modern mainstay in computational science, with several outstanding challenges. For example, coping with simulations and experiments of varying fidelities and representing physics at different scales is exacerbated by the high-dimensional nature of models. Recent advances in reduced order modeling techniques allow practitioners nowadays to successfully tackle some of these pressing problems using computationally tenable algorithms. The purpose of this minisymposium is to bring together researchers who have contributed to the advancement of reduced order modeling strategies in UQ, to present novel and promising methods, and to discuss future trends for research.

Organizer: Yanlai Chen

University of Massachusetts, Dartmouth, USA

Organizer: Andrea Manzoni

École Polytechnique Fédérale de Lausanne, Switzerland

Organizer: Akil Narayan

University of Utah, USA

10:30-10:55 Active Subspaces for Dimension Reduction in Parameter Studies

Paul Constantine, Colorado School of Mines, USA

11:00-11:25 Asymptotically Exact MCMC Using Local Approximations in Likelihood-Informed Subspaces

Andrew D. Davis and Youssef M. Marzouk, Massachusetts Institute of Technology, USA

11:30-11:55 Reduced Basis Anova Methods for Partial Differential Equations with High-Dimensional Random Inputs

Qifeng Liao, ShanghaiTech University, China; Guang Lin, Purdue University, USA

12:00-12:25 Stochastic Collocation with Multi-Fidelity Models

Xueyu Zhu, Dongbin Xiu, and Akil Narayan, University of Utah, USA

Tuesday, July 12

MS47

Showcasing Diversity: Women in Mathematical Biology

10:30 AM-12:30 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

Four minority women mathematicians will discuss their research on mathematical problems with applications to the Biological and the Medical Sciences. The talks will feature the use of a range of pure and applied mathematical tools ranging from algebraic topology to numerical techniques. This session will showcase the work of four junior, female mathematical biologists who are working to establish themselves at the top of their profession.

Organizer: Shelby Wilson

Morehouse College, USA

10:30-10:55 Optimal Scheduling of Antiangiogenic and Chemotherapeutic Cancer Treatments

Shelby Wilson, Morehouse College, USA

11:00-11:25 Statistical Text Analysis of Guyanese Suicide-related News Data

Calandra Tate Moore, City College of CUNY, USA

11:30-11:55 Discussion on a "Possible" Biological Application of Knot Floer Homology

Candice Price, Taylor Martin, and Brandy Doleshal, Sam Houston State University, USA

12:00-12:25 A Structured Two-Stage Population Model with Migration

Selenne Banuelos, California State University, Channel Islands, USA

Tuesday, July 12

MS48

Student Days: Student Chapter Presentations

10:30 AM-12:30 PM

Room:Commonwealth B - Concourse Level

For Part 2 see MS34
For Part 4 see MS63

Student Days session organized by the SIAM Education Committee.

Organizer: Daniel Eckhardt

Rensselaer Polytechnic Institute, USA

Organizer: Nguyenho Ho

Worcester Polytechnic Institute, USA

Organizer: Melody Takeuchi

Tufts University, USA

10:30-10:45 Analysis of the Open Pit Mining Problem from a Shape Optimization Perspective

Nicolás Barnafi and Felipe Rivera, Pontificia Universidad Católica de Chile, Chile

10:50-11:05 Internal Numerical Differentiation Approach for Parameter Estimation for Two-Dimensional Partial Differential Equation Problems

Anja Bettendorf, Heidelberg University, Germany

11:10-11:25 Modeling Self-Shading of Light on Kelp Growth in Aquaculture Operations

Oliver Evans, University of Akron, USA

11:30-11:45 Pediatric ECG Feature Identification

Emily Hendryx, Rice University, USA

11:50-12:05 Generating Audio Mixtures Using Deep Convolutional Neural Networks

Ariel Herbert-Voss, Dusstin Webb, and Suresh Venkatasubramanian, University of Utah, USA

12:10-12:25 A Second Order Time Homogenized Model for Sediment Transport

Jiang Yuchen and Ruo Li, Peking University, China; Shuonan Wu, Pennsylvania State University, USA

Tuesday, July 12

MS155

Recent Advances in Nonlinear Optimization

10:30 AM-12:30 PM

Room:Otis - Lobby Level

Organized by SIAG/OP

In this minisymposium, the presenters will talk about their recent work in nonlinear optimization. These talks focus on problems where either second-order information is unavailable or there is inherent special structure in the objective function.

Organizer: Jennifer Erway

Wake Forest University, USA

10:30-10:55 Manifold Sampling for Nonconvex Piecewise Continuously Differentiable Functions

Jeffrey M. Larson, Stefan Wild, and Kamil Khan, Argonne National Laboratory, USA; Matt Menickelly, Lehigh University, USA

11:00-11:25 Cubic Regularization for First-Order Methods

Hande Y. Benson, Drexel University, USA

11:30-11:55 Inexact Alternating Direction Algorithm for Separable Convex Optimization

Hongchao Zhang, Louisiana State University, USA; William Hager, University of Florida, USA

12:00-12:25 A Trust-Region Method for Sparse Recovery

Lasith Adhikari, University of California, Merced, USA; *Jennifer Erway* and Shelby Lockhart, Wake Forest University, USA; Roummel F. Marcia, University of California, Merced, USA; Robert Plemmons, Wake Forest University, USA

Tuesday, July 12

CP7

Control and Systems Theory

10:30 AM-12:30 PM

Room:Commonwealth C - Concourse Level

Chair: Nihav K. Dhawale, Yale University, USA

10:30-10:45 Running and Falling: Dynamics on Rough Terrains

Nihav K. Dhawale, Yale University, USA; Shreyas Mandre, Brown University, USA; Madhusudhan Venkadesan, Yale University, USA

10:50-11:05 Null Controllability of a Non-Linear System Governed by a Nonlocal Operator

Carole Louis-Rose, Université des Antilles, France

11:10-11:25 The Stochastic Linear Quadratic Control Problem on Hilbert Spaces: Theory and Applications

Hermann Mena, University of Innsbruck, Austria

11:30-11:45 An Efficient $O(n^2)$ Algorithm for Solving the Dynamic Matching Problem in TFT-LCD Cell Assembly Process

Shine-Der Lee, National Cheng Kung University, Taiwan; Pei-Shiun Lee, AUX Optronics, Taiwan

11:50-12:05 Direct Adaptive Control, Direct Optimization

Felipe M. Pait, University of Sciences in Philadelphia, USA; Rodrigo Romano, Instituto Maua de Tecnologia, Brazil

12:10-12:25 Boundary Observation in Shape Optimization

Dan I. Tiba, Romanian Academy, Romania

Tuesday, July 12

CP8

Numerical Optimization and Applications

10:30 AM-11:50 AM

Room:BCEC Room 251

Chair: Yunan Yang, University of Texas at Austin, USA

10:30-10:45 Optimal Transport for Seismic Full Waveform Inversion

Yunan Yang and Bjorn Engquist, University of Texas at Austin, USA; Brittany Froese, New Jersey Institute of Technology, USA

10:50-11:05 Globally Convergent Semismooth Newton Methods in Nonsmooth Regularization

Thorsten Raasch, University of Mainz, Germany

11:10-11:25 On the Solution of Operator Equation Problems with Application to Preisach Density Estimation

Yu Hua and Ram V. Iyer, Texas Tech University, USA

11:30-11:45 Development of An Effective Collaboration Scheme for Multiple Carriers Based on Data Mining and Meta-Heuristic Optimization Approach

Fu-Shiung Hsieh, Chaoyang University of Technology, Taiwan

Prizes and Awards Luncheon (Offsite at the connected Convention Center - BCEC)

12:30 PM-2:30 PM

Room:BCEC Room 253ABC

Connected by Skywalk from the Westin

Tuesday, July 12

SP2

The John von Neumann Lecture: Satisfiability and Combinatorics

2:30 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: L. Pamela Cook, University of Delaware, USA

The Satisfiability Problem, which asks whether or not a given Boolean formula can be satisfied for some values of its variables, has long been thought to be computationally hopeless. Indeed, SAT is the well-known "Poster Child" for NP-complete problems. But algorithmic breakthroughs have made it possible for many important special cases of the problem to be solved efficiently. Industrial-strength "SAT solvers" have become a billion-dollar industry, and they play a vital part in the design of contemporary computers. The speaker will explain how the new SAT technology also helps us to solve a wide variety of problems that belong to combinatorial mathematics.

Donald E. Knuth
Stanford University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Tuesday, July 12

MS49

Advances in Numerical Linear Algebraic Techniques for Inverse Problems - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 254B

For Part 1 see MS35
Organized by SIAG/LA

Inverse problems appear in several prominent applications, such as image deblurring, medical image reconstruction, baggage screening and imaging the subsurface of the earth. Due to the scale of the forward problems and the sensitivity of the reconstruction/restoration to noise in the data, sophisticated numerical linear algebraic techniques need to be employed to recover quality images. The talks in this minisymposium focus on developing and using these techniques to combat various computational bottlenecks associated with solving inverse problems.

Organizer: Misha E. Kilmer
Tufts University, USA

4:00-4:25 Solving Inverse Modeling in Subsurface Hydrology Using a Computationally Efficient Levenberg-Marquardt Algorithm
Youzuo Lin, Dan O'Malley, and Velimir V. Vesselinov, Los Alamos National Laboratory, USA

4:30-4:55 Reduced Order Modeling in Photoacoustic Tomography
Sarah Vallelian, Statistical and Applied Mathematical Sciences Institute, USA; Arvind Saibaba, North Carolina State University, USA

5:00-5:25 Inner-Outer Krylov Methods for Diffuse Optical Tomographic Image Reconstruction
Meghan O'Connell and Misha E. Kilmer, Tufts University, USA; Eric De Sturler, Serkan Gugercin, and Christopher A. Beattie, Virginia Tech, USA

5:30-5:55 Optimization via Parametric Model Reduction with Stochastic Error Estimates
Drayton Munster and Eric De Sturler, Virginia Tech, USA

Tuesday, July 12

MS50

Advances in Uncertainty Quantification for Industrial Applications - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom A - Councourse Level

For Part 1 see MS36
The importance of uncertainty quantification (UQ) for reliable predictions, system performance and risk assessment, decision-making is widely recognized and remains an active area of research. Substantial progress has been made in adopting and combining various approaches including model reduction, surrogate modeling, Bayesian inference, data assimilation and compression, variance- based decomposition, to address practical challenges across different domains. This minisymposium focuses on recent advances in UQ approaches and covers a wide range of their industrial applications including geosciences, climate modeling and computational fluid dynamics.

Organizer: Khachik Sargsyan
Sandia National Laboratories, USA

Organizer: Nikita Chugunov
Schlumberger-Doll Research, USA

4:00-4:25 A Surrogate Accelerated Multicanonical Monte Carlo Method for Uncertainty Quantification
Jinglai Li and Keyi Wu, Shanghai Jiao Tong University, China; Guang Lin, Pacific Northwest National Laboratory, USA

4:30-4:55 Multifidelity Reliability Analysis
Dongbin Xiu, University of Utah, USA

5:00-5:25 Subsurface Flow Model Calibration Under Uncertain Geologic Scenarios
Azarang Golmohammadi and Benham Jafarpour, University of Southern California, USA

5:30-5:55 Fast Deployment of Surrogate Modelling-Based Uncertainty Quantification Techniques Using UQLab
Stefano Marelli and Bruno Sudret, ETH Zürich, Switzerland

Tuesday, July 12

MS51

Applications of Algebraic Geometry - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom CDE - Councourse Level

For Part 1 see MS37

Problems from various application areas can be pitched as polynomial systems. Recent examples include problems from string theory, optimization, systems biology, and kinematics. Algebraic geometry is the mathematical area devoted to the study of polynomial systems and their solution sets. This minisymposium brings together speakers representing several areas of applications of algebraic geometry, particularly those making use of numerical methods. Topics vary from specific applications (e.g., synchronization of coupled phase oscillators) to general computational techniques (e.g., certification of numerical results and parallel computation).

Organizer: Dan Bates
Colorado State University, USA

Organizer: Jonathan Hauenstein
University of Notre Dame, USA

Organizer: Daniel Brake
University of Notre Dame, USA

4:00-4:25 Understanding Quantum Adiabatic Computing via Numerical Algebraic Geometry
Matthew Niemerg, Fields Institute for Research in Mathematical Sciences, Canada; Lei Zhixian and Xun Gao, Tsinghua University, China

4:30-4:55 Numerical Algebraic Geometry and Multiparameter Equations of State
Jonathan Hauenstein, *Alan Liddell*, Dhagash Mehta, and Hythem Sidky, University of Notre Dame, USA

5:00-5:25 Heuristic Methods for Choosing Paths In Homotopy Methods
Tim E. Hodges, Colorado State University, USA

5:30-5:55 Numerical Algebraic Geometry for Exploring Systems Biology Models
Kee-Myoung Nam, Harvard Medical School, USA

Tuesday, July 12

MS52

AWM Meeting - Workshop: Career Panel: Addressing the Challenges Facing Female Scientists and Mathematicians

4:00 PM-6:00 PM

Room:BCEC Room 253A

Sponsored by Association for Women in Mathematics (AWM)

This panel will bring together leading female mathematicians from academia, industry, national labs and funding agencies, who will talk about the challenges they encountered on their career paths and share lessons they learned along the way. There will be opportunities to ask questions and hear their advice on a variety of different topics in an informal discussion. We welcome graduate students, postdocs as well as more seasoned researchers to join us for this unique opportunity to discuss issues that affect female scientists and mathematicians.

Organizer: Hoa Nguyen
Trinity University, USA

Organizer: Laura Ellwein
Virginia Commonwealth University, USA

Organizer: Maria Emelianenko
George Mason University, USA

Panelists

Lynn Apfel
U.S. Department of Defense, USA

Lisa J. Fauci
Tulane University, USA

Rachel Levy
Harvey Mudd College, USA

Christine Tobler
MathWorks, USA

Tuesday, July 12

MS53

Chaotic High-Fidelity Simulations and Design - Part II of II

4:00 PM-5:30 PM

Room:BCEC Room 252A

For Part 1 see MS38

High fidelity simulations can revolutionize technology. Relying on first-principle physics, not empirical laws, they let innovators explore designs that differ from existing technologies. When predictive high-fidelity simulations become widely available, it will greatly accelerate technology innovation. Great mathematics can originate from high-fidelity simulations and design. Particularly interesting is chaotic behavior in many large-scale simulations, including turbulent flows and flow-induced vibrations. For example, these simulations can break conventional way of sensitivity analysis, offering opportunity for new analysis and new methods. This, and other mathematical problems in large-scale, chaotic simulations for design and optimization, is the theme of his minisymposium.

Organizer: Qiqi Wang
Massachusetts Institute of Technology, USA

Organizer: Jason E. Hicken
Rensselaer Polytechnic Institute, USA

4:00-4:25 Output Error Estimation for Chaotic Systems
Yukiko Shimizu and Krzysztof Fidkowski, University of Michigan, USA

4:30-4:55 Stabilized Unsteady Adjoint of Large Eddy Simulations
Chaitanya Talnikar, Massachusetts Institute of Technology, USA

5:00-5:25 Non-Intrusive Lease Square Shadowing Sensitivity Analysis via Projection
Angxiu Ni, Massachusetts Institute of Technology, USA

Tuesday, July 12

MS54

Computational Method for Waves in Inhomogeneous Media with Applications - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 259A

For Part 1 see MS39

Many modern micro/nano scale devices such as solar cells, diffraction gratings, surface plasmons, as well as classical geological prospecting, rely on wave scattering in inhomogeneous media. Therefore, robust and fast computational methods play an important role optimizing and developing such technology. However, because of added complexity in both structures and material properties, accurate and robust numerical simulation is challenging in all aspects, from the formulation of the problem to the numerical solver. This minisymposium will discuss recent advances and challenges in both computational methods and applications.

Organizer: Min Hyung Cho

University of Massachusetts, Lowell, USA

Organizer: Jun Lai

Courant Institute of Mathematical Sciences, New York University, USA

Organizer: Carlos C. Borges

Courant Institute of Mathematical Sciences, New York University, USA

4:00-4:25 Fundamental Limits to Wave Scattering in Linear Media

Owen D. Miller, Massachusetts Institute of Technology, USA

4:30-4:55 Accurate and Efficient Nystrom Volume Integral Equation Method for the Maxwell Equations for 3-D Scatterers

Duan Chen and Wei Cai, University of North Carolina, Charlotte, USA; Min Hyung Cho, University of Massachusetts, Lowell, USA; Brian Zinser, University of North Carolina, Charlotte, USA

5:00-5:25 Second Kind Integral Equation Formulation for Mode Calculation of Optical Waveguides

Jun Lai, Courant Institute of Mathematical Sciences, New York University, USA; Shidong Jiang, New Jersey Institute of Technology, USA

5:30-5:55 Computation of Electromagnetic Fields Due to a Dipole Source in Multilayered Media

Min Hyung Cho, University of Massachusetts, Lowell, USA

Tuesday, July 12

MS55

Computational Modeling and Numerical Simulation of Nonlocal Problems - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 257B

For Part 1 see MS40

Numerical solution of nonlocal problems remains a challenge, and requires new approaches to design robust, efficient and predictive numerical methods. The goal of this minisymposium is to bring together researchers working on different applications related to nonlocal models and present approaches for their numerical solution. This minisymposium will be organized in two parts; the first session is focused on mathematical models and the second session on numerical methods for their solution.

Organizer: Marta D'Elia

Sandia National Laboratories, USA

Organizer: Pavel Bochev

Sandia National Laboratories, USA

4:00-4:25 Collocation Method for One Dimensional Nonlocal Diffusion Equations

Qingguang Guan, Florida State University, USA; Xiaoping Zhang, Wuhan University, China; Max Gunzburger, Florida State University, USA

4:30-4:55 Finite Element Approximations of Nonlocal Electrostatics Models

Bin Zheng, Pacific Northwest National Laboratory, USA

5:00-5:25 Simulation of Nonlocal Electrostatics in Python Using Fenics and Bem++

Ali Mehdizadeh Rahimi, Northeastern University, USA

5:30-5:55 Multiscale Schwarz Coupling for Capturing Boundary Effects in Dilute Charged Particle Systems

James Cheung, Florida State University, USA

Tuesday, July 12

MS56

Dynamic Data Driven Applications Systems - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 252B

For Part 1 see MS41

Dynamic Data Driven Applications Systems (DDDAS) is a paradigm whereby the computation and instrumentation aspects of a system are dynamically integrated in a feedback control loop. Sensor data can be dynamically incorporated to affect the system's operation, and in reverse, the executing model can control the instrumentation. The minisymposium presents advances in DDDAS methods, which draw on fields such as sensor fusion, reduced modeling, inverse problems, data assimilation, uncertainty quantification, and decision support.

Organizer: Karen E. Willcox

Massachusetts Institute of Technology, USA

Organizer: Kamran Mohseni

University of Florida, USA

4:00-4:25 Data-Driven Optimal Learning for Dynamic Online Flight Capability Estimation for Self-Aware Aerospace Vehicles

Doug Allaire, Texas A&M University, USA

4:30-4:55 Reduced-Space Gaussian Process Regression Forecast for Nonlinear Dynamical Systems

Zhong Yi Wan and *Themistoklis Sapsis*, Massachusetts Institute of Technology, USA

5:00-5:25 Real-Time Vehicle Detection and Tracking Dddas Using Hyperspectral Features from Aerial Video

Matthew J. Hoffman, Rochester Institute of Technology, USA

5:30-5:55 Dynamic Data-Driven Modeling of Multi-Stage Nanocrystal Growth Using in-Situ Tem Video Data

Yu Ding, Texas A&M University, USA

Tuesday, July 12

MS57

Fluid Physics and Advanced Numerical Methods for Chemical Enhanced Oil Recovery

4:00 PM-6:00 PM

Room:BCEC Room 251

In this minisymposium, the speakers will present recent recent results on control of fluid flow related instabilities that arise in displacement processes of many injection policies of chemical enhanced oil recovery. Large scale simulation of a new global pressure based formulation modeling multiphase multi-component multi-physics porous media flows in heterogeneous media using a discontinuous FEM plus MMOC based hybrid method will also be presented.

Organizer: Prabir Daripa

Texas A&M University, USA

4:00-4:25 Physical and Mathematical Modeling of Chemical Enhanced Oil Recovery

Prabir Daripa, Texas A&M University, USA

4:30-4:55 Numerical Analysis of a Hybrid Method and Large Scale Simulation Results of SP-Flooding

Sourav Dutta and Prabir Daripa, Texas A&M University, USA

5:00-5:25 Forward and Inverse Problems for Multiphase Flow Through Porous Media

Subhendu Hazra, Bankura University, India

5:30-5:55 Bayesian Framework for Validation of Models for Subsurface Flows

Ahmad Jan, Oak Ridge National Laboratory, USA; Morteza Akbarabadi, University of Wyoming, USA; Marcio Borges, National Laboratory for Scientific Computing, Brazil; Felipe Pereira, University of Texas at Dallas, USA; Mohammad Piri, University of Wyoming, USA

Tuesday, July 12

MS58

Forecasting from Big, Noisy Data: Challenges and Techniques

4:00 PM-6:00 PM

Room:Grand Ballroom B - Concourse Level

The so-called "four Vs" of big data (volume, velocity, variety, and veracity) combine to make big data uniquely noisy. This gives rise to mathematical challenges for practitioners of predictive analytics seeking reliable forecasts based on big data. We will discuss these challenges and present techniques for overcoming them drawn from applied mathematics and allied disciplines, including computer science, network science, and statistical learning theory.

Organizer: Joseph R. Zipkin

Massachusetts Institute of Technology, USA

4:00-4:25 Mathematical Challenges in Predictive Analytics

Joseph R. Zipkin, Massachusetts Institute of Technology, USA

4:30-4:55 Predicting Events Using Diverse Ensemble Models

Amy Sliva, Charles River Analytics, USA

5:00-5:25 Probabilistic Forecasting in the Presence of Noisy and Conflicting Evidence

Alexander Memory, Leidos, Inc., USA

5:30-5:55 Relational Object Analysis Drives Multi-Modal Attack Prediction (Roadmap)

Rebecca Cathey, BAE Systems, USA

Tuesday, July 12

MS59

Mining in Graph Data - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 256

For Part 1 see MS42

Organized by SIAG/DMA

Graphs and networks are abundant in real world data, e.g., computer networks, the nation's electric grid, and shipping data from around the world. All of these sources of data can be written in terms of entities (vertices) and relationships (edges). Mining this kind of data for patterns or using machine learning and classification algorithms is an increasingly difficult task due to the size and complexity of the graphs.

Organizer: Jennifer B. Webster

Pacific Northwest National Laboratory, USA

Organizer: Mahantesh Halappanavar

Pacific Northwest National Laboratory, USA

Organizer: Emilie Hogan

Pacific Northwest National Laboratory, USA

4:00-4:25 How Can We Learn from a Trillion-Edge Graph?

David Haglin, Pacific Northwest National Laboratory, USA

4:30-4:55 Mining for Communities in Large-Scale Graphs

Ananth Kalyanaraman, Washington State University, USA

5:00-5:25 Multiscale Anomaly Detection on Time-Varying Graph Data with Cyber Applications

Robert A. Bridges, Oak Ridge National Laboratory, USA

5:30-5:55 Mapping Communities Across Graphs via Edge Cover

Ariful Azad and Aydin Buluc, Lawrence Berkeley National Laboratory, USA; Alex Pothen, Purdue University, USA

Tuesday, July 12

MS60

Novel Numerical Methods for PDEs - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 257A

For Part 1 see MS43

Approximation of the solutions associated with PDEs has been one of the major research interests in the computational/ applied science. This is because of the rapid growth of the complexity in engineering/ scientific problems involving PDEs in recent years. Thus, to a large extent, a major thrust in these communities has been to improve the collective ability to develop new novel numerical approaches to solve complicated PDEs. Traditionally, a set of PDEs is solved numerically by such approaches as FDM, FEM, FVM, BEM, etc. In this minisymposium, we aim to introduce a few novel numerical methods for solving various kinds of PDEs.

Organizer: Guangming Yao

Clarkson University, USA

4:00-4:25 Residue-Error Cross Validation, a New Method On Selecting An Optimal Shape Parameter For RBF Approximation

L. H. Kuo, University of West Florida, USA

4:30-4:55 Fast Method of Approximate Particular Solutions with Polyharmonic Splines As RBFs

Anup R. Lamichhane, University of Southern Mississippi, USA

5:00-5:25 Method of Fundamental Solutions Using Transformed Angular Basis Functions

Huiqing Zhu, University of Southern Mississippi, USA

5:30-5:55 A Mixed Finite Element Method for a Sixth Order Elliptic Problem

Bishnu P. Lamichhane, University of New Castle, NSW, Australia

Tuesday, July 12

MS61

Numerical Methods for Plasmonics and Optics - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 255

For Part 1 see MS44

The main purpose of this minisymposium is to bring together specialists in the fields of plasmonics and optics. The last decades have seen an impressive advance in the understanding of electromagnetics and acoustics. In particular, algorithm design, analysis, application and implementations of mathematical models in the area are now at the heart everyday technologies such as seismic imaging, underwater acoustics, and biomathematics; nevertheless some very important issues still remain open. This mini symposium is meant to be a platform to exchange ideas on these problems.

Organizer: Youngjoon Hong

University of Ilinois at Chicago, USA

Organizer: David P. Nicholls

University of Ilinois at Chicago, USA

4:00-4:25 Scalable High-Order Algorithms for Large-Scale Electromagnetic Systems

MiSun Min, Argonne National Laboratory, USA

4:30-4:55 Hybrid Numerical-Asymptotic Boundary Element Methods for High Frequency Scattering

David Hewett, University of Reading, United Kingdom

5:00-5:25 High-Order Perturbation of Surfaces Methods for Electromagnetic scattering: Multi-Layered Periodic Structure

Youngjoon Hong, University of Ilinois at Chicago, USA

5:30-5:55 Analysis and Computation of Topologically Protected Edge States in Honeycomb Structures

Charles Fefferman, Princeton University, USA; *James P. Lee-Thorp* and Michael I. Weinstein, Columbia University, USA

Tuesday, July 12

MS62

Recent Advances in High-Order Discontinuous Galerkin Methods - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 254A

For Part 1 see MS45

Discontinuous Galerkin (DG) methods have attracted considerable attention in computational science and engineering community because they possess a number of desirable properties for solving partial differential equations such as local conservation, high-order accuracy easy parallelization, and enabling adaptivity, to name a few. In this minisymposium, the speakers will address theoretical and computational issues such as stability, optimal convergence order, sparse discretization, (hp)-adaptivity, application of DG methods to real-world problems, and their efficient implementations.

Organizer: Jaime Peraire

Massachusetts Institute of Technology, USA

Organizer: Pablo Fernandez

Massachusetts Institute of Technology, USA

4:00-4:25 Iterative Methods for EDG and HDG

Sander Rhebergen, University of Waterloo, Canada

4:30-4:55 Output-Based Mesh and Order Optimization for the Hybridized Discontinuous Galerkin Method

Krzysztof Fidkowski and *Johann Dahm*, University of Michigan, USA

5:00-5:25 Sparse Grid Discontinuous Galerkin Schemes for High-Dimensional PDEs

Da Ying, Michigan State University, USA

5:30-5:55 An Adaptive SDG Method for Incompressible Flows

Jie Du, Chinese University of Hong Kong, Hong Kong

Tuesday, July 12

MS63

Student Days: An Informal Meeting with the Co-chairs and Invited Speakers

4:00 PM-6:00 PM

Room:BCEC Room 253B

For Part 3 see MS48
For Part 5 see MS77

Student Days session organized by the Annual Meeting Organizing Committee Co-Chairs. This informal session provides opportunities for students to meet invited speakers. This is your chance to ask research or career questions, or listen to advice provided by the experts.

Organizer: David F. Gleich
Purdue University, USA

Organizer: Mary Silber
University of Chicago, USA

Participating invited speakers:

Tanya Y. Berger-Wolf, University of Illinois, Chicago, USA; Freddy Bouchet, ENS Lyon, France; Mark Embree, Virginia Tech, USA; Gary Froyland, University of New South Wales, Australia; Nigel Goldenfeld, University of Illinois at Urbana-Champaign, USA; Bryan Grenfell, Princeton University, USA; Karen Saxe, Macalester College, USA; Bernd Sturmfels, University of California, Berkeley, USA; Tadashi Tokieda, University of Cambridge, United Kingdom and Stanford University, USA; Stefan Wild, Argonne National Laboratory, USA

Tuesday, July 12

MS64

Some Biological and Physical Models in Applied Mathematics

4:00 PM-6:00 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

Applications of mathematics are broad and far-reaching in both the specific branch of mathematics and the corresponding application. This minisymposium, proposed under SIAM's Workshop Celebrating Diversity, brings together a wide range of topics and mathematics that are currently in use. Whether looking at walking droplets, bone formation and metabolism, or photoreceptors, this collection of research talks will provide a range of topics in applied mathematics and highlight the diversity of problems and approaches within fields.

Organizer: Stephen Wirkus
Arizona State University, USA

Organizer: Erica Graham
Bryn Mawr College, USA

Organizer: Raegan Higgins
Texas Tech University, USA

Organizer: Sue Minkoff
University of Texas at Dallas, USA

4:00-4:25 Mathematical Modeling of Fungal Infection in Immune Compromised Individuals: The Effect of Back Mutation on Drug Treatment
Stephen Wirkus, Arizona State University, USA

4:30-4:55 Simulations of Walking Droplets in a Harmonic Potential
Kristin M. Dettmers, Massachusetts Institute of Technology, USA; Daniel Harris, University of North Carolina at Chapel Hill, USA; Anand Oza, Courant Institute of Mathematical Sciences, New York University, USA; Rodolfo R. Rosales and John W. Bush, Massachusetts Institute of Technology, USA

5:00-5:25 The Role of RdCVF in the Health of Cone Photoreceptors
Erika T. Camacho, Arizona State University, USA

5:30-5:55 Mathematical Models for Bone Formation and Metabolism
Alicia Prieto Langarica, Youngstown State University, USA

Tuesday, July 12

MS129

Direct and Inverse Scattering in Electromagnetics and Optics - Part I of II

4:00 PM-5:30 PM

Room:Otis - Lobby Level

For Part 2 see MS147

Electromagnetic wave scattering is encountered in wide range of applications such as medical and biological imaging, industrial design and identifications, optics and photonics, etc. The mathematical studies of scattering problems pose significant analytical and computational challenges. This minisymposium seeks to bring together researchers to promote exchange of ideas, and present recent developments on the mathematical analysis and novel computational methods in this area.

Organizer: Songting Luo
Iowa State University, USA

Organizer: Junshan Lin
Auburn University, USA

4:00-4:25 Nonlinear Photoacoustic Tomography with Two-Photon Absorption
Kui Ren, University of Texas at Austin, USA

4:30-4:55 Domain Decomposition Methods for the Solution of Multiple Scattering Problems
Michael Pedneault and Catalin Turc, New Jersey Institute of Technology, USA

5:00-5:25 Computational Methods for Extremal Steklov Problems
Eldar Akhmetgaliyev, Simon Fraser University, Canada; *Chiu-Yen Kao*, Claremont McKenna College, USA; Braxton Osting, University of Utah, USA

Tuesday, July 12

CP9

Dynamics

4:00 PM-5:40 PM

Room:Commonwealth C - Concourse Level

Chair: Kelum Gajamanna, Clarkson University, USA

4:00-4:15 Modeling the Segregation of a Herd of Cows by Assessing Hunger, Fatigue and Risk
Kelum D. Gajamannage and Erik Bollt, Clarkson University, USA; Mason A. Porter and Marian Dawkins, University of Oxford, United Kingdom

4:20-4:35 Fractional Dynamics with Distributed Age Initial Condition
Peter S. Straka and Gurtek Gill, University of New South Wales, Australia

4:40-4:55 Chaotic Behaviour Of The Shift Map On The Generalized Symbol Space And Topological Conjugacy
Tarini K. Dutta, Gauhati University, India

5:00-5:15 Instability in Payoff Positive Game Dynamics
Dashiell Fryer, San Jose State University, USA

5:20-5:35 Network-Theoretic Analyses of Vortex Dynamics
Aditya G. Nair and Kunihiko Taira, Florida State University, USA; Steven Brunton, University of Washington, USA

Tuesday, July 12

CP10

Optimization and Operations Research

4:00 PM-6:00 PM

Room:Commonwealth B - Concourse Level

Chair: Juliane Mueller, Lawrence Berkeley National Laboratory, USA

4:00-4:15 Ultra-High-Dimensional Optimization Approach to Requirements Development for Acquisition Programs
Alexander Dessanti, Jack Gauthier, Stephen Henry, and Matthew Hoffman, Sandia National Laboratories, USA

4:20-4:35 A Duality Approach For Sparse Representation In Classification
Reinaldo Sanchez-Arias, Wentworth Institute of Technology, USA

4:40-4:55 Reference-Based Almost Stochastic Dominance Rules with Application in Risk-Averse Optimization
Jian Hu, University of Michigan, Dearborn, USA

5:00-5:15 Epigraphical Convergence of Sample Averages of a Random Lower Semi-Continuous Functional Generated by a Markov Chain
Arnab Sur and John Birge, The University of Chicago, USA

5:20-5:35 Computationally Expensive Optimization Problems with Hidden Constraints
Juliane Mueller, Lawrence Berkeley National Laboratory, USA

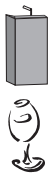
5:40-5:55 Optimization of Integrated Energy Supply Systems by Minlp
Jianjie Lu and Stefan Volkwein, University of Konstanz, Germany

Intermission

6:00 PM-6:15 PM

Tuesday, July 12

SIAM Business Meeting (Class of 2016 Fellows will be recognized.)



6:15 PM-7:15 PM

Room:Grand Ballroom AB- Concourse Level
Complimentary beer and wine will be served.

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

Room:Galleria Level

Computational Exploration of Integrodifference Population Models
Kennedy Agwamba, Harvey Mudd College, USA

Uncertainty in Estimating Lead/Lag Relationships
Seonmin Ahn, Brown University, USA; Deborah Khider, University of California, Santa Barbara, USA; Charles Lawrence, Brown University, USA; Lorraine Lisiecki, University of California, Santa Barbara, USA; Markus Kienast, Dalhousie University, Canada

Parabolic Bursting in Swim CPGs
Deniz Alacam and Andrey Shilnikov, Georgia State University, USA

Advanced Statistical Learning Algorithms for Comparative Multisource Formation Permeability Modelling
Watheq J. Al-Mudhafar, Louisiana State University, USA

Higher Order Upwind Methods for Maxwell's Equations in Second-Order Form
Jordan B. Angel and Jeffrey W. Banks, Rensselaer Polytechnic Institute, USA

A Multiobjective Optimization for the Performance Measure of EWMA AR (1) Processes When the Observation Is Trend Exponential
Ajibade G. Ayodele, Alshahrani Mohammed, Riaz Muhammad, and Ridwan A. Sanusi, King Fahd University of Petroleum and Minerals, Saudi Arabia

continued on next page

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

continued

Galerkin Differences: Achieving Very High Order Accuracy Energy Stable PDE Discretizations
Jeffrey W. Banks and John Jacangelo, Rensselaer Polytechnic Institute, USA

Towards Composable Bayesian Inference with PDE Forward Models
Paul Bauman, State University of New York at Buffalo, USA

The Quilted Synchrosqueezing Transform for Adaptive Time-Frequency Signal Analysis
Alexander J. Berrian and Naoki Saito, University of California, Davis, USA

Numerical Evaluation of Minimum Average Deviance Estimation in Ultra High Dimensional Poisson Regression
Ely C. Biggs, Wentworth Institute of Technology, USA; Tessa Helble, University of Maryland, Baltimore County, USA; George Jeffreys, Rutgers University, USA; Elias Al-Najjar, University of Maryland, Baltimore County, USA; Amit Nayak, George Washington University, USA; Kofi Adragni, University of Maryland, Baltimore County, USA

Unstructured Geometric Multigrid Using PETSc and libMesh
Boris Boutkov and Paul Bauman, State University of New York at Buffalo, USA

Determining Optimal Economic Policy to Mitigate Catastrophic Loss
Karleigh Cameron, Colorado State University, USA

Partial Synchronization in Pulse-Coupled Oscillator Networks
Bolun Chen, Jan Engelbrecht, and Renato Mirollo, Boston College, USA

A Stable Algorithm for Divergence and Curl-Free Radial Basis Functions in the Flat Limit
Kathryn P. Drake and Grady B. Wright, Boise State University, USA

continued in next column

An Analysis of Joint Inversion for Regularization of Ill-posed Problems
James F. Ford, Boise State University, USA

Node Diversification in Complex Networks by Decentralized Coloring
Richard B. Garcia - Lebron and Shouhuai Xu, University of North Texas, San Antonio, Texas; Jie Sun, Clarkson University, USA

Advanced Time Integration Methods for Atmospheric Physics
David J. Gardner, Peter Caldwell, and Carol S. Woodward, Lawrence Livermore National Laboratory, USA

Numerical Solutions to the Navier-Stokes Equations with a Free Surface Using Universal Meshes
Evan S. Gawlik, University of California, San Diego, USA

Resilience Analysis for Multigrid Methods
Christian Glusa and Mark Ainsworth, Brown University, USA

Enstrophy Dissipation in 2D Incompressible Flow Via Singular Vortex Dynamics
Takeshi Gotoda and Takashi Sakajo, Kyoto University, Japan

The Dynamics of a Viscoelastic Filament During a Stretch and Hold Experiment
Holly Grant, Virginia Tech, USA

A Sampling Kaczmarz-Motzkin Algorithm for Linear Feasibility
Jamie Haddock and Jesus De Loera, University of California, Davis, USA; Deanna Needell, Claremont McKenna College, USA

Computing Sobol' Indices for Stochastic Models
Joseph L. Hart, Alen Alexandrian, and Pierre Gremaud, North Carolina State University, USA

New Independent Potentials for the Stationary Klein-Gordon Equation in Terms of the Heun Functions
Tigran Ishkhanyan, Moscow Institute of Physics and Technology, Russia; Artur Ishkhanyan and Arthur Tarloyan, National Academy of Sciences, Armenia

Comparative Multivariate Rock Lithofacies Classifications Through Multinomial Logistic Regression and Probabilistic Neural Networks
Ali Jaber, unaffiliated; Watheq J. Al-Mudhafar, Louisiana State University, USA

continued in next column

An Energy Conservative, Skew-Symmetric Method for Compressible Flow with Adaptive Mesh Refinement and Fluid-Structure Interaction
Matthew B. Jemison, Florida A&M University and Florida State University, USA; Kunihiko Taira, Florida State University, USA

Generalized Gossip-Based Subgradient Method for Distributed Optimization
Zhanhong Jiang and Soumik Sarkar, Iowa State University, USA

Managing the Spread of Alfalfa Stem Nematodes (Ditylenchus Dipsaci): The Relationship Between Crop Rotation Periods and Pest Re-Emergence
Scott G. Jordan, Luis Gordillo, Ricardo Ramirez, and Claudia Nischwitz, Utah State University, USA

Collegiate Leadership Development: Analyzing Data from the Multi-Institutional Study of Leadership
Caitlin Lingley and *Claire Kelling*, Virginia Tech, USA

Study on the Viscoelastic Fluid Flows using Adaptive Least-Squares Finite Element Methods
Hsueh-Chen Lee, Wenzao Ursuline College of Languages, Taiwan

Parameter Estimation, Ill-Conditioning and Identifiability Analysis of the Anaerobic Digestion Model No 1 (adm1) for Biogas Production
Diana C. Lopez C and Mariano N. Cruz, Technische Universitaet Berlin, Germany; Tilman Barz, Austrian Institute of Technology, Australia; Peter Neubauer, Technische Universitaet Berlin, Germany

Image Deblurring with Blur Learning
Kelsey Maass, University of Washington, USA

A Stable and Efficient Interface Condition for Conjugate Heat Transfer Problems
Fanlong Meng, William Henshaw, and Jeffrey W. Banks, Rensselaer Polytechnic Institute, USA

Runge-Kutta-Chebyshev Time Stepping for Parabolic Equations on Adaptively Refined, Quadtree Meshes
Talin Mirzakhanian and Donna Calhoun, Boise State University, USA

continued on next page

Bayesian Global Optimization of Noisy Functions
Piyush Pandita, Ilias Bilionis, and Jitesh Panchal, Purdue University, USA

Quantitative Estimates in Nonlinear Elasticity
Christopher Policastro, University of California, Berkeley, USA

Dynamical Analysis of Connected Neuronal Motifs with OpenAcc and OpenMPI
Krishna Pusuluri and Sunitha Basodi and Andrey Shilnikov, Georgia State University, USA

Dissipative Particle Dynamics Simulation of Polymer Nanomaterials for Drugs Delivery
Leela Rakesh, Central Michigan University, USA

The Role of the Replacement Rate in the Basic Reproduction Number
Irma Thalia Rodriguez and Hana Dobrovolny, Texas Christian University, USA

Eigensurfaces of Reflectors and the Passenger Side Mirror Problem
Sarah G. Rody and Robert Hicks, Drexel University, USA; Ronald Perline, Drew University, USA

Development of Integer Programming Models for LCD Mother Glass Manufacturing As a Two-Dimensional Strip Packing Problem
Jun-Hyung Ryu, Dongguk University, South Korea; Kyung Tae Park and In-Beum Lee, POSTECH, Korea

Effects of Auxiliary Information on Ewma Control Chart
Ridwan A. Sanusi and Muhammad Riaz, King Fahd University of Petroleum and Minerals, Saudi Arabia; Nurudeen Adegoke, Federal University of Technology, Akure, Nigeria; Ganiyu A. Ajibade, King Fahd University of Petroleum and Minerals, Saudi Arabia

Blind Reconstruction of a Single-Source Signal Embedded in Another Signal
Hirofumi Sasaki, Waseda University, Japan; Fumio Sasaki, Tokyo University of Science, Japan; Michio Yamada, Kyoto University, Japan

continued in next column

Sufficient Conditions for Stability of Permanent Rotations of a Two-Gyrostat Chain in a Central Gravitational Field
Dmitriy Chebanov, City University of New York, USA; *Jose Salas*, City College of New York, USA

Effects of Biodiversity on Epizootics: The Importance of Decreasing Variability in Transmission
Peter Shaffery, University of Colorado Boulder, USA; Bret Elderd, Louisiana State University, USA; Vanja Dukic, University of Colorado Boulder, USA

Generalization of Arithmetic Progression and Sums of Powers
Mazoleka M. Simon, University of Dar es Salaam, Tanzania

Optimal Mating Strategies for Simultaneous Hermaphrodites in the Presence of Predators
Corin W. Stratton, Josh Auld, Nicole Bishop, Allison Kolpas, and Allison Kolpas, West Chester University, USA

Tsunami Sediment Transport with GeoClawSed
Hui Tang and Robert Weiss, Virginia Tech, USA

Trace Theorems for Some Nonlocal Function Spaces
Xiaochuan Tian and Qiang Du, Columbia University, USA

Stable and High-Order Accurate Finite Difference Methods for the Wave Equation with Non-Conforming Grid Interfaces
Siyang Wang and Gunilla Kreiss, Uppsala University, Sweden

Spectra of Quantum Trees and Orthogonal Polynomials
Zhaoxia Wang and Stephen P. Shipman, Louisiana State University, USA

Goal-Oriented Network Design for Pairwise Comparison Ranking
Jie Sun, *Shandeepa Wickramasinghe*, and Christino Tamon, Clarkson University, USA

Multigrid Framework for Multiphysics Problems
Tobias A. Wiesner, Jonathan J. Hu, and Raymond Tuminaro, Sandia National Laboratories, USA

continued in next column

Lagrangian Data Assimilation of Traffic-Flow Models
Chao Xia, Brown University, USA

Online Adaptive Model Reduction for Flows in Heterogeneous Porous Media
Yanfang Yang, Yalchin Efendiev, and Eduardo Gildin, Texas A&M University, USA

Stiffness of the Arched Human Foot
Ali Yawar, Yale University, USA; Maria Lugo-Bolanos and Shreyas Mandre, Brown University, USA; Madhusudhan Venkadesan, Yale University, USA

Decision Analysis for Water-Energy Nexus Considering Multiple Objectives
Xiaodong Zhang and Velimir V. Vesselinov, Los Alamos National Laboratory, USA

SIAM Presents

Since 2008, SIAM has recorded many Invited Lectures, Prize Lectures, and selected Minisymposia from various conferences. These are available by visiting SIAM Presents (*http://www.siam.org/meetings/presents.php*).

Tuesday, July 12

PP2

Minisymposterium: AWM Posters

8:00 PM-10:00 PM

Room:Galleria Level

Organizer:
Fengyan Li, Rensselaer Polytechnic Institute, USA

Eva M. Strawbridge, James Madison University, USA

Joyati Debnath, Winona State University, USA

AWM Workshop: A Multi-Risk Model for Understanding the Spread of Chlamydia
Asma Azizi Boroojeni, Tulane University, USA

AWM Workshop: Modeling of Mrna Localization in Xenopus Egg Cells
Veronica M. Ciocanel, Brown University, USA

AWM Workshop: Fitness Effects of Defense Strategies on Plants under Herbivory
Karen M. Cumings, Rensselaer Polytechnic Institute, USA

AWM Workshop: Quantifying Dynamic Growing Roots in 3D by Persistent Homology
Mao Li, Florida State University, USA

AWM Workshop: A Numerical Investigation of a Simplied Human Birth Model
Roseanna Pealatere, Tulane University, USA

AWM Workshop: Identification of the Vasodilatory Stimulus from Cerebral Blood Flow Data
Jamie Prezioso, Case Western Reserve University, USA

AWM Workshop: Little's Law Applied to a Stochastic Model of Poliomyelitis
Celeste Vallejo, University of Florida, USA

AWM Workshop: Diffusion Maps for Image Segmentation
Marilyn Yazmin Vazquez, George Mason University, USA

AWM Workshop: Modeling Cooperation and Competition
Karen E Wood, University of California, Irvine, USA

continued in next column

AWM Workshop: A Multi-Scale Model of Escherichia Coli Chemotaxis from Intracellular Signaling Pathway to Motility and Nutrient Uptake in Nutrient Gradient and Isotropic Fluid Environments
Feifei Xu, Florida State University, USA

AWM Workshop: Online Adaptive Model Reduction for Flows in Heterogeneous Porous Media
Yanfang Yang, Texas A&M University, USA

Tuesday, July 12

PP3

Minisymposterium: Advanced Numerical Methods for Electromagnetic Materials and Magnetohydrodynamics

8:00 PM-10:00 PM

Room:Galleria Level

Organizer:
Vrushali A. Bokil, Oregon State University, USA

We present novel numerical methods for the discretization of electromagnetic problems arising in three different applications: wave propagation in dispersive and meta-materials, wave propagation in ferromagnetic materials, and the detection of arcs in magneto-hydrodynamic generator channels

A Dispersion Minimized Mimetic Finite Difference Method for Maxwell's Equations in Linear Dispersive Dielectrics
Vrushali A. Bokil and Duncan A. Mcgregor, Oregon State University, USA; Vitaliy Gyrya, Los Alamos National Laboratory, USA

Modeling and Detecting Arcs in Magnetohydrodynamic Generator Channels
Duncan A. Mcgregor, Vrushali A. Bokil, and Nathan L. Gibson, Oregon State University, USA; Rigel Woodside, National Energy Technology Laboratory, USA

Operator Splitting Methods for Maxwell's Equations in Ferromagnetic Materials
Puttha Sakkaplangkul and Vrushali A. Bokil, Oregon State University, USA

Tuesday, July 12

PP4

Minisymposterium: Algorithms and Software in Numerical Linear Algebra

8:00 PM-10:00 PM

Room:Galleria Level

Organized by SIAG/LA

Organizers:
Nicholas Higham, University of Manchester, United Kingdom

Francoise Tisseur, University of Manchester, United Kingdom

This minisymposterium presents recent developments in algorithms and software in numerical linear algebra. It reflects the diverse aspects of the subject, including exploitation of structure and sparsity and development of algorithms for evolving computer architectures. The following presentations are also part of this minisymposterium. They have been selected to participate in SIAM's first ePoster session! See PP7 Electronic Posters.

- RKToolbox: A Rational Krylov Toolbox for MATLAB - Berljafa, Mario
- Density of States for Graph Analysis - Bindel, David
- Discovering and Visualizing Active Subspaces (byod: Bring Your Own Data)- Constantine, Paul
- Erasure Coding for Fault Oblivious Linear System Solvers - Gleich, David
- A High-Performance Parallel Algorithm for Nonnegative Matrix Factorization - Kannan, Ramakrishnan
- Iterative Regularization Tools -- A Matlab Package for Large Scale Inverse Problems - Nagy, James
- A Randomized Tensor-SVD Algorithm with Applications in Image Processing - Zhang, Jiani
- Multifrontal Sparse Matrix Algorithms in Julia - Zhang, Weijian

Randomized Methods for Matrix Estimation in Inversion, Optimization, and UQ

Eric De Sturler, Virginia Tech, USA; Xiaojia Zhang, Georgia Institute of Technology, USA; Selin Sariaydin, Virginia Tech, USA; Misha E. Kilmer, Tufts University, USA; Glaucio Paulino, University of Illinois, USA

continued in next column

Computing the Matrix Logarithm at Higher Precision

Massimiliano Fasi and Nicholas J. Higham, University of Manchester, United Kingdom

Network Asymmetry Through Time Dependency

Des Higham and Alex Mantzaris, University of Strathclyde, United Kingdom

Estimating the Largest Elements of a Matrix

Nicholas J. Higham and Samuel Relton, University of Manchester, United Kingdom

Recent Developments Within the Feast Eigenvalue Solver

James Kestyn and Eric Polizzi, University of Massachusetts, Amherst, USA

Hierarchical Computations on Manycore Architectures (hicma)

David E. Keyes, Hatem Ltaief, and George Turkiyyah, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Rio Yokota, Tokyo Institute of Technology, Japan

Uncovering Hidden Block Structure

Philip Knight, University of Strathclyde, United Kingdom; Iain Duff, Science & Technology Facilities Council, United Kingdom and CERFACS, Toulouse, France; Sandrine Mouysset, Universite de Toulouse, France; Daniel Ruiz, ENSEEIHT, Toulouse, France; Bora Ucar, ENS Lyon, France

High-Performance Right-Looking Householder-Based LLL and BKZ (2.0)

Jack L. Poulson and Ron Estrin, Stanford University, USA

Computing a Random Eigenvalue Distribution by Solving a PDE

Brian D. Sutton, Randolph-Macon College, USA; Alex Bloemendal, Broad Institute of MIT and Harvard University, USA

Max-Plus Approximation of Lu Factorization

Francoise Tisseur and James Hook, University of Manchester, United Kingdom

SVDS - Practical Aspects of Bidirectional Lanczos Method

Christine Tobler, MathWorks, USA; Lola Davidson, University of Kentucky, USA

Global Polynomial Rootfinding in 1D, 2D, and DD

Alex Townsend, Massachusetts Institute of Technology, USA; Vanni Noferini, University of Essex, United Kingdom; Yuji Nakatsukasa, University of Tokyo, Japan

continued in next column

A Class of Preconditioners Based on Low-Rank Approximation Techniques

Yuanzhe Xi and Yousef Saad, University of Minnesota, USA

The Shift and Invert Lanczos Algorithm for the Solution of Structural Dynamics Problems

Mante Zemaityte, University of Manchester, United Kingdom; Ramaseshan Kannan, Arup, Manchester, United Kingdom; Francoise Tisseur, University of Manchester, United Kingdom

Tuesday, July 12

PP5

Minisymposterium: Disease Modeling

8:00 PM-10:00 PM

Room:Galleria Level

Organizer:
Crista Arangala, Elon University, USA

This minisymposterium will feature research on disease models including SIR models of different feature of Dengue fever and Measles.

A Mathematical Investigation of Vaccination Strategies in a Heterogeneous Population to Prevent Measles Epidemics
Aleah Archibald and Nicholas Luke, North Carolina A&T State University, USA

Modeling the Spread of Measles with Pockets of Low Vaccination Coverage Rates
Melanie Payton, North Carolina A&T State University, USA

Mathematical Modeling of Dengue
Michelle Rave, Elon University, USA

Working in the City and Getting Dengue Fever: A Mathematical Model of Dengue Fever Incorporating Mobility
Kelly Reagan, Elon University, USA

Tuesday, July 12

PP6

Minisymposterium: Mathworks

8:00 PM-10:00 PM

Room:Galleria Level

Organizer:
Christine Tobler, MathWorks, USA

An opportunity to talk about new MATLAB features with the people who implemented them. We give an overview of some recent additions to MATLAB and show some applications The following presentations are also part of this minisymposterium. They have been selected to participate in SIAM's first ePoster session! See PP7 Electronic Posters.

- Interactive Demo of Graph Algorithms in MATLAB - Ionita, Antonio Cosmin
- Making Machine Learning Workflows Easy - Lane, Tom
- Does Your MATLAB Code Pass the Test? Tools for Testing for MATLAB Code - Lord, Steven

Working with Big Data in Matlab
Penny Anderson, The MathWorks, Inc., USA

Mixed-Integer Optimization with Matlab and Optimization Toolbox
Steve Grikschat, MathWorks, USA

Computational Geometry in Matlab
Jin Ma, MathWorks, USA

SIAM Presents

Since 2008, SIAM has recorded many Invited Lectures, Prize Lectures, and selected Minisymposia from various conferences. These are available by visiting SIAM Presents (*http://www.siam.org/meetings/presents.php*).

Tuesday, July 12

PP7

Electronic Posters

8:00 PM-10:00 PM

Room:Galleria Level

Nonlinear Model Reduction in Computational Fluid Dynamics
Kevin T. Carlberg and Matthew Barone, Sandia National Laboratories, USA; Harbir Antil, George Mason University, USA; Syuzanna Sargsyan, University of Washington, USA

Information Flow in Transient Network Dynamics
Jeremie A. Fish, Jie Sun, and Erik Bollt, Clarkson University, USA

The Humility Project: Text Analysis for Characteristic Linguistic Patterns
Tyler Perini, College of Charleston, USA

3D Visualization of Growth Pattern of Artemisia Tridentata (Sagebrush)
Michael J. Scarinci, Katherine Encarnacion, Nicholas Italiano, Angel R. Pineda, and Lance Evans, Manhattan College, USA

Spectra of Short Pulse Solutions of the Cubic-Quintic Complex Ginzburg Landau Equation Near Zero Dispersion
Yannan Shen, Southern Methodist University, USA; John Zweck, University of Texas at Dallas, USA; Curtis R. Menyuk, University of Maryland, Baltimore County, USA

Clustering of Omics Data in Biological Systems
Min Wang, Ohio State University, USA

How You Can Improve the Scalability of your PDE Solver by Using Swept Domain Decomposition
Qiqi Wang, Massachusetts Institute of Technology, USA

RKToolbox: A Rational Krylov Toolbox for MATLAB (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
Mario Berljafa and Stefan Guettel, University of Manchester, United Kingdom

Density of States for Graph Analysis (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
David Bindel, Cornell University, USA

continued on next page

Discovering and Visualizing Active Subspaces (byod: Bring Your Own Data) - (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
Paul Constantine, Colorado School of Mines, USA

Erasure Coding for Fault Oblivious Linear System Solvers (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
David F. Gleich, Purdue University, USA

A High-Performance Parallel Algorithm for Nonnegative Matrix Factorization (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
Ramakrishnan Kannan, Oak Ridge National Laboratory, USA; Grey Ballard, Sandia National Laboratories, USA; Haesun Park, Georgia Institute of Technology, USA

Iterative Regularization Tools -- A Matlab Package for Large Scale Inverse Problems (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
James G. Nagy, Emory University, USA; Silvia Gazzola, University of Bath, United Kingdom; Per Christian Hansen, Technical University of Denmark, Denmark

A Randomized Tensor-SVD Algorithm with Applications in Image Processing (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
Jiani Zhang, Misha E. Kilmer, Arvind Saibaba, and Shuchin Aeron, Tufts University, USA

Multifrontal Sparse Matrix Algorithms in Julia (Part of PP4 Minisymposterium: Algorithms and Software in Numerical Linear Algebra)
Weijian Zhang, University of Manchester, United Kingdom; Jiahao Chen, Massachusetts Institute of Technology, USA

continued in next column

Interactive Demo of Graph Algorithms in MATLAB (Part of PP6 Minisymposterium: Mathworks)
Antonio Cosmin Ionita and Patrick Quillen, MathWorks, USA

Making Machine Learning Workflows Easy (Part of PP6 Minisymposterium: Mathworks)
Tom Lane, Ilya Narsky, Jon Cherrie, and Don Mathis, MathWorks, USA

Does Your MATLAB Code Pass the Test? Tools for Testing for MATLAB Code (Part of PP6 Minisymposterium: Mathworks)
Steven Lord, MathWorks, USA

Wednesday, July 13

Fundamentals of Algorithms Book Series Editorial Board Meeting

7:00 AM-8:30 AM

Room:Executive Board Room - Mezzanine Level

Programs & Conferences Committee Meeting

7:00 AM-8:30 AM

Room:Faneuil - Mezzanine Level

Registration

8:00 AM-4:30 PM

Room:Concourse Level

Wednesday, July 13

IT5

Beyond the Black Box in Derivative-Free and Simulation-Based Optimization

8:30 AM-9:15 AM

Room:Grand Ballroom - Concourse Level

Chair: Kevin T. Carlberg, Sandia National Laboratories, USA

The advent of computational science has unveiled large classes of nonlinear optimization problems where derivatives of the objective and/or constraints are unavailable. Often, these problems are posed as black-box optimization problems, but rarely is this by necessity. We report on our experience extracting additional structure on problems consisting of both black-box and algebraic or otherwise known components. We provide examples on calibration problems, knowing a subset of derivatives, and nonsmooth composite optimization. In each case, we use quadratic surrogates to model both the black-box and algebraic components to obtain new, globally convergent grey-box optimization methods.

Stefan Wild
Argonne National Laboratory, USA

Wednesday, July 13

IT6

First Order Methods for Well Structured Optimization Problems

9:15 AM-10:00 AM

Room:Grand Ballroom - Concourse Level

Chair: Suvrit Sra, Massachusetts Institute of Technology, USA

Many fundamental scientific and engineering problems arising in signal recovery, imaging science, machine learning and other fields can be formulated as well structured optimization problems. These problems are typically very large scale, often nonsmooth and even nonconvex, leading to challenging theoretical and computational difficulties, and often precluding the use of sophisticated algorithms. Elementary first order methods then often remain our best alternative to tackle such problems. We discuss recent advances on the design and analysis of such algorithms for some generic optimization models arising in these applications, highlighting the ways in which problem structures and data information can be beneficially exploited to devise simple and efficient optimization methods.

Marc Teboulle
Tel Aviv University, Israel

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Wednesday, July 13

MT2

Minitutorial: Directions for Graduate and Undergraduate Modeling Courses

10:30 AM-12:30 PM

Room:Grand Ballroom B- Concourse Level

Chair: Jeffrey Humpherys, Brigham Young University, USA

Chair: Rachel Levy, Harvey Mudd College, USA

Chair: Thomas P. Witelski, Duke University, USA

This minitutorial will take a workshop approach to help participants explore considerations for designing an undergraduate or graduate mathematical modeling course. Example syllabi and learning objectives will be discussed to best meet goals for students. Pros and cons of various organizing principles for modeling courses will be weighed, including one organized around prerequisites of linear algebra and differential equations, another focusing on algorithms, and a third based on industrial mathematics problems.

Jeffrey Humpherys, Brigham Young University, USA

Wednesday, July 13

MS65

Advances in Computational Methods for Fluid-Structure Interaction Problems - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 257A

For Part 2 see MS81

Fluid-structure interaction (FSI) problems are important in many fields of engineering and applied science. These problems are often difficult to simulate in an efficient, stable and accurate manner. This minisymposium aims to describe recent advances in the development of numerical methods and computational frameworks for the related problems.

Organizer: Longfei Li

Rensselaer Polytechnic Institute, USA

Organizer: Qi Tang

Rensselaer Polytechnic Institute, USA

10:30-10:55 A Stable Partitioned FSI Algorithm for Incompressible Flow and Deforming Beams

Longfei Li, William Henshaw, Jeffrey W. Banks, and Donald W. Schwendeman, Rensselaer Polytechnic Institute, USA

11:00-11:25 Verification of Partitioned Fluid-Structure Interaction Algorithms with Disparate Order of Accuracy

Nicholas LaBarbera and Jonathan Pitt, Pennsylvania State University, USA

11:30-11:55 An Overset Mesh Hybridizable Discontinuous Galerkin Fluid-Structure Interaction Algorithm

Justin A. Kauffman and Jonathan S. Pitt, Pennsylvania State University, USA

12:00-12:25 A New DG Interface Scheme for FSI

David Wells, Fengyan Li, and Jeff Banks, Rensselaer Polytechnic Institute, USA

Wednesday, July 13

MS66

Algorithms and Statistical Methods for Noisy Network Analysis - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253B

For Part 2 see MS82

Network analysis is an elegant, graph-based method for studying complex systems of interacting entities. These mathematical models, however, inherently include some discrepancy from the real-world systems they represent. Some relationships may not be observable, and there may be errors in the measurements taken to infer the network structure. Since traditional graph theory deals with exact mathematics, one of the most challenging aspects of modern network analysis is accounting for this noise. This minisymposium will include talks on algorithmic techniques to handle noise in networks and obtain reliable results from their analysis, and work on statistical analysis of noisy networks.

Organizer: Sanjukta Bhowmick

University of Nebraska, Omaha, USA

Organizer: Benjamin A. Miller

Massachusetts Institute of Technology, USA

10:30-10:55 Synthesizing Social Networks From Random Walks

Oleg Kolgushev and Armin Mikler, University of North Texas, USA

11:00-11:25 Estimating Network Degree Distributions from Sampled Networks: An Inverse Problem

Eric D. Kolaczyk and Alexandrina Goeva, Boston University, USA; Richard B. Lehoucq, Sandia National Laboratories, USA

11:30-11:55 Identifying and Ranking Critical Interactions in Stochastic Dynamical Systems

Stephen Eubank, *Yihui Ren*, Srinivasan Venkatramanan, and Madhav Marathe, Virginia Tech, USA

12:00-12:25 Improved Planted Clique Detection with Low-Rank Sparse PCA

Alexis Núñez-Betancourt, Brown University, USA; Benjamin A. Miller, Massachusetts Institute of Technology, USA

Wednesday, July 13

MS67

Data Centric Computing – Challenges and Opportunities - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom CDE - Concourse Level

For Part 2 see MS84

The volume, variety, velocity and veracity of data in our world today transforms how we think about computer systems to be more data centric. The challenge is not the ability to compute, but the need to efficiently move and handle large data sets. Instead of how fast can we compute, the real question is time to solution. We need to optimize across the entire system by looking at the entire workflow that makes up a compute solution. This minisymposium will discuss the challenges and opportunities for compute solutions to exploit the data centric systems as we evolve to exascale.

Organizer: Kirk E. Jordan

IBM T.J. Watson Research Center, USA

Organizer: Constantinos Evangelinos

IBM T.J. Watson Research Center, USA

10:30-10:55 Data Centric Systems: Workflow Challenges and Opportunities

Kirk E. Jordan, IBM T.J. Watson Research Center, USA

11:00-11:25 A Hierarchical Characterization of Scientific and Engineering Workflows Applied to Examples from the DoE and Other Communities

David Montoya, Los Alamos National Laboratory, USA; Constantinos Evangelinos, IBM T.J. Watson Research Center, USA

11:30-11:55 In-Memory Computing for Bioinformatics Pipelines

Vipin Sachdeva, IBM T.J. Watson Research Center, USA; Srinivas Aluru and David A. Bader, Georgia Institute of Technology, USA; Kirk E. Jordan, IBM T.J. Watson Research Center, USA; Martyn Winn, The Hartree Center, United Kingdom

continued on next page

Wednesday, July 13

MS67

Data Centric Computing – Challenges and Opportunities - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom CDE - Concourse Level

continued

12:00-12:25 Using Performance Models to Manage Computation/ Data Movement Tradeoffs in HPC Applications
Hormozd Gahvari, Lawrence Livermore National Laboratory, USA; William D. Gropp, University of Illinois at Urbana-Champaign, USA; Kirk E. Jordan, IBM T.J. Watson Research Center, USA; Jacob B. Schroder, Martin Schulz, and Ulrike Meier Yang, Lawrence Livermore National Laboratory, USA

Wednesday, July 13

MS68

Eigenvalue Solvers for Large Problems: Locally Optimal Block Preconditioned Conjugate Gradient Method and Beyond

10:30 AM-12:30 PM

Room:BCEC Room 252B

This minisymposium marks the fifteenth anniversary of the Locally Optimal Block Preconditioned Conjugate Gradient (LOBPCG) algorithm for large-scale eigenvalue problems. The presented talks will feature novel extensions of the method, its applications, and efficient implementations.

Organizer: Eugene Vecharynski
Lawrence Berkeley National Laboratory, USA

Organizer: Andrew Knyazev
Mitsubishi Electric Research Laboratories, USA

10:30-10:55 LOBPCG-like Iterations in Eigenvalue-like Problems
Andrew Knyazev, Mitsubishi Electric Research Laboratories, USA

11:00-11:25 A Robust and Efficient Implementation of Lobpcg
Meiyue Shao and Chao Yang, Lawrence Berkeley National Laboratory, USA; Jed Duersch and Ming Gu, University of California, Berkeley, USA

11:30-11:55 Preconditioned Solvers for Interior Eigenvalues of a Nonlinear Hermitian Eigenproblem
Fei Xue, University of Louisiana, Lafayette, USA

12:00-12:25 Distributed PCA and Robust PCA
Vahan Huroyan and Gilad Lerman, University of Minnesota, USA

Wednesday, July 13

MS69

Inferring Networks from Non-Network Data - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom A - Concourse Level

For Part 2 see MS85
Organized by SIAG/DMA

Network representation learning is an emerging field that is exclusively focused on developing the understanding and rigor for inferring useful network representations from noisy, indirect and diverse data. In many practical settings, researchers are often faced with having to make arbitrary decisions on how to construct networks. Such arbitrary decisions have important implications on the quality of subsequent learning tasks. This minisymposium will explore recent developments in the area of network representation learning including 1) fusion techniques that lead to robust network representations, 2) task-based network representation learning, and 3) validation of representation quality in the absence of ground truth.

Organizer: Rajmonda Caceres
Massachusetts Institute of Technology, USA

Organizer: Ivan Brugere
University of Ilinois at Chicago, USA

Organizer: Tanya Y. Berger-Wolf
University of Illinois, Chicago, USA

10:30-10:55 Window Selection in Dynamic Networks
Benjamin Fish, University of Ilinois at Chicago, USA; *Rajmonda Caceres*, Massachusetts Institute of Technology, USA

11:00-11:25 Using Local Methods to Robustify Graph-Based Learning
David F. Gleich, Purdue University, USA; Michael Mahoney, University of California, Berkeley, USA

11:30-11:55 Learning Opinion Dynamics in Social Networks
Manuel Gomez Rodriguez, Max Planck Institute for Software Systems, Germany

12:00-12:25 Tissue-Specific Regulatory Circuits Reveal Variable Modular Perturbations Across Complex Diseases
Daniel Marbach, University of Lausanne, Switzerland

Wednesday, July 13

MS70

Model Reduction and Krylov-Subspace Methods

10:30 AM-12:30 PM

Room:BCEC Room 252A

Model reduction and Krylov-subspace methods for solving sparse linear systems have surprisingly close connections. Both compute approximate solutions in low-dimensional subspaces, and Krylov-subspace methods underpin interpolatory model reduction for linear-time-invariant systems. This minisymposium explores these connections and as well as new techniques for effective data-driven model reduction.

Organizer: Eric De Sturler
Virginia Tech, USA

Organizer: Benjamin Peherstorfer
Massachusetts Institute of Technology, USA

10:30-10:55 Krylov-Subspace Recycling via the POD-Augmented Conjugate Gradient Method
Kevin T. Carlberg, Sandia National Laboratories, USA; Virginia Forstall, University of Maryland, College Park, USA; Ray S. Tuminaro, Sandia National Laboratories, USA

11:00-11:25 Krylov Subspace Recycling for Computing and Updating Reduced Order Models
Eric De Sturler, Virginia Tech, USA

11:30-11:55 Data-Driven Model Reduction of Convection-Dominated, Unsteady Flows
Maciej Balajewicz, University of Illinois at Urbana-Champaign, USA

12:00-12:25 A Mode Decomposition for Transport-Dominated and Parameter-Dependent Phenomena: The Shifted Proper Orthogonal Decomposition
Philipp Schulze, Julius Reiss, Sergio Benguechea, and Joem Sesterhenn, TU Berlin, Germany

Wednesday, July 13

MS71

Model Reduction for Inverse Problems - Part I of II

10:30 AM-12:00 PM

Room:BCEC Room 257B

For Part 2 see MS87
This minisymposium brings together applied and theoretical experts that use model reduction techniques to solve inverse problems arising in large-scale time- and frequency-domain wave field problems. This gives efficient inversion methods in applications including geophysics.

Organizer: Fernando Guevara Vasquez
University of Utah, USA

Organizer: Alexander V. Mamonov
University of Houston, USA

10:30-10:55 Discrete Conductivity and Schroedinger Inverse Problems
Fernando Guevara Vasquez, University of Utah, USA

11:00-11:25 Computing Reduced Order Models for Diffuse Optical Tomography
Meghan O'Connell and *Misha E. Kilmer*, Tufts University, USA; Eric De Sturler, Serkan Gugercin, and Christopher A. Beattie, Virginia Tech, USA

11:30-11:55 Geometric Interpretations of Reduced Order Models
Vladimir L. Druskin, Schlumberger-Doll Research, USA

Wednesday, July 13

MS72

Novel Numerical Methods on Polyhedral Meshes - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 259A

For Part 2 see MS91
In many real-world scientific and engineering applications modeled by partial differential equations (PDEs), polyhedral meshes are preferred. Although many polytonal discretization methods for numerical approximation of PDEs have been developed, the design of efficient simulation techniques on polyhedral meshes is still a challenging task. For example, mesh generation, stable finite element/difference methods, efficient time integration, quadrature rules on polyhedral meshes, and fast linear solvers. The main theme of the minisymposium is on the advanced numerical methods on polyhedral meshes. The focus is on the mesh generation, robust temporal and spatial discretizations, efficient nonlinear and linear solvers, and practical implementations for a wide range of applications.

Organizer: Xiaozhe Hu
Tufts University, USA

Organizer: Lin Mu
Oak Ridge National Laboratory, USA

10:30-10:55 Basics of Weak Galerkin Finite Element Methods: Theory and Implementation
Junping Wang, National Science Foundation, USA

11:00-11:25 New Class of Finite Element Methods: Weak Galerkin Methods
Xiu Ye, University of Arkansas at Little Rock, USA

11:30-11:55 Weak Galerkin FEMs for Sensitivity Analysis for Elliptic Problems on Polyhedral Meshes
Jiangguo Liu, Colorado State University, USA

12:00-12:25 A Parallel Implicit Scheme for Geometric Nonlinear Elastic Equation Based on Weak Galerkin Finite Element Method
Liangwei Li, George Washington University, USA

Wednesday, July 13

MS73

Numerical Linear and Multilinear Algebra: Celebrating Charlie Van Loan - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254B

For Part 2 see MS92

Organized by SIAG/LA

Charlie Van Loan has contributed broadly to numerical linear algebra and computational science and is one of the best known expositors in the area. His work includes six books on computational science and numerical linear algebra, including the widely-used Matrix Computations with Gene Golub (now in its fourth edition). His research work includes high-performance GEMM-based BLAS and parallel factorization schemes, eigenvalue and SVD computations, tensors, and the many dubious ways to compute the matrix exponential. The talks in this minisymposium will highlight some of the many contributions of Charlie Van Loan's career.

Organizer: David Bindel

Cornell University, USA

Organizer: Ilse Ipsen

North Carolina State University, USA

10:30-10:55 Parallel Tucker-Based Compression for Regular Grid Data

Tamara G. Kolda, Sandia National Laboratories, USA; Woody N. Austin, University of Texas at Austin, USA; Grey Ballard, Sandia National Laboratories, USA

11:00-11:25 Cancer Diagnostics and Prognostics from Comparative Spectral Decompositions of Patient-Matched Genomic Profiles

Orly Alter, University of Utah, USA

11:30-11:55 Exploiting Structure in the Simulation of Super Carbon Nanotubes

Christian H. Bischof, Technische Universität Darmstadt, Germany

12:00-12:25 A Revisit to the GEMM-Based Level 3 BLAS and Its Impact on High Performance Matrix Computations

Bo T. Kågström, Umeå University, Sweden

Wednesday, July 13

MS74

Numerical Methods for the Variable-Medium High-Frequency Helmholtz Equation - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 256

For Part 2 see MS93

Numerical solution of the high-frequency Helmholtz equation, in inhomogeneous and/or discontinuous media, is crucial for applications such as acoustics, optical devices, communications, and wave-based inverse problems. Yet it is well known that its oscillatory nature can thwart modern elliptic or boundary solvers relying on multigrid, low-rank structures, etc. This pair of minisymposia gathers geographically diverse junior and senior researchers who are at the forefront of two avenues where analytic insight about wave propagation is boosting computational efficiency: 1) boundary integral equations, including optimal handling of material jumps and inhomogeneous media, and 2) fast solvers and preconditioners for the directly discretized PDE.

Organizer: Leonardo Zepeda-Nunez

University of California, Irvine, USA

Organizer: Alex H. Barnett

Dartmouth College and Simons Foundation, USA

10:30-10:55 High Frequency Boundary Integral Equations in a Linearly Stratified Medium

Alex H. Barnett, Dartmouth College and Simons Foundation, USA; Bradley Nelson, Stanford University, USA; J. Matthew Mahoney, University of Vermont, USA

11:00-11:25 Why Is High-Frequency Helmholtz Equation Difficult to Solve?

Hongkai Zhao, University of California, Irvine, USA

11:30-11:55 Well-Posed Boundary Integral Equation Formulations and Nyström Discretizations for the Solution of Helmholtz Transmission Problems in Lipschitz Domains

Catalin Turc, New Jersey Institute of Technology, USA

12:00-12:25 Multiple Traces Formulations: Novel Extensions and Challenges

Carlos Jerez-Hanckes and Simon Tournier, Pontificia Universidad Católica de Chile, Chile

Wednesday, July 13

MS75

Recent Progress on Inviscid Fluid Dynamics - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 255

For Part 2 see MS94

Organized by SIAG/APDE

This minisymposium focuses on mathematical analysis related to the incompressible Euler equations and associated models. There are several important open problems concerning the Euler equations, including the blow-up problem, uniqueness of weak solutions, and the precise nature of inviscid dissipation. These problems are associated, in different ways, with the physical description of inviscid turbulence. This is an active area of research, and the objective of this minisymposium is to showcase recent progress in this area, pointing to directions of future investigation.

Organizer: Helena J. Nussenzveig Lopes

Universidade Federal do Rio De Janeiro, Brazil

10:30-10:55 The 2d Euler Equations at Low Regularity

Tarek M. Elgindi, Princeton University, USA

11:00-11:25 On the Spectrum of Rayleigh-Taylor Instability in Presence of a Background Shear

Roman Shvydkoy, University of Ilinois at Chicago, USA; Zhiwu Lin and Chongchun Zhen, Georgia Institute of Technology, USA

11:30-11:55 The Vanishing Viscosity Limit in Porous Media

Anna Mazzucato, Pennsylvania State University, USA; Christophe Lacave, Universite Paris 7-Denis Diderot, France

12:00-12:25 Critical Regularity for Energy Conservation in 2D Inviscid Fluid Dynamics

Alexey Cheskidov, University of Illinois, Chicago, USA; Milton Lopes Filho and *Helena J. Nussenzveig Lopes*, Universidade Federal do Rio De Janeiro, Brazil; Roman Shvydkoy, University of Ilinois at Chicago, USA

Wednesday, July 13

MS76

Sensitivity Analysis and Optimality Conditions for Nonsmooth Problems

10:30 AM-12:30 PM

Room:BCEC Room 253C

Nonsmoothness can emerge in engineering applications such as obstacle problems, thermodynamic phase transitions, and multistream heat exchanger modeling, and can hinder traditional numerical methods that assume differentiability. This minisymposium presents several recent advances in describing and computing useful sensitivity information for nonsmooth problems, for use in nonsmooth optimization and equation-solving methods. Efficient, automatable techniques are presented for computing generalized derivatives and piecewise linearizations under minimal assumptions. The accompanying theory of nonsmooth analysis is extended as well, including new optimality conditions based on piecewise linearizations, and new relations between established generalized derivatives.

Organizer: Peter G. Stechlinski

Massachusetts Institute of Technology, USA

Organizer: Kamil Khan

Argonne National Laboratory, USA

10:30-10:55 A Generalized Abs-Normal Form

Torsten F. Bosse, Argonne National Laboratory, USA

11:00-11:25 Lexicographic Derivatives of Nonsmooth Systems

Kamil Khan, Argonne National Laboratory, USA

11:30-11:55 Sensitivity Analysis of Nonsmooth Differential-Algebraic Equations

Peter G. Stechlinski and Paul I Barton, Massachusetts Institute of Technology, USA

12:00-12:25 Optimality or Convexity Conditions for Nonsmooth Objectives

Andreas Griewank, Yachay Tech University, Ecuador; Andrea Walther, University of Paderborn, Germany

Wednesday, July 13

MS77

Student Days: Student Chapter Presentations

10:30 AM-12:30 PM

Room:Commonwealth B - Concourse Level

For Part 4 see MS63
For Part 6 see MS95

Student Days session organized by the SIAM Education Committee.

Organizer: Daniel Eckhardt

Rensselaer Polytechnic Institute, USA

Organizer: Nguyenho Ho

Worcester Polytechnic Institute, USA

Organizer: Melody Takeuchi

Tufts University, USA

10:30-10:45 Evaluating and Improving Sleep Spindle Detection Methods by SPEA2

Min-Yin Liu, Adam Huang, and Norden Huang, National Central University, Taiwan

10:50-11:05 Game-Theoretic Transition Threshold in Hyperbolic Random Geometric Graphs

Christine Marshall, Colm O'Riordan, and James Cruickshank, National University of Ireland, Galway, Ireland

11:10-11:25 Variance-Reduced HMM for Stochastic Slow-Fast Systems

Ward Melis and Giovanni Samaey, KU Leuven, Belgium

11:30-11:45 Constitutive Restrictions in Nonlinear Elasticity

Kunal Patil and C.S. Jog, Indian Institute of Science, Bangalore, India

11:50-12:05 Modeling Stripe Formation in Zebrafish: An Agent-Based Approach

Alexandria Volkening and Bjorn Sandstede, Brown University, USA

12:10-12:25 Infinite Dimensional Numerical Linear Algebra

Marcus Webb, University of Cambridge, United Kingdom; Sheehan Olver, University of Sydney, Australia

Wednesday, July 13

MS78

Student Days: Student Paper Prize Winner Presentations

10:30 AM-12:30 PM

Room:Commonwealth C - Concourse Level

For Part 6 see MS95

Student Days session organized by the SIAM Education Committee.

Organizer: Sigal Gottlieb

University of Massachusetts, Dartmouth, USA

Participants To Be Announced

Wednesday, July 13

MS79

The Diversity of Applied Mathematics

10:30 AM-12:30 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

Mathematics is used in many fields and applied to many problems whether modeling oceans, optimizing systems, or analyzing images. This minisymposium highlights the vast approaches and applications of mathematics as a part of the Workshop Celebrating Diversity. In addition, this minisymposium features young female mathematicians working in and outside of academia.

Organizer: Jessica Meixner
I.M. Systems Group, USA

Organizer: Erica J. Graham
Bryn Mawr College, USA

Organizer: Raegan Higgins
Texas Tech University, USA

Organizer: Susan Minkoff
University of Texas, Dallas, USA

10:30-10:55 Modeling Tides in the West Pacific
Jessica Meixner, I.M. Systems Group, USA; Steven Brus, Joannes Westerink, and Hans Westerink, University of Notre Dame, USA; Shangyao Nong, FM Global, USA

11:00-11:25 Analysis of Hyperspectral Images Via Difusion Methods on Graphs
Karamatou A. Yacoubou Djima, Swarthmore College, USA

11:30-11:55 An Optimization Approach to the Airlift Planning Problem
Dimitris Bertsimas, *Allison Chang*, Velibor Misic, and Nishanth Mundru, Massachusetts Institute of Technology, USA

12:00-12:25 Target Identification in Sonar Imagery Via Simulations of Helmholtz Equations
Christina Frederick, Georgia Institute of Technology, USA

Wednesday, July 13

CP11

Applications in Economics and Social Science

10:30 AM-12:50 PM

Room:BCEC Room 251

Chair: Barret Deris, Massachusetts Institute of Technology, USA

10:30-10:45 Do Prices Coordinate Markets?
Ryan M. Rogers, Justin Hsu, Jamie Morgenstern, Aaron Roth, and Rakesh Vohra, University of Pennsylvania, USA

10:50-11:05 Lateral Trait Transfer Enhances Cooperation
Barrett Deris and Jeff Gore, Massachusetts Institute of Technology, USA

11:10-11:25 Users Dynamics on Two-Sided Platforms
Victoria Rayskin, Pennsylvania State University, USA

11:30-11:45 Forecasting Chaotic Business Cycles Perturbed by Noise
James M. Haley, Point Park University, USA

11:50-12:05 Functional Segmentation of Marketing Technologies via Topological Methods
Tyler J. Foxworthy, Zachary Cardwell, and Caleb Eiler, DemandJump, USA

12:10-12:25 The Carrying Capacity Allocation Model for Express Freight and General Cargo Under the Price Elasticity of Demand
Cheng-Chang Lin, National Cheng Kung University, Taiwan

12:30-12:45 Control Chart for Simultaneous Monitoring of Linear Profile Parameters
Tahir Mahmood, Saddam Abbasi, Muhammad Riaz, and Nasir Abbas, King Fahd University of Petroleum and Minerals, Saudi Arabia

Wednesday, July 13

CP12

Fluids

10:30 AM-12:50 PM

Room:Otis - Lobby Level

Chair: Anand Oza, Courant Institute of Mathematical Sciences, New York University, USA

10:30-10:45 Stretching a Filament for a Viscoelastic Constitutive Model with Thixotropic Yield Stress Behavior
Yuriko Renardy and Holly Grant, Virginia Tech, USA

10:50-11:05 Conservative DEC Discretization of Incompressible Navier-Stokes Equations on General Surface Simplicial Meshes
Mamdouh S. Mohamed, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Anil Hirani, University of Illinois at Urbana-Champaign, USA; Ravi Samtaney, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

11:10-11:25 On Solutions of the 2D Navier-Stokes Equations with Constant Energy and Enstrophy
Jing Tian and Bingsheng Zhang, Texas A&M University, USA

11:30-11:45 Coupled RapidCell and Lattice Boltzmann Models to Simulate Hydrodynamics of Bacterial Transport in Response to Chemoattractant Gradients in Confined Domains
Hoa Nguyen, Trinity University, USA

11:50-12:05 A Dynamical System for Interacting Flapping Swimmers
Anand Oza, Leif Ristroph, and Michael J. Shelley, Courant Institute of Mathematical Sciences, New York University, USA

12:10-12:25 On the Influence of Surface Chemistry and Vibration on Sedimentation of Pigments in Liquid Coating Formulations
Emmanuel O. Asante-Asamani, Bruce Wade, and Lei Wang, University of Wisconsin, Milwaukee, USA

12:30-12:45 Analysis of High-Speed Rotating Flow in 2D Polar (r -θ) Coordinate
Sahadev Pradhan, V. Kumaran, and *Sahadev Pradhan*, Indian Institute of Science, Bangalore, India

Wednesday, July 13

CP13

Simulation and Modeling

10:30 AM-12:50 PM

Room:BCEC Room 254A

Chair: David J. Gardner, Lawrence Livermore National Laboratory, USA

10:30-10:45 Filters of the Improvement of Multiscale Data from Atomistic Simulations
David J. Gardner, Lawrence Livermore National Laboratory, USA; Daniel R. Reynolds, Southern Methodist University, USA

10:50-11:05 A Cellular Automaton Model Examining the Effects of Oxygen, Hydrogen Ions and Lactate on Early Tumour Growth
Maymona Al-Husari, Gulf University for Science and Technology, Kuwait; Steven Webb, University of Liverpool, United Kingdom; Craig Murdoch, University of Sheffield, United Kingdom

11:10-11:25 Spatial Adaptivity in Stochastic Simulations
Hans-Werner Van Wyk, Auburn University, USA

11:30-11:45 Algorithms and Analysis for Nonequilibrium Langevin Dynamics
Matthew Dobson, University of Minnesota, USA

11:50-12:05 The Effect of a Variable Viscous Profile on the Stability of Multi-Layer Radial Porous Media and Hele-Shaw Flows
Craig Gin and Prabir Daripa, Texas A&M University, USA

12:10-12:25 Robust Optimization of Gas Assisted Gravity Drainage Process under Geological Uncertainties
Watheq J. Al-Mudhafar, Louisiana State University, USA

12:30-12:45 New Explicit Analytical Solutions to Boundary-Value Problem for Poisson's Equations in Application to Groundwater Hydrology/ Geomorphology
Rouzalia Kasimova, German University of Technology in Oman, Oman; Ilgiz Kayumov and Yurii Obnosov, Kazan Federal University, Russia; Anvar Kacimov, Sultan Qaboos University, Oman

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Wednesday, July 13

Workshop Celebrating Diversity Lunch

By Invitation Only

12:30 PM-2:00 PM

Room:Marina-Lobby Level

Book Committee Meeting

12:30 PM-2:00 PM

Room:Faneuil - Mezzanine

Industry Committee Meeting

12:30 PM-2:00 PM

Room:Executive Board Room - Mezzanine Level

Wednesday, July 13

IT7

Ecological Collapse and the Phase Transition to Turbulence

2:00 PM-2:45 PM

Room:Grand Ballroom - Concourse Level

Chair: Mary Silber, University of Chicago, USA

How do fluids become turbulent as their flow velocity is increased? In recent years, careful experiments in pipes and Taylor-Couette systems have revealed that the lifetime of transient turbulent regions in a fluid appears to diverge with flow velocity just before the onset of turbulence, faster than any power law or exponential function. I show how this superexponential scaling of the turbulent lifetime in pipe flow is related to extreme value statistics, which I show is a manifestation of a mapping between transitional turbulence and the statistical mechanics model of directed percolation. This mapping itself arises from a further surprising and remarkable connection: laminar and turbulent regions in a fluid behave as a predator-prey ecosystem. Such ecosystems are governed by individual fluctuations in the population and being naturally quantized, are solvable by path integral techniques from field theory. I explain the evidence for this mapping, and propose how a unified picture of the transition to turbulence emerges in systems ranging from turbulent convection to magnetohydrodynamics.

Nigel Goldenfeld
University of Illinois at Urbana-Champaign, USA

Intermission

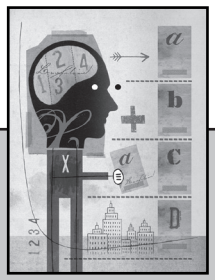
2:45 PM-3:00 PM

Wanted: Challenge Problems

Problem Ideas Being Sought for High School Math Modeling Competition

Moody's Mega Math Challenge®

$150,000 in Scholarship Prizes!



Moody's Mega Math (M^3) Challenge is an Internet-based, applied mathematics contest for high school juniors and seniors. M^3 takes place each year in late February or March. Teams of 3–5 students are given 14 hours to solve an open-ended, math modeling problem related to a real-world issue. Winners receive college scholarships totaling $150,000. Registration and participation are **free**.

The goal of the Challenge is to motivate students to study and pursue careers in STEM disciplines, especially applied mathematics, computational science, economics, and finance. The problem is revealed to the students only after they login on their selected Challenge day. Solutions are judged by professional mathematicians on the approach and methods used and the creativity displayed in problem solving and mathematical modeling.

Coming up with great problem ideas year after year is not easy, and that's where we're hoping you can help.

Required problem characteristics

- Accessibility to 11th and 12th graders
- Suitability for solution in 14 hours
- Possibility for significant mathematical modeling
- Topic of current interest involving interdisciplinary problem solving and critical thinking skills (e.g., humanitarian or environmental concerns, social media or online community challenges economic or financial problems)
- Availability of enough data for a variety of approaches and depth of solutions (but no easy answers found on the web)
- Problem is broken into a few pieces
- References are identified that will be helpful for getting students started
- Please submit problem statement idea in the format of previous Challenge problems

Problem structure

Within the problem statement, there should be three questions for teams to answer:

- Question One: The warm up — Every serious team can answer.
- Question Two: The guts — Framed so that every team can have some success and many teams can cover it well.
- Question Three: The discriminator — Many teams can do something, while only a few will have striking results.

Honoraria

- $150 for problems found suitable to add to the M^3 problem reserve "bank"
- $300 for problems posted on the website as sample modeling problems
- $1,000 for problems selected from the reserve bank to be used as "the" Challenge problem

View "past problems" and other related items at *http://m3challenge.siam.org/resources/sample-problems*.

6/16

To submit new ideas or get additional information, contact:

Michelle Montgomery
Project Director, Moody's Mega Math Challenge
SIAM – Society for Industrial and Applied Mathematics
3600 Market Street, 6th Floor, Philadelphia, PA 19104 USA

Montgomery@siam.org
M3Challenge@siam.org
http://m3challenge.siam.org/resources/suggest-problems

The Moody's Foundation **m3challenge.siam.org** siam Society for Industrial and Applied Mathematics

Wednesday, July 13

SP3

W.T. and Idalia Reid Prize in Mathematics

3:00 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Pamela Cook, Univeristy of Delaware

Not available at time of publication.

Ioannis Kevrekidis
Princeton University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Wednesday, July 13

MS80

Advanced Numerical Methods for Electromagnetic Wave Problems in Complex Media

4:00 PM-6:00 PM

Room:BCEC Room 252B

Forward simulations of the propagation and scattering of transient electromagnetic (EM) waves in complex media are important in a variety of applications such as radar, environmental and medical imaging, including noninvasive detection of cancerous tumors, and the investigation of the effect of precursors on the human body. Thus, the development and analysis of efficient numerical methods which are accurate, consistent and stable is important for constructing prediction tools that are reliable. The talks in this minisymposium will address advances in numerical techniques for multiscale modeling, interface modeling, handling anisotropy and unstructured meshes for simulating EM wave propagation in complex media.

Organizer: Vrushali A. Bokil
Oregon State University, USA

4:00-4:25 A Numerical Homogenization Method for Composite Dispersive Materials
Vrushali A. Bokil, Oregon State University, USA

4:30-4:55 Anisotropic Material Based FDTD Method for Dispersive and Complex Media
Jinjie Liu, Delaware State University, USA

5:00-5:25 Time Domain Interface Methods for Electromagnetic Wave Propagation in Dispersive Media
Shan Zhao, University of Alabama, USA

5:30-5:55 Charge-Conserving Electromagnetic Particle-in-Cell Algorithms on Unstructured Grids Based on Differential Forms
Fernando Teixeira, Ohio State University, USA

Wednesday, July 13

MS81

Advances in Computational Methods for Fluid-Structure Interaction Problems - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 257A

For Part 1 see MS65
Fluid-structure interaction (FSI) problems are important in many fields of engineering and applied science. These problems are often difficult to simulate in an efficient, stable and accurate manner. This minisymposium aims to describe recent advances in the development of numerical methods and computational frameworks for the related problems.

Organizer: Longfei Li
Rensselaer Polytechnic Institute, USA

Organizer: Qi Tang
Rensselaer Polytechnic Institute, USA

4:00-4:25 An Added Mass Partitioned FSI Algorithm for Rigid Bodies and Incompressible Flows
Qi Tang, Jeffrey W. Banks, William Henshaw, and Donald W. Schwendeman, Rensselaer Polytechnic Institute, USA

4:30-4:55 The Shifted Immersed Boundary FEM Method for FSI
Guglielmo Scovazzi, Ting Song, and Alex Main, Duke University, USA

5:00-5:25 FSI in Multi-Phase Flows Using An ALE/Phase-Field Formulation
Xiaoning Zheng, Brown University, USA

5:30-5:55 The Shifted Nitsche Method: A New Approach to Embedded Boundary Conditions
Alex Main and Guglielmo Scovazzi, Duke University, USA

Wednesday, July 13

MS82

Algorithms and Statistical Methods for Noisy Network Analysis - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 253B

For Part 1 see MS66

Network analysis is an elegant, graph-based method for studying complex systems of interacting entities. These mathematical models, however, inherently include some discrepancy from the real-world systems they represent. Some relationships may not be observable, and there may be errors in the measurements taken to infer the network structure. Since traditional graph theory deals with exact mathematics, one of the most challenging aspects of modern network analysis is accounting for this noise. This minisymposium will include talks on algorithmic techniques to handle noise in networks and obtain reliable results from their analysis, and work on statistical analysis of noisy networks.

Organizer: Sanjukta Bhowmick

University of Nebraska, Omaha, USA

Organizer: Benjamin A. Miller

Massachusetts Institute of Technology, USA

4:00-4:25 Stability and Continuity of Centrality Measures in Weighted Graphs

Santiago Segarra and Alejandro Ribeiro, University of Pennsylvania, USA

4:30-4:55 Evolution of Co-authorship Networks as Measure of Interdisciplinarity

Deryc T. Painter, Manfred Laubichler, and Nadya Bliss, Arizona State University, USA

5:00-5:25 Iterative Sample Removal for Reliable Networks

Kathryn Dempsey, University of Nebraska, Omaha, USA

5:30-5:55 Noise in Networks: Future Directions

Benjamin A. Miller, Massachusetts Institute of Technology, USA; Vladimir Ufimtsev and Sanjukta Bhowmick, University of Nebraska, Omaha, USA

Wednesday, July 13

MS83

An *O(N)* matrix free approach to Rothe's method, the Method of Lines Transpose (MOL^T)

4:00 PM-6:00 PM

Room:BCEC Room 253A

Solving stiff PDEs numerically is a challenging problem at scale. Traditional implicit methods that rely on inverting large matrices have problems scaling on modern super computers. Here we focus on exploring semi-analytic methods based on the Method Of Lines Transpose (MOL^T) for a range of linear and non-linear PDEs. The MOLT formulation, which is a practical approach to Rothe's method, starts by discretizing a PDE in time. Next, the resulting set of coupled boundary value problems is efficiently solved using fast summation. The approach hear differs from the traditional formulation which resulted in large matrices that were cumbersome.

Organizer: Andrew J. Christlieb

Michigan State University, USA

4:00-4:25 A Numerical Framework for Integrating Deferred Correction Methods to Solve High Order Collocation Formulations of ODEs

Wenzhen Qu, Hohai University, China; Namdi Brandon, Dangxing Chen, *Jingfang Huang*, and Tyler Kress, University of North Carolina at Chapel Hill, USA

4:30-4:55 Method of Lines Transpose Applied to Regularized Kernels

Bryan D. Quaife, Florida State University, USA; Benjamin Ong and Andrew J. Christlieb, Michigan State University, USA

5:00-5:25 Successive Convolution: a High Order Framework for Pdes Based on the Method of Lines Transpose

Matt Causley, Kattering University, USA

5:30-5:55 An Integral Equation Approach to Solving the Navier-Stokes Equations Via Rothe's Method

Mary-Catherine Kropinski, Simon Fraser University, Canada

Wednesday, July 13

MS84

Data Centric Computing – Challenges and Opportunities - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom CDE - Concourse Level

For Part 1 see MS67

The volume, variety, velocity and veracity of data in our world today transforms how we think about computer systems to be more data centric. The challenge is not the ability to compute, but the need to efficiently move and handle large data sets. Instead of how fast can we compute, the real question is time to solution. We need to optimize across the entire system by looking at the entire workflow that makes up a compute solution. This minisymposium will discuss the challenges and opportunities for compute solutions to exploit the data centric systems as we evolve to exascale.

Organizer: Kirk E. Jordan

IBM T.J. Watson Research Center, USA

Organizer: Constantinos Evangelinos

IBM T.J. Watson Research Center, USA

4:00-4:25 Moving Molecular Data for Mobile Visualization

Thomas J. Peters and Kevin Marinelli, University of Connecticut, USA

4:30-4:55 Data Management on the GPU Using OpenMP 4

David Appelhans, IBM Research, USA

5:00-5:25 Data Centric Workflow of Industrial and Global Seismic Processing, Imaging and Inversion

Sanzong Zhang and Kirk E. Jordan, IBM Research, USA

5:30-5:55 The Seismic Stress Test for Data Centric Systems

Phil Bording, Alabama A&M University, USA; Debanjan Datta, University of Texas at Austin, USA; Kirk E. Jordan, IBM T.J. Watson Research Center, USA

Wednesday, July 13

MS85

Inferring Networks from Non-Network Data -- Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom A - Concourse Level

For Part 1 see MS69

Organized by SIAG/DMA

Network representation learning is an emerging field that is exclusively focused on developing the understanding and rigor for inferring useful network representations from noisy, indirect and diverse data. In many practical settings, researchers are often faced with having to make arbitrary decisions on how to construct networks. Such arbitrary decisions have important implications on the quality of subsequent learning tasks. This minisymposium will explore recent developments in the area of network representation learning including 1) fusion techniques that lead to robust network representations, 2) task-based network representation learning, and 3) validation of representation quality in the absence of ground truth.

Organizer: Rajmonda Caceres

Massachusetts Institute of Technology, USA

Organizer: Ivan Brugere

University of Ilinois at Chicago, USA

Organizer: Tanya Y. Berger-Wolf

University of Illinois, Chicago, USA

4:00-4:25 Do I Have the 'Right' Network? Task-Oriented Models for Network Structure Inference and Validation

Ivan Brugere, University of Ilinois at Chicago, USA

4:30-4:55 Mis-Specification, Sparsity, and Superpoplulation Inference for Sparse Social Networks

Edoardo Airoldi and Alexander D'Amour, Harvard University, USA

5:00-5:25 Inferring Roles of People in Social Networks Extracted from New York Times Articles

Glorimar Castro-Noriega, University of Puerto Rico, Mayaguez, Puerto Rico; *Joel Acevedo-Aviles* and William Campbell, Massachusetts Institute of Technology, USA

5:30-5:55 Networks in Neuroscience and Climate Science

Gowtham Atluri, Saurabh Agrawal, and Vipin Kumar, University of Minnesota, USA

Wednesday, July 13

MS86

Making Noise Work For You: Switching, Extinction, Control and all that!

4:00 PM-6:00 PM

Room:Grand Ballroom B - Concourse Level

In many physical and biological problems, random fluctuations occur due to internal interactions and/or external stochastic forces. Examples occur in population networks that support epidemics, ecological bio-diversity, cancer cell growth, and switching used in sensor design, among others. In almost all examples, fluctuations organize in such a way to drastically alter the dynamics, leading to improved global predictions of rare events and novel dynamic stochastic controls. In this session, the topic of noise interacting with dynamical systems will be explored using topics from biophysics, cell biology, epidemiology, and engineering. In particular, situations will be discussed where noise can work for you.

Organizer: Ira B. Schwartz

Naval Research Laboratory, USA

Organizer: Lora Billings

Montclair State University, USA

4:00-4:25 The Force of Fluctuations: from Analysis to Control in Extinction and Switching in Networks

Ira B. Schwartz, Naval Research Laboratory, USA

4:30-4:55 Does Delay Constructively Influence the Dynamics of Genetic Networks?

William Ott, University of Houston, USA

5:00-5:25 Using the Wentzell-Freidlin Least Action to Maneuver Network Dynamical Systems

William Kath, Northwestern University, USA

5:30-5:55 Analysis and Control of Pre-Extinction Dynamics in Population Networks

Lora Billings, Montclair State University, USA

Wednesday, July 13

MS87

Model Reduction for Inverse Problems - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 257B

For Part 1 see MS71

This minisymposium brings together applied and theoretical experts that use model reduction techniques to solve inverse problems arising in large-scale time- and frequency-domain wave field problems. This gives efficient inversion methods in applications including geophysics.

Organizer: Fernando Guevara Vasquez

University of Utah, USA

Organizer: Alexander V. Mamonov

University of Houston, USA

4:00-4:25 Nonlinear Seismic Imaging via Reduced Order Model Backprojection

Alexander V. Mamonov, University of Houston, USA; Vladimir L. Druskin, Schlumberger-Doll Research, USA; Andrew E. Thaler, Institute for Mathematics and its Applications, USA; Mikhail Zaslavsky, Schlumberger-Doll Research, USA

4:30-4:55 A Model Reduction Approach to Inversion for a Parabolic Partial Differential Equation

Liliana Borcea, University of Michigan, USA

5:00-5:25 A Model Based Data Driven Dictionary Learning for Seismic Data Representation

Evren Yarman, Schlumberger, United Kingdom

5:30-5:55 Equivalence of Spectrally Matched Grids and Galerkin Methods

Shari Moskow, Drexel University, USA; Vladimir L. Druskin, Schlumberger-Doll Research, USA; Alexander V. Mamonov, University of Houston, USA; Mikhail Zaslavsky, Schlumberger-Doll Research, USA

Wednesday, July 13

MS88

Modeling Biological and Physical Phenomena in a Fluid Environment

4:00 PM-6:00 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

An understanding of fluid mechanics is essential to understanding the world around us. Many of the systems that keep the human body functioning properly occur in a fluid environment. Organisms live in fluids as diverse as the ocean, the air, and biofluids. This session collects several examples of how mathematics is currently being used to study a range of biological and physical problems with ties to fluid mechanics. Computational methods, mathematical modeling, associated analytic techniques, and laboratory experimentation are employed to better understand a range of applications from swimming microorganisms to blood clots.

Organizer: Brittany Bannish
University of Central Oklahoma, USA

Organizer: Raegan Higgins
Texas Tech University, USA

Organizer: Susan Minkoff
University of Texas, Dallas, USA

Organizer: Erica J. Graham
Bryn Mawr College, USA

4:00-4:25 Molecular and Physical Mechanisms of Fibrinolysis: Modeling and Experimentation
Brittany Bannish, University of Central Oklahoma, USA

4:30-4:55 A Mathematical Model of Venous Thrombosis Initiation
Priscilla Elizondo and Aaron L. Fogelson, University of Utah, USA

5:00-5:25 Numerical Methods for Micro-Structure Evolution of Materials
Saulo Orizaga, University of Arizona, USA

5:30-5:55 Microorganisms Swimming Through a Compliant Viscoelastic Network
Ricardo Cortez, Tulane University, USA

Wednesday, July 13

MS89

Modeling of Synchronous and Correlated Behavior in Neuronal Networks

4:00 PM-6:00 PM

Room:BCEC Room 253C

The speakers in this session will discuss several ways in which synchrony and oscillations arise using various mathematical models with applications to neuronal networks. Many of these networks naturally exist in a synchronous state. Gaining insight into the underlying mechanisms behind this oscillatory behavior is useful for explaining numerous neuronal phenomena.

Organizer: Pamela B. Pyzza
Ohio Wesleyan University, USA

Organizer: Gregor Kovacic
Rensselaer Polytechnic Institute, USA

4:00-4:25 Firing-Rate Model of Locust Antennal Lobe
Pamela B. Pyzza, Ohio Wesleyan University, USA; Gregor Kovacic, Rensselaer Polytechnic Institute, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

4:30-4:55 Emergence of Limit Cycles In Simplified Basal Ganglia Model
Michael Caiola and Mark Holmes, Rensselaer Polytechnic Institute, USA

5:00-5:25 Synchrony Among Chemically and Electrically Coupled Neurons
Jennifer Kile and Gregor Kovacic, Rensselaer Polytechnic Institute, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

5:30-5:55 Impact of Single-Neuron Dynamics on Transfer of Correlations from Common Input
Andrea K. Barreiro, Southern Methodist University, USA

Wednesday, July 13

MS90

Modeling, Simulation, and Optimization for Sustainable Resources

4:00 PM-6:00 PM

Room:BCEC Room 254A

Moving towards a sustainable environment is one of the most important issues facing the global community. Progress on these problems requires an interdisciplinary approach, both within the mathematical sciences and the larger scientific and engineering community. The speakers in this minisymposium will discuss their efforts to address the mathematical aspects and inherent challenges associated with problems with human and natural components.

Organizer: Kathleen Fowler
Clarkson University, USA

Organizer: Lea Jenkins
Clemson University, USA

4:00-4:25 Analysis of Farming Processes Using Simulation-Based Optimization
Kathleen Fowler, Clarkson University, USA

4:30-4:55 Exploiting Infiltration Events: Management of Recharge Networks
Lea Jenkins, Clemson University, USA; Farthing Matthew, United States Army Corps of Engineers, USA

5:00-5:25 Optimal Design of a Bioremediation System for Water Resources
Jesse Clark-Stone, Clarkson University, USA

5:30-5:55 Lyme Disease in New York - Modeling Multilevel Population Interactions as Affected by Human Driven Development
Joe Skufca, Clarkson University, USA

Wednesday, July 13

MS91

Novel Numerical Methods on Polyhedral Meshes - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 259A

For Part 1 see MS72

In many real-world scientific and engineering applications modeled by partial differential equations (PDEs), polyhedral meshes are preferred. Although many polytonal discretization methods for numerical approximation of PDEs have been developed, the design of efficient simulation techniques on polyhedral meshes is still a challenging task. For example, mesh generation, stable finite element/difference methods, efficient time integration, quadrature rules on polyhedral meshes, and fast linear solvers. The main theme of the minisymposium is on the advanced numerical methods on polyhedral meshes. The focus is on the mesh generation, robust temporal and spatial discretizations, efficient nonlinear and linear solvers, and practical implementations for a wide range of applications.

Organizer: Xiaozhe Hu

Tufts University, USA

Organizer: Lin Mu

Oak Ridge National Laboratory, USA

4:00-4:25 Finite Element Multigrid Framework for Mimetic Finite Difference Discretizations

Carmen Rodrigo and Francisco José Gaspar, University of Zaragoza, Spain; *Xiaozhe Hu*, Tufts University, USA; Ludmil Zikatanov, Pennsylvania State University, USA

4:30-4:55 Providing User Interfaces for Mesh Generation and Simulations Using Computational Model Builder (CMB)

Robert O'Bara, Kitware, Inc., USA

5:00-5:25 A Posteriori Error Analysis and Efficient Discretization for Two-Stage Time Integration Methods and the Parareal Algorithm

Jehanzeb H. Chaudhry, University of New Mexico, USA; Don Estep and *Simon Tavener*, Colorado State University, USA

5:30-5:55 Meshing and Fem Simulation of Ion Transport in Protein Channels and Nanopores

Tiantian Liu, Chinese Academy of Sciences, China; Benzhuo Lu, Institute of Computational Mathematics, China

Wednesday, July 13

MS92

Numerical Linear and Multilinear Algebra: Celebrating Charlie Van Loan - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 254B

For Part 1 see MS73

Organized by SIAG/LA

Charlie Van Loan has contributed broadly to numerical linear algebra and computational science and is one of the best known expositors in the area. His work includes six books on computational science and numerical linear algebra, including the widely-used Matrix Computations with Gene Golub (now in its fourth edition). His research work includes high-performance GEMM-based BLAS and parallel factorization schemes, eigenvalue and SVD computations, tensors, and the many dubious ways to compute the matrix exponential. The talks in this minisymposium will highlight some of the many contributions of Charlie Van Loan's career.

Organizer: David Bindel

Cornell University, USA

Organizer: Ilse Ipsen

North Carolina State University, USA

4:00-4:25 Charlie Van Loan and the Matrix Exponential

Nicholas J. Higham, University of Manchester, United Kingdom

4:30-4:55 Nineteen Dubious Ways to Compute the Zeros of a Polynomial

Cleve Moler, The MathWorks, Inc., USA

5:00-5:25 The Efficient Computation of Dense Derivative Matrices in MATLAB Using ADMAT and Why Sparse Linear Solvers Can Help

Thomas F. Coleman, University of Waterloo, Canada

5:30-5:55 On Rank-One Perturbations of a Rotation

Robert Schreiber, Hewlett-Packard Laboratories, USA

Wednesday, July 13

MS93

Numerical Methods for the Variable-Medium High-Frequency Helmholtz Equation - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 256

For Part 1 see MS74

Numerical solution of the high-frequency Helmholtz equation, in inhomogeneous and/or discontinuous media, is crucial for applications such as acoustics, optical devices, communications, and wave-based inverse problems. Yet it is well known that its oscillatory nature can thwart modern elliptic or boundary solvers relying on multigrid, low-rank structures, etc. This pair of minisymposia gathers geographically diverse junior and senior researchers who are at the forefront of two avenues where analytic insight about wave propagation is boosting computational efficiency: 1) boundary integral equations, including optimal handling of material jumps and inhomogeneous media, and 2) fast solvers and preconditioners for the directly discretized PDE.

Organizer: Leonardo Zepeda-Nunez

University of California, Irvine, USA

Organizer: Alex H. Barnett

Dartmouth College and Simons Foundation, USA

4:00-4:25 Interconnected Hierarchical Structures for Solving Non-coercive Elliptic PDEs

Xiao Liu, Rice University, USA; Jianlin Xia, Purdue University, USA; Maarten de Hoop, Rice University, USA

4:30-4:55 Optimized Helmholtz Discretizations: New Applications and a Connection to Geometrical Optics

Christiaan C. Stolk, University of Amsterdam, Netherlands

5:00-5:25 Fast Huygens Sweeping Methods for High Frequency Waves in Inhomogeneous Media

Jianliang Qian and Wangtao Lu, Michigan State University, USA; Robert Burridge, University of New Mexico, USA

5:30-5:55 Recent Progress on Fast Algorithms for Oscillatory Problems from Density Function Theory

Anil Damle, Stanford University, USA; Lin Lin, University of California, Berkeley and Lawrence Berkeley National Laboratory, USA; Lexing Ying, Stanford University, USA

Wednesday, July 13

MS94

Recent Progress on Inviscid Fluid Dynamics - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 255

For Part 1 see MS75
Organized by SIAG/APDE

This minisymposium focuses on mathematical analysis related to the incompressible Euler equations and associated models. There are several important open problems concerning the Euler equations, including the blow-up problem, uniqueness of weak solutions, and the precise nature of inviscid dissipation. These problems are associated, in different ways, with the physical description of inviscid turbulence. This is an active area of research, and the objective of this minisymposium is to showcase recent progress in this area, pointing to directions of future investigation.

Organizer: Helena J. Nussenzveig Lopes
Universidade Federal do Rio De Janeiro, Brazil

4:00-4:25 The Van Dommelen and Shen Singularity in the Prandtl Equations
Igor Kukavica, University of Southern California, USA; *Vlad C. Vicol*, Princeton University, USA; Fei Wang, University of Southern California, USA

4:30-4:55 The Vanishing Alpha Limit of Incompressible Euler-Alpha
Milton Lopes Filho, Universidade Federal do Rio De Janeiro, Brazil

5:00-5:25 The Aggregation Equation with Newtonian Potential
Elaine Cozzi, Oregon State University, USA; Gung-Min Gie, University of Louisville, USA; James P. Kelliher, University of California, Riverside, USA

5:30-5:55 Determining Wavenumber for Fluid Equations
Alexey Cheskidov, University of Illinois, Chicago, USA

Wednesday, July 13

MS95

Student Days: MCM Prize Winner Presentations

4:00 PM-6:00 PM

Room:Commonwealth B - Concourse Level

For Part 5 see MS77
For Part 7 see MS78
Student Days session organized by the SIAM Education Committee.

Organizer: Sigal Gottlieb
University of Massachusetts, Dartmouth, USA

Wednesday, July 13

MS147

Direct and Inverse Scattering in Electromagnetics and Optics - Part II of II

4:00 PM-6:00 PM

Room:Otis - Lobby Level

For Part 1 see MS129
Electromagnetic wave scattering is encountered in wide range of applications such as medical and biological imaging, industrial design and identifications, optics and photonics, etc. The mathematical studies of scattering problems pose significant analytical and computational challenges. This minisymposium seeks to bring together researchers to promote exchange of ideas, and present recent developments on the mathematical analysis and novel computational methods in this area.

Organizer: Songting Luo
Iowa State University, USA

Organizer: Junshan Lin
Auburn University, USA

4:00-4:25 Fast Computation of 2D-Periodic Green Functions in 3D Near Cutoff Frequencies
Stephen P. Shipman, Louisiana State University, USA; Oscar P. Bruno, California Institute of Technology, USA; Catalin Turc, New Jersey Institute of Technology, USA; Stephanos Venakides, Duke University, USA

4:30-4:55 Inverse Random Source Scattering Problems in Several Dimensions
Peijun Li, Purdue University, USA

5:00-5:25 Acoustic Scattering by a Sphere in the Time Domain
Paul A. Martin, Colorado School of Mines, USA

5:30-5:55 Stekloff Eigenvalues in Inverse Scattering
Fioralba Cakoni, Rutgers University, USA; David L. Colton, *Shixu Meng*, and Peter B. Monk, University of Delaware, USA

Wednesday, July 13

CP14

Materials Science

4:00 PM-6:00 PM

Room:BCEC Room 252A

Chair: Aisa Biria, Yale University, USA

4:00-4:15 Estimation of Shear Stress in Machining by Inversion of Abel Transform
Timothy J. Burns and Bert W. Rust, National Institute of Standards and Technology, USA

4:20-4:35 Intermediate Materials Alleviate Stress Concentration at Tissue Interfaces
Aisa Biria, Yale University, USA; Shreyas Mandre, Brown University, USA; Madhusudhan Venkadesan, Yale University, USA

4:40-4:55 Stasis Domains in the Locomotion of a Bio-Inspired Crawler
Paolo Gidoni and Antonio DeSimone, SISSA, International School for Advanced Studies, Trieste, Italy

5:00-5:15 Design Issues for Magnetic Rulers
Armin Fügenschuh, Helmut-Schmidt-University, Germany

5:20-5:35 An Efficient Integral Equation Solver for Two-Dimensional Simulations in Nanoplasmonics
Harun Kurkcu, Gulf University for Science and Technology, Kuwait

5:40-5:55 Boundary Integral Equation Method in the Theory of Thermoelasticity of Double Porosity Materials
Merab Svanadze, Ilia State University, Georgia

Wednesday, July 13

CP15

Numerical PDEs I

4:00 PM-6:00 PM

Room:BCEC Room 251

Chair: Jonathan Graf, University of Maryland, Baltimore County, USA

4:00-4:15 Adaptive BDDC Methods for Problems Posed in H(div)
Duk-Soon Oh, Rutgers University, USA; Olof B. Widlund, Courant Institute of Mathematical Sciences, New York University, USA; Stefano Zampini, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Clark R. Dohrmann, Sandia National Laboratories, USA

4:20-4:35 Efficient Time-Stepping Methods for the Numerical Solution of Large Stiff Systems Within Parabolic Partial Differential Equations
Jonathan Graf and Matthias K. Gobbert, University of Maryland, Baltimore County, USA

4:40-4:55 Multigrid KSS Methods for Time-Dependent PDE
Haley Dozier and James V. Lambers, University of Southern Mississippi, USA

5:00-5:15 Partition of Unity Isogeometric Analysis of Elliptic Singular Perturbation Problems
Hyunju Kim, North Greenville University, USA; Bongsoo Jang, Ulsan National Institute of Science and Technology, South Korea; Hae-Soo Oh and Sinae Kim, University of North Carolina, Charlotte, USA

5:20-5:35 Investigation and Numerical Solution of the Difference Analogue of One Nonlinear Parabolic Equation
Mikheil Tutberidze, Ilia State University, Georgia

5:40-5:55 An O(N) Molt ^{T} Energy Gradient Flows Using Direct Operator Inversion for Phase Field Models
Hana Cho and Andrew J. Christlieb, Michigan State University, USA; Matt Causley, Kettering University, USA

Wednesday, July 13

CP16

Partial Differential Equations I

4:00 PM-6:00 PM

Room:Commonwealth C - Concourse Level

Chair: Luiz M. Faria,

4:00-4:15 Study of a Model Equation in Detonation Theory: Multidimensional Effects
Luiz M. Faria, Massachusetts Institute of Technology, USA; Aslan Kasimov, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Rodolfo R. Rosales, Massachusetts Institute of Technology, USA

4:20-4:35 Global Attractors and Weak Exponential Attractors for Strongly Damped Wave Equations with Nonlinear Hyperbolic Dynamic Boundary Conditions
P. Jameson Graber, University of Texas at Dallas, USA; *Joseph L. Shomberg*, Providence College, USA

4:40-4:55 A Compact Scheme on the Cubed Sphere Grid for Propagation Problems in Climatology
Jean-Pierre Croisille, CNRS and University of Lorraine, France; Matthieu Brachet, University of Lorraine, France

5:00-5:15 A Triple Bubble Solution in a Quaternary Inhibitory System
Chong Wang and Xiaofeng Ren, George Washington University, USA

5:20-5:35 Interior and Boundary Spikes for the Two-Dimensional GM System
Yeyao Hu and Xiaofeng Ren, George Washington University, USA

5:40-5:55 A Numerical Scheme for Two Dimensional Hyperbolic Partial Differential Equations
Ram Jiwari, Indian Institute of Technology Roorkee, India

Wednesday, July 13

SP4

I. E. Block Community Lecture: Toy Models

6:15 PM-7:15 PM

Room:Grand Ballroom - Concourse Level

Chair: To Be Determined

Would you like to come see some toys? 'Toys' here have a special sense: objects of daily life which you can find or make in minutes, yet which, if played with imaginatively, reveal surprises that keep scientists puzzling for a while. We will see table-top demos of many such toys and visit some of the science that they open up. The common theme is singularity.

Tadashi Tokieda
University of Cambridge, United Kingdom and Stanford University, USA

Community Reception

7:15 PM-8:15 PM

Room:Pavilion and Grand Ballroom - Concourse Level

SIAM Journal on Applied Mathematics (SIAP) Editorial Board Meeting

8:00 PM-10:00 PM

Room:Faneuil - Mezzanine Level

Thursday, July 14

Registration

8:00 AM-4:30 PM

Room:Concourse Level

IT8

Mathematical Sciences Education: What Is Wrong and Why Should You Care?

8:30 AM-9:15 AM

Room:Grand Ballroom - Concourse Level

Chair: Rachel Levy, Harvey Mudd College, USA

Education in the mathematical sciences is in the national spotlight. The good news includes data from the Bureau of Labor Statistics indicating that strong math skills are required for many top jobs including, according to one ranking using these data, actuary (no. 1 ranked job), mathematician (no. 3), statistician (no. 4), and data scientist (no. 6). There's also plenty of bad news. For example, women are almost twice as likely as men to choose not to continue beyond Calculus I, even when Calculus II is required for their intended major. In this talk I will provide a snapshot of current efforts to improve post-secondary teaching and learning in the mathematical sciences, with particular focus on courses taken in the first two years of college.

Karen Saxe
Macalester College, USA

Thursday, July 14

IT9

Graph Structure in Polynomial Systems: Chordal Networks

9:15 AM-10:00 AM

Room:Grand Ballroom - Concourse Level

Chair: C. David Levermore, University of Maryland, College Park, USA

The sparsity structure of a system of polynomial equations or an optimization problem can be naturally described by a graph summarizing the interactions among the decision variables. It is natural to wonder whether the structure of this graph might help in computational algebraic geometry tasks (e.g., in solving the system). In this lecture we will provide a gentle introduction to this area, focused on the key notions of chordality and treewidth, which are of great importance in related areas such as numerical linear algebra, database theory, constraint satisfaction, and graphical models. In particular, we will discuss "chordal networks", a novel representation of structured polynomial systems that provides a computationally convenient decomposition of a polynomial ideal into simpler (triangular) polynomial sets, while maintaining its underlying graphical structure. As we will illustrate through examples from different application domains, algorithms based on chordal networks can significantly outperform existing techniques. Based on joint work with Diego Cifuentes (MIT).

Pablo A. Parrilo
Massachusetts Institute of Technology, USA

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Thursday, July 14

MS96

Advances in Fast Algorithms for High Accuracy Solutions to PDEs - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253C

For Part 2 see MS113

The introduction of fast algorithms has dramatically increased the collection of problems for which a solution can be approximated to high accuracy. Some of the most notable contributions include the FMM, FFT and more recently fast direct solvers. The collection of methods presented in this session utilize, are extension of, or are inspired by the famous fast methods. In particular, fast algorithms for discretizing integral equations, inverse scattering in variable media, tensor based solvers and an expansion approach for solving PDEs with corners will be presented.

Organizer: Adrianna Gillman
Rice University, USA

Organizer: Michael O'Neil
New York University, USA

10:30-10:55 Harmonic Polynomials and Quadrature by Expansion
Matt Wala, University of Illinois, USA

11:00-11:25 Recent Developments in Fast and Robust Algorithms for Quadrature by Expansion (QBX)
Manas N. Rachh, Yale University, USA

11:30-11:55 Improved Solvers for the Time Harmonic Maxwell Equations on Axially Symmetric Domains
Johan Helsing, Lund University, Sweden

12:00-12:25 On the Solution of Elliptic Partial Differential Equations on Regions with Corners
Kirill Serkh, Yale University, USA

Thursday, July 14

MS97

Advances in Scattered Data Approximation and Meshless Methods

10:30 AM-12:30 PM

Room:BCEC Room 257B

Meshfree methods have many inherent properties that make them useful for a variety of problems in science and engineering, from fitting data to numerically solving differential equations. These methods provide flexibility for problems where mesh generation is either prohibitively expensive or infeasible. This minisymposium focuses primarily on methods based on moving least squares approximation or radial basis functions. The talks will address recent advances in the application of these methods to large-scale problems and recent developments in the methods themselves.

Organizer: Nathaniel Trask
Brown University, USA

10:30-10:55 A High-Order Staggered Meshless Method for Stokes Equations with Applications to Electrokinetic Suspension Flow
Nathaniel Trask, Brown University, USA

11:00-11:25 Lagrangian Particle Simulations of Geophysical Fluid Flow
Robert Krasny, University of Michigan, USA; Peter A. Bosler, Sandia National Laboratories, USA; James Kent, Swansea University of South Wales, United Kingdom; Lei Wang, University of Wisconsin, Milwaukee, USA; Christiane Jablonowski, University of Michigan, USA

11:30-11:55 A Galerkin Radial Basis Function Method for Nonlocal Diffusion
Stephen D. Bond, Sandia National Laboratories, USA

12:00-12:25 Numerical Study of Space-Time RBF for PDEs
Alfa Heryudono, University of Massachusetts, Dartmouth, USA

Thursday, July 14

MS98

Computational Aspects of Special Functions

10:30 AM-12:30 PM

Room:BCEC Room 259A

Special functions appear in a vast number of scientific applications where numerical values for the functions are required. Algorithms and methods for the computation of special functions are discussed. Related problems such as the computation of Gaussian quadrature rules and the numerical solution of ordinary differential equations will be also addressed.

Organizer: Amparo Gil
Universidad de Cantabria, Spain

Organizer: Javier Segura
Universidad de Cantabria, Spain

Organizer: Nico M. Temme
Centrum voor Wiskunde en Informatica (CWI), Netherlands

10:30-10:55 Efficient Computation of Gaussian Quadrature Rules
Amparo Gil, Diego Ruiz-Antolin, and *Javier Segura*, Universidad de Cantabria, Spain; Nico M. Temme, Centrum voor Wiskunde en Informatica (CWI), Netherlands

11:00-11:25 A Method for the Numerical Computation of Nonoscillatory Phase Functions
James Bremer, University of California, Davis, USA

11:30-11:55 Ultraspherical Spectral Method and Approximating Special Functions
Sheehan Olver, University of Sydney, Australia

12:00-12:25 Computing Without Spherical Harmonics
Alex Townsend, Massachusetts Institute of Technology, USA; Grady B. Wright and Heather D. Wilber, Boise State University, USA

Thursday, July 14

MS99

Conservation Laws with Singular Shocks: Analytical, Numerical and Experimental Studies - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 255

For Part 2 see MS115
Organized by SIAG/APDE

Singular shock waves provide one of the principal tools for solving Riemann problems which cannot be solved by classical shocks and rarefactions. This minisymposium aims to present recent developments in that area placing emphasis on systems with physical interest.

Organizer: Andrea L. Bertozzi
University of California, Los Angeles, USA

Organizer: Charis Tsikkou
West Virginia University, USA

10:30-10:55 Singular Shocks in a Chromatography Model
Charis Tsikkou, West Virginia University, USA

11:00-11:25 Asymptotic and Numerical Studies of Free Boundaries and Singular Shocks in Magnetized Target Fusion Reactors
Michael Lindstrom, University of California, Los Angeles, USA

11:30-11:55 Contagion Shocks in One Dimension
Martin Short, Georgia Institute of Technology, USA; Andrea L. Bertozzi and Li Wang, University of California, Los Angeles, USA; Jesus Rosado Linares, Universidad de Buenos Aires, Argentina

12:00-12:25 Particle-Laden Viscous Flow on An Incline: Singular Shock Solutions and Surface Tension Effects
Jeffrey Wong, University of California, Los Angeles, USA

Thursday, July 14

MS100

Diverse Mathematicians in Diverse Settings

10:30 AM-12:30 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

That mathematics can be applied in a rich diversity of disciplines is on full display at the SIAM Annual Meeting and well understood in this community. What is also true is that mathematicians work and contribute within diverse settings, from industry to academia, from math departments to schools of public health. That women and minorities have been underrepresented in fields driven by mathematical innovation is a challenge to the entire field. This session deals with this challenge by highlighting the contributions of a diverse set of speakers.

Organizer: Josef Sifuentes
University of Texas, Rio Grande Valley

Organizer: Susan Minkoff
University of Texas, Dallas, USA

Organizer: Raegan Higgins
Texas Tech University, USA

Organizer: Erica J. Graham
Bryn Mawr College, USA

10:30-10:55 Randomized Methods for Rank-Deficient Linear Systems
Josef Sifuentes, University of Texas, Rio Grande Valley

11:00-11:25 Polynomial Time Instance of the Maximum Weighted Co-2-Plex Problem
Cynthia Wood, Coinalytics Company

11:30-11:55 Discontinuous Galerkin Methods for Boltzmann - Poisson Systems of Electronic Transport in Semiconductors
Jose Moroles Escalante, University of Texas at Austin, USA

12:00-12:25 Modeling the Dynamics of Immunological Memory to Malaria
Lauren Childs, Harvard University, USA

Thursday, July 14

MS101

Education Programs in Data Science and Data Analytics - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 251

For Part 2 see MS116
Organized by the SIAM Education Committee

Data Analytics as well as Data Science and Engineering are evolving towards being an additional pillar of scientific progress. In business and industry, data will be one of the key resources of the 21th century. On the other hand, structured programs to educate undergraduate and graduate students in Data Science, or even programs that lead to a data-related major, are still emerging. Hence, there are no "mainstream" templates for data-oriented programs available, yet, nor are there related training opportunities for faculty. The goal of this minisymposium is therefore to present and discuss curricula and recent activities towards installing data-related programs.

Organizer: Michael Bader
Technische Universität München, Germany

Organizer: Rachel Levy
Harvey Mudd College, USA

Organizer: Sigal Gottlieb
University of Massachusetts, Dartmouth, USA

Organizer: Suzanne L. Weekes
Worcester Polytechnic Institute, USA

10:30-10:55 The Miseducation of Data Scientists
Mechie Nkengla, Ernst & Young LLP, USA

11:00-11:25 Interdisciplinary Data Analytics - A Graduate Masters Degree Across Business, Engineering, and Science
Joseph Skufca, Clarkson University, USA

11:30-11:55 Education for Data Challenges in the 21th Century - BS/MS Program in Data Science at Umass
Donghui Yan, University of Massachusetts, Dartmouth, USA

12:00-12:25 Strategies for Enabling Data Science Research and Education
Randy Paffenroth, Worcester Polytechnic Institute, USA

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6/16

Thursday, July 14

MS102

High-Fidelity Modeling for Cellular Flows - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 252B

For Part 2 see MS117

The dynamics of red blood cells, fibrous suspensions, platelets, bacteria, and other cells is typically modeled as elastic microstructures submerged in a Newtonian fluid. Numerical simulations of such systems are challenging because of fluid-structure interactions, large deformations, strong nonlinearities, non-local interactions, evolving interfaces, and multiple length and time scales. High fidelity methods, such as boundary integral methods, have become a powerful framework that addresses many of these challenges. This minisymposium will discuss recent developments in the high-fidelity scalable numerical simulation of the cellular flows.

Organizer: Abtin Rahimian

Courant Institute of Mathematical Sciences, New York University, USA

Organizer: Shravan Veerapaneni

University of Michigan, USA

10:30-10:55 A Fast Platform for Simulating Flexible Fiber Suspensions Applied to Cell Mechanics

Ehssan Nazockdast, Abtin Rahimian, Denis Zorin, and Michael J. Shelley, Courant Institute of Mathematical Sciences, New York University, USA

11:00-11:25 Accelerating Blood Simulations: a Coarse-Grained Theory to Understand Cellular Suspensions

Maggie Qi and Eric S. Shaqfeh, Stanford University, USA

11:30-11:55 A High-Order Immersed Boundary Method for Solving Fluid Problems on Arbitrary Smooth Domains

Becca Thomases, University of California, Davis, USA

12:00-12:25 Elastic Fingering Pattern in a Hele-Shaw Cell

John Lowengrub, University of California, Irvine, USA; Andrew Belmonte, Pennsylvania State University, USA; Shuwang Li, Xiaofan Li, and Meng Zhao, Illinois Institute of Technology, USA

Thursday, July 14

MS103

Model Reduction for Wavefield Simulations - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254B

For Part 2 see MS118

Organized by SIAG/LA

When solving large-scale time- and frequency-domain wave field problems in complex structures, efficient model order reduction approaches have been developed just recently. A significant progress has been achieved in this area and wave field model-order reduction techniques have been successfully applied in a wide range of important application areas including geophysics and nano-optics. We bring together applied and theoretical experts to present newly obtained results and to discuss further progress in this exciting research field. This minisymposium is the first part out of two: it covers the forward modeling only, while the inversion will be discussed in the second part.

Organizer: Mikhail Zaslavsky

Schlumberger-Doll Research, USA

Organizer: Rob F. Remis

Delft University of Technology, Netherlands

10:30-10:55 On Rational Krylov Subspace Methods for Large-Scale Time and Frequency-Domain Wavefield Computations

Rob F. Remis, Delft University of Technology, Netherlands; Vladimir L. Druskin and Mikhail Zaslavsky, Schlumberger-Doll Research, USA; Joern Zimmerling, Delft University of Technology, Netherlands

11:00-11:25 Automatic Smoothness Detection of the Resolvent Krylov Subspace Method for the Approximation of Semigroups

Volker Grimm and Tanja Goeckler, Karlsruhe Institute of Technology, Germany

continued in next column

11:30-11:55 Generalized Multiscale Finite Element Method for Wave Propagation

Eric Chung, The Chinese University of Hong Kong, Hong Kong

12:00-12:25 Optimal Basis Computation for Multiscale Spectral Element Methods via Reduced Order Gramians

Leonid Knizhnerman, Central Geophysical Expedition, Russia; Vladimir Druskin, Schlumberger-Doll Research, USA; Yousef Saad, University of Minnesota, USA; Mikhail Zaslavsky, Schlumberger-Doll Research, USA

Thursday, July 14

MS104

Model Reduction of Parametrized PDEs in Continuum Mechanics - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom B - Concourse Level

For Part 2 see MS119

This minisymposium explorers recent developments in model reduction methods that provide rapid and reliable solution of parametrized PDEs in continuum mechanics. The particular emphasis is on the formulation and analysis of techniques that extend the envelope of model reduction methods to complex engineering problems in fluid mechanics, solid mechanics, and acoustics. Topics include the effective treatment of nonlinearity, high-dimensional problems, solution error certification, and their application to industrial problems and engineering education.

Organizer: Gianluigi Rozza

SISSA-ISAS International School for Advanced Studies, Italy

Organizer: Masayuki Yano

University of Toronto, Canada

10:30-10:55 PDE Apps for Simulation; Application to Elasticity and Acoustics

Anthony T. Patera, Massachusetts Institute of Technology, USA

11:00-11:25 Applications of the Static Condensation Reduced Basis Element Method to Industrial Problems

David Knezevic, Akselos, Switzerland

11:30-11:55 A Multiscale Reduced Basis Method for Wave Propagation in Heterogeneous Materials

Ferran Vidal-Codina, Cuong Nguyen, and Jaime Peraire, Massachusetts Institute of Technology, USA

12:00-12:25 Fully Certified, Adaptive and Localized Reduced Basis Methods

Felix Schindler and Mario Ohlberger, University of Muenster, Germany

Thursday, July 14

MS105

New Numerical Approaches to Ocean Modeling Across Scales - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 257A

For Part 2 see MS120

Organized by SIAG/GS

Applied mathematics and numerical fluid dynamics methods have had a great impact on ocean modeling in recent years. Complex domain boundaries with changing nonlinear regimes in ocean depth transition zones lead to interesting mathematical problems when realistic simulations are the research goal. Depending on the research focus, mainly two-dimensional, layered or fully three-dimensional approximations of ocean dynamics can be chosen. The choice of approximation type has large influence on accuracy, efficiency and modeling uncertainty of the simulation. This minisymposium aims at compiling a number of current results of numerical ocean modeling.

Organizer: Jörn Behrens

University of Hamburg, Germany

10:30-10:55 Numerical Methods for Adaptive Shallow Water Equations in Coastal Ocean Modeling

Jörn Behrens, University of Hamburg, Germany

11:00-11:25 A Class of Mimetic Ocean Primitive Equation Models

Peter Korn, Max Planck Insitute for Meteorology, Germany

11:30-11:55 Two-Layer Wind-Wave Coastal Ocean Models

Kyle T. Mandli and *Colton Conroy*, Columbia University, USA

12:00-12:25 Wave Amplification and Its Impact on Onshore Mass Transport

Nicole Beisiegel, University College Dublin, Ireland; Frédéric Dias, University College Dublin, Ireland and Ecole Normale Supérieure de Cachan, France

Thursday, July 14

MS106

Preconditioners for Structured Matrices - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253B

For Part 2 see MS121

Discretizations of boundary integral equations result in dense, but structured, linear systems. These linear systems are, most often, either solved iteratively with a fast summation algorithm such as the fast multipole method, or with a direct solver. Both these methods have optimal or near-optimal complexity, but recent applications have shown that a combination of the two methods is appropriate. In particular, a direct solver constructed with low accuracy or with a nearby geometry can be interpreted as a preconditioner for an iterative solver. This minisymposium will discuss recent developments for such applications.

Organizer: Bryan D. Quaife

Florida State University, USA

Organizer: Eric F. Darve

Stanford University, USA

Organizer: Pieter Coulier

Stanford University, USA

10:30-10:55 The Inverse FMM as a Preconditioner for Dense Linear Systems

Pieter Coulier, Stanford University, USA

11:00-11:25 Fast Direct Solvers as Preconditioners for Evolved Geometries

Adrianna Gillman, Rice University, USA

11:30-11:55 Structured Eigenvalue Approximation and Accuracy

Jianlin Xia, Purdue University, USA

12:00-12:25 On the Use of Low Rank Approximations for Sparse Direct Solvers

Pierre Ramet, Université de Bordeaux, Inria, LaBRI, France

Thursday, July 14

MS107

Recent Development and Application on High Order Methods for Time-Dependent PDEs - Part I of II

10:30 AM-12:00 PM

Room:Grand Ballroom CDE- Concourse Level

For Part 2 see MS122

Development and application of high order numerical methods for solving time-dependent partial differential equations (PDEs) has soared in popularity in recent years. This minisymposium aims to bring researchers together to discuss advanced and practical approaches when designing high order methods for time-dependent PDEs, with particular attention on weighted essentially non-oscillatory (WENO) methods and discontinuous Galerkin (DG) methods.

Organizer: Wei Guo

Michigan State University, USA

Organizer: Yan Jiang

Michigan State University, USA

10:30-10:55 WENO-based Line Transpose Approach for Vlasov Equation

Yan Jiang, Andrew Chrislieb, and Wei Guo, Michigan State University, USA

11:00-11:25 Constraint-Preserving High Order Schemes by Lagrangian Multipliers

Jingmei Qiu and Xiaofeng Cai, University of Houston, USA

11:30-11:55 Runge-Kutta Discontinuous Galerkin Method with a Simple and Compact Hermit Weno Limiter

Jun Zhu, Nanjing University of Aeronautics and Astronautics, China; *Xinghui Zhong*, University of Utah, USA; Chi-Wang Shu, Brown University, USA; Jianxian Qiu, Xiamen University, China

Thursday, July 14

MS108

Scientific Computing and Big Data - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 256

For Part 2 see MS123

Organized by SIAG/DMA

The term "Big Data" has become a common term to represent the difficulty in working with large quantities of information and bring to mind challenges associated with the volume, velocity and variety of data. While the usage of the term "Big Data" has been a relatively recent trend, scientific problems such as modeling and simulation have developed a set of tools and techniques that enable the extraction of knowledge from large, messy datasets. In this minisymposium, we will hear from a variety of scientists from diverse technical domains as they describe their "Big Data" problem and the tools and techniques they have developed to extract knowledge.

Organizer: Vijay Gadepally

Massachusetts Institute of Technology, USA

10:30-10:55 Databases and Mathematics for Big Data

Vijay Gadepally, Massachusetts Institute of Technology, USA

11:00-11:25 Making Big Data Systems Efficient and Easy to Program

Abhishek Bhattacharjee, Rutgers University, USA

11:30-11:55 Fast Processing of Large Graph Applications Using Asynchronous Architectures

Michel Kinsy, University of Oregon, USA

12:00-12:25 Role of Scientific Computing in Gas Turbine Engine Design

Shashank Yellapantula, GE Global Research, USA

Thursday, July 14

MS109

Space-Time Parallel Methods for PDEs - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 254A

For Part 2 see MS124

As the number of cores in the largest supercomputers continues to dramatically increase, the development of new algorithms that expose computational concurrency is desired. In application areas where the problem of interest concerns the numerical solution of time-dependent partial differential equations, a promising strategy is to extend traditional spatial parallelization techniques to include the time direction. This minisymposium brings together researchers working on various space-time parallelization techniques for PDEs. In their talks, they will give overviews of recently developed space-time algorithms, discuss implementation strategies, and report on experiences from applications on modern scientific computing architectures.

Organizer: Michael Minion

Lawrence Berkeley National Laboratory, USA

10:30-10:55 Assessing Time Parallel Efficiency for Test Problems in Climate Science

Andreas Kreienbuehl, Lawrence Berkeley National Laboratory, USA

11:00-11:25 Fault-Tolerant Parallel-in-Time Integration with PFASST

Robert Speck, Jülich Supercomputing Centre, Germany

11:30-11:55 Multigrid Reduction in Time, Theory and Applications

Veselin Dobrev, Robert D. Falgout, Tzanio V. Kolev, Anders Petersson, Jacob B. Schroder, and Ulrike Meier Yang, Lawrence Livermore National Laboratory, USA

12:00-12:25 Analysis of a Fully Scalable Balanced Parareal Method

Yvon Maday, Université Pierre et Marie Curie, France and Brown University, USA

Thursday, July 14

MS110

Stochastic Control and Risk Management - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 253A

For Part 2 see MS125

This minisymposium will provide a platform for the dissemination of cutting edge research in two important fields of Financial Mathematics: Stochastic Control and Risk Management. The speakers will discuss (i) optimal portfolio choice with market frictions and incompleteness, (ii) the identification and assessment of risks, and (iii) minimization of the probability and impact of unfortunate events, which all aim at pushing theories closer to industry practice. We will bring both eminent researchers and promising young scholars in this field, and thereby create possibilities of new collaborations.

Organizer: Gu Wang

Worcester Polytechnic Institute, USA

Organizer: Hyungbin Park

Worcester Polytechnic Institute, USA

10:30-10:55 Nonlinear Price Impact and Portfolio Choice

Paolo Guasoni, Boston University, USA and Dublin City University, Ireland

11:00-11:25 A Second-Order Expansion of the Value Function in the Problem of Optimal Investment in Incomplete Markets

Oleksii Mostovyi, University of Connecticut, USA

11:30-11:55 The Systemic Effects of Benchmarking

Gustavo Schwenkler, Boston University, USA

12:00-12:25 Market Stability and Indifference Prices

Kim Weston, University of Texas at Austin, USA

Thursday, July 14

MS111

Structured Polynomial Equations and Applications - Part I of II

10:30 AM-12:30 PM

Room:Grand Ballroom A - Concourse Level

For Part 2 see MS126

Systems of polynomial equations have been used to model problems in various areas such as: cryptography, robotics, computer vision, graph theory, differential equations, statistics and optimization. In most applications the systems arising have a particular structure, and exploiting such structure can greatly improve the computational cost. Different kinds of structure have been explored in the literature, including symmetries, multi-linearity and sparsity, yielding significant improvements and also leading to new mathematical ideas (e.g., toric geometry). The goal of this minisymposium is to share recent developments that exploit special structure in polynomial systems, and to identify their theoretical and practical implications.

Organizer: Diego Cifuentes

Massachusetts Institute of Technology, USA

Organizer: Pablo A. Parrilo

Massachusetts Institute of Technology, USA

10:30-10:55 Chordal Structure and Polynomial Systems

Diego Cifuentes and Pablo A. Parrilo, Massachusetts Institute of Technology, USA

11:00-11:25 Symmetric Polynomials from Extremal Combinatorics

Annie Raymond and Rekha Thomas, University of Washington, USA

11:30-11:55 The Ubiquity of Determinantal Equations

Frank Sottile, Texas A&M University, USA

12:00-12:25 Hilbert's Nullstellensatz and Perfect Matchings

Susan Margulies and Chris Griffin, United States Naval Academy, USA

Thursday, July 14

MS112

Theoretical and Practical Aspects of Gaussian Process-Based Surrogate Modeling - Part I of II

10:30 AM-12:30 PM

Room:BCEC Room 252A

For Part 2 see MS127

Surrogate modeling refers to the process of emulating a high-fidelity model based on a set of sampled data points. The spatial Gaussian process, aka Kriging is a pseudo-statistical surrogate modeling technique that leads to the best linear unbiased predictor for the given sampled input. However, in order to set up a Kriging predictor the user faces a lot of questions ranging from choosing the appropriate correlation model up to the numerical reliability of the predictor. This minisymposium aims at bringing together experts working on the various aspects of Kriging-based surrogates and thus to trigger synergies between the different lines of research.

Organizer: Ralf Zimmermann

Technische Universität Braunschweig, Germany

Organizer: Zhonghua Han

Northwestern Polytechnical University, China

10:30-10:55 Speeding Up Kriging by Using Pivoted Cholesky Decomposition and Low-Rank Structures

Dishi Liu, German Aerospace Center (DLR), Germany; *Ralf Zimmermann* and Hermann Matthies, Technische Universität Braunschweig, Germany

11:00-11:25 Mixture of Experts with Kriging: A Divide-and-Conquer Approach to Model Heterogeneous Function Profiles

Rhea P. Liem, Hong Kong University of Science and Technology, Hong Kong

11:30-11:55 High Performance Multi-Level Covariance Estimation and Kriging for Large Scale Non-Gridded Spatial Datasets

Julio E. Castrillon-Candas, SRI International, USA; Marc Genton, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Rio Yokota, Tokyo Institute of Technology, Japan

12:00-12:25 Bayesian Optimization with a Finite Budget: An Approximate Dynamic Programming Approach

Remi Lam and Karen E. Willcox, Massachusetts Institute of Technology, USA

Thursday, July 14

CP17

Linear Algebra

10:30 AM-12:10 PM

Room:Commonwealth B - Concourse Level

Chair: Peter R. Kotiuga, Boston University, USA

10:30-10:45 Improved Functionality and Performance for the Spike Banded Solver
Braegan S. Spring and Eric Polizzi, University of Massachusetts, Amherst, USA

10:50-11:05 Spectral Geometry of Families of Large Sparse Stieltjes Matrices via Examples
Peter R. Kotiuga, Boston University, USA

11:10-11:25 Computing Geodesic Rotations
Brian D. Sutton, Randolph-Macon College, USA

11:30-11:45 Graph Signal Classification Using Wavelet Packet Dictionaries and the Lasso
Eugene Shvarts and Naoki Saito, University of California, Davis, USA

11:50-12:05 Properties of Linear Multiparameter Matrix Pencils and Applications to Matrix Operator Systems
Benard O. Nyaare, Jaramogi Oginga Odinga University of Science and Technology, Kenya

Thursday, July 14

CP18

Partial Differential Equations II

10:30 AM-12:30 PM

Room:Commonwealth C - Concourse Level

Chair: Susan Minkoff, University of Texas, Dallas, USA

10:30-10:45 Full Waveform Inversion for Microseismic Event Estimation
Susan Minkoff, University of Texas, Dallas, USA

10:50-11:05 Destriping of Remote Sensing Imagery by Optimizing An Inverse Problem
Ranil Basnayake and Erik Bollt, Clarkson University, USA; Nicholas Tufillaro, Oregon State University, USA; Jie Sun, Clarkson University, USA

11:10-11:25 Randomization for Efficiently Computing Reduced Order Models in Nonlinear Parametric Inversion
Selin Sariaydin and Eric De Sturler, Virginia Tech, USA; Arvind Saibaba, North Carolina State University, USA; Misha E. Kilmer, Tufts University, USA

11:30-11:45 On the Upper Bound of the Kolmogorov Entropy of the Weak Global Attractor of the 3D Navier-Stokes Equations
Bingsheng Zhang, Texas A&M University, USA; Ciprian Foias, Texas A&M University and Indiana University, USA; Cecilia Mondaini, Texas A&M University, USA

11:50-12:05 Economical Finite-Difference Scheme for One System of Nonlinear Multi-Dimensional Partial Differential Equations
Temur Jangveladze, Giorgi Jangveladze, and Zurab Kiguradze, Ivane Javakhishvili Tbilisi State University, Georgia

12:10-12:25 On the Stability of Stationary Solution and Numerical Approximation for One Nonlinear Model
Maia Kratsashvili, St. George's British-Georgian School, Georgia; Temur Jangveladze, Ivane Javakhishvili Tbilisi State University, Georgia

Thursday, July 14

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

SIAM Review Editorial (SIREV) Board Meeting

12:30 PM-2:00 PM

Room:Faneuil - Mezzanine Level

IT10

Implementing Reproducibility in Computational Science

2:00 PM-2:45 PM

Room:Grand Ballroom - Concourse Level

Chair: Randall LeVeque, University of Washington, USA

The ability to verify published computational results is foundational to scientific progress, and the scientific community current faces a credibility gap. In this talk I will present ways to implement notions of reproducibility in various research settings, from high performance computing environments through the long tail of research. Solutions include expanding our traditional definition of publication to include digital scholarly objects (such as data, code, workflows) that can enable the verification of computational findings. If time permits, I will discuss recent policy advances in enabling reproducibility in the scholarly record, from Whitehouse initiatives to funding agency and journal efforts.

Victoria Stodden
University of Chicago at Urbana-Champaign, USA

SIAM Presents

Since 2008, SIAM has recorded many Invited Lectures, Prize Lectures, and selected Minisymposia from various conferences. These are available by visiting SIAM Presents (*http://www.siam.org/meetings/presents.php*).

Thursday, July 14

IT11

Large Deviation Theory Applied to Climate Physics, A New Frontier of Statistical Physics and Applied Mathematics

2:45 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Peter R. Kramer, Rensselaer Polytechnic Institute, USA

I will review some of the recent developments in the theoretical and mathematical aspects of the non-equilibrium statistical mechanics of climate dynamics. At the intersection between statistical mechanics, turbulence, and geophysical fluid dynamics, this field is a wonderful new playground for applied mathematics involving large deviation theory, stochastic partial differential equations, and diffusion Monte-Carlo algorithms. We will discuss two classes of applications. First extreme heat waves as an example of a rare events with a huge impacts. Second rare trajectories that suddenly drive the complex dynamical system from one attractor to a completely different one, related to abrupt climate changes.

Freddy Bouchet
ENS Lyon, France

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Thursday, July 14

MS113

Advances in Fast Algorithms for High Accuracy Solutions to PDEs - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 253C

For Part 1 see MS96

The introduction of fast algorithms has dramatically increased the collection of problems for which a solution can be approximated to high accuracy. Some of the most notable contributions include the FMM, FFT and more recently fast direct solvers. The collection of methods presented in this session utilize, are extension of, or are inspired by the famous fast methods. In particular, fast algorithms for discretizing integral equations, inverse scattering in variable media, tensor based solvers and an expansion approach for solving PDEs with corners will be presented.

Organizer: Adrianna Gillman
Rice University, USA

Organizer: Michael O'Neil
New York University, USA

4:00-4:25 Voxelized Geometries, Volume Integral Equations, and the Reemergence of FFT-Based Sparsification
Jacob White, Athanasios Polymeridis, Jorge Villena, Luca Daniel, and Richard Zhang, Massachusetts Institute of Technology, USA

4:30-4:55 A Tensor-Train Accelerated Solver for Integral Equations in Complex Geometries
Abtin Rahimian, Eduardo Corona, and Denis Zorin, Courant Institute of Mathematical Sciences, New York University, USA

5:00-5:25 Inverse Medium Scattering with Multiple Frequency Data and Multiple Angles of Incidence
Carlos C. Borges, Courant Institute of Mathematical Sciences, New York University, USA; Adrianna Gillman, Rice University, USA; Leslie Greengard, Simons Foundation and Courant Institute of Mathematical Sciences, New York University, USA

5:30-5:55 High-Performance Surface Integral Equation Solvers Towards Extreme-Scale Electromagnetic Computation
Zhen Peng, University of New Mexico, USA

Thursday, July 14

MS114

Computational Science and Statistics for Complex Models

4:00 PM-6:00 PM

Room:Commonwealth A - Concourse Level

Part of the SIAM Workshop Celebrating Diversity

Advances in the computational capacity of computers, the increasing sophistication of mathematical models, and the development of novel algorithms has vastly improved the fidelity of computer models of phenomena encompassing several disciplines. Novel computational techniques are used to analyze complex models and large amounts of data. This minisymposium will focus on research being conducted using computational statistical methods applied to diverse applications. Specifically, as part of the Workshop Celebrating Diversity, this session will highlight the work of scientists from underrepresented minority groups.

Organizer: Lindley C. Graham
Florida State University, USA

Organizer: Susan Minkoff
University of Texas, Dallas, USA

Organizer: Erica J. Graham
Bryn Mawr College, USA

Organizer: Raegan Higgins
Texas Tech University, USA

4:00-4:25 Measure-Theoretic Augmentation of Multifidelity Monte-Carlo Estimation
Lindley C. Graham and Max Gunzburger, Florida State University, USA; Troy Butler, University of Colorado, Denver, USA

4:30-4:55 Stochastic Characteristics of Quantum-Inspired and Quantum Algorithms
Erika Jones, George Mason University, USA

5:00-5:25 Bayesian Fused Lasso Regression for Dynamic Binary Networks
Brenda Betancourt, Duke University, USA; Abel Rodriguez, University of California, Santa Cruz, USA

5:30-5:55 Estimating $\mathcal{R}_0$ For Avian Influenza Through Transmission Chains And Data Fitting
Omar Saucedo, University of Florida, USA

Thursday, July 14

MS115

Conservation Laws with Singular Shocks: Analytical, Numerical and Experimental Studies - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 255

For Part 1 see MS99
Organized by SIAG/APDE

Singular shock waves provide one of the principal tools for solving Riemann problems which cannot be solved by classical shocks and rarefactions. This minisymposium aims to present recent developments in that area placing emphasis on systems with physical interest.

Organizer: Andrea L. Bertozzi
University of California, Los Angeles, USA

Organizer: Charis Tsikkou
West Virginia University, USA

4:00-4:25 Two-Species Chromatography with Anti-Langmuir Isotherms: A Case Study for Singular Shocks
Barbara L. Keyfitz and Ting-Hao Hsu, The Ohio State University, USA; Martin Krupa, Inria Paris-Rocquencourt, France; Charis Tsikkou, West Virginia University, USA

4:30-4:55 Shock Waves in the Presence of Dispersion
Michael Shearer, North Carolina State University, USA; Gennady El, Loughborough University, United Kingdom; Mark A. Hoefer, University of Colorado Boulder, USA

5:00-5:25 Singular Shocks in Nonlinear Chromatography: Theoretical and Experimental Considerations
Franziska Ortner and Marco Mazzotti, ETH Zürich, Switzerland

5:30-5:55 Viscous Singular Shock Profiles for a System Modeling Incompressible Two-Phase Fluid Flow
Ting-Hao Hsu, The Ohio State University, USA

Thursday, July 14

MS116

Education Programs in Data Science and Data Analytics - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 251

For Part 1 see MS101
Organized by the SIAM Education Committee

Data Analytics as well as Data Science and Engineering are evolving towards being an additional pillar of scientific progress. In business and industry, data will be one of the key resources of the 21th century. On the other hand, structured programs to educate undergraduate and graduate students in Data Science, or even programs that lead to a data-related major, are still emerging. Hence, there are no "mainstream" templates for data-oriented programs available, yet, nor are there related training opportunities for faculty. The goal of this minisymposium is therefore to present and discuss curricula and recent activities towards installing data-related programs.

Organizer: Michael Bader
Technische Universität München, Germany

Organizer: Rachel Levy
Harvey Mudd College, USA

Organizer: Sigal Gottlieb
University of Massachusetts, Dartmouth, USA

Organizer: Suzanne L. Weekes
Worcester Polytechnic Institute, USA

4:00-4:25 Shaping A Well-Rounded Analyst
Kaitlyn Brady, Staples Inc., USA

4:30-4:55 Motivating Data Science students with Hackathons and Oi-X
Bjarne Kjær Ersbøll, Technical University of Denmark, Denmark

5:00-5:25 Data Science: A Natural Fit in the Liberal Arts Curriculum
David Shuman, Macalester College, USA

5:30-5:55 Mathematics and Computer Science: Education in Data Science, Data Engineering and Data Analytics at Tum
Thomas K. Huckle, Technische Universität München, Germany

Thursday, July 14

MS117

High-Fidelity Modeling for Cellular Flows - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 252B

For Part 1 see MS102
The dynamics of red blood cells, fibrous suspensions, platelets, bacteria, and other cells is typically modeled as elastic microstructures submerged in a Newtonian fluid. Numerical simulations of such systems are challenging because of fluid-structure interactions, large deformations, strong nonlinearities, non-local interactions, evolving interfaces, and multiple length and time scales. High fidelity methods, such as boundary integral methods, have become a powerful framework that addresses many of these challenges. This minisymposium will discuss recent developments in the high-fidelity scalable numerical simulation of the cellular flows.

Organizer: Abtin Rahimian
Courant Institute of Mathematical Sciences, New York University, USA

Organizer: Shravan Veerapaneni
University of Michigan, USA

4:00-4:25 On the Gating of a Mechanosensitive Channel by Fluid Shear Stress
Yuan-Nan Young, New Jersey Institute of Technology, USA; On Shun Pak, Santa Clara University, USA; Zhangli Peng, University of Notre Dame, USA; Shravan Veerapaneni, University of Michigan, USA

4:30-4:55 A Fast Algorithm for Particulate Flows Through Complex Periodic Geometries
Shravan Veerapaneni and Gary Marple, University of Michigan, USA; Alex H. Barnett, Dartmouth College and Simons Foundation, USA; Adrianna Gillman, Rice University, USA

5:00-5:25 Low Resolution Simulations of 2D Vesicle Suspensions
Gokberk Kabacaoglu, University of Texas, USA; Bryan D. Quaife, Florida State University, USA; George Biros, University of Texas at Austin, USA

5:30-5:55 Convergence of a Boundary Integral Method for 3D Interfacial Flow with Surface Tension
David Ambrose, Drexel University, USA

Thursday, July 14

MS118

Model Reduction for Wavefield Simulations - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 254B

For Part 1 see MS103

Organized by SIAG/LA

When solving large-scale time- and frequency-domain wave field problems in complex structures, efficient model order reduction approaches have been developed just recently. A significant progress has been achieved in this area and wave field model-order reduction techniques have been successfully applied in a wide range of important application areas including geophysics and nano-optics. We bring together applied and theoretical experts to present newly obtained results and to discuss further progress in this exciting research field. This minisymposium is the first part out of two: it covers the forward modeling only, while the inversion will be discussed in the second part.

Organizer: Mikhail Zaslavsky

Schlumberger-Doll Research, USA

Organizer: Rob F. Remis

Delft University of Technology, Netherlands

4:00-4:25 Multi-Scale Mimetic Reduced-Order Models for Large-Scale Wavefield Simulations

Mikhail Zaslavsky and Vladimir L. Druskin, Schlumberger-Doll Research, USA; Alexander V. Mamonov, University of Houston, USA

4:30-4:55 Optimizing Radiation Boundary Conditions and Absorbing Layers for Time Domain Problems

Thomas M. Hagstrom, Southern Methodist University, USA; Daniel Appelo, University of New Mexico, USA; John Lagrone, Southern Methodist University, USA

continued in next column

5:00-5:25 Asymptotically Corrected Krylov Subspace Model-Order Reduction of Wavefields in Travel-Time Dominated Structures

Jörn T. Zimmerling, Delft University of Technology, Netherlands; Vladimir L. Druskin, Schlumberger-Doll Research, USA; Rob Remis, Delft University of Technology, Netherlands; Mikhail Zaslavsky, Schlumberger-Doll Research, USA

5:30-5:55 Nested Krylov Methods for Solving the Time-Harmonic Elastic Wave Equation at Multiple Frequencies

Martin B. van Gijzen and *Manuel Baumann*, Delft University of Technology, Netherlands

Thursday, July 14

MS119

Model Reduction of Parametrized PDEs in Continuum Mechanics - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom B - Concourse Level

For Part 1 see MS104

This minisymposium explorers recent developments in model reduction methods that provide rapid and reliable solution of parametrized PDEs in continuum mechanics. The particular emphasis is on the formulation and analysis of techniques that extend the envelope of model reduction methods to complex engineering problems in fluid mechanics, solid mechanics, and acoustics. Topics include the effective treatment of nonlinearity, high-dimensional problems, solution error certification, and their application to industrial problems and engineering education.

Organizer: Gianluigi Rozza

SISSA-ISAS International School for Advanced Studies, Italy

Organizer: Masayuki Yano

University of Toronto, Canada

Organizer: Masayuki Yano

University of Toronto, Canada

4:00-4:25 Advances in Reduced Order Methods for Computational Fluid Dynamics

Francesco Ballarin and *Gianluigi Rozza*, SISSA-ISAS International School for Advanced Studies, Italy

4:30-4:55 Large Eddy Simulation Reduced Order Models

Xuping Xie, Virginia Tech, USA

5:00-5:25 Goal-Oriented Model Order Reduction for Vector-Valued Variables of Interest

Olivier Zahm, Massachusetts Institute of Technology, USA; Marie Billaud-Friess and Anthony Nouy, Ecole Centrale de Nantes, France

5:30-5:55 Simultaneous Spatio-Parameter Adaptivity for Parametrized Problems in CFD

Masayuki Yano, University of Toronto, Canada

Thursday, July 14

MS120

New Numerical Approaches to Ocean Modeling Across Scales - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 257A

For Part 1 see MS105
Organized by SIAG/GS

Applied mathematics and numerical fluid dynamics methods have had a great impact on ocean modeling in recent years. Complex domain boundaries with changing nonlinear regimes in ocean depth transition zones lead to interesting mathematical problems when realistic simulations are the research goal. Depending on the research focus, mainly two-dimensional, layered or fully three-dimensional approximations of ocean dynamics can be chosen. The choice of approximation type has large influence on accuracy, efficiency and modeling uncertainty of the simulation. This minisymposium aims at compiling a number of current results of numerical ocean modeling.

Organizer: Jörn Behrens
University of Hamburg, Germany

4:00-4:25 Adjoint Error Estimation for Tsunami Modeling
Brisa Davis and Randall LeVeque, University of Washington, USA

4:30-4:55 Applications of Tsunami Inundation Models in the North of Chile
Cristóbal E. Castro, Universidad de Tarapaca, Chile; Davide Vanzo and Annunziato Siviglia, Swiss Federal Institute of Technology, Switzerland; Ricardo Fuentes, Universidad de Tarapaca, Chile

5:00-5:25 Scaling Element-Based Galerkin Methods on Multi-core and Many-Core Computers for Geophysical Fluid Dynamics Models
Daniel Abdi, Andreas Müller, and Lucas Wilcox, Naval Postgraduate School, USA; Tim Warburton, Virginia Tech, USA; Francis X. Giraldo, Naval Postgraduate School, USA

5:30-5:55 Improved Multi-Scale Characterization of Hurricane Storm Surge
Jennifer Proft and Clint Dawson, University of Texas at Austin, USA

Thursday, July 14

MS121

Preconditioners for Structured Matrices - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 253B

For Part 1 see MS106
Discretizations of boundary integral equations result in dense, but structured, linear systems. These linear systems are, most often, either solved iteratively with a fast summation algorithm such as the fast multipole method, or with a direct solver. Both these methods have optimal or near-optimal complexity, but recent applications have shown that a combination of the two methods is appropriate. In particular, a direct solver constructed with low accuracy or with a nearby geometry can be interpreted as a preconditioner for an iterative solver. This minisymposium will discuss recent developments for such applications.

Organizer: Bryan D. Quaife
Florida State University, USA

Organizer: Eric F. Darve
Stanford University, USA

Organizer: Pieter Coulier
Stanford University, USA

4:00-4:25 Fast Solvers for 3D elastodynamic Boundary Element Methods
Stephanie Chaillat, Laboratoire POEMS (CNRS-ENSTA-INRIA), France; Patrick Ciarlet and Luca Desiderio, CNRS, France

4:30-4:55 Optimal Complexity Fast Volume Integral Equation Solvers in Electromagnetics
Saad Omar, Schlumberger, USA

5:00-5:25 FMM Pre-Conditioners for Highly Ill-Conditioned Structured Matrices in Approximation Theory
Shivkumar Chandrasekaran, University of California, Santa Barbara, USA

5:30-5:55 Efficient Preconditioners and Hierarchical Interpolative Decompositions
Victor Minden, Anil Damle, and Lexing Ying, Stanford University, USA

Thursday, July 14

MS122

Recent Development and Application on High Order Methods for Time-Dependent PDEs - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom CDE - Concourse Level

For Part 1 see MS107
Development and application of high order numerical methods for solving time-dependent partial differential equations (PDEs) has soared in popularity in recent years. This minisymposium aims to bring researchers together to discuss advanced and practical approaches when designing high order methods for time-dependent PDEs, with particular attention on weighted essentially non-oscillatory (WENO) methods and discontinuous Galerkin (DG) methods.

Organizer: Wei Guo
Michigan State University, USA

Organizer: Yan Jiang
Michigan State University, USA

4:00-4:25 An Asymptotic Preserving Maxwell Solver Resulting in the Darwin Limit of Electrodynamics
Wei Guo, Yingda Cheng, and Andrew J. Christlieb, Michigan State University, USA; Benjamin W. Ong, Michigan Technological University, USA

4:30-4:55 Maximum-Principle-Satisfying Third Order Direct Discontinuous Galerkin Methods for Time Dependent Convection Diffusion Equations on Unstructured Triangular Mesh
Zheng Chen, Oak Ridge National Laboratory, USA; Hongying Huang, Zhejiang University, China; Jue Yan, Iowa State University, USA

5:00-5:25 A Conservative Sweeping Method for Enforcing Maximum Principle
Yuan Liu, Mississippi State University, USA

5:30-5:55 A Conservative Semi-Lagrangian HWENO Method for the Vlasov Equation
Jianxian Qiu, Xiamen University, China; Jingmei Qiu and *Xiaofeng Cai*, University of Houston, USA

Thursday, July 14

MS123

Scientific Computing and Big Data - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 256

For Part 1 see MS108

Organized by SIAG/DMA

The term "Big Data" has become a common term to represent the difficulty in working with large quantities of information and bring to mind challenges associated with the volume, velocity and variety of data. While the usage of the term "Big Data" has been a relatively recent trend, scientific problems such as modeling and simulation have developed a set of tools and techniques that enable the extraction of knowledge from large, messy datasets. In this minisymposium, we will hear from a variety of scientists from diverse technical domains as they describe their "Big Data" problem and the tools and techniques they have developed to extract knowledge.

Organizer: Vijay Gadepally

Massachusetts Institute of Technology, USA

4:00-4:25 Linking and Mining Electronic Health Records and Claims Data to Understand Patterns of Care

Ashok K. Krishnamurthy, Rennaisance Computing Institute (RENCI), USA

4:30-4:55 Big Data in High Throughput Screening

Steven Finkbeiner, University of California, San Francisco, USA

5:00-5:25 Secondary Use of an Eighty-Billion-Row Clinical Data Warehouse

Andrew Zimolzak, Harvard Medical School, USA; Valmeek Kudesia, US Department of Veterans Affairs, USA

5:30-5:55 Collaborative Data Analytics with DataHub

Aaron J. Elmore, University of Chicago, USA; Amol Desphande, University of Maryland, USA; Samuel Madden, Massachusetts Institute of Technology, USA; Aditya Parameswaran, University of Illinois at Urbana-Champaign, USA

Thursday, July 14

MS124

Space-Time Parallel Methods for PDEs - Part II of II

4:00 PM-5:30 PM

Room:BCEC Room 254A

For Part 1 see MS109

As the number of cores in the largest supercomputers continues to dramatically increase, the development of new algorithms that expose computational concurrency is desired. In application areas where the problem of interest concerns the numerical solution of time-dependent partial differential equations, a promising strategy is to extend traditional spatial parallelization techniques to include the time direction. This minisymposium brings together researchers working on various space-time parallelization techniques for PDEs. In their talks, they will give overviews of recently developed space-time algorithms, discuss implementation strategies, and report on experiences from applications on modern scientific computing architectures.

Organizer: Michael Minion

Lawrence Berkeley National Laboratory, USA

4:00-4:25 Dirichlet-Neumann & Neumann-Neumann Waveform Relaxation

Benjamin W. Ong and Bankim Mandal, Michigan Technological University, USA

4:30-4:55 A Parallel Space-Time Solver for the Time-Periodic Navier-Stokes Problems

Daniel Hupp, ETH Zürich, Switzerland; Dominik Obrist, University of Bern, Switzerland; Peter Arbenz, ETH Zürich, Switzerland

5:00-5:25 Time-Integrating PDEs Faster by Tessellating Space-Time Better

Qiqi Wang and *Maitham Alhubail*, Massachusetts Institute of Technology, USA

Thursday, July 14

MS125

Stochastic Control and Risk Management - Part II of II

4:00 PM-6:00 PM

Room:BCEC Room 253A

For Part 1 see MS110

This minisymposium will provide a platform for the dissemination of cutting edge research in two important fields of Financial Mathematics: Stochastic Control and Risk Management. The speakers will discuss (i) optimal portfolio choice with market frictions and incompleteness, (ii) the identification and assessment of risks, and (iii) minimization of the probability and impact of unfortunate events, which all aim at pushing theories closer to industry practice. We will bring both eminent researchers and promising young scholars in this field, and thereby create possibilities of new collaborations.

Organizer: Gu Wang

Worcester Polytechnic Institute, USA

Organizer: Hyungbin Park

Worcester Polytechnic Institute, USA

4:00-4:25 Calculating the Greeks with the H-Transform

Hyungbin Park, Worcester Polytechnic Institute, USA

4:30-4:55 Endogenous Current Coupons

Scott Robertson, Boston University, USA

5:00-5:25 Optimal Retirement Plan on a Finite Horizon

Dan Ren, The University of Dayton, USA

5:30-5:55 The Bounds on the Risk Premium of Markovian Pricing Kernels and the Recovery with Transient Processes

Jihun Han, New York University, USA

Thursday, July 14

MS126

Structured Polynomial Equations and Applications - Part II of II

4:00 PM-6:00 PM

Room:Grand Ballroom A - Concourse Level

For Part 1 see MS111

Systems of polynomial equations have been used to model problems in various areas such as: cryptography, robotics, computer vision, graph theory, differential equations, statistics and optimization. In most applications the systems arising have a particular structure, and exploiting such structure can greatly improve the computational cost. Different kinds of structure have been explored in the literature, including symmetries, multi-linearity and sparsity, yielding significant improvements and also leading to new mathematical ideas (e.g., toric geometry). The goal of this minisymposium is to share recent developments that exploit special structure in polynomial systems, and to identify their theoretical and practical implications.

Organizer: Diego Cifuentes

Massachusetts Institute of Technology, USA

Organizer: Pablo A. Parrilo

Massachusetts Institute of Technology, USA

4:00-4:25 Computing Small Certificates of Inconsistency of Quadratic Fewnomial Systems

Jean-Charles Faugere, Inria Paris-Rocquencourt, France

4:30-4:55 Polynomial Continuation Techniques for Equations Arising from Nonlinear Optimization

Brent R. Davis, Dan Bates, Chris Peterson, and Michael Kirby, Colorado State University, USA; Justin Marks, Wesleyan University, USA

5:00-5:25 Learning Directed Acyclic Graphs Based on Sparsest Permutations

Caroline Uhler, Massachusetts Institute of Technology, USA

5:30-5:55 Singular Vectors of Tensors

Anna Seigal, University of California, Berkeley, USA

Thursday, July 14

MS127

Theoretical and Practical Aspects of Gaussian Process-Based Surrogate Modeling - Part II of II

4:00 PM-5:30 PM

Room:BCEC Room 252A

For Part 1 see MS112

Surrogate modeling refers to the process of emulating a high-fidelity model based on a set of sampled data points. The spatial Gaussian process, aka Kriging is a pseudo-statistical surrogate modeling technique that leads to the best linear unbiased predictor for the given sampled input. However, in order to set up a Kriging predictor the user faces a lot of questions ranging from choosing the appropriate correlation model up to the numerical reliability of the predictor. This minisymposium aims at bringing together experts working on the various aspects of Kriging-based surrogates and thus to trigger synergies between the different lines of research.

Organizer: Ralf Zimmermann

Technische Universität Braunschweig, Germany

Organizer: Zhonghua Han

Northwestern Polytechnical University, China

4:00-4:25 Gradient-Enhanced Kriging Model for Large Data Set: A New Formulation

Zhonghua Han and *Yu Zhang*, Northwestern Polytechnical University, China

4:30-4:55 Locally Optimized Covariance Kriging for Engineering Design Exploration

Ha-Rok Bae, Wright State University, USA

5:00-5:25 Some Theoretical Notes on Variable Fidelity Modeling

Anna Sauerbrei, Technische Universität Braunschweig, Germany

Thursday, July 14

MS134

Generalized Meshless Multiscale Modeling of Complex Media - Part I of II

4:00 PM-6:00 PM

Room:Otis - Lobby Level

For Part 2 see MS150

The goal of the symposium is to bring together active researchers working in various aspects of meshless methods and, particularly, focusing on meshless modeling of complex media including multi-phase / multi-components fluid flow, wave propagation in elastoplastic media, hydraulic fracturing, and smart materials. The objectives of this symposium are to establish fundamental aspects common to different meshless approaches, identify the areas for improvements, and formulate key challenging topics. A list of key topics is 1. Mathematical theory of meshless methods, generalized finite element, and particle methods; 2. Identification of problems where meshless methods have clear advantage over classical approaches;

Organizer: Alexander Lukyanov

Schlumberger-Doll Research, USA

Organizer: Marc Alexander Schweitzer

Universität Bonn, Germany

Organizer: Kees Vuik

Delft University of Technology, Netherlands

4:00-4:25 Construction of Optimal Multi Scale Basis Functions for Partition of Unity Methods

Marc Alexander Schweitzer, Universität Bonn, Germany; Ziegenhagel Albert, Fraunhofer SCAI, Germany; Wu Sa, Universität Bonn, Germany

4:30-4:55 An Implicit Corrected SPH Formulation for Fluid Flow in Anisotropic Porous Media

Alexander Lukyanov, Schlumberger-Doll Research, USA; Virginia Rossi, Technische Universität Delft, Germany; Cornelius Vuik, Delft University of Technology, Netherlands

5:00-5:25 A Peridynamic Model for Hydraulic Fracture

John T. Foster, Jason York, Hisanao Ouchi, and Michael Brother, University of Texas at Austin, USA

5:30-5:55 A Partition of Unity Method for the Propagation of Hydraulic Fractures With/Without Lag

Albert Ziegenhagel, Fraunhofer SCAI, Germany; Marc Alexander Schweitzer, University of Bonn, Germany

Thursday, July 14

CP19

Dynamical Systems

4:00 PM-6:00 PM

Room:Commonwealth B - Concourse Level

Chair: Carey Witkov, Harvard University, USA

4:00-4:15 Autoresonance and Mathieu Stability Boundaries
Carey Witkov, Harvard University, USA

4:20-4:35 New Phenomena in Dynamic Hopf Bifurcation: Spatial Delays, Spatial Memory Effects, and How Persistent Fluctuations on Nonlinear Ramps Influence the Memory Effect
Steven M. Baer, Arizona State University, USA; Lydia Bilinsky, Duke University, USA; Eric DeMarco, Arizona State University, USA

4:40-4:55 Flow Field Free, Image Processing Inference If Coherence, From Jupiter Observations, With Koopman Operator Connections
Abd Alrahman R. Almomani and Erik Bollt, Clarkson University, USA

5:00-5:15 Real and Complex Behavior for Networks of Coupled Logistic Maps
Anca R. Radulescu, State University of New York at Buffalo, USA

5:20-5:35 Inference of Boolean Networks Using Optimal Causation Entropy
Jie Sun and Erik Bollt, Clarkson University, USA

5:40-5:55 Identifying the Coupling Structure in Complex Systems Through the Optimal Causation Entropy Principle
Erik Bollt, Clarkson University, USA

Thursday, July 14

CP20

Numerical PDEs II

4:00 PM-5:40 PM

Room:BCEC Room 257B

Chair: Daniel B. Szyld, Temple University, USA

4:00-4:15 Asynchronous Optimized Schwarz Methods for the Solution of Pdes
Daniel B. Szyld, Temple University, USA; Frederic Magoules and Cedric Venet, Ecole Centrale Paris, France

4:20-4:35 Analysis of the Parallel Schwarz Method for the Solution of Chains of Particles in the Solvation Model
Gabriele Ciaramella and Martin J. Gander, Université de Genève, Switzerland

4:40-4:55 Overcoming Order Loss in High Order Runge-Kutta Methods for Initial Boundary Value Problems
Dong Zhou, Temple University, USA; David Shiorkoff, New Jersey Institute of Technology, USA; Benjamin Seibold, Temple University, USA; Rodolfo R. Rosales, Massachusetts Institute of Technology, USA

5:00-5:15 Density Estimation for a Class of Elliptic Problems on Stochastically Perturbed Domains
Jehanzeb H. Chaudhry, University of New Mexico, USA; Don Estep, Colorado State University, USA; Nathanial Burch, Gonzaga University, USA

5:20-5:35 GPU-Accelerated Bernstein-Bezier Dg Methods for Wave Problems
Jesse Chan and Timothy Warburton, Virginia Tech, USA

Thursday, July 14

CP21

Partial Differential Equations III

4:00 PM-5:40 PM

Room:Commonwealth C - Concourse Level

Chair: Zurab Kiguradze, Ivane Javakhishvili Tbilisi State University, Georgia

4:00-4:15 Evolutionary Singularly Perturbed Problems and Their Efficient Numerical Simulations
Kailash C. Patidar, University of the Western Cape, South Africa

4:20-4:35 On the Existence and the Asymptotic Stability of Solutions to the Rotating Boussinesq Equations for the Atmosphere and Ocean
Maleafisha Stephen Tladi, University of Limpopo, South Africa

4:40-4:55 On Two-Dimensional Nonlinear Integro-Differential Equation Associated with the Penetration of a Magnetic Field into a Substance
Zurab Kiguradze, Ivane Javakhishvili Tbilisi State University, Georgia; Maia Kratsashvili, St. George's British-Georgian School, Georgia

5:00-5:15 Haar Wavelet Based Method for Numerical Simulation of Parabolic Burgers' Equation with Variable Coefficients
Sapna Pandit and Prof. R.C. Mittal, Indian Institute of Technology Roorkee, India

5:20-5:35 Lie Symmetry Analysis and Dust-Acoustic Waves in Dusty Plasma Modeled by Burgers' Type Equation
Vikas Kumar, D.A.V. College Pundri, India

Thursday, July 14

CP22

Simulation and Modeling II

4:00 PM-6:20 PM

Room:BCEC Room 259A

Chair: Jeffrey M. Hokanson, University of Texas MD Anderson Cancer Center, USA

4:00-4:15 Accelerating Newton's Method for Semilinear Parabolic Control Via Reduced-Order Modeling
Caleb C. Magruder, Rice University, USA

4:20-4:35 Approximation of Dynamical Systems with Nonlinear Frequency Dependence via a Structure-preserving Model Reduction Algorithm
Klajdi Sinani, Serkan Gugercin, and Christopher A. Beattie, Virginia Tech, USA

4:40-4:55 Proper Symplectic Decomposition for Forced and Dissipative Hamiltonian Systems
Kamran Mohseni and *Liqian Peng*, University of Florida, USA

5:00-5:15 Fast Minimum Uncertainty Estimates for the Exponential Fitting Problem
Jeffrey M. Hokanson, University of Texas MD Anderson Cancer Center, USA

5:20-5:35 Automatic Dimensionality Reduction Using Gaussian Processes: Application to High Dimensional Uncertainty Quantification
Rohit Tripathy, Ilias Bilionis, and Marcial Gonzalez, Purdue University, USA

5:40-5:55 Uncertainties in Coherent X-Ray Diffractive Imaging 3D Reconstructions
Jing Liu, Stefan Engblom, and Carl Nettelblad, Uppsala University, Sweden

6:00-6:15 A Global-Local Optimization Template for Multiple History-Matched Reservoir Parameters
Abeeb Awotunde, King Fahd University of Petroleum and Minerals, Saudi Arabia

SIAM Council Meeting

4:00 PM

Room:Faneuil - Mezzanine Level

Exhibit Hall Closes

4:30 PM

Room:Galleria Level

Thursday, July 14

Intermission

6:00 PM-6:15 PM

Professional Development Evening: Landing Your Dream Job

6:15 PM-7:30 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Sven Leyffer, Argonne National Laboratory, USA

Join us for an evening devoted to developing a successful career in the mathematical sciences. Professionals from academia, government, and industry will share their job-search experiences and give advice on how to develop successful application materials tailored to specific job opportunities and how to perform well in job interviews. The target audience for this event includes early career professionals (i.e., less than five years past last degree), postdocs, and students. However, we are also encouraging participation from the senior professional community during the networking session to share their own experience. Part I: Finding and Applying for Jobs

David Brown
Lawrence Livermore National Laboratory, USA

Jennifer Erway
Wake Forest University, USA

Des Higham
University of Strathclyde, United Kingdom

Helen Moore
Bristol-Myers Squibb, USA

Thursday, July 14

Professional Development Evening: Networking Break

7:30 PM-8:15 PM

Room:Grand Ballroom AB- Concourse Level

Professional Development Evening: Landing Your Dream Job

8:15 PM-9:30 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Sven Leyffer, Argonne National Laboratory, USA

Join us for an evening devoted to developing a successful career in the mathematical sciences. Professionals from academia, government, and industry will share their job-search experiences and give advice on how to develop successful application materials tailored to specific job opportunities and how to perform well in job interviews. The target audience for this event includes early career professionals (i.e., less than five years past last degree), postdocs, and students. However, we are also encouraging participation from the senior professional community during the networking session to share their own experience. Part II: The Job Interview

Misha Kilmer
Tufts University, USA

Tamara Kolda
Sandia National Laboratories, USA

John Peach
Massachusetts Institute of Technology, USA

Friday, July 15

Diversity Committee Meeting

7:00 AM-8:30 AM

Room:Faneuil - Mezzanine Level

Compensation Committee Meeting

8:00 AM-11:00 AM

Room:Douglas - Mezzanine Level

Registration

8:00 AM-4:30 PM

Room:Concourse Level

Friday, July 15

IT12

The Life Cycle of An Eigenvalue Problem: From Data to Numerics

8:30 AM-9:15 AM

Room:Grand Ballroom AB - Concourse Level

Chair: Françoise Tisseur, The University of Manchester, UK

Eigenvalue problems lurk everywhere, from our buildings to our vehicles, from our music to our networks, from sociology to biology to material science. Yet the move from application to computed eigenvalue involves numerous nontrivial steps. We shall survey this process, starting from measured data from guitar strings, through the steps of modeling, linearizing, discretizing, projecting, and, finally, numerically computing eigenvalues. Along the route we shall discuss the mathematical design of musical instrument strings that produce a custom sound, and the vibration of spider webs.

Mark Embree
Virginia Tech, USA

Friday, July 15

IT13

On the Mathematical Study of Defects in Liquid Crystals

8:30 AM-9:15 AM

Room:Grand Ballroom CDE - Concourse Level

Chair: Michael Shearer, North Carolina State University, USA

The mathematical analysis of liquid crystal models poses many challenging questions, as can be seen by their close relationship to the study of singularities for harmonic maps. In this talk, I will discuss the structure of defects in the context of different models of nematic liquid crystals, and their connection to classical results on harmonic maps into the sphere. To illustrate, I will present the physically fundamental problem of defects created by a colloid particle immersed in a nematic, and present recent results using the Landau-de Gennes energy. We find that the Landau-de Gennes model allows for a greater variety of types of singularity than the (harmonic map-based) Oseen-Frank energy, including line singularities such as the "Saturn Ring" defect.

Lia Bronsard
McMaster University, Canada

Friday, July 15

IT14

Dynamics, Mixing, and Coherence

9:15 AM-10:00 AM

Room:Grand Ballroom AB - Concourse Level

Chair: Jeff Moehlis, University of California, Santa Barbara, USA

Coherent structures in geophysical flows play fundamental roles by organising fluid flow and obstructing transport. For example, in the ocean, coherence manifests itself at global scales down to scales of at least tens of kilometres, and strongly influences the transportation of heat, salt, nutrients, phytoplankton, pollution, and garbage. I will describe some recent mathematical constructions, ranging across dynamical systems, probability, and geometry, which enable the accurate identification and tracking of such structures, and the quantification of associated mixing and transport properties. I will present case studies from a variety of geophysical settings.

Gary Froyland
University of New South Wales, Australia

Coffee Break

10:00 AM-10:30 AM

Room:Grand Ballroom Prefunction - Concourse Level

Friday, July 15

MS128

Algebraic Approaches for Investigating Biological Systems - Part I of II

10:30 AM-12:30 PM

Room:Lewis - Conference Level

For Part 2 see MS145

The focus of our minisymposium is on algebraic methods in systems biology, with emphasis on the computer algebra and optimization to solve these problems. We are interested in topics ranging from the analysis of single molecules to biochemical reaction networks. In particular, we are interested in the algebraic techniques used to address problems arising in systems biology (e.g. multistability, control, identifiability, etc) and the difficulties that arise when studying these problems.

Organizer: Nicolette Meshkat
North Carolina State University, USA

Organizer: Heather Harrington
University of Oxford, United Kingdom

10:30-10:55 Algebraic Complexity in Gene Regulation
Jeremy Gunawardena, Harvard Medical School, USA

11:00-11:25 Which Biochemical Reaction Networks Are Multistationary?
Anne Shiu, University of Chicago, USA; Badal Joshi, California State University, San Marcos, USA

11:30-11:55 Numerical Methods for Exploring Parameter Spaces
Dan Bates, Colorado State University, USA

12:00-12:25 A Case Study in Algebraic Systems Biology
Elizabeth Gross, University of Ilinois at Chicago, USA

Friday, July 15

MS130

Educating Quantitative Biologists: Modeling, Computing, Data Science and Beyond

10:30 AM-12:30 PM

Room:Harbor Ballroom III - Conference Level

Quantitative approaches in life sciences have expanded rapidly. A variety of approaches are available to enhance biology quantitative education. Learning goals include providing adequate experience with the diversity of quantitative methods so that students are able to: read the life science literature, apply quantitative methods to research problems across biology, and develop collaborations with quantitative specialists including mathematicians, statisticians and computational scientists. This minisymposium brings together leaders in undergraduate and graduate life science quantitative education so that attendees may consider alternative methods to broaden the educational experiences offered at their institutions in this expanding field.

Organizer: Louis J. Gross
University of Tennessee, USA

Organizer: Rachel Levy
Harvey Mudd College, USA

10:30-10:55 Some Lessons from 40 Years of Quantitative Education for Biologists
Louis J. Gross, University of Tennessee, USA

11:00-11:25 Using Case Studies to Integrate Modeling into Biocalculus Classes
Troy Day, Queen's University, Canada

11:30-11:55 Can You Build a Taj Mahal Out of Lego Blocks? Teaching Systems and Simulation Modeling to Graduate Students in Ecology
Wayne M. Getz, University of California, Berkeley, USA

12:00-12:25 Preparing for a Quantitative Job in the BioPharma Industry
Helen Moore, Bristol-Myers Squibb, USA

Friday, July 15

MS131

Effects of Randomness on Extended Physical Systems

10:30 AM-12:30 PM

Room:Grand Ballroom D - Concourse Level

This session addresses how random forcing and initial conditions, frequently together with nonlinearity, affect the behavior of extended systems. In fluids, a description of how diffusion and flow geometry combine to influence tracer transport will be presented. Stochastic switching of noisy initial conditions to a high-dimensional Langevin system will be discussed. Cascading spectra of a dispersionless, driven-damped system, in which nonlinearity and random drive induce effective dispersion, derived analytically and computed numerically, will be shown. A near-universal effective dispersion relation satisfied by sufficiently random solutions of the Nonlinear Schrodinger Equation will be presented.

Organizer: Katherine Newhall

University of North Carolina at Chapel Hill, USA

10:30-10:55 Causes of Metastability and Their Effects on Transition Times

Katherine Newhall, University of North Carolina at Chapel Hill, USA

11:00-11:25 Waveaction Spectra and Effective Dispersion of Fully Nonlinear Mmt Model

Michael Schwarz, Gregor Kovacic, and Peter R. Kramer, Rensselaer Polytechnic Institute, USA; David Cai, Courant Institute of Mathematical Sciences, New York University, USA

11:30-11:55 The Effective Dispersion Relation for the Nonlinear Schrodinger Equation

Katelyn J. Leisman, Rensselaer Polytechnic Institute, USA

12:00-12:25 The Role of Geometry in Controlling Asymmetries in Passive Scalar Transport

Manuchehr Aminian, Francesca Bernardi, Roberto Camassa, and *Richard McLaughlin*, University of North Carolina, USA

Friday, July 15

MS132

Electrohydrodynamics and Electrodiffusion in Material Sciences and Biology - Part I of II

10:30 AM-12:30 PM

Room:Commonwealth A - Concourse Level

For Part 2 see MS148

Electrohydrodynamics and electrodiffusion, in particular the study of droplets and deformable membranes in fluid under the effect of electric field or the flow of ions in salt exchange membranes and fuel cells, are classical fields in the material sciences. On the other hand, description and modeling of corresponding phenomena in biology is relatively sparse, but its presence and significance is starting to be recognized. In this minisymposium, we aim to bring experts of electrohydrodynamics and electrodiffusion in both the material sciences and biology to foster discussion. The talks will address various aspects of electrohydrodynamics/diffusion including phenomenology, modeling and computation.

Organizer: Yoichiro Mori

University of Minnesota, USA

Organizer: Yuan-Nan Young

New Jersey Institute of Technology, USA

10:30-10:55 Electrohydrodynamics of a Planar Lipid Bilayer Membrane

Yuan-Nan Young, New Jersey Institute of Technology, USA; Michael Miksis, Northwestern University, USA; Shravan Veerapaneni, University of Michigan, USA; Yuan-Nan Young and *Szu-Pei Fu*, New Jersey Institute of Technology, USA

11:00-11:25 Vesicles in Electric and Magnetic Fields

David Salac, State University of New York at Buffalo, USA

11:30-11:55 Numerical Modeling of the Electrohydrodynamic of a Viscous Droplet

Maxime Theillard and David Saintillan, University of California, San Diego, USA

12:00-12:25 Computational Modeling of Osmotic Water Flow with Moving Interfaces

Lingxing Yao, Case Western Reserve University, USA; Yoichiro Mori, University of Minnesota, USA

Friday, July 15

MS133

Fractional Partial Differential Equations: Modeling, Simulation, Application, and Analysis - Part I of II

10:30 AM-12:30 PM

Room:Commonwealth C - Concourse Level

For Part 2 see MS149

FPDEs are emerging as a powerful tool for modeling challenging multiscale phenomena including overlapping microscopic and macroscopic scales, anomalous transport, and long range time memory or spatial interactions, which cannot be modeled accurately by integer-order differential equations. However, these problems raise new modeling, computational, mathematical, and numerical difficulties that have not been encountered in the context of integer-order differential equations. The aim of this minisymposium is to cover the recent development in modeling, simulation, application, and analysis in this field.

Organizer: Hong Wang

University of South Carolina, USA

Organizer: George E. Karniadakis

Brown University, USA

10:30-10:55 Backward Fractional Diffusion Equation

Mark Meerschaert, Michigan State University, USA; Roseanna Neupauer, University of Colorado Boulder, USA; Yong Zhang, University of Alabama, USA

11:00-11:25 Fast Numerical Methods for Space-Time Fractional Pdes

Hong Wang, University of South Carolina, USA

11:30-11:55 Petrov-Galerkin Spectral Methods for Distributed-Order Fractional PDEs

Mohsen Zayernouri, Michigan State University, USA

12:00-12:25 High-Order Algorithms for Caputo Derivatives and Caputo-Type Partial Differential Equations

Changpin Li, Shanghai University, China

Friday, July 15

MS135

Highlights of NSF's Enriched Doctoral Training Program in Mathematical Sciences

10:30 AM-12:30 PM

Room:Harbor Ballroom II - Conference Level

Today fewer than 50% of Mathematical Sciences PhD students in the US land jobs in academia. The US National Science Foundation recently launched a new program entitled "Enriched Doctoral Training in the Mathematical Sciences" (EDT). The first two EDT projects were awarded in 2015 to the University of Texas at Dallas for their project "Team Training Mathematical Scientists Through Industrial Collaborations" and to Princeton University for the project "Mathematical Methods for Water Problems". We highlight two subprojects at each institution which illustrate how PhD students are being trained to tackle open-ended, real-world problems in collaboration with external partners.

Organizer: Susan Minkoff

University of Texas, Dallas, USA

10:30-10:55 Velocity Estimation Using Multi-Level Monte Carlo Bayesian Inversion

Georgia Stuart, Weihua Yang, Susan Minkoff, and Felipe Pereira, University of Texas, Dallas, USA

11:00-11:25 Dynamics of Water Use

Sarah E. Drohan, Princeton University, USA

11:30-11:55 Inferring Offline Social Networks from Online Data

Jonathan Popa, John Zweck, Yulia Gel and Kusha Nezafati, University of Texas, Dallas, USA

12:00-12:25 Stochastically Driven Plant Biomass and Soil Moisture Dynamics in Water-Limited Ecosystems: Analytical Results

Benjamin Schaffer and Ignacio Rodriguez-Iturbe, Princeton University, USA; Jan M. Nordbotten, University of Bergen, Norway

Friday, July 15

MS136

Innovative Methods for Large Scale Eigenvalue Solutions

10:30 AM-12:30 PM

Room:Adams - Mezzanine Level

Organized by SIAG/LA

This minisymposium is concerned with innovative methods for large scale eigenvalue solutions. The increasing complexity of modern scientific computing and engineering simulations introduces significant challenges for the existing eigensolvers. In recent years, quite some exciting developments have been proposed, such as those based on rational approximations, polynomial filtering, structured matrices, etc. This minisymposium intends to discuss recent algorithm designs, their analysis, parallel implementation and the related practical applications.

Organizer: Yuanzhe Xi

University of Minnesota, USA

Organizer: Yousef Saad

University of Minnesota, USA

10:30-10:55 Spectrum Slicing by Polynomial and Rational Function Filtering

Yuanzhe Xi and Yousef Saad, University of Minnesota, USA

11:00-11:25 Block Preconditioned Thick-Restart Lanczos Method with Subspace Optimization for Symmetric Eigenvalue Problems

Lingfei Wu, College of William & Mary, USA; Fei Xue, University of Louisiana, Lafayette, USA; Andreas Stathopoulos, College of William & Mary, USA

11:30-11:55 Parallelization of the Rational Arnoldi Method

Mario Berljafa and Stefan Guettel, University of Manchester, United Kingdom

12:00-12:25 A Contour-Integral Based Structured Eigensolver for Non-Hermitian Matrices

Xin Ye and Jianlin Xia, Purdue University, USA; Raymond H. Chan, Chinese University of Hong Kong, Hong Kong

Friday, July 15

MS137

Model Reduction of Parametrized PDEs: Application to Optimization and Uncertainty Quantification

10:30 AM-12:30 PM

Room:Harbor Ballroom I - Conference Level

This minisymposium explores recent developments in model reduction methods that provide rapid and reliable solution of parametrized PDEs in the many-query scenarios in optimization and uncertainty quantification (UQ). The minisymposium considers both model reduction formulations that incorporates specific structures of optimization problems, and optimization strategies that leverage rapid solutions provided by the reduced, surrogate models. Topics include the variational inequality, stochastic optimization, solution error certification, and their application to design and control problems in engineering.

Organizer: Karen Veroy

RWTH Aachen University, Germany

Organizer: Martin Grepl

RWTH Aachen University, Germany

10:30-10:55 A Certified Reduced Basis Method for Variational Inequalities and Optimal Control Problems

Karen Veroy-Grepl, Eduard Bader, Martin Grepl, Mark Kaercher, and Zhenying Zhang, RWTH Aachen University, Germany

11:00-11:25 A Globally Convergent, Inexact Trust-Region Method for Optimization Under Uncertainty using Sparse Grids and Model Reduction

Matthew J. Zahr, Stanford University, USA; Kevin T. Carlberg and Drew P. Kouri, Sandia National Laboratories, USA

11:30-11:55 A Certified Reduced Basis Approach to PDE-constrained Parameter Optimization

Elizabeth Qian, Massachusetts Institute of Technology, USA; Martin Grepl and Karen Veroy-Grepl, RWTH Aachen University, Germany; Karen E. Willcox, Massachusetts Institute of Technology, USA

12:00-12:25 Control for Systems With Uncertain Parameters through Reduced Order Models

Boris Kramer, Karen E. Willcox, and Benjamin Peherstorfer, Massachusetts Institute of Technology, USA

Friday, July 15

MS138

Multiscale Epidemics: Integrating Data from Multiple Processes - Part I of II

10:30 AM-12:30 PM

Room:Burroughs - Conference Level

For Part 2 see MS152

Biological processes such as epidemics often have sub-processes operating on multiple scales. Even with data obtained separately at different scales, it can be difficult to make inferences about system parameters or the role of each sub-process on the system dynamics. Some modelling approaches allow for direct quantification of the importance of sub-processes, but are often unable to account for complex behaviors without significant computation. This minisymposium will examine cases where flexible statistical and mathematical modelling can combine the strengths of both experiments and methodology to infer the extent to which small-scale processes affect large-scale dynamics.

Organizer: Peter Shaffery

University of Colorado Boulder, USA

Organizer: Vanja Dukic

University of Colorado Boulder, USA

10:30-10:55 Effects of Biodiversity on Disease Outbreaks: The Importance of Decreasing Variability in Transmission

Peter Shaffery, University of Colorado Boulder, USA; Bret Elderd, Louisiana State University, USA; Vanja Dukic, University of Colorado Boulder, USA

11:00-11:25 Cannibalism and Disease Transmission: How Risky is it to Eat your Own?

Bret Elderd and Benjamin Van Allen, Louisiana State University, USA

continued in next column

11:30-11:55 A Bayesian Approach to Understanding the Effects of a Fatal Virus Disease on Gypsy Moth Populations

Gregory Dwyer, University of Chicago, USA; Vanja Dukic, University of Colorado Boulder, USA; Bret Elderd, Louisiana State University, USA

12:00-12:25 Managing Multiple Sources of Uncertainty: Optimal Outbreak Response for Foot-and-Mouth Disease

Matthew Ferrari, Pennsylvania State University, USA; William Probert and Michael Tildesley, Nottingham University, United Kingdom; Christopher Fonnesbeck, Vanderbilt University, USA; Katriona Shea, Pennsylvania State University, USA; Michael Runge, United States Geological Survey, USA; Christoper Jewell, Lancaster University, United Kingdom

Friday, July 15

MS139

Particle Methods for Multiphysics Simulations

10:30 AM-12:30 PM

Room:Grand Ballroom E - Councourse Level

Particle methods have wide applicability in simulations across the sciences. This symposium is aimed at bringing together practitioners to highlight and discuss current work on the development of particle methods for applications in biophysics, computational chemistry and geophysics.

Organizer: Henry A. Boateng

Bates College, USA

10:30-10:55 Developing a Lagrangian Particle Method for Geophysical Applications

Peter A. Bosler, Sandia National Laboratories, USA

11:00-11:25 Pros and Cons of Cartesian Treecode and Fast Multipole Method

Weihua Geng, Southern Methodist University, USA

11:30-11:55 A Particle-Cluster Cartesian Treecode for Multipolar Electrostatic Interactions in Molecular Simulations

Henry A. Boateng, Bates College, USA

12:00-12:25 Computational Methods for Local and Non-Local Hydrodynamic Models for Phase Transitions

Arvind Baskaran, National Institute of Standards and Technology, USA; Zhen Guan and John Lowengrub, University of California, Irvine, USA

Friday, July 15

MS140

Pattern Formation in Singularly Perturbed Variational Problems

10:30 AM-12:30 PM

Room:Grand Ballroom B - Concourse Level

Organized by SIAG/APDE

Diverse patterns arise from singular limits of partial differential equations and their associated variational problems, including transition layers in materials such as co-polymers, defects in liquid crystals, or vortices in superconductors. This minisymposium will represent singular variational problems arising from different physical contexts, unified by the use of analytical methods such as Gamma convergence, geometric measure theory, nonlinear functional analysis, and regularity theory.

Organizer: Stan Alama
McMaster University, Canada

Organizer: Lia Bronsard
McMaster University, Canada

10:30-10:55 Vortices in P-Wave Superconductivity
Stan Alama and Lia Bronsard, McMaster University, Canada; Xavier Lamy, Max Planck Institute for Mathematics in the Sciences, Germany

11:00-11:25 Periodic Orbits to Gross Pitaevskii in the Disc with vortices following Point Vortex Flow
Raghav Venkatraman, Indiana University, USA

11:30-11:55 To Be Announced

12:00-12:25 Approximate Global Minimizers for Pairwise Interaction Problems
David Shirokoff, New Jersey Institute of Technology, USA

Friday, July 15

MS141

Recent Advances in Finite Element Methods for Nonlinear PDEs

10:30 AM-12:30 PM

Room:Grand Ballroom A - Councourse Level

This session will focus on recent advances in finite element methods for nonlinear PDEs. Nonlinear PDEs arise in a wide range of applications. As such, it is important to build stable, efficient, and accurate numerical methods for solving these equations. Finite element methods have become a popular tool for modeling nonlinear PDEs due to the relatively simple representation of the problems to be solved. Among the topics of discussion are optimizing the Kelvin force in a moving target subdomain, adaptivity for nonlinear PDEs, and finite element methods for elliptic PDEs in non-divergence form and for fully nonlinear second order PDEs.

Organizer: Amanda E. Diegel
Louisiana State University, USA

Organizer: Susanne Brenner
Louisiana State University, USA

10:30-10:55 Primal and Mixed Finite Element Methods for Elliptic PDEs in Non-Divergence Form
Michael J. Neilan, University of Pittsburgh, USA

11:00-11:25 A Regularized Approach to Adaptivity for Nonlinear PDE in the Coarse Mesh Domain
Sara Pollock, Texas A&M University, USA

11:30-11:55 Numerical Moments and the Approximation of Fully Nonlinear Second Order Partial Differential Equations
Tom Lewis, University of North Carolina at Greensboro, USA

12:00-12:25 Optimizing the Kelvin Force in a Moving Target Subdomain
Harbir Antil, George Mason University, USA

Friday, July 15

MS142

Sentiment Analysis in Big Data: Recent Results and Mathematical Challenges

10:30 AM-12:30 PM

Room:Grand Ballroom C - Concourse Level

Understanding the sentiment of large, varied corpora poses exciting mathematical and computational challenges. From the sentiment of tweets to the analysis of click stream data from web browsing, surfacing sentiment in large and heterogeneous data sets has become an essential activity in modern industrial and government research. This workshop brings together researchers from academia and industry whose work is aimed at revealing the sentiment found in a variety of sources. The mini symposium focuses on contributions to the field from both mathematical and computational angles.

Organizer: Jesse Berwald
Target Corporation, USA

Organizer: Zachary Voller
Target Corporation, USA

10:30-10:55 Public Opinion Polling with Twitter
Emily Cody, Andrew Reagan, Peter Dodds, and *Chris Danforth*, University of Vermont, USA

11:00-11:25 Mining Large Scale Reviews for Consumer Sentiment
Kasturi Bhattacharjee, University of California, Santa Barbara, USA

11:30-11:55 Reimagining Recommendations: Contextual Embeddings from Online Browsing Data
Jesse Berwald, Target Corporation, USA

12:00-12:25 Leveraging Big Data for Societal Well-Being on a Range of Scales
Morgan R. Frank, University of Vermont, USA

Friday, July 15

MS143

Time Stepping Methods for the Evolution of PDEs - Part I of II

10:30 AM-12:30 PM

Room:Commonwealth B - Concourse Level

For Part 2 see MS153

Many complex physical phenomena are modeled by time-dependent partial differential equations. Numerical simulations of time-dependent PDEs require both spatial and temporal discretization. As spatial discretization methods have become more sophisticated, accurate, and efficient, computational scientists are finding that temporal integration forms a bottleneck in many application areas. Some of these challenges have been troubling practitioners for many years, and have been addressed by the creation of different types of time integrators. Recently there has been rapid development in the field of time-integration of PDEs. This minisymposium aims to present the recent progress in the time evolution of numerical PDEs.

Organizer: Sigal Gottlieb

University of Massachusetts, Dartmouth, USA

Organizer: David I. Ketcheson

King Abdullah University of Science & Technology (KAUST), Saudi Arabia

10:30-10:55 Explicit Strong Stability Preserving Multistage Two-Derivative Time-Stepping Schemes

Zachary J. Grant and Sigal Gottlieb, University of Massachusetts, Dartmouth, USA; Andrew J. Christlieb, Michigan State University, USA; David C. Seal, United States Naval Academy, USA

11:00-11:25 Efficient Computation of High Derivatives for Multiderivative Methods

David C. Seal, United States Naval Academy, USA

11:30-11:55 Implicit Strong Stability Preserving Runge--Kutta Methods

Sidafa Conde and *Sigal Gottlieb*, University of Massachusetts, Dartmouth, USA; John Shadid, Sandia National Laboratories, USA

12:00-12:25 Making SSP Integrators More Practical

David I. Ketcheson, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

Friday, July 15

MS144

Visual Analytics - Part I of II

10:30 AM-12:30 PM

Room:Carlton - Conference Level

For Part 2 see MS154

Organized by SIAG/DMA

Visual analytics is the science of combining interactive visual interfaces and information visualization techniques with automatic algorithms to support analytical reasoning through human-computer interaction. People use visual analytics tools and techniques to synthesize information and derive insight from massive, dynamic, ambiguous, and often conflicting data, and to communicate their findings effectively for decision-making. This minisymposium will serve as an introduction to the science and technology of visual analytics and will include both lectures on foundational topics as well as the presentation of novel results in various application areas.

Organizer: R. Jordan Crouser

Smith College, USA

10:30-10:55 An Overview of Visual Analytics

R. Jordan Crouser, Smith College, USA

11:00-11:25 Re-Centering Human Centered Visualization

Lane Harrison, Worcester Polytechnic Institute, USA

11:30-11:55 Parameter Manipulation for Visualization

Amelia McNamara, Smith College, USA

12:00-12:25 Do You See What I See?: An HCI Perspective on Evaluation in Vis

Evan M. Peck, Bucknell University, USA

Friday, July 15

MS150

Generalized Meshless Multiscale Modeling of Complex Media - Part II of II

10:30 AM-12:30 PM

Room:Otis - Lobby Level

For Part 1 see MS134

The goal of the symposium is to bring together active researchers working in various aspects of meshless methods and, particularly, focusing on meshless modeling of complex media including multi-phase / multi-components fluid flow, wave propagation in elastoplastic media, hydraulic fracturing, and smart materials. The objectives of this symposium are to establish fundamental aspects common to different meshless approaches, identify the areas for improvements, and formulate key challenging topics. A list of key topics is 1. Mathematical theory of meshless methods, generalized finite element, and particle methods; 2. Identification of problems where meshless methods have clear advantage over classical approaches;

Organizer: Alexander Lukyanov

Schlumberger-Doll Research, USA

Organizer: Marc Alexander Schweitzer

Universität Bonn, Germany

Organizer: Kees Vuik

Delft University of Technology, Netherlands

10:30-10:55 An XFEM Model for Propagation and Reorientation of Hydraulic Fractures

Elizaveta Gordeliy, Schlumberger-Doll Research, USA; Safdar Abbas, Schlumberger, USA; Anthony Peirce, University of British Columbia, Canada; Romain Prioul, Schlumberger-Doll Research, USA

11:00-11:25 The XFEM in a Simplified Model for Hydraulic Fracturing in Three Dimensions

Thomas-Peter Fries, Graz University of Technology, Austria; Markus Schaetzer, Technische Universität, Graz, Austria

11:30-11:55 Meshfree Direct Simulation "Monte Carlo"

Benjamin Seibold, Temple University, USA

12:00-12:25 Modeling of Liquefaction with MPM

Lisa Wobbes, Technische Universiteit Delft, Netherlands; Lars Beuth, Deltares, Netherlands

Friday, July 15

CP23

Life Sciences

10:30 AM-12:10 PM

Room:Griffin - Conference Level

Chair: Patrick T. Davis, Central Michigan University, USA

10:30-10:45 Modelling of the Ebola Disease: The Most Deadly Disease of Our Time?
Jude N. Onicha, James Obeahon, and Benjamin Oboh, University of Benin, Nigeria

10:50-11:05 A General Framework for the Analysis of Infectious Disease Models with Delayed Differential Equations
Patrick T. Davis and Leela Rakesh, Central Michigan University, USA

11:10-11:25 Minimal Sensor Networks for Detecting Non-Diffusive Disease Spreading
Kyle B. Gustafson and Josh Proctor, Institute for Disease Modeling, USA

11:30-11:45 Mathematical Model of Ischemia-Reperfusion Injury and Postconditioning in a Two-Dimensional Channel
Daniel Fong, United States Merchant Marine Academy, USA; Linda Cummings, New Jersey Institute of Technology, USA

11:50-12:05 A Multigene Genetic Programming for Thyroid Disorder
Joseph Ackora-Prah, Kwame Nkrumah University of Science and Technology, Ghana

Friday, July 15

CP24

Ordinary Differential Equations

10:30 AM-11:50 AM

Room:Paine - Lobby Level

Chair: Charles T. Fulton, Florida Institute of Technology, USA

10:30-10:45 Improving the Efficiency of Stiffly Accurate Exponential Propagation Iterative Methods of Runge-Kutta Type (epirk)
Greg Rainwater and Mayya Tokman, University of California, Merced, USA

10:50-11:05 New Preconditioned Exponential Time Integrators for Stiff Differential Equations
Vu Thai Luan, Mayya Tokman, and Greg Rainwater, University of California, Merced, USA

11:10-11:25 Eigenfunction Expansions for Legendre's Equation
Charles T. Fulton, Florida Institute of Technology, USA; Heinz Langer, Vienna University of Technology, Austria

11:30-11:45 Mathematical Model and Numerical Simulations of the Transmission Dynamics of Ebola Virus
Blessing Uzor, University of Guelph, Canada; Simeon Inyama, Federal University of Technology Owerri, Nigeria

Friday, July 15

CP25

Numerical PDEs III

10:30 AM-12:10 PM

Room:Revere - Lobby Level

Chair: Michaela J. Kubacki, Middlebury College, USA

10:30-10:45 High-Order Absorbing Boundary Conditions for Discontinuous Galerkin Time-Domain Schemes
Axel Modave, Rice University, USA; Jesse Chan, Virginia Tech, USA; Andreas Alte, Total, France; Russell Hewett, Total E&P, USA; Tim Warburton, Virginia Tech, USA

10:50-11:05 High Efficiency Sixth Order Computation with Richardson Extrapolation for Elliptic PDEs
Ruxin Dai, University of Wisconsin-River Falls, USA

11:10-11:25 A High-Order Scheme for the Biharmonic and the Navier-Stokes Equations in Irregular Domains
Dalia Fishelov, Afeka-Tel-Aviv Academic College of Engineering, Israel; Matania Ben-Artzi, The Hebrew University, Israel; Jean-Pierre Croisille, CNRS and University of Lorraine, France

11:30-11:45 Partitioned Methods for Contaminant Transport Models in Coupled Groundwater-Surface Water Flows
Michaela J. Kubacki, Middlebury College, USA

11:50-12:05 Numerical Study of a Dielectric Barrier Discharge Phenomena and Its Effect on the Air Flow
Ivan Soukup, Charles University in Prague and Czech Technical University in Prague, Czech Republic; Jan Mikeš, Czech Technical University, Prague, Czech Republic

Friday, July 15

CP26

Computational Fluid Dynamics

10:30 AM-12:50 PM

Room:Hancock - Lobby Level

Chair: Lindsay C. Erickson, Sandia National Laboratories, USA

10:30-10:45 Simulating Surfactant Spreading: Impact of a Physically Motivated Equation of State
Dina Sinclair, Harvey Mudd College, USA; Karen Daniels, North Carolina State University, USA; Rachel Levy, Harvey Mudd College, USA

10:50-11:05 Optimum Permeability Profile and Fouling in Membrane Filters
Pejman Sanaei and Linda Cummings, New Jersey Institute of Technology, USA

11:10-11:25 A VMS-FEM for Monolithic ALE Computations of Shock Hydrodynamics
Xianyi Zeng and Guglielmo Scovazzi, Duke University, USA

11:30-11:45 An Interpolative Particle Level Set Method
Lindsay C. Erickson, Jeremy Templeton, and Karla Morris, Sandia National Laboratories, USA

11:50-12:05 Wetting and Dewetting of Thin Viscoelastic Drops
Valeria Barra, Shahriar Afkhami, and Lou Kondic, New Jersey Institute of Technology, USA

12:10-12:25 An Efficient Particle Vortex Method for Vorticity Dynamics in Free Space
Ling Xu and Robert Krasny, University of Michigan, USA

12:30-12:45 Multi-Scale Modeling of Compaction-Initiated Detonation in Heterogeneous Explosives
James R. Gambino, Ashwani K. Kapila, and Donald W. Schwendeman, Rensselaer Polytechnic Institute, USA

Friday, July 15

Systems Oversight Committee (SOC) Meeting

11:00 AM-12:00 PM

Room:Executive Board Room - Mezzanine Level

SOC/FMC Lunch Meeting

12:00 PM-1:00 PM

Room:Faneuil - Mezzanine Level

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Financial Management Committee (FMC) Meeting

1:00 PM-4:00 PM

Room:Executive Board Room - Mezzanine Level

Friday, July 15

IT15

Social Science in the Age of Big Data

2:00 PM-2:45 PM

Room:Grand Ballroom - Concourse Level

Chair: David F. Gleich, Purdue University, USA

The digital age has created exciting new opportunities to study social behavior. Yet, many of these opportunities have not been fully realized, in part because researchers have focused their attention on inappropriate sources of data. In this talk, I'll present a framework for differentiating social data. Then, I'll describe a new form of survey we have developed called a wiki survey, which combines the quantifiability of a survey with the openness of an interview. The talk will conclude with a discussion of research areas that are ripe for collaboration between computational scientists and social scientists.

Matthew Salganik
Princeton University, USA

Friday, July 15

IT16

Anatomy of MERS Epidemic

2:45 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Ira B. Schwartz, Naval Research Laboratory, USA

The Middle East respiratory syndrome coronavirus (MERS) that causes a severe lower respiratory tract infection in humans continues raising public health concern due to the failure to stop the spread since its first description (June 2012). MERS has reached 26 countries infecting a total of 1,638 confirmed cases (WHO, March 2016). The majority of cases has occurred in the Middle East, where the disease is endemic, with cases being reported worldwide in travelers from the Middle East or their contacts. In this talk I will present the work we conducted during successive phases of the epidemic to characterize its features, in terms of transmissibility, relative role of zoonotic vs. human transmission route, geographical heterogeneity and seasonal variations, and risk following MERS importation.

Vittoria Colizza
Inserm, France

Coffee Break

3:30 PM-4:00 PM

Room:Grand Ballroom Prefunction - Concourse Level

Friday, July 15

MS145

Algebraic Approaches for Investigating Biological Systems - Part II of II

4:00 PM-6:00 PM

Room:Lewis - Conference Level

For Part 1 see MS128

The focus of our minisymposium is on algebraic methods in systems biology, with emphasis on the computer algebra and optimization to solve these problems. We are interested in topics ranging from the analysis of single molecules to biochemical reaction networks. In particular, we are interested in the algebraic techniques used to address problems arising in systems biology (e.g. multistability, control, identifiability, etc) and the difficulties that arise when studying these problems.

Organizer: Nicolette Meshkat
North Carolina State University, USA

Organizer: Heather Harrington
University of Oxford, United Kingdom

4:00-4:25 Linear Compartment Models and the Existence of Identifiable Reparametrizations
Jasmijn Baaijens, CWI, Amsterdam, Netherlands

4:30-4:55 Combinatorial Interventions for Control Tasks in Large-Scale Signaling Networks
Paola Vera-Licona, University of Connecticut Health Center, USA

5:00-5:25 What Makes a Neural Code Convex?
Nora Youngs, Harvey Mudd College, USA

5:30-5:55 Studying Continuous Conformational Changes of Proteins Using Cryo-EM
David M. Dynerman, University of Wisconsin, USA

Friday, July 15

MS146

Data-Based Methods Towards Optimal Control of Complex Systems

4:00 PM-6:00 PM

Room:Adams - Mezzanine Level

Organized by SIAG/LA

Recent advances in data-driven, equation-free models have made significant progress in the analysis of complex systems. The goal, though, of understanding these complex systems such as neural networks, infectious disease systems, and fluid flow applications is more than analysis and characterization: it is prediction and optimal control. This minisymposium brings together leading experts who are integrating ideas from model-based optimal control with data-driven, equation-free methods. Further, this session seeks to illustrate how these methodological developments can impact a wide array of engineering, physical, and biological sciences where describing the governing equations is a significant challenge.

Organizer: Boris Kramer
Massachusetts Institute of Technology, USA

Organizer: Joshua L. Proctor
Institute for Disease Modeling, USA

4:00-4:25 On Nonlinear System Identification for Complex Systems Including Infectious Diseases
Joshua L. Proctor, Institute for Disease Modeling, USA

4:30-4:55 Operator Theoretic Framework for Estimation and Control
Amit Surana, United Technologies Research Center, USA

5:00-5:25 Cluster-based Reduced-order Modeling and Control of Nonlinear Dynamics
Eurika Kaiser, University of Washington, USA

5:30-5:55 Inferring Nonlinear Dynamics on Networks from Data
Niall M. Mangan, University of Washington, Seattle, USA

Friday, July 15

MS148

Electrohydrodynamics and Electrodiffusion in Material Sciences and Biology - Part II of II

4:00 PM-6:00 PM

Room:Commonwealth A - Concourse Level

For Part 1 see MS132

Electrohydrodynamics and electrodiffusion, in particular the study of droplets and deformable membranes in fluid under the effect of electric field or the flow of ions in salt exchange membranes and fuel cells, are classical fields in the material sciences. On the other hand, description and modeling of corresponding phenomena in biology is relatively sparse, but its presence and significance is starting to be recognized. In this minisymposium, we aim to bring experts of electrohydrodynamics and electrodiffusion in both the material sciences and biology to foster discussion. The talks will address various aspects of electrohydrodynamics/diffusion including phenomenology, modeling and computation.

Organizer: Yoichiro Mori
University of Minnesota, USA

Organizer: Yuan-Nan Young
New Jersey Institute of Technology, USA

4:00-4:25 Modeling Neuronal Electromechanics Using Fractional Operators of Variable Order
Corina Drapaca, Pennsylvania State University, USA

4:30-4:55 A Multidomain Electrodiffusion Model of Cortical Spreading Depression
Yoichiro Mori and Rosemary O'Connell, University of Minnesota, USA

5:00-5:25 Models for Tear Film and Ocular Epithelium Interaction
Spencer R. Walker and Richard Braun, University of Delaware, USA

5:30-5:55 Drift-Diffusion Simulation of Channels and Synapses
Carl L. Gardner, Arizona State University, USA

Friday, July 15

MS149

Fractional Partial Differential Equations: Modeling, Simulation, Application, and Analysis - Part II of II

4:00 PM-6:00 PM

Room:Commonwealth C - Concourse Level

For Part 1 see MS133

FPDEs are emerging as a powerful tool for modeling challenging multiscale phenomena including overlapping microscopic and macroscopic scales, anomalous transport, and long range time memory or spatial interactions, which cannot be modeled accurately by integer-order differential equations. However, these problems raise new modeling, computational, mathematical, and numerical difficulties that have not been encountered in the context of integer-order differential equations. The aim of this minisymposium is to cover the recent development in modeling, simulation, application, and analysis in this field.

Organizer: Hong Wang
University of South Carolina, USA

Organizer: George E. Karniadakis
Brown University, USA

4:00-4:25 Numerical Solutions for Fractional Convection Equations
Kassem Mustapha, King Fahd University of Petroleum and Minerals, Saudia Arabia

4:30-4:55 Fractional Boundary Conditions
Harish Sankaranarayanan, Michigan State University, USA

5:00-5:25 Fractional Laplacian and Applications
Fangying Song, Brown University, USA

5:30-5:55 Second-Order Convergence of Non-Smooth Solutions to Multi-Term Fractional Differential Equations
Fanhai Zeng, Brown University, USA

Friday, July 15

MS151

Implementing Transformational Undergraduate Modeling Experiences

4:00 PM-6:00 PM

Room:Hancock - Lobby Level

Modeling creates opportunities to engage application motivated students in mathematics. As a natural point of connection with other disciplines, mathematical modeling has been promoted through initiatives such as SIAM's Modeling Across the Curriculum and highlighted in the Mathematics 2025 and Common Vision reports. A well implemented modeling experience can transform an undergraduate's relationship to their mathematical knowledge, changing their perceptions of mathematics. This minisymposium brings together speakers from universities and liberal arts colleges, who have created diverse modeling experiences for students. By focusing on implementation, this session aims to promote the spread of these kinds of learning opportunities.

Organizer: Sarah Iams
Harvard University, USA

Organizer: Chad M. Topaz
Macalester College, USA

4:00-4:25 How I Abandoned the Textbook: A Primary Source Driven Modeling Course
Chad M. Topaz, Macalester College, USA

4:30-4:55 A Zero-Prerequisite Sustainability-Focused Computational Modeling Course for Senior Non-Majors
Gwen Spencer, Smith College, USA

5:00-5:25 Modeling Initiatives for Upper-Level Math Majors: Looking Back, Forward and Across Time Scales
Maria Emelianenko, George Mason University, USA

5:30-5:55 Adding Modeling to the Early Undergraduate Engineering Program
Matthew Ando, University of Illinois, USA

Friday, July 15

MS152

Multiscale Epidemics: Integrating Data from Multiple Processes - Part II of II

4:00 PM-6:00 PM

Room:Burroughs - Conference Level

For Part 1 see MS138

Biological processes such as epidemics often have sub-processes operating on multiple scales. Even with data obtained separately at different scales, it can be difficult to make inferences about system parameters or the role of each sub-process on the system dynamics. Some modelling approaches allow for direct quantification of the importance of sub-processes, but are often unable to account for complex behaviors without significant computation. This minisymposium will examine cases where flexible statistical and mathematical modelling can combine the strengths of both experiments and methodology to infer the extent to which small-scale processes affect large-scale dynamics.

Organizer: Peter Shaffery
University of Colorado Boulder, USA

Organizer: Sama Shrestha
University of Colorado Boulder, USA

Organizer: Vanja Dukic
University of Colorado Boulder, USA

4:00-4:25 Modeling the Dynamics of Human Papillomavirus: Mechanistic Inference from Longitudinal Data
Sylvia Ranjeva and Edward Baskerville, University of Chicago, USA; Anna Giuliano, H. Lee Moffitt Cancer Center & Research Institute, USA; Vanja Dukic, University of Colorado Boulder, USA; Sarah Cobey and Gregory Dwyer, University of Chicago, USA

4:30-4:55 Survival Analysis of Fall Armyworm in a Tritrophic System through Model Comparison
Sama Shrestha and Vanja Dukic, University of Colorado Boulder, USA; Bret Elderd, Louisiana State University, USA

5:00-5:25 Bayesian Multiresolution Modeling of Time to Event Data
Vanja Dukic and Yolanda Hagar, University of Colorado Boulder, USA

5:30-5:55 A Mathematical Framework for Understanding the Effects of Ecological Interactions on Disease Transmission in Multi-Host Communities
John Vinson and Andrew Park, University of Georgia, USA; *Suzanne O'Regan*, National Institute for Mathematical and Biological Synthesis, USA

Friday, July 15

MS153

Time Stepping Methods for the Evolution of PDEs - Part II of II

4:00 PM-6:00 PM

Room:Commonwealth B - Concourse Level

For Part 1 see MS143

Many complex physical phenomena are modeled by time-dependent partial differential equations. Numerical simulations of time-dependent PDEs require both spatial and temporal discretization. As spatial discretization methods have become more sophisticated, accurate, and efficient, computational scientists are finding that temporal integration forms a bottleneck in many application areas. Some of these challenges have been troubling practitioners for many years, and have been addressed by the creation of different types of time integrators. Recently there has been rapid development in the field of time-integration of PDEs. This minisymposium aims to present the recent progress in the time evolution of numerical PDEs.

Organizer: Sigal Gottlieb
University of Massachusetts, Dartmouth, USA

Organizer: David I. Ketcheson
King Abdullah University of Science & Technology (KAUST), Saudi Arabia

4:00-4:25 Building an Efficient Exponential Time Integrator
Mayya Tokman, University of California, Merced, USA

4:30-4:55 Multilevel Spectral Deferred Correction Methods
Michael Minion, Lawrence Berkeley National Laboratory, USA

5:00-5:25 Higher-Order Time-Adaptive Splitting Schemes for Evolution Equations
Winfried Auzinger, Vienna University of Technology, Austria

5:30-5:55 New Positivity and SSP Analysis of Diagonally Implicit Time-Stepping Methods for PDEs
Zoltan Horvath, Széchenyi István University, Györ, Hungary

Friday, July 15

MS154

Visual Analytics - Part II of II

4:00 PM-6:00 PM

Room:Carlton - Conference Level

For Part 1 see MS144

Organized by SIAG/DMA

Visual analytics is the science of combining interactive visual interfaces and information visualization techniques with automatic algorithms to support analytical reasoning through human-computer interaction. People use visual analytics tools and techniques to synthesize information and derive insight from massive, dynamic, ambiguous, and often conflicting data, and to communicate their findings effectively for decision-making. This minisymposium will serve as an introduction to the science and technology of visual analytics and will include both lectures on foundational topics as well as the presentation of novel results in various application areas.

Organizer: R. Jordan Crouser
Smith College, USA

4:00-4:25 Storytelling with Visual Analytics
Megan Monroe, IBM Research, USA

4:30-4:55 Measuring the Effectiveness of Visual Analytics Systems
Steven R. Gomez, Massachusetts Institute of Technology, USA

5:00-5:25 Supporting Bayesian Reasoning in Non-Experts
Alvitta Ottley, Tufts University, USA

5:30-5:55 Human-in-the-Loop Machine Learning
Eli T. Brown, DePaul University, USA

Friday, July 15

CP27

Life Sciences II

4:00 PM-6:00 PM

Room:Griffin - Conference Level

Chair: Neelima Sharma, Yale University, USA

4:00-4:15 Optical Biosensors for Multicomponent Reactions
David A. Edwards, University of Delaware, USA; Ryan Evans, University of Delaware, USA

4:20-4:35 Optimal Mating Strategies for Preferentially Outcrossing Simultaneous Hermaphrodites in the Presence of Predators
Allison Kolpas, Josh Auld, Corin Stratton, and Nicole Bishop, West Chester University, USA

4:40-4:55 Scaling and Similarity of Biological Joints
Neelima Sharma, Yale University, USA; Shreyas Mandre, Brown University, USA; Madhusudhan Venkadesan, Yale University, USA

5:00-5:15 High Throughput Chemical Toxicity Screening As a Bayesian Signaling Game
Lyle D. Burgoon, US Army Engineer Research and Development Center, USA

5:20-5:35 A Mathematical Model to Elucidate Brain Tumor Abrogation by Immunotherapy with T11 Target Structure
Subhas Khajanchi and Sandip Banerjee, Indian Institute of Technology Roorkee, India; Swapna Chaudhuri, Calcutta School of Tropical Medicine, India

5:40-5:55 Mathematical Modeling of Nanocarrier Distribution in the Microvasculature
Tae-Rin Lee, Seoul National University, South Korea

Friday, July 15

CP28

Numerical PDEs IV

4:00 PM-6:00 PM

Room:Revere - Lobby Level

Chair: Jonathan J. Hu, Sandia National Laboratories, USA

4:00-4:15 An Arbitrary Order, Fully Implicit, Hybrid Kinetic Solver for Radiative Transport Using Integral Deferred Correction
Michael Crockatt, Michigan State University, USA

4:20-4:35 Multigrid Methods for Systems Arising from High Order {CVFEM} Discretizations
Jonathan J. Hu and Christopher Siefert, Sandia National Laboratories, USA

4:40-4:55 A Non-Stiff Method for Airy Flow: Application to the Modified Korteweg De Vries Equation.
Mariano C. Franco De Leon and John Lowengrub, University of California, Irvine, USA

5:00-5:15 From Discrete Time Random Walks to Numerical Methods for Fractional Order Differential Equations
Christopher N. Angstmann and Bruce I. Henry, University of New South Wales, Australia

5:20-5:35 Formulation of a Discontinuous Galerkin Method for Unstructured Causal Grids in Spacetime and Linear Dispersive Electromagnetic Media
Reza Abedi, University of Tennessee Space Institute, USA; Saba Mudaliar, Air Force Research Laboratory, USA

5:40-5:55 Construction and Analysis of a Weighted Sequential Splitting Method for the 3D Maxwell's Equations
Puttha Sakkaplangkul and Vrushali A. Bokil, Oregon State University, USA

Friday, July 15

CP29

Partial Differential Equations IV

4:00 PM-5:40 PM

Room:Paine - Lobby Level

Chair: Mouhacine Benosman, MERL, USA

4:00-4:15 Interpolation of Functions with Parameter Dependent Jumps by Transformed Snapshots
Gerrit Welper, Texas A&M University, USA

4:20-4:35 Stochastic Partial Functional Differential Equations with Delay
Peter Y. Pang, National University of Singapore, Republic of Singapore

4:40-4:55 Lyapunov-Based Robust Reduced Order Model Stabilization for Partial Differential Equations: Application to the Coupled Burgers Equation
Mouhacine Benosman, Petros Bourfounos, Piyush Grover, and Saleh Nabi, MERL, USA

5:00-5:15 Fundamental Gaps and Energy Asymptotics of the Gross-Pitaevskii/nonlinear Schrodinger Equation with Repulsive Interaction
Xinran Ruan and Weizhu Bao, National University of Singapore, Singapore

5:20-5:35 Gepup: Reformulating the Incompressible Navier-Stokes Equations (inse) for Fourth Or Higher-Order Numerical Solutions
Qinghai Zhang, Zhejiang University, China

Board of Trustees Executive Session

4:00 PM-7:00 PM

Room:Faneuil - Mezzanine Level

Saturday, July 16

Board of Trustees Regular Session

8:00 AM-3:00 PM

Room:Faneuil - Mezzanine Level

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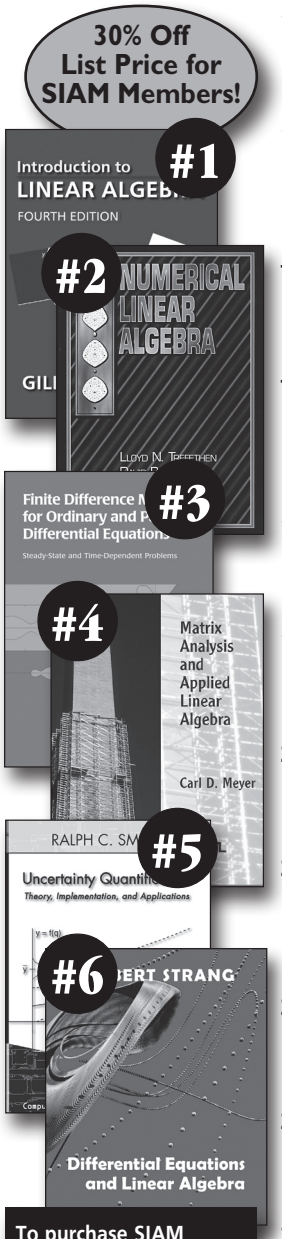

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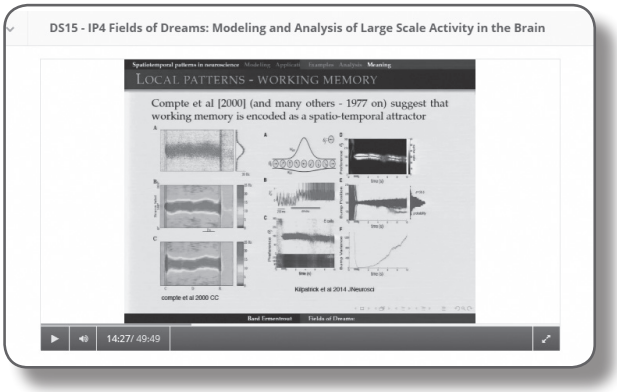

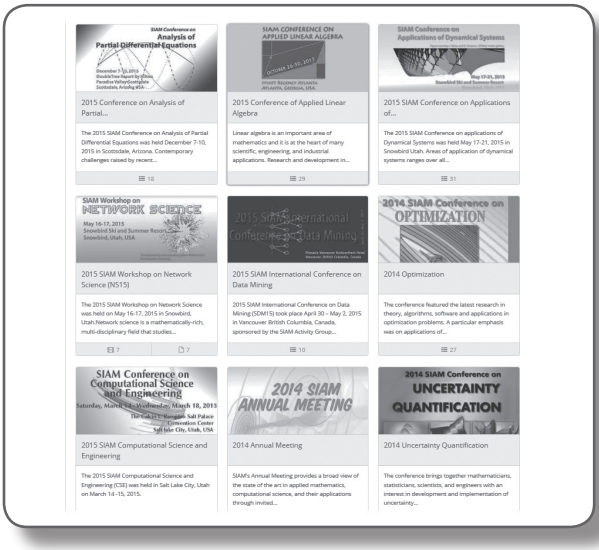

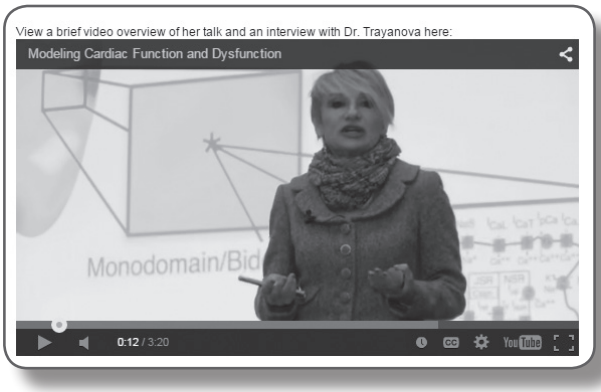

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SIAM Conference on the

Life Sciences

July 11-14, 2016

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Sunday, July 10

Registration
2:00 PM-8:00 PM

Room:Concourse Level

Student Days: Student Orientation
5:00 PM-6:00 PM

Room:Commonwealth Ballroom BC - Concourse Level

Welcome Reception
6:00 PM-8:00 PM

Room:Grand Ballroom Prefunction

Monday, July 11

Registration
7:00 AM-4:30 PM

Room:Concourse Level

Opening Remarks
8:15 AM-8:30 AM

Room:Harbor Ballroom II and III - Conference Level

IC1
Beating in Fluid: Hearts and Cilia by the Immersed Boundary Method
8:30 AM-9:15 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Aaron L. Fogelson, University of Utah, USA

The immersed boundary (IB) method treats immersed elastic bodies or boundaries as if they were a part of the fluid in which additional forces are applied. In the context of the beating heart, this makes possible the simultaneous simulation of the thin, flexible heart valve leaflets and the thick, muscular heart walls, along with the blood flow in the cardiac chambers; and it turns out that the IB methodology is also well suited to the simultaneous numerical solution of the bidomain equations of cardiac electrophysiology. The problem of beating cilia is one of synchronization. How do the hundreds of dynein motors distributed within a given cilium coordinate to achieve the ciliary beat, and then at a higher level, how do the multiple cilia of an array coordinate their beating to move fluid? We introduce a phenomenological model in which each dynein motor obeys a simple dynamical law and in which both types of coordination emerge spontaneously. This talk describes joint work with Boyce Griffith, Jihun Han, Alexander Kaiser, and David McQueen

Charles S. Peskin
Courant Institute of Mathematical Sciences, New York University, USA

IC2
Mathematical Models for Cell Polarization and Gradient Sensing
9:15 AM-10:00 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Wanda Strychalski, Case Western Reserve University, USA

Directed or "polarized" growth and the detection of chemical gradients are two fundamental cellular processes. Here we combine mathematical modeling with various experimental approaches to investigate the molecular mechanisms that underline both processes during the mating response of Saccharomyces cerevisiae (budding yeast). Our analysis reveals a novel method for gradient sensing and insight into the biochemical mechanisms that ensure the establishment of a unique polarity site.

Timothy C. Elston
University of North Carolina at Chapel Hill, USA

Exhibit Hall Open
9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break
10:00 AM-10:30 AM

Room:Galleria Level

Monday, July 11

MS1

Modeling and Simulation for Applications of Complex Fluids in Biosciences - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom II - Conference Level

For Part 2 see MS14

The minisymposium focus on modeling and simulation techniques for applications in life sciences via complex fluids formulations. In many life sciences applications the fundamental problem is to understand the interaction and coupling between different processes and/or scales and these type of problems can be naturally addressed by using complex fluids formulations. The aim of the minisymposium is to bring together researchers working on modeling and/or simulation for several type of applications where the coupling between different processes and scales is crucial for understanding the phenomena of interest.

Organizer: Giordano Tierra

Temple University, USA

10:30-10:55 A Multicomponent Phase-Field Model of Deformation and Detachment of a Biofilm under Fluid Flow

Giordano Tierra, Temple University, USA

11:00-11:25 General Diffusion in Biological Environments

Chun Liu, Pennsylvania State University, USA

11:30-11:55 The Impact of Shear Stress on Current Production and Structure of Electroactive Biofilms

Cullen Buie, Massachusetts Institute of Technology, USA

12:00-12:25 Deformation and Rupture of a Blood Clot under Flow Studied Using a Multi-Component Model

Shixin Xu, Zhiliang Xu, and Mark S. Alber, University of Notre Dame, USA

Monday, July 11

MS2

Celebrating Charles S. Peskin's 70th Birthday: Mathematical Modeling in Biological Fluid Dynamics and Systems Biology - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom III - Conference Level

For Part 2 see MS15

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on applications of the immersed boundary (IB) method as well as mathematical models in systems biology.

Organizer: Sookkyung Lim

University of Cincinnati, USA

Organizer: Boyce E. Griffith

University of North Carolina at Chapel Hill, USA

10:30-10:55 Fibrin Gelation During Blood Clotting

Aaron L. Fogelson, Cheryl Zapata-Allegro, and James P. Keener, University of Utah, USA

11:00-11:25 Effects of Boundaries on Pulse Wave Simulations

Muhammad U. Qureshi, North Carolina State University, USA

11:30-11:55 Modeling of Pulsating Soft Corals

Shilpa Khatri, University of California, Merced, USA

12:00-12:25 Effective, General-purpose Multigrid Preconditioners for Implicit Immersed Boundary Methods

Boyce E. Griffith and Amneet P.S. Bhalla, University of North Carolina at Chapel Hill, USA; Matthew G. Knepley, Rice University, USA; Robert D. Guy, University of California, Davis, USA

Monday, July 11

MS3

Molecular Bioscience and Biophysics - Charge Transport and Ion Channles

10:30 AM-12:30 PM

Room:Burroughs - Conference Level

Research on ion channels, which a type of membrane proteins responsible for cell-cell or cell- environment communication, is one of the most important topics in molecular bioscience and biophysics. However, properties of ion channels and their functions are far from well understood, either in molecular biology or in mathematical modeling and simulation. In this minisymposium, we aim at gathering experts in biophysics, biology, and applied mathematics to establish a platform to exchange ideas, information, and methodologies in studying functions of ion channels and charge transport in narrow protein pores. We also expect collaborations can be developed interdisciplinary to shed light on and contribute to the research of this field.

Organizer: Duan Chen

University of North Carolina, Charlotte, USA

10:30-10:55 Simulating Charge Transport in Ion Channels by a New Pnp Model

Duan Chen, University of North Carolina, Charlotte, USA

11:00-11:25 Effects of (small) Permanent Charge and Channel Geometry on Ionic Flows via Classical Poisson-Nernst-Planck Models

Mingji Zhang, New Mexico Institute of Mining and Technology, USA

11:30-11:55 Polarization Generalized Poisson-Boltzmann and Poisson-Nernst-Planck Models

Zixuan Cang, Michigan State University, USA

12:00-12:25 Title Not Available

Maria Sushko, Pacific Northwest National Laboratory, USA

Monday, July 11

MS4

Mathematical Modeling of Fluids and Structures in the Eye - Part I of II

10:30 AM-12:30 PM

Room:Carlton - Conference Level

For Part 2 see MS17

The aim of this minisymposium is to present current mathematical modeling efforts devoted to fundamental understanding of the mechanics and physiology of the eye. The first half of the symposium addresses the ocular surface with models of the flow of the tear film and its interactions with contact lenses. The second half of the symposium presents mathematical models of the lens and retina. These models are compared closely with in vivo data, and address conditions such as dry eye, glaucoma and cataracts.

Organizer: Julia Arciero

Indiana University - Purdue University Indianapolis, USA

Organizer: Kara L. Maki

Rochester Institute of Technology, USA

Organizer: Richard Braun

University of Delaware, USA

10:30-10:55 A Theoretical Model of Tissue Oxygenation in the Retina

Julia Arciero, Indiana University - Purdue University Indianapolis, USA

11:00-11:25 Influence of Tissue Viscoelasticity on the Optic Nerve Head Perfusion: A Mathematical Model

Daniele Prada and Giovanna Guidoboni, Indiana University - Purdue University Indianapolis, USA; Bernardo Cockburn, University of Minnesota, USA; Riccardo Sacco, Politecnico di Milano, Italy; Lorena Bociu, North Carolina State University, USA; Justin Webster, College of Charleston, USA; Brent Siesky and Alon Harris, Indiana University School of Medicine, USA

11:30-11:55 Theory and Application of the LSPDE for Determining Gibbs Free Energies of Eye Lens Protein Mixtures

David S. Ross and George Thurston, Rochester Institute of Technology, USA; Christopher Wahle, University of Findlay, USA

12:00-12:25 Optimal Control Strategies for Saccadic Eye Movements in Humans

Ram V. Iyer, Texas Tech University, USA

Monday, July 11

MS5

Complex Cardiac Electrical Dynamics: Alternans and Chaos at Subcellular, Cellular, and Tissue Levels - Part I of II

10:30 AM-12:30 PM

Room:Griffin - Conference Level

For Part 2 see MS18

Electrical signaling in the heart triggers intracellular calcium cycling that initiates contraction. However, both cellular and subcellular processes related to voltage and calcium are susceptible to the development of oscillations and instabilities that can lead to periodic, quasiperiodic, and chaotic dynamics, which in turn can have effects at the tissue level and give rise to cardiac arrhythmias. In this two-part minisymposium, we will discuss the mathematics of a broad range of complex dynamical states that cardiac cells and tissue can exhibit as well as how these behaviors at different scales can contribute to the development of arrhythmias.

Organizer: Flavio Fenton

Georgia Institute of Technology, USA

10:30-10:55 Inducing Alternans Using Delay-Differential Equations

Elizabeth M. Cherry, Rochester Institute of Technology, USA; Justin Eastman, Millersville University, USA; Julian Sass, University of Maryland, Baltimore County, USA; Johnny Gomes and Rodrigo Weber dos Santos, Federal University of Juiz de Fora, Brazil

11:00-11:25 Calcium Alternans as a Critical Order-Disorder Transition

Enric Alvarez-Lacalle and *Blas Echebarria*, Universidad Politecnica de Catalunya, Spain; Jon Spalding, California State University, USA; Yohannes Shiferaw, California State University, Northridge, USA

11:30-11:55 Period Doubling Cascade in Cardiac Tissue

Conner Herndon, Flavio M. Fenton, Ilija Uzelac, and Diandian Diana Chen, Georgia Institute of Technology, USA

12:00-12:25 Spatiotemporal Dynamics of Calcium-Driven Alternans: Hysteresis, Multi-Periodicity, and Chaos

Per Sebastian Skardal, Trinity College, USA

Monday, July 11

MS6

Stochastic Modeling and Simulation of Cell Biology - Part I of II

10:30 AM-12:30 PM

Room:Lewis - Conference Level

For Part 2 see MS19

This minisymposium aims to bring researchers in computational systems biology with diverse background to address recent advances in stochastic modeling and computational technologies for complex systems in developmental and cell biology that include (but not limited to) cell signaling pathways, cell oscillation and polarization, cancer stem cells, cancer tumor growth and and cell mitosis etc. In this minisymposium, the challenges of modeling these complex systems will be discussed and, moreover, the new analytical and computational techniques to simulate these complicated models will also be presented.

Organizer: Xinfeng Liu

University of South Carolina, USA

Organizer: Ching-Shan Chou

The Ohio State University, USA

10:30-10:55 Multi-Step Transitions Between Epithelial and Mesenchymal States and Cellular Plasticity

Qing Nie, University of California, Irvine, USA

11:00-11:25 Find Network Topologies That Can Achieve Biochemical Adaptation and Noise Attenuation

Lei Zhang, Peking University, China

11:30-11:55 Stochastic Modeling of Yeast Cell Polarization: From Cell Budding to Population Development

Wing-Cheong Lo, City University of Hong Kong, Hong Kong

12:00-12:25 Stochastic Models for the Stem Cell Niche

Shahriyari Leili, Ohio State University, USA

Monday, July 11

MS7

Experiment and Theory Combined: An Ideal Vantage Point Upon Neurodynamics - Part I of II

10:30 AM-12:30 PM

Room:Otis - Conference Level

For Part 2 see MS20

We propose to host a minisymposium in two sessions that aim to highlight the important relationship between experiment and theory in neuroscience. The field of computational biophysics is where experiment now meets theory, and where advances will be made more efficiently than they would be by either field separately. To emphasize the importance of such collaborations, each session will intermingle theoretical and experimental topics; time will remain for discussion. The hosts are postdoctoral scholars in collaborating groups: computational physics (Eve Armstrong with Henry Abarbanel at UCSD) and experimental neurobiology (Arij Daou with Daniel Margoliash at the University of Chicago).

Organizer: Eve Armstrong

University of California, San Diego, USA

10:30-10:55 To Infer Network Connectivity, What Measurements Must Be Made?

Eve Armstrong, University of California, San Diego, USA

11:00-11:25 Learning Effects on Somatic Ionic Currents

Arij Daou, University of Chicago, USA

11:30-11:55 Neural Models and Their Interactions in the Song Center of the Zebra Finch

Richard Bertram, Florida State University, USA

12:00-12:25 Robustness in a Rhythmic Neuronal Circuit

Eve Marder, Brandeis University, USA

Monday, July 11

MS8

Combinatorics and Algebra in Biological Structures - Part I of II

10:30 AM-12:30 PM

Room:Paine - Lobby Level

For Part 2 see MS21

Combinatorics and algebra have always been important in mathematical biology for algorithm development and optimization problems. But recently these areas of mathematics have been playing a larger role in different specializations across the life sciences due to an increased recognition of their suitability for many modeling and data management problems. Our proposed minisymposium will include talks about combinatorial and algebraic approaches to such problems from molecular and evolutionary biology, personalized medicine, pharmaceutical development, and neuroscience.

Organizer: Ruth Davidson

University of Illinois at Urbana-Champaign, USA

Organizer: Elizabeth Drellich

University of North Texas, USA

10:30-10:55 Branching Polytopes: Geometric Combinatorics and RNA Secondary Structures

Elizabeth Drellich, University of North Texas, USA; Andrew Gainer-Dewar, University of Connecticut Health Center, USA; Heather Harrington, University of Oxford, United Kingdom; Qijun He, Clemson University, USA; Christine Heitsch, Georgia Institute of Technology, USA; Svetlana Poznanovikj, Clemson University, USA

11:00-11:25 Parametric Analysis of RNA Secondary Structure Prediction

Svetlana Poznanovikj, Clemson University, USA

11:30-11:55 Enumerative Properties of Gene Tree Configurations in Species Trees

Filippo Disanto and Noah Rosenberg, Stanford University, USA

12:00-12:25 Local Equations for Equivariant Evolutionary Models

Jesús Fernández-Sánchez and Marta Casanellas, Universitat Politecnica de Catalunya, Spain; Mateusz Michalek, Polish Academy of Sciences, Poland

Monday, July 11

MS9

Neuromechanical Locomotion

10:30 AM-12:30 PM

Room:Stone - Lobby Level

Locomotion, whether it's flying, walking or swimming, involves complex interactions between the nervous systems, muscles, and environmental forces. While there are systems, such as muscle, that are common among species and locomotion-type, there are also features of locomotion that are specific to the type of locomotion and species. For example, heel strike is an important aspect of walking, whereas fluid forces play an important role in swimming and flying. Speakers in this minisymposium will give an overview ongoing research and current questions in neuromechanical locomotion across a broad range of species and types of locomotion.

Organizer: Kathleen A. Hoffman

University of Maryland, Baltimore County, USA

10:30-10:55 Effects of Sensory Feedback on Lamprey Locomotion

Kathleen A. Hoffman and Nicole Massarelli, University of Maryland, Baltimore County, USA; Tim Kiemel, University of Maryland, USA; Eric Tytell, Tufts University, USA

11:00-11:25 System Identification of Free Flight Maneuvers in Agile Insects

Simon Sponberg, Georgia Institute of Technology, USA; Eatai Roth, University of Washington, USA

11:30-11:55 Modeling Rhythmic Biological Behaviors Using Limited Data

M.Mert Ankarali, Johns Hopkins University, USA; Nicole Danos and Eric Tytell, Tufts University, USA; *Noah J. Cowan*, Johns Hopkins University, USA

12:00-12:25 The Neural Mechanisms of Limb Coordination in Crustacean Swimming: The Roles of Nearest-Neighbor and Longer-Range Connectivity

Timothy Lewis, University of California, Davis, USA; Lucy Spardy, Skidmore College, USA; Calvin Zhang, Courant Institute of Mathematical Sciences, New York University, USA

Monday, July 11

MS10

The Dynamics and Structure of Neuronal Networks

10:30 AM-12:30 PM

Room:Webster - Lobby Level

The dynamics and structure of neuronal networks have facilitated significant advances in the understanding of both cognitive function and the nature computation in the brain. This minisymposium explores recent work in the modeling and analysis of neuronal network dynamics, emphasizing implications on connectivity reconstruction, sensory processing, and brain disorders. The speakers will draw particular attention to new mathematical advances in characterizing the structure-function relationship for complex neuronal networks and techniques for understanding the biophysical mechanisms underlying experimentally observed phenomena.

Organizer: Victor Barranca

Swarthmore College, USA

Organizer: Douglas Zhou

Shanghai Jiao Tong University, China

10:30-10:55 Sparsity and Compressed Coding in Sensory Systems

Douglas Zhou, Shanghai Jiao Tong University, China; Victor Barranca, Swarthmore College, USA; Gregor Kovacic, Rensselaer Polytechnic Institute, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

11:00-11:25 Spike-Triggered Regression on Neuronal Network Reconstruction

Yaoyu Zhang, Courant Institute New York University, USA and New York University Abu Dhabi, United Arab Emirates

continued in next column

11:30-11:55 The Contribution of Interneurons to Hippocampal Oscillations

Songting Li, Courant Institute of Mathematical Sciences, New York University, USA; Douglas Zhou, Shanghai Jiao Tong University, China; David Cai, Courant Institute of Mathematical Sciences, New York University, USA; Jiamin Xu and Longnian Lin, East China Normal University, China

12:00-12:25 Data Analysis and Mathematical Modeling of Multiscale Dynamics in Human Cortex

Mark Kramer, Boston University, USA; Louis-Emmanuel Martinet, Harvard University and Massachusetts General Hospital, USA; Grant Fiddyment and Jessica Nadalin, Boston University, USA; Sydney Cash, Harvard University and Massachusetts General Hospital, USA

Monday, July 11

MS11

Mathematical Methodologies for Parameter Estimation and Prediction - Part I of II

10:30 AM-12:30 PM

Room:Revere - Lobby Level

For Part 2 see MS24

The application of mathematical models, especially in the life sciences, may require the estimation of many parameters using only a limited amount of available data. This estimation challenge is often related to large uncertainties or poor performance in predicting future outcomes using the model. Overcoming these issues requires the development of new mathematical, statistical, and modeling methodologies for parameter estimation in order to meet requirements on model accuracy and predictive value. The speakers will present recent contributions to develop such methodologies in the context of specific models in different biological areas (ecology, oncology, molecular biology, immunology, epidemiology, and cognitive science).

Organizer: Kevin Flores

North Carolina State University, USA

Organizer: Suzanne Sindi

University of California, Merced, USA

10:30-10:55 Integrating Model-Free and Mechanistic Modeling Approaches for Parameter Estimation and Prediction

Franz Hamilton, Kevin Flores, and Alun Lloyd, North Carolina State University, USA

11:00-11:25 Parameter Estimation in Modeling Influenza Infections: When & Why Parameter Values Don't Matter

Amber Smith, St. Jude Children's Research Hospital, USA

11:30-11:55 Estimating Kinetic Rates of Prion Replication from a Structured Population Model

Suzanne Sindi, University of California, Merced, USA

12:00-12:25 Using Kalman Filtering for Prediction of Cardiovascular Regulation During Blood Withdrawal

Andrea Arnold and Mette S. Olufsen, North Carolina State University, USA; Brian Carlson, University of Michigan, Ann Arbor, USA

Monday, July 11

MS12

Modeling Insulin and Glucagon Secretion and Their Roles in Diabetes - Part I of II

10:30 AM-12:30 PM

Room:Alcott - Mezzanine Level

For Part 2 see MS25

The failure of insulin-secreting pancreatic beta-cells is a core feature of diabetes. We identify beta-cell failure at various levels to better understand the complexity of the underlying mechanisms. At the cellular level, ER stress regulates signal pathways of beta-cell glucose metabolism, resulting in altering insulin secretion. At the inter- cellular level, the failure of coordination of insulin with its paracrine hormone, glucagon, is another key feature of the disease and loss of pulsatile insulin secretion is a biomarker of the disease. At the whole body level, understanding temporal patterns of elevated glucose is essential to capture the natural history of diabetes.

Organizer: Joon Ha

National Institutes of Health, USA

10:30-10:55 Alpha-Cell Heterogeneity: The Role of TASK

Margaret A. Watts and Arthur S. Sherman, National Institutes of Health, USA

11:00-11:25 Glucose Oscillations Can Activate An Endogenous Oscillator in Pancreatic Islets

Joseph Mckenna, Raghuram Dhumpa, Nikita Mukhitov, Michael Roper, and Richard Bertram, Florida State University, USA

11:30-11:55 Pancreatic Beta Cells - Synchronization and Intrinsic Heterogeneity

Randolph Leiser and Horacio G. Rotstein, New Jersey Institute of Technology, USA

12:00-12:25 Applying Mathematical Modeling to Drug Development Decisions: Non-Clinical and Phase I Evaluation of Hypoglycemic Risk of a Novel, Partial Glucokinase Activator

Theodore Rieger, Russell Miller, William Denney, Cynthia Musante, and Jeffrey Pfefferkorn, Pfizer Inc., USA

Monday, July 11

MS13

Inverse Problems and Modeling in the Era of Precision Medicine - Part I of II

10:30 AM-12:30 PM

Room:Adams - Mezzanine Level

For Part 2 see MS26

According to the President's Council of Advisors on Science and Technology precision medicine means tailoring medical treatment to the individual characteristics of each patient. This is of particular importance in case of chronic diseases. One consequence is that model based treatment strategies will become more important and that complex models have to be adapted to individual patients which requires improved methodologies for inverse problems, parameter estimation and optimal experimental design. The presentations of the speakers will address these requirements in the context of concrete applications

Organizer: Franz Kappel

University of Graz, Austria

10:30-10:55 Inverse Problems and Parameter Estimation in the Era of Precision Medicine

Franz Kappel, University of Graz, Austria

11:00-11:25 Automated Parameter Estimation for a Complex System of PDEs - A Crucial Step Towards Personalized Anemia Therapy

Doris H. Fuertinger, Renal Research Institute, USA

11:30-11:55 A Structural Model of Passive Forces in Myofibrils Allowing Efficient Parameter Estimation

Gudrun Schappacher-Tilp, University of Graz, Austria

12:00-12:25 Computation of Optimal Epo Doses for Patients with Chronic Kidney Disease Using a Model Predictive Control Approach

Sabrina Rogg, Universität Konstanz, Germany

Monday, July 11

CP1

Chemical Reactions

10:30 AM-12:10 PM

Room:Hancock - Lobby Level

Chair: To Be Determined

10:30-10:45 When Can Michealis-Menten or Hill Functions Lead Accurate Stochastic Simulations?

Jae Kyoung Kim, Korea Advanced Institute of Science and Technology, Korea; Krešimir Josic, University of Houston, USA; Matthew Bennett, Rice University, USA

10:50-11:05 Systems Analysis of Nf_kb Signaling System Reveals Signaling Nodes and Their Robust Features Controlling Transcriptional Outcome

Shibin Mathew, Harvard Medical School, USA; Arvind Chavali, Victor Wong, and Kathryn Miller-Jensen, Yale University, USA; Suzanne Gaudet, Harvard Medical School, USA

11:10-11:25 Delayed Stochastic Simulation Modelling of Stalled Transcription in Prokaryotes

Silky Sharma, University of Lethbridge, Canada

11:30-11:45 Solving the Chemical Master Equation by an Adaptive Finite State Projection Method

Huy D. Vo and Roger Sidje, University of Alabama, USA

11:50-12:05 Origin of Balanced Growth, Homeostasis and Bacterial Growth Laws in Growing-Dividing Models of Cells

Parth P. Pandey, University of Delhi, India; Sanjay Jain, Santa Fe Institute, USA

Monday, July 11

CP2

Genetics and Informatics

10:30 AM-12:30 PM

Room:Hale - Mezzanine Level

Chair: Mario Banuelos, University of California, Merced, USA

10:30-10:45 Leveraging Sparsity to Detect Structural Variants in Genomic Data
Mario Banuelos, Rubi Almanza, Lasith Adhikari, Suzanne Sindi, and Roummel F. Marcia, University of California, Merced, USA

10:50-11:05 Mechanistic Modeling of Subpopulation Structures for Multivariate Single-Cell Data
Carolin Loos, Helmholtz Zentrum München, Germany; Katharina Moeller and Tim Hucho, University Hospital Cologne, Germany; Jan Hasenauer, Helmholtz Zentrum München, Germany

11:10-11:25 ddPCR and qPCR Accuracy Comparison Using Probability Theory and Computation
Ryan M. Zurakowski and Cesar Vargas-Garcia, University of Delaware, USA; Jiefu Li, University of California, Santa Barbara, USA; LaMont Cannon, University of Delaware, USA

11:30-11:45 Immune Epitope Database and Analysis Resource (iedb)
Ward Fleri, La Jolla Institute for Allergy and Immunology, USA

11:50-12:05 Homeolog Specific Expression Bias
Ronald D. Smith, College of William & Mary, USA

12:10-12:25 Interlaboratory Comparison and Reproducibility Analysis of Nuclear Magnetic Resonance Spectroscopy Using Cluster Analysis
David Sheen, Werickson F.C. Rocha, Daniel Bearden, and Katrice Lippa, National Institute of Standards and Technology, USA

Monday, July 11

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

JP1

Spatio-Temporal Dynamics of Childhood Infectious Disease: Predictability and the Impact of Vaccination

2:00 PM-2:45 PM

Room:Grand Ballroom - Concourse Level

Chair: Zhilan Feng, Purdue University, USA

Violent epidemics of childhood infections such as measles provide a particularly clear illustration of oscillatory 'predator-prey' dynamics. We discuss limits on the predictability of these systems, both in the era before vaccination and at present, where vaccine hesitancy limits the effectiveness of vaccination programs in many countries. We also discuss the impact of viral evolution on predictability and the design of vaccination programs, with particular reference to influenza and rotavirus.

Bryan Grenfell

Princeton University, USA

Monday, July 11

SP1

AWM-SIAM Sonia Kovalevsky Lecture - Biofluids of Reproduction: Oscillators, Viscoelastic Networks and Sticky Situations

2:45 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Ami Radunskaya, Pomona College, USA

From fertilization to birth, successful mammalian reproduction relies on interactions of elastic structures with a fluid environment. Sperm flagella must move through cervical mucus to the uterus and into the oviduct, where fertilization occurs. In fact, some sperm may adhere to oviductal epithelia, and must change their pattern of oscillation to escape. In addition, coordinated beating of oviductal cilia also drives the flow. Sperm-egg penetration, transport of the fertilized ovum from the oviduct to its implantation in the uterus and, indeed, birth itself are rich examples of elasto-hydrodynamic coupling. We will discuss successes and challenges in the mathematical and computational modeling of the biofluids of reproduction. In addition, we will present reduced models that evoke intriguing questions in fundamental fluid dynamics.

Lisa J. Fauci

Tulane University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Monday, July 11

MS14

Modeling and Simulation for Applications of Complex Fluids in Biosciences - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom II - Conference Level

For Part 1 see MS1

The minisymposium focus on modeling and simulation techniques for applications in life sciences via complex fluids formulations. In many life sciences applications the fundamental problem is to understand the interaction and coupling between different processes and/or scales and these type of problems can be naturally addressed by using complex fluids formulations. The aim of the minisymposium is to bring together researchers working on modeling and/or simulation for several type of applications where the coupling between different processes and scales is crucial for understanding the phenomena of interest.

Organizer: Giordano Tierra

Temple University, USA

4:00-4:25 Causes and Effects of Material Heterogeneity in Biofilms

Isaac Klapper, Temple University, USA

4:30-4:55 Stochastic Modeling of Cancer Cell Lineage with Time Delays

Xinfeng Liu, University of South Carolina, USA

5:00-5:25 Strong Defense by Weak Affinities: Modeling Virus-Antibody-Mucin Kinetics

Timothy Wessler, University of North Carolina at Chapel Hill, USA

5:30-5:55 Stochastic Features of Airway Liquid Flows

Oliver E. Jensen, University of Manchester, United Kingdom

Monday, July 11

MS15

Celebrating Charles S. Peskin's 70th Birthday: Mathematical Modeling in Biological Fluid Dynamics and Systems Biology - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom III - Conference Level

For Part 1 see MS2

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on applications of the immersed boundary (IB) method as well as mathematical models in systems biology.

Organizer: Sookkyung Lim

University of Cincinnati, USA

Organizer: Boyce E. Griffith

University of North Carolina at Chapel Hill, USA

4:00-4:25 Stochastic Fluctuations in Suspensions of Swimming Microorganisms

Peter R. Kramer, Rensselaer Polytechnic Institute, USA

4:30-4:55 They Are Not Third-Parties: Solutes and Polymers in the Fluid-Structure Interaction

Pilhwa Lee, University of Michigan, USA

5:00-5:25 Self-Organization in Micro-Swimmer Suspensions

Enkeleida Lushi, Brown University, USA

5:30-5:55 Computational Modeling of a Swimming Lamprey Driven by a Central Pattern Generator with Sensory Feedback

Christina Hamlet and Lisa J. Fauci, Tulane University, USA; Kathleen A. Hoffman, University of Maryland, Baltimore County, USA; Eric Tytell, Tufts University, USA

Monday, July 11

MS16

Molecular Bioscience and Biophysics - Recent Advances of Membrane Modeling and Computation - Part I of II

4:00 PM-6:00 PM

Room:Burroughs - Conference Level

For Part 2 see MS30

Dynamics of lipid bilayer in vivo involves multiscale interactions with surrounding fluid and other macromolecular complexes. To date, grand challenges remain in high-fidelity modeling and efficient computation of the composition variations, large deformation and topological changes of membrane induced by multiscale electrostatic, entropic, hydrodynamics, and mechanical interactions. This minisymposium will (1) address some of the most interesting topics in modeling of bilayer membranes, including coupling of asymmetric bilayers, protein insertion and pore formation, pattern formation, multicomponent coupling, fluid-vesicle coupling, fluid-electrostatics-vesicle coupling, and fast algorithms; (2) nurture collaborations among investigators in applied and computational mathematics, biophysics, and mechanical engineering.

Organizer: Shuwang Li

Illinois Institute of Technology, USA

Organizer: Yongcheng Zhou

Colorado State University, USA

4:00-4:25 Composition Induced Bifurcation in Multicomponent Lipid Membranes

Keith Promislow and Qiliang Wu, Michigan State University, USA

4:30-4:55 Fluctuating Vesicles in a Time-Dependent Viscous Flow

Kai Liu and John Lowengrub, University of California, Irvine, USA; Shuwang Li, Illinois Institute of Technology, USA

5:00-5:25 Dynamics and Rheology of Dense Vesicle Suspensions

Mariana Carrasco-Teja, Gary Marple, and *Shravan Veerapaneni*, University of Michigan, USA

5:30-5:55 Membrane Mechanics and the Influence of Integral Proteins: Continuum Elasticity Theory & Proteins of Arbitrary Shape

David Argudo, University of California, San Francisco, USA

Monday, July 11

MS17

Mathematical Modeling of Fluids and Structures in the Eye - Part II of II

4:00 PM-6:00 PM

Room:Carlton - Conference Level

For Part 1 see MS4

The aim of this minisymposium is to present current mathematical modeling efforts devoted to fundamental understanding of the mechanics and physiology of the eye. The first half of the symposium addresses the ocular surface with models of the flow of the tear film and its interactions with contact lenses. The second half of the symposium presents mathematical models of the lens and retina. These models are compared closely with in vivo data, and address conditions such as dry eye, glaucoma and cataracts.

Organizer: Julia Arciero

Indiana University - Purdue University Indianapolis, USA

Organizer: Kara L. Maki

Rochester Institute of Technology, USA

Organizer: Richard Braun

University of Delaware, USA

4:00-4:25 Tear Film Dynamics on a Model Blinking Eye-Shaped Domain

Tobin Driscoll, University of Delaware, USA

4:30-4:55 Tear Film Evaporation and Breakup with a Mobile Lipid Layer

Michael Stapf and Richard Braun, University of Delaware, USA; P. Ewen King-Smith, The Ohio State University, USA

5:00-5:25 Modeling Contact Lens Induced Suction Pressure

Kara L. Maki, David S. Ross, Roland Sanford, and Emily Holz, Rochester Institute of Technology, USA

5:30-5:55 Modeling Contact Lens Motion and Tear Film Dynamics During Blinking

Daniel M. Anderson, George Mason University, USA; Maria Corsaro, University of Notre Dame, USA; Jonathan Horton, George Mason University, USA

Monday, July 11

MS18

Complex Cardiac Electrical Dynamics: Alternans and Chaos at Subcellular, Cellular, and Tissue Levels - Part II of II

4:00 PM-6:00 PM

Room:Griffin - Conference Level

For Part 1 see MS5

Electrical signaling in the heart triggers intracellular calcium cycling that initiates contraction. However, both cellular and subcellular processes related to voltage and calcium are susceptible to the development of oscillations and instabilities that can lead to periodic, quasiperiodic, and chaotic dynamics, which in turn can have effects at the tissue level and give rise to cardiac arrhythmias. In this two-part minisymposium, we will discuss the mathematics of a broad range of complex dynamical states that cardiac cells and tissue can exhibit as well as how these behaviors at different scales can contribute to the development of arrhythmias.

Organizer: Flavio Fenton

Georgia Institute of Technology, USA

4:00-4:25 Spatial Discordance and Phase Reversals in a Discrete-Time Map Model

Seth H. Weinberg, Old Dominion University, USA

4:30-4:55 Subcellular Spatiotemporal Calcium Dynamics Underlying Early Afterdepolarizations in Ventricular Myocytes

Alain Karma and Colin Rees, Northeastern University, USA; Dmitry Terentyev, Bum-Rak Choi, and Gideon Koren, Rhode Island Hospital and Brown University, USA

5:00-5:25 Characterization of Spatial-Temporal Chaos in Excitable Media and Transitions Between Chaotic and Non-Chaotic States

Thomas Lilienkamp, Ulrich Parlitz, and Stefan Luther, Max Planck Institute for Dynamics and Self-Organization, Germany

5:30-5:55 Floquet Stability Analysis of a Model of Two-Dimensional Paced Cardiac Tissue Exhibiting Wave Breakup

Alejandro Garzon, Universidad Sergio Arboleda, Colombia and Georgia Institute of Technology, USA; Roman Grigoriev, Georgia Institute of Technology, USA

Monday, July 11

MS19

Stochastic Modeling and Simulation of Cell Biology - Part II of II

4:00 PM-6:00 PM

Room:Lewis - Conference Level

For Part 1 see MS6

This minisymposium aims to bring researchers in computational systems biology with diverse background to address recent advances in stochastic modeling and computational technologies for complex systems in developmental and cell biology that include (but not limited to) cell signaling pathways, cell oscillation and polarization, cancer stem cells, cancer tumor growth and and cell mitosis etc. In this minisymposium, the challenges of modeling these complex systems will be discussed and, moreover, the new analytical and computational techniques to simulate these complicated models will also be presented.

Organizer: Xinfeng Liu

University of South Carolina, USA

Organizer: Ching-Shan Chou

The Ohio State University, USA

4:00-4:25 Energy Landscape and the Two-Scale Large Deviations for Biological Stochastic Dynamics

Tiejun Li, Peking University, China

4:30-4:55 Robust Dynamics in Tissue Growth and Stochastic Developmental Patterning

Weitao Chen, University of California, Irvine, USA

5:00-5:25 Stochastically Patterning the Early Mammalian Embryo

William Holmes, Vanderbilt University, USA

5:30-5:55 Comparison of Stochastic and Deterministic Models of Cell Polarity

Alexandra Jilkine, University of Notre Dame, USA

Monday, July 11

MS20

Experiment and Theory Combined: An Ideal Vantage Point Upon Neurodynamics - Part II of II

4:00 PM-6:00 PM

Room:Otis - Conference Level

For Part 1 see MS7

We propose to host a minisymposium in two sessions that aim to highlight the important relationship between experiment and theory in neuroscience. The field of computational biophysics is where experiment now meets theory, and where advances will be made more efficiently than they would be by either field separately. To emphasize the importance of such collaborations, each session will intermingle theoretical and experimental topics; time will remain for discussion. The hosts are postdoctoral scholars in collaborating groups: computational physics (Eve Armstrong with Henry Abarbanel at UCSD) and experimental neurobiology (Arij Daou with Daniel Margoliash at the University of Chicago).

Organizer: Eve Armstrong

University of California, San Diego, USA

4:00-4:25 Phase Oscillator Model of Insect CPGs

Zahra Aminzare, Rutgers University, USA

4:30-4:55 Dynamical Systems Models of Songbird Singing

Daniel Margoliash, University of Chicago, USA

5:00-5:25 Scientific Applications of Bayesian Event Time Inference

Joshua Merel, Columbia University, USA

5:30-5:55 How Does the Brain Generate Sequences for Behavior?

Michael Long, New York University, USA

Monday, July 11

MS21

Combinatorics and Algebra in Biological Structures - Part II of II

4:00 PM-6:00 PM

Room:Paine - Lobby Level

For Part 1 see MS8

Combinatorics and algebra have always been important in mathematical biology for algorithm development and optimization problems. But recently these areas of mathematics have been playing a larger role in different specializations across the life sciences due to an increased recognition of their suitability for many modeling and data management problems. Our proposed minisymposium will include talks about combinatorial and algebraic approaches to such problems from molecular and evolutionary biology, personalized medicine, pharmaceutical development, and neuroscience.

Organizer: Ruth Davidson

University of Illinois at Urbana-Champaign, USA

Organizer: Elizabeth Drellich

University of North Texas, USA

4:00-4:25 A Boolean Network Model of the L-Arabinose Operon

Andy Jenkins and *Matthew Macauley*, Clemson University, USA

4:30-4:55 Weakly Mutually Uncorrelated Codes

S. M. Hossein Tabatabaei Yazdi, University of Illinois, USA; Han Mao Kiah, Nanyang Technical University, Singapore; Olgica Milenkovic, University of Illinois at Urbana-Champaign, USA

5:00-5:25 Toric Ideals of Neural Codes

Nora Youngs, Harvey Mudd College, USA

5:30-5:55 A Stochastic Algebraic Model of Synergistic T Cell Activation by Pharmaceutical Agonists

Anna Konstorum, Reinhard Laubenbacher, and Anthony Vella, University of Connecticut Health Center, USA

Monday, July 11

MS22

Neuromechanical Modeling of Invertebrates

4:00 PM-6:00 PM

Room:Stone - Lobby Level

Swimming, flying, and maneuvering requires sensing the environment and controlling the movement accordingly. The goal of this minisymposium is to discuss models of invertebrate movement including neuron and muscle dynamics. We seek to understand motion from an integrated muscular response to the frequency of neuron action potentials.

Organizer: Katherine Newhall

University of North Carolina at Chapel Hill, USA

4:00-4:25 Spike Trains to Force Generation

Katherine Newhall, University of North Carolina at Chapel Hill, USA

4:30-4:55 Neural Control of Leg Movements in Drosophila

Vikas Bhandawat, Duke University, USA

5:00-5:25 Towards a Biomechanical Template for Slow Walking

Tirtho Biswas, Loyola University, USA

5:30-5:55 Neuromechanical Control of Jellyfish Turning

Alexander Hoover, Boyce E. Griffith, Laura A. Miller, and *Grace McLaughlin*, University of North Carolina at Chapel Hill, USA

Monday, July 11

MS23

The Emergence of Oscillations in Neuronal Networks

4:00 PM-6:00 PM

Room:Webster - Lobby Level

The brain is composed of neurons that form networks in which they communicate via synapses to propagate information. Brain networks are known to give rise to global oscillations that are linked to synchronized neuronal activity. In a healthy brain, these oscillations have been shown to contribute to cognitive processes such as perception, motor performance, learning and memory. Interestingly, certain neurological diseases are also believed to alter network connectivity leading to abnormal oscillations that can propagate throughout the brain. Determining the mechanism behind the emergence of these oscillations will crucially increase our understanding of the brain.

Organizer: Michael Caiola

Rensselaer Polytechnic Institute, USA

Organizer: Jennifer Kile

Rensselaer Polytechnic Institute, USA

4:00-4:25 Deep Brain Stimulation in the Subthalamic Nucleus Can Restore Function in Striatal Networks: A Modeling Study

Michelle McCarthy, Boston University, USA; Krishnakanth Kondabolu, Rutgers University, USA; Erik Roberts, Xue Han, and Nancy J. Kopell, Boston University, USA

4:30-4:55 The Role of Gap Junctions Between Excitatory Neurons in the Cortex

Jennifer Kile and Gregor Kovacic, Rensselaer Polytechnic Institute, USA; David Cai, Courant Institute of Mathematical Sciences, New York University, USA

5:00-5:25 The Progression of Parkinson's Disease in the Basal Ganglia

Michael Caiola and Mark Holmes, Rensselaer Polytechnic Institute, USA

5:30-5:55 Pallidostriatal Projections Promote Beta Oscillations Under Dopamine Depletion

Jonathan E. Rubin and Victoria Corbit, University of Pittsburgh, USA; Timothy Whalen, Carnegie Mellon University, USA; Kevin Zitelli, University of Pittsburgh, USA; Stephanie Crilly and Aryn Gittis, Carnegie Mellon University, USA

Monday, July 11

MS24

Mathematical Methodologies for Parameter Estimation and Prediction - Part II of II

4:00 PM-6:00 PM

Room:Revere - Lobby Level

For Part 1 see MS11

The application of mathematical models, especially in the life sciences, may require the estimation of many parameters using only a limited amount of available data. This estimation challenge is often related to large uncertainties or poor performance in predicting future outcomes using the model. Overcoming these issues requires the development of new mathematical, statistical, and modeling methodologies for parameter estimation in order to meet requirements on model accuracy and predictive value. The speakers will present recent contributions to develop such methodologies in the context of specific models in different biological areas (ecology, oncology, molecular biology, immunology, epidemiology, and cognitive science).

Organizer: Kevin Flores

North Carolina State University, USA

Organizer: Suzanne Sindi

University of California, Merced, USA

4:00-4:25 A Mathematical Model of GI261-Luc2 Glioma Growth in Mice

Erica Rutter and Yang Kuang, Arizona State University, USA

4:30-4:55 Development of the MCR Method for Parameter Estimation in Continuous-Time Markov Chain Models

Michele Joyner, East Tennessee State University, USA

5:00-5:25 Modeling Time Series of Composite Disease Activity Indices

Charles Fisher, Pfizer Inc., USA

5:30-5:55 Towards a Model-based Control of Neuronal Systems

Ullah Ghanim, University of South Florida, USA

Monday, July 11

MS25

Modeling Insulin and Glucagon Secretion and Their Roles in Diabetes - Part II of II

4:00 PM-6:00 PM

Room:Alcott - Mezzanine Level

For Part 1 see MS12

The failure of insulin-secreting pancreatic beta-cells is a core feature of diabetes. We identify beta-cell failure at various levels to better understand the complexity of the underlying mechanisms. At the cellular level, ER stress regulates signal pathways of beta-cell glucose metabolism, resulting in altering insulin secretion. At the inter- cellular level, the failure of coordination of insulin with its paracrine hormone, glucagon, is another key feature of the disease and loss of pulsatile insulin secretion is a biomarker of the disease. At the whole body level, understanding temporal patterns of elevated glucose is essential to capture the natural history of diabetes.

Organizer: Joon Ha

National Institutes of Health, USA

4:00-4:25 Regulation of Glucagon Secretion and Glucagon Counterregulation in Type 1 Diabetes

Leon S. Farhy, University of Virginia, USA

4:30-4:55 Mathematical Modeling of Podocytes in Diabetic Kidney Disease

Ashlee N. Ford Versypt, Minu Pilvankar, and Michele Higgins, Oklahoma State University, USA

5:00-5:25 Diverse Pathways to Type 2 Diabetes

Joon Ha and Arthur S. Sherman, National Institutes of Health, USA

5:30-5:55 A Mathematical Model of Type 2 Diabetes Driven by Insulin Hypersecretion

Pranay Goel, Indian Institute for Science Education and Research, Pune, India

Monday, July 11

MS26

Inverse Problems and Modeling in the Era of Precision Medicine - Part II of II

4:00 PM-6:00 PM

Room:Adams - Mezzanine Level

For Part 1 see MS13

According to the President's Council of Advisors on Science and Technology precision medicine means tailoring medical treatment to the individual characteristics of each patient. This is of particular importance in case of chronic diseases. One consequence is that model based treatment strategies will become more important and that complex models have to be adapted to individual patients which requires improved methodologies for inverse problems, parameter estimation and optimal experimental design. The presentations of the speakers will address these requirements in the context of concrete applications

Organizer: Franz Kappel

University of Graz, Austria

4:00-4:25 Control of Voluntary Immune Suppression in Transplant Recipients

H. T. Banks, North Carolina State University, USA

4:30-4:55 Parameter Estimation and Uncertainty Analysis of a Vascular Refilling Model Using Hematocrit Data in Hemodialysis Treatment

Aureliio A. de los Reyes V, University of the Philippines Diliman, Philippines

5:00-5:25 Improving Protein-Bound Uremic Toxins Removal: Model and Multi-Objective Optimization Based Displacer Profiling

Vaibhav Maheshwari, Renal Research Institute, USA

5:30-5:55 Systems Models and Data Assimilation in Cardiometabolic Drug Development

Clay Thompson, Pfizer Inc., USA

Monday, July 11

CP3

Cell and Molecular Biology - Part I

4:00 PM-5:40 PM

Room:Hancock - Lobby Level

Chair: To Be Determined

4:00-4:15 Parameter Estimation for Gene Regulatory Network Modeling

Ben Fitzpatrick and Kam Dahlquist, Loyola Marymount University, USA

4:20-4:35 A Stability Analysis of the Biological Networks, Transcriptional Network, Neural Circuit and Ecosystem

Katsumi Sakata, Maebashi Institute of Technology, Japan

4:40-4:55 Volume-Excluding Diffusion Models at Varying Spatial Scales

Paul R. Taylor, University of Oxford, United Kingdom; Christian Yates, University of Bath, United Kingdom; Matthew Simpson, Queensland University of Technology, Australia; Ruth E. Baker, University of Oxford, United Kingdom

5:00-5:15 Improved Ergodicity and Mixing Estimators for Single Particle Tracking

Denis Grebenkov and Yann Lanoiselee, Ecole Polytechnique, France

5:20-5:35 Understanding the Role of Mitochondria Distribution in Calcium-Induced Exocytosis in Bovine Chromaffin Cells

Amparo Gil, Universidad de Cantabria, Spain; Luis Miguel Gutierrez, Universidad Miguel Hernández de Elch, Spain

Monday, July 11

CP4

Cancer

4:00 PM-5:20 PM

Room:Hale - Mezzanine Level

Chair: Elyse Garon, University of Southern Mississippi, USA

4:00-4:15 Scalable Simulation of Systems of PDEs for Modeling Tumor Growth

Elyse Garon and James V. Lambers, University of Southern Mississippi, USA

4:20-4:35 A Mathematical Model to Elucidate Brain Tumor Abrogation by Immunotherapy with T11 Target Structure

Subhas Khajanchi and Sandip Banerjee, Indian Institute of Technology Roorkee, India; Swapna Chaudhuri, School of Tropical Medicine, Kolkata, India

4:40-4:55 Identifiability of Ode Models of Tumor Growth

Maria Pia Saccomani, University of Padova, Italy; Karl Thomaseth, National Research Council IEIIT-CNR Padova,Italy

5:00-5:15 An Integrative Modeling Framework for in Vivo Tissue Regeneration

Manuel I. Balaguera, Konrad Lorenz University Foundation, Colombia

Intermission

6:00 PM-6:15 PM

Monday, July 11

PD1

Panel: Careers in Business, Industry and Government

6:15 PM-7:15 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Rachel Levy, Harvey Mudd College, USA

Chair: Lalitha Venkataramanan, Schlumberger-Doll Research, USA

Chair: William G. Kolata, SIAM, USA

Interested in exploring opportunities outside academia? Mathematics plays a pivotal role in many industries including financial, pharmaceutical, oilfield, defense, software and IT. Within each company, applied mathematics is widely used in various aspects of research, engineering, manufacturing as well as sustaining. This discussion will feature panelists from different industries who will share their experiences of working and using applied mathematics in their companies. Following their introductions, the moderators will lead a discussion on how students interested in BIG careers might wish to broaden their educational experience and prepare for careers in industry.

Penny Anderson
The MathWorks, Inc., USA

Dean Bottino
Physiome Sciences, Inc., Israel

Gary Green
The Aerospace Corporation, USA

Tamara Kolda
Sandia National Laboratories, USA

Amy Sliva
Charles River Analytics, USA

Career Fair, Graduate Student and Industry Reception

7:15 PM-9:15 PM

Room:Pavilion - Concourse Level

Tuesday, July 12

Registration

7:30 AM-4:30 PM

Room:Concourse Level

Remarks

8:20 AM-8:30 AM

Room:Harbor Ballroom II and III - Conference Level

IC3

Qualitative Features of Transient Responses A Case Study: Scale-Invariance

8:30 AM-9:15 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Gheorghe Craciun, University of Wisconsin, Madison, USA

This talk will review the biological phenomenon, and formulate a theoretical framework leading to a general theorem characterizing scale invariant behavior by equivariant actions on sets of vector fields that satisfy appropriate Lie-algebraic nondegeneracy conditions. The theorem allows one to make experimentally testable predictions, and the presentation will discuss the validation of these predictions using genetically engineered bacteria and microfluidic devices, as well their use as a "dynamical phenotype" for model invalidation. The talk will also include some speculative remarks about the role of the shape of transient responses in immune system self/other recognition and in cancer immunotherapy.

Eduardo Sontag
Rutgers University, USA

Tuesday, July 12

IC4

Rational Design of Tissue Engineered Heart Valves

9:15 AM-10:00 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Boyce E. Griffith, University of North Carolina at Chapel Hill, USA

Valve replacement with mechanical or bioprosthetic prostheses is the most common intervention for valvular disease, with almost 300.000 annual replacements worldwide. However, in particular in patients younger than 18 years freedom from reoperation is only 58-68% at 15 years. Tissue engineering of living heart valves seeks to overcome these limitations. One of the most critical problems in heart valve tissue engineering is the progressive development of valvular insufficiency. In an effort to resolve this challenge, a computational model was developed to predict the in vivo remodeling process in tissue engineered heart valves subjected to dynamic pulmonary and aortic pressure conditions, and to assess the risk of valvular insufficiency.

Frank Baaijens
Technische Universiteit Eindhoven, The Netherlands

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Tuesday, July 12

MS27

Mathematical Modeling and Simulations of Cellular Dynamics - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom I - Conference Level

For Part 2 see MS40

This minisymposium aims to bring researchers in applied mathematics with diverse background to address recent advances in mathematical modeling and computational technologies for cell biology that include (but not limited to) cell oscillation and polarization, cell motility, cancer tumor growth and cell mitosis etc. Such systems usually consist of multiple interacting components that exhibit complicated temporal and spatial dynamics with multiple time and length scales, which are extremely difficult to model and make faithful predictions. In this mini symposium, the challenges of modeling these complex cellular systems will be discussed and, moreover, the new analytical and computational techniques to simulate these models will also be presented.

Organizer: Jia Zhao

University of North Carolina at Chapel Hill, USA

Organizer: Qi Wang

University of South Carolina, USA and Beijing Computational Science Research Center, China

10:30-10:55 A Multiphase Complex-Fluids Model for Collective Cell Motions on Patterned Substrate

Qi Wang, University of South Carolina, USA and Beijing Computational Science Research Center, China

11:00-11:25 Jamming and Glassy Behavior in Dense Biological Tissues

Dapeng Bi, Rockefeller University, USA

11:30-11:55 Modeling Keratinocyte Wound Healing: Cell-Cell Adhesion Promotes Collective Migration

John Nardini and David M. Bortz, University of Colorado Boulder, USA

12:00-12:25 Model Cell-ECM Interactions in Cancer Invasion

Xiuxiu He and Yi Jiang, Georgia State University, USA

Tuesday, July 12

MS28

Micro-organism Locomotion in Complex Environments from Flagellar Mechanics to Function - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom II - Conference Level

For Part 2 see MS41

Many cells and micro-organisms swim using thin flexible appendages called flagella, whose structure is common to a variety of organisms. The beating motion of a flagellum is an emergent behavior arising from the interactions between molecular motors that power the motion, the passive mechanics of the flagella, and the external environment. Talks in this session present results from experiments, numerics, and analysis that focus on locomotion in complex fluids, how the environment effects locomotion strategies, and how small scale mechanics of the flagellum are related to the large scale behaviors of organisms.

Organizer: Becca Thomases

University of California, Davis, USA

Organizer: Robert D. Guy

University of California, Davis, USA

10:30-10:55 Flexibility and Waveform Analysis for Flagellar Motility in Viscoelastic Fluids

Becca Thomases and Robert Guy, University of California, Davis, USA

11:00-11:25 Oscillations in Active, Viscoelastic, Filament-Motor Biological Systems

Arvind Gopinath, University of California, Merced, USA

11:30-11:55 Swimming in Complex Fluids: Experiments with Model Organisms

Paulo E. Arratia, University of Pennsylvania, USA; Arvind Gopinath, University of California, Merced, USA; Boyang Qin, University of Pennsylvania, USA

12:00-12:25 A Numerical Study on Flagellar Kinematics in Different Fluid Rheologies

Chuanbin Li, Robert D. Guy, and Becca Thomases, University of California, Davis, USA

Tuesday, July 12

MS29

Celebrating Charles S. Peskin's 70th Birthday: Mathematical and Experimental Models in Cell Biology - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom III - Conference Level

For Part 2 see MS42

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on mathematical models and quantitative experimental techniques in cell biology.

Organizer: Samuel A. Isaacson

Boston University, USA

Organizer: Sookkyung Lim

University of Cincinnati, USA

10:30-10:55 Mathematical Modeling and Computational Methods for the Tumor Microenvironment

Robert H. Dillon, Jie Zhao, Adnan Morshed, and Prashanta Dutta, Washington State University, USA

11:00-11:25 Modeling Polymorphic Transformation of Bacterial Flagella

William Ko and Sookkyung Lim, University of Cincinnati, USA

11:30-11:55 Incorporating Cellular Substructure into Reaction-Diffusion Models

Samuel A. Isaacson, Boston University, USA

12:00-12:25 Mathematical Models of Telomere Length Regulation

Ignacio A. Rodriguez-Brenes, University of California, Irvine, USA

Tuesday, July 12

MS30

Molecular Bioscience and Biophysics - Recent Advances of Membrane Modeling and Computation - Part II of II

10:30 AM-12:30 PM

Room:Burroughs - Conference Level

For Part 1 see MS16

Dynamics of lipid bilayer in vivo involves multiscale interactions with surrounding fluid and other macromolecular complexes. To date, grand challenges remain in high-fidelity modeling and efficient computation of the composition variations, large deformation and topological changes of membrane induced by multiscale electrostatic, entropic, hydrodynamics, and mechanical interactions. This minisymposium will (1) address some of the most interesting topics in modeling of bilayer membranes, including coupling of asymmetric bilayers, protein insertion and pore formation, pattern formation, multicomponent coupling, fluid-vesicle coupling, fluid-electrostatics-vesicle coupling, and fast algorithms; (2) nurture collaborations among investigators in applied and computational mathematics, biophysics, and mechanical engineering.

Organizer: Shuwang Li

Illinois Institute of Technology, USA

Organizer: Yongcheng Zhou

Colorado State University, USA

10:30-10:55 Phase-Field Free Energy and Boundary Force for Molecular Solvation

Shibin Dai, New Mexico State University, USA

11:00-11:25 Calculating Energy Barriers and Activation States for Steps of Fusion

Rolf Ryham, Fordham University, USA

11:30-11:55 Turning Phenomenon in a Physical Model of Cell Migration

Yanxiang Zhao, George Washington University, USA

12:00-12:25 Domain Dynamics of Lipid Vesicle Membranes

Prerna Gera and David Salac, State University of New York at Buffalo, USA

Tuesday, July 12

MS31

Mathematical Modeling of Biological Growth and Deformation - Part I of II

10:30 AM-12:30 PM

Room:Carlton - Conference Level

For Part 2 see MS44

Biological growth and deformation play critical roles in processes such as wound healing, swelling, tumor growth and angiogenesis. Biological growth refers to mass increase, and deformation refers to changes in displacement. These two processes often occur simultaneously or as a result of another. They involve interactions among proteins, cells, tissues, organs, and water flows. The modeling techniques include continuum mechanics, cell-based and agent-based approaches, or hybrid models. Areas represented by the speakers include mathematical modeling of the blood vessel growth, soft tissue swelling, and growth and deformation in a variety of physiological or pathological processes.

Organizer: Xiaoming Zheng

Central Michigan University, USA

Organizer: Kun Gou

Texas A&M University, Kingsville, USA

10:30-10:55 A Viscoelastic Model of Blood Capillary Growth

Xiaoming Zheng, Central Michigan University, USA; Chunjing Xie, Shanghai Jiao Tong University, China

11:00-11:25 Computational Modeling of Early Brain Morphogenesis

Zi Chen, Nan Hu, and Lina Zhang, Dartmouth College, USA; Eric Dai, Washington University, USA

11:30-11:55 Morphological Stability Analysis of An Elastic Tumor-Host Interface

Emma Turian and Shuwang Li, Illinois Institute of Technology, USA

12:00-12:25 Modeling Growth of Residually Stressed Biological Tissue Within An Eulerian Framework

Maya E. Johnson and Jay R. Walton, Texas A&M University, USA

Tuesday, July 12

MS32

Modeling Cardiac Arrhythmias and Applications - Part I of II

10:30 AM-12:30 PM

Room:Griffin - Conference Level

For Part 2 see MS45

Cardiac arrhythmias like atrial and ventricular fibrillation are significant health problems, and many efforts are being directed at improving the modeling of these diseases in ways that ultimately can be applied clinically to improve patient health. This two-part minisymposium will span advances in mathematical and computational modeling as well as steps toward impactful applications. On the modeling side, topics such as incorporating data into simulations, the effects of noise and stochasticity, and advanced numerical techniques will be discussed. Applications will include patient-specific modeling, validation, and efforts to aid clinicians in treating challenging arrhythmias.

Organizer: Elizabeth M. Cherry

Rochester Institute of Technology, USA

10:30-10:55 Estimation of Dynamical Variables in a Cardiac Myocyte Model

Laura Munoz and Kalyan Pusarla, Rochester Institute of Technology, USA

11:00-11:25 Effects of Temporal Noise versus Spatial Stochastic Distribution on Cardiac Focal Activity

Alireza Aghighi, James Elber Duverger, and *Philippe Comtois*, Université de Montréal, Canada

11:30-11:55 Electrocardiac Defibrillation Simulations Using Sharp Boundary Method

Hyunkyung Lim, Shuai Xue, and James G. Glimm, State University of New York, Stony Brook, USA; Flavio M. Fenton, Georgia Institute of Technology, USA; Elizabeth M. Cherry, Rochester Institute of Technology, USA

12:00-12:25 Reconstructing 3D Reentrant Cardiac Electrical Wave Dynamics Using Data Assimilation

Matthew J. Hoffman and Elizabeth M. Cherry, Rochester Institute of Technology, USA; Flavio M. Fenton, Georgia Institute of Technology, USA; Nicholas LaVigne, State University of New York, Geneseo, USA

Tuesday, July 12

MS33

Collective Dynamics in the Life and Social Sciences - Part I of II

10:30 AM-12:30 PM

Room:Lewis - Conference Level

For Part 2 see MS46

Collective behaviour is an important feature of interacting particle models in the life and social sciences. Here, interactions among particles may lead to the synchronization of characteristics, such as speed or direction. In this minisymposium, we aim to highlight recent advances in the field of collective dynamics. Motivated by experiments, we focus on mathematical models, their simulation and analysis. These models often develop complex patterns and steady states, whose dynamics are seldom well understood. We bring together researchers studying different aspects of collective dynamics to advance further progress and discussion among disciplines.

Organizer: Alethea Barbaro

Case Western Reserve University, USA

Organizer: Marie-Therese Wolfram

Radon Institute for Computational and Applied Mathematics, Austria

10:30-10:55 A Coupled Reaction-Diffusion Model for Gang Territorial Development

Alethea Barbaro, Abdulaziz Alsenafi, and Wanda Strychalski, Case Western Reserve University, USA

11:00-11:25 Swarm Robotic Control Strategies Inspired by Biological Collective Behaviors

Spring M. Berman, Arizona State University, USA

11:30-11:55 A Local PDE Model of Aggregation Formation in Bacterial Colonies

Paul Chavy-Waddy and *Theodore Kolokolnikov*, Dalhousie University, Canada

12:00-12:25 Collective Behavior in Systems with Active Sensing

Nicole Abaid, Virginia Tech, USA

Tuesday, July 12

MS34

Algebra and Geometry of Genome Evolution - Part I of II

10:30 AM-12:30 PM

Room:Paine - Lobby Level

For Part 2 see MS47

Evolutionary biologists use binary leaf-labeled trees as models to describe how species across the tree of life are related. Genomic data in the form of DNA sequences from present species are used to reconstruct such unknown trees. Mathematical tools from algebraic geometry and other areas are used to prove properties of such models such as identifiability.

Organizer: James H. Degnan

University of Canterbury, New Zealand

10:30-10:55 Linear Invariants for F81 and Other Evolutionary Models

Marta Casanellas, Universitat Politecnica de Catalunya, Spain; Mike Steel, University of Canterbury, New Zealand

11:00-11:25 An Algebraic Approach to Determine a Minimal Weighted Inversion Distance

Sangeeta Bhatia, University of Western Sydney, Australia

11:30-11:55 Topological Algebras in Bacterial Genome Rearrangements

Shona Yu, University of Western Sydney, Australia

12:00-12:25 A Bayesian Approach to Inferring Rates of Selfing and Locus-Specific Mutation

Benjamin Redelings, Seiji Kumagai, and Marcy Uyenoyama, Duke University, USA

Tuesday, July 12

MS35

Applications of Multiple Time Scale Dynamics In Biological Systems - Part I of II

10:30 AM-12:30 PM

Room:Stone - Lobby Level

For Part 2 see MS48

Many biological rhythms evolve over multiple spatial and temporal scales. Elucidating the mathematical and biological mechanisms that underlie these rhythms and the transitions between them is a significant undertaking. New phenomena, such as torus canards and three-time-scale singularities, have recently been linked with interesting and unexpected behaviour in neuronal dynamics. However, theoretical and numerical tools for analyzing such features have yet to be properly developed. This two-part session surveys some of the exciting new theoretical, numerical, and modeling developments in multi-scale dynamics and their applications to biological systems.

Organizer: Theodore Vo

Boston University, USA

Organizer: Jonathan Rubin

University of Pittsburgh, USA

10:30-10:55 Generic Torus Canards & A Novel Class of Elliptic Bursting Rhythms

Theodore Vo and Tasso J. Kaper, Boston University, USA

11:00-11:25 Interacting Oscillation Mechanisms in Three-Time-Scale Systems

Benjamin Letson and Jon Rubin, University of Pittsburgh, USA; Theodore Vo, Boston University, USA

11:30-11:55 Finding Canards with the Zero Derivative Principle

Morten Brons, Technical University of Denmark, Denmark; Mathieu Desroches, Inria Paris-Rocquencourt, France; Simon Grejs, Technical University of Denmark, Denmark

12:00-12:25 The Effect of Quasi-Steady-State Reductions in the Analysis of Biophysical Models

Sebastian Boie, Vivien Kirk, and James Sneyd, University of Auckland, New Zealand; Martin Wechselberger, University of Sydney, Australia

Tuesday, July 12

MS36

Connecting Network Architecture and Network Computation - Part I of II

10:30 AM-12:30 PM

Room:Webster - Lobby Level

For Part 2 see MS49

Through new experimental techniques as well as high-throughput ventures such as the Allen Institute, we enjoy today a rapidly increasing amount of high-quality data about detailed neural network connectivity. The speakers in this session will connect specific features of network connectivity with network-level computations. Network features such as heterogeneity, clustering, and spatial connectivity structure will be addressed. Network-level computations include inference in the face of changing environments or conflicting evidence.

Organizer: Andrea K. Barreiro

Southern Methodist University, USA

Organizer: Katherine Newhall

University of North Carolina at Chapel Hill, USA

10:30-10:55 Symmetries Constrain Dynamics in a Family of Balanced Neural Networks

Andrea K. Barreiro, Southern Methodist University, USA; J. Nathan Kutz and Eli Shlizeman, University of Washington, USA

11:00-11:25 Learning and Evidence Accumulation in Changing Environments

Krešimir Josic and Adrian Radillo, University of Houston, USA; Alan Veliz-Cuba, University of Dayton, USA; Zachary Kilpatrick, University of Houston, USA

11:30-11:55 Spiking and Oscillatory Dynamics in the Frontoparietal Attention Network during Sustained Attention in the Ferret

Kristin Sellers, Chunxiu Yu, Zhe Charles Zhou, Iain Stitt, Yuhui Li, Susanne Radtke-Schuller, Sankaraleengam Alagapan, and Flavio Frohlich, University of North Carolina at Chapel Hill, USA

12:00-12:25 Building a Theory of Subsampled Networks from the Bottom Up

Braden Brinkman, Fred Rieke, and Eric Shea-Brown, University of Washington, USA; Michael Buice, Allen Institute for Brain Science, USA

Tuesday, July 12

MS37

Strategies for Evolutionary Adaptation in Biological Systems

10:30 AM-12:00 PM

Room:Revere - Lobby Level

Living organisms must constantly adapt to changing environments with an appropriate response that enables survival. In this session, will discuss how different evolutionary strategies for adaptation are employed at the genetic, cellular and organismal levels. We will focus on how mathematical and computational models can be used to understand these mechanisms, and how these methods contribute to our understanding of evolvability in biology.

Organizer: Loretta Au

University of Chicago, USA

10:30-10:55 Detecting Protein Coevolutionary Signals in the Absence of Persistent Structural Order

Loretta Au and D. Allan Drummond, University of Chicago, USA

11:00-11:25 Phenotypic Buffering and Adaptation

John Reinitz and *Pengyao Jiang*, University of Chicago, USA

11:30-11:55 Modeling Evolution at Multiple Scales in the Context of Host-Pathogen Coevolution

Jeewoen Shin and Thomas MacCarthy, State University of New York, Stony Brook, USA

Tuesday, July 12

MS38

Immune Repertoires Models and Analysis - Part I of II

10:30 AM-12:00 PM

Room:Alcott - Mezzanine Level

For Part 2 see MS50

Large scale sequencing experiments of B and T cell receptors are standard in recent years. These observed repertoires represent classical micro-ecologies and can be used to understand the immune system dynamics, but also general arguments in ecology and evolution. New computational and statistical methods have been developed to define these repertoires and extract meaningful information from the clone combination. We present current state of the art data analysis, modeling approaches combining population structure and genetic information to translate observed B and T cell receptor sequences into mechanistic aspects of the immune response. Such methods are applicable in all domains of ecology and evolution.

Organizer: Yoram Louzoun

Bar-Ilan University, Israel

10:30-10:55 Computational Methods for Repertoire Diversity Estimate

Yoram Louzoun, Bar-Ilan University, Israel

11:00-11:25 Diversity and Selection in Adaptive Immune Repertoires

Aleksandra Walczak, ENS, France; *Yuval Elhanati*, École Normale Supérieure Paris, France

11:30-11:55 Computational Modelling of Adaptive Immune Responses to Influenza Vaccination

Jacob Glanville, Stanford University, USA

Tuesday, July 12

MS39

Predicting Therapeutic Outcomes using Mathematical Models of Cancer - Part I of II

10:30 AM-12:30 PM

Room:Adams - Mezzanine Level

For Part 2 see MS51

Mathematical models are increasingly being employed to elucidate the multi-scale dynamics that drive tumor progression. The formulation of these models depends on the questions being asked and the data available. At times, non-spatial deterministic models (ordinary differential equations, game theoretic approaches) suffice, and in other cases more complexity (spatial models, hybrid approaches, etc.) is required. As models are becoming more proficient at capturing tumor complexity, they are further being used to gain insight into treatment response. In this minisymposium, we will explore how different mathematical models help to improve our understanding of tumor response to anti-cancer drugs.

Organizer: Jana Gevertz

The College of New Jersey, USA

Organizer: Jill Gallagher

H. Lee Moffitt Cancer Center & Research Institute, USA

10:30-10:55 How a Tumor's Phenotypic Distribution Can Guide Treatment Strategy

Jill Gallaher, H. Lee Moffitt Cancer Center & Research Institute, USA

11:00-11:25 Tumor Heterogeneity and its Implications in Drug Resistance

Jim Greene, Rutgers University, USA

11:30-11:55 Evolutionary Dynamics of Cancer and its Response to Treatment

Ivana Bozic, Harvard University, USA

12:00-12:25 Optimizing Oncolytic Virotherapy in Combination with Immunostimulation

Joanna Wares, University of Richmond, USA

Tuesday, July 12

CP5

Cell and Molecular Biology - Part II

10:30 AM-12:30 PM

Room:Hancock - Lobby Level

Chair: Andrey A. Dovzhenok, University of Cincinnati, USA

10:30-10:45 Mathematical Modeling and Experimental Validation of Cell Cycle and Circadian Clock Coupling in Adult Stem Cell Cultures

Andrey A. Dovzhenok, Toru Matsu-Ura, Eitaro Aihara, Jill Rood, Yan Ren, Tongli Zhang, Marshall Montrose, Sookkyung Lim, Sean Moore, and Christian Hong, University of Cincinnati, USA

10:50-11:05 Structured Cell Population Models with Internal Cell Cycle

Willy Govaerts and Charlotte Sonck, Ghent University, Belgium; Markus Kirkilionis, University of Warwick, United Kingdom

11:10-11:25 Model of Bacterial Chemotaxis and its Simulation

Mustafa Elmas, University of Tennessee, USA

11:30-11:45 A Deep-Learning Method for Protein-Protein Interface Residue Pair Prediction

Xinqi Gong, Renmin University of China, China

11:50-12:05 Computational Modeling of Calcium Transient Response in Urinary Bladder Smooth Muscle Cell

Chitaranjan Mahapatra and Rohit Manchanda, Indian Institute of Technology Bombay, India

12:10-12:25 Stability Analysis of Signal Peptide Mutants

Pranveer Singh, Indira Gandhi National Tribal University (IGNTU), India

Tuesday, July 12

CP6

Health

10:30 AM-12:10 PM

Room:Hale - Mezzanine Level

Chair: Asma Azizi Boroojeni, Tulane University, USA

10:30-10:45 Modeling the Impact of Screening and Partner Notification on Chlamydia Intervention in New Orleans

Asma Azizi Boroojeni, James Mac Hyman, Jeremy Dewar, and Patricia Kissinger, Tulane University, USA

10:50-11:05 Predicting the Number of Multiple Chronic Conditions in Older Adults in Us-Mexico Border Using Rapidminer

Najah Al-Shanableh, Inna Pivkina, and Kristynia Robinson, New Mexico State University, USA

11:10-11:25 Investigate the Drivers for Non-elective Admissions Among Patients in Sheffield

Aramide T. Gbolahan, Keith Burley, Shona Kelly, and Teresa B. X, Sheffield Hallam University, United Kingdom

11:30-11:45 A Quantitative Analysis of Statistical Power Identifies Limitations in Exploratory Studies of Obesity Endpoints in Mice

Jangir Selimkhanov, Pfizer Inc., USA; Juen Guo, National Institutes of Health, USA; Kevin Hall, NIDDK, NIH, USA; Clay Thompson and Cynthia Musante, Pfizer Inc., USA

11:50-12:05 Development of An Expert System for Improving Post-Accident Monitoring Protocols in Nuclear Industry

Leila Gharsalli, Mathilde Vincent, Estelle Davesne, Eric Chojnacki, and Eric Blanchardon, IRSN, France

Prizes and Awards Luncheon

(Offsite at the connected Convention Center - BCEC)

Connected by Skywalk from the Westin

12:30 PM-2:00 PM

Room:BCEC Room 253ABC

Tuesday, July 12

SP2

The John von Neumann Lecture: Satisfiability and Combinatorics

2:30 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: L. Pamela Cook, University of Delaware, USA

The Satisfiability Problem, which asks whether or not a given Boolean formula can be satisfied for some values of its variables, has long been thought to be computationally hopeless. Indeed, SAT is the well-known "Poster Child" for NP-complete problems. But algorithmic breakthroughs have made it possible for many important special cases of the problem to be solved efficiently. Industrial-strength "SAT solvers" have become a billion-dollar industry, and they play a vital part in the design of contemporary computers. The speaker will explain how the new SAT technology also helps us to solve a wide variety of problems that belong to combinatorial mathematics.

Donald E. Knuth
Stanford University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Tuesday, July 12

MS40

Mathematical Modeling and Simulations of Cellular Dynamics - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom I - Conference Level

For Part 1 see MS27

This minisymposium aims to bring researchers in applied mathematics with diverse background to address recent advances in mathematical modeling and computational technologies for cell biology that include (but not limited to) cell oscillation and polarization, cell motility, cancer tumor growth and cell mitosis etc. Such systems usually consist of multiple interacting components that exhibit complicated temporal and spatial dynamics with multiple time and length scales, which are extremely difficult to model and make faithful predictions. In this mini symposium, the challenges of modeling these complex cellular systems will be discussed and, moreover, the new analytical and computational techniques to simulate these models will also be presented.

Organizer: Jia Zhao

University of North Carolina at Chapel Hill, USA

Organizer: Qi Wang

University of South Carolina, USA and Beijing Computational Science Research Center, China

4:00-4:25 Hydrodynamic Theories for Pattern Formation in Clusters of Stem Cells and Differentiated Cells
Xueping Zhao, University of South Carolina, USA; Qi Wang, University of South Carolina, USA and Beijing Computational Science Research Center, China

4:30-4:55 Kinetic Monte Carlo Simulations of Multicellular Aggregate Self-Assembly in Biofabrication
Yi Sun, University of South Carolina, USA

5:00-5:25 Multiscale Modeling of Angiogenesis
Samara Pillay, Philip Maini, and Helen Byrne, University of Oxford, United Kingdom

5:30-5:55 A Hydrodynamic Model of Cell Cytokinesis Driven by Actomyosin Contractile Ring
Jia Zhao, University of North Carolina at Chapel Hill, USA

Tuesday, July 12

MS41

Micro-organism Locomotion in Complex Environments from Flagellar Mechanics to Function - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom II - Conference Level

For Part 1 see MS28

Many cells and micro-organisms swim using thin flexible appendages called flagella, whose structure is common to a variety of organisms. The beating motion of a flagellum is an emergent behavior arising from the interactions between molecular motors that power the motion, the passive mechanics of the flagella, and the external environment. Talks in this session present results from experiments, numerics, and analysis that focus on locomotion in complex fluids, how the environment effects locomotion strategies, and how small scale mechanics of the flagellum are related to the large scale behaviors of organisms.

Organizer: Becca Thomases

University of California, Davis, USA

Organizer: Robert D. Guy

University of California, Davis, USA

4:00-4:25 Wonders of Bacterial Motility
Howard Berg, Harvard University, USA

4:30-4:55 Marine Bacteria Exploit a Flagellar Buckling Instability for Reorientation and Chemotaxis
Kwangmin Son, Massachusetts Institute of Technology, USA; Jeffrey Guasto, Tufts University, USA; Filippo Menolascina, Massachusetts Institute of Technology, USA; Roman Stocker, ETH Zürich, Switzerland

5:00-5:25 Effects of Shear on Bacterial Motility in Porous Media Flows
Jeffrey Guasto, Nicolas Waisbord, and Amin Dehkharghani, Tufts University, USA; Norbert Stoop and Joern Dunkel, Massachusetts Institute of Technology, USA

5:30-5:55 Role of Flagellar Bending Stiffness on Sperm Motility
Sarah D. Olson, Worcester Polytechnic Institute, USA

Tuesday, July 12

MS42

Celebrating Charles S. Peskin's 70th Birthday: Mathematical and Experimental Models in Cell Biology - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom III - Conference Level

For Part 1 see MS29

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on mathematical models and quantitative experimental techniques in cell biology.

Organizer: Samuel A. Isaacson

Boston University, USA

Organizer: Sookkyung Lim

University of Cincinnati, USA

4:00-4:25 Calcium Dynamics: The Interaction of Theory and Experiment

James Sneyd, University of Auckland, New Zealand

4:30-4:55 Modeling Type 2 Diabetes Pathogenesis

Arthur S. Sherman and Joon Ha, National Institutes of Health, USA

5:00-5:25 From a Network of 10,000 Neurons to a Smartphone App with 125,000 Users: Linking Scales in Biological Rhythms

Daniel Forger, University of Michigan, USA

5:30-5:55 Abrupt Transitions to High Frequency Firing Caused by Recurrent Excitation in Neuronal Networks

Christoph Borgers and Ryusei Melody Takeuchi, Tufts University, USA; Daniel Rosebrock, Broad Institute of MIT and Harvard University, USA

Tuesday, July 12

MS43

Molecular Bioscience and Biophysics-multiscale Modeling of Solvation - Part I of II

4:00 PM-6:00 PM

Room:Burroughs - Conference Level

For Part 2 see MS55

The understanding of solvation is an essential prerequisite for the quantitative description and analysis of biomolecular systems because solvation is an elementary process in nature and is of paramount importance to many biomolecular processes. Robust models of polar and nonpolar interactions are vital to understanding the solvation properties of biomolecules and the effects of solvation upon biomolecular folding, binding, enzyme catalysis, and dynamic. Multiscale models of solvation have been used to treat different regions of the molecular systems. In this session, invited speakers will present a wide range of multiscale simulation methodologies in hybrid models of solvation.

Organizer: Zhan Chen

Georgia Southern University, USA

Organizer: Jaydeep Bardhan

Northeastern University, USA

4:00-4:25 Modeling and Computation of Molecular Solvation

Bao Wang, Michigan State University, USA

4:30-4:55 Adaptive Boundaries and Transferable Potentials in Multi-Resolution Simulations

Jason Wagoner, Stony Brook University, USA

5:00-5:25 Solvation Free Energy Decomposition Using the 3D-RISM Theory of Molecular Solvation

Tyler Luchko, California State University, Northridge, USA

5:30-5:55 Differential Geometry Based Multiscale Solvation Models

Zhan Chen, Georgia Southern University, USA

Tuesday, July 12

MS44

Mathematical Modeling of Biological Growth and Deformation - Part II of II

4:00 PM-6:00 PM

Room:Carlton - Conference Level

For Part 1 see MS31

Biological growth and deformation play critical roles in processes such as wound healing, swelling, tumor growth and angiogenesis. Biological growth refers to mass increase, and deformation refers to changes in displacement. These two processes often occur simultaneously or as a result of another. They involve interactions among proteins, cells, tissues, organs, and water flows. The modeling techniques include continuum mechanics, cell-based and agent-based approaches, or hybrid models. Areas represented by the speakers include mathematical modeling of the blood vessel growth, soft tissue swelling, and growth and deformation in a variety of physiological or pathological processes.

Organizer: Xiaoming Zheng

Central Michigan University, USA

Organizer: Kun Gou

Texas A&M University, Kingsville, USA

4:00-4:25 Mathematical Modeling of Human Pregnant Cervix

Kun Gou, Texas A&M University, Kingsville, USA; Thomas Pence, Michigan State University, USA

4:30-4:55 Modeling of Growth, Gene, and Protein Expression in Biofilms

Tianyu Zhang and Philip Stewart, Montana State University, USA; Isaac Klapper, Temple University, USA; Breanna Pabst, Montana State University, USA

5:00-5:25 A Biochemical and Mechanical Model of Injury-Induced Intimal Thickening

Rebecca Sanft, University of North Carolina at Asheville; Pak-Wing Fok, University of Delaware, USA

5:30-5:55 Modeling the Effects of Focal Adhesion Size and Distribution on Stress Fiber Activity and Cell Shape

Magda Stolarska, University of St. Thomas, USA; Aravind Rammohan, Corning Incorporated, USA; Kara Huyett, University of St. Thomas, USA

Tuesday, July 12

MS45

Modeling Cardiac Arrhythmias and Applications - Part II of II

4:00 PM-6:00 PM

Room:Griffin - Conference Level

For Part 1 see MS32

Cardiac arrhythmias like atrial and ventricular fibrillation are significant health problems, and many efforts are being directed at improving the modeling of these diseases in ways that ultimately can be applied clinically to improve patient health. This two-part minisymposium will span advances in mathematical and computational modeling as well as steps toward impactful applications. On the modeling side, topics such as incorporating data into simulations, the effects of noise and stochasticity, and advanced numerical techniques will be discussed. Applications will include patient-specific modeling, validation, and efforts to aid clinicians in treating challenging arrhythmias.

Organizer: Elizabeth M. Cherry

Rochester Institute of Technology, USA

4:00-4:25 Credibility of Predictions of Computational Models of the Heart Given Validation Evidence

Pras Pathmanathan and Richard Gray, U.S. Food and Drug Administration, USA

4:30-4:55 A Catheter-Simulator Software Tool to Generate Electrograms of Any Multi-Polar Diagnostic Catheter from 2D and 3D Atrial Tissue

Kristina Shillieto, Prasanth Ganesan, Anthony Salmin, and Elizabeth M. Cherry, Rochester Institute of Technology, USA; Arkady Pertsov, SUNY Upstate Medical University, USA; *Behnaz Ghoraani*, Rochester Institute of Technology, USA

5:00-5:25 Patient-Specific Fitting of Detailed and Simplified Models of Human Atrial Myocytes for Modeling Atrial Fibrillation

Daniel Lombardo, University of California, San Diego, USA; Flavio M. Fenton, Georgia Institute of Technology, USA; Sanjiv Narayan, Stanford University, USA; Wouter-Jan Rappel, University of California, San Diego, USA

5:30-5:55 New Approaches to Identify the Pivot Point of Rotor

Elena Tolkacheva, University of Minnesota, USA

Tuesday, July 12

MS46

Collective Dynamics in the Life and Social Sciences - Part II of II

4:00 PM-6:00 PM

Room:Lewis - Conference Level

For Part 1 see MS33

Collective behaviour is an important feature of interacting particle models in the life and social sciences. Here, interactions among particles may lead to the synchronization of characteristics, such as speed or direction. In this minisymposium, we aim to highlight recent advances in the field of collective dynamics. Motivated by experiments, we focus on mathematical models, their simulation and analysis. These models often develop complex patterns and steady states, whose dynamics are seldom well understood. We bring together researchers studying different aspects of collective dynamics to advance further progress and discussion among disciplines.

Organizer: Alethea Barbaro

Case Western Reserve University, USA

Organizer: Marie-Therese Wolfram

Radon Institute for Computational and Applied Mathematics, Austria

4:00-4:25 A Boltzmann Mean Field Game Model for Knowledge Growth

Marie-Therese Wolfram, University of Warwick, United Kingdom; Martin Burger, University of Münster, Germany; Alexander Lorz, UPMC, France

4:30-4:55 Lane Formation by Side-Stepping

Helene Ranetbauer, Radon Institute for Computational and Applied Mathematics, Austria

5:00-5:25 Analytical and Numerical Investigation of Nonlocal Hyperbolic Models for Collective Behavior in Animals and Cells

Raluca Eftimie, University of Dundee, United Kingdom

5:30-5:55 Models of Collective Dynamics with Complex Orientation Mechanisms

Pierre Degond and *Sara Merino-Aceituno*, Imperial College of London, United Kingdom

Tuesday, July 12

MS47

Algebra and Geometry of Genome Evolution - Part II of II

4:00 PM-6:00 PM

Room:Paine - Lobby Level

For Part 1 see MS34

Evolutionary biologists use binary leaf-labeled trees as models to describe how species across the tree of life are related. Genomic data in the form of DNA sequences from present species are used to reconstruct such unknown trees. Mathematical tools from algebraic geometry and other areas are used to prove properties of such models such as identifiability.

Organizer: James H. Degnan

University of Canterbury, New Zealand

4:00-4:25 Invariant Measures and Unbiased Statistics for Phylogenetic Quartet Estimation

Jeremy Sumner, University of Tasmania, Australia

4:30-4:55 Split Scores on Phylogenetic Trees with Applications

Elizabeth S. Allman, University of Alaska, Fairbanks, USA; Laura Kubatko, Ohio State University, USA; John A. Rhodes, University of Alaska, Fairbanks, USA

5:00-5:25 Inequality-Based Gene Tree Invariants and Phylogenomic Species Tree Inference

Ruth Davidson, University of Illinois at Urbana-Champaign, USA

5:30-5:55 Displayed Trees Do Not Determine Distinguishability Under the Network Multispecies Coalescent

James H. Degnan, University of Canterbury, New Zealand

Tuesday, July 12

MS48

Applications of Multiple Time Scale Dynamics In Biological Systems - Part II of II

4:00 PM-6:00 PM

Room:Stone - Lobby Level

For Part 1 see MS35

Many biological rhythms evolve over multiple spatial and temporal scales. Elucidating the mathematical and biological mechanisms that underlie these rhythms and the transitions between them is a significant undertaking. New phenomena, such as torus canards and three-time-scale singularities, have recently been linked with interesting and unexpected behaviour in neuronal dynamics. However, theoretical and numerical tools for analyzing such features have yet to be properly developed. This two-part session surveys some of the exciting new theoretical, numerical, and modeling developments in multi-scale dynamics and their applications to biological systems.

Organizer: Jonathan Rubin

University of Pittsburgh, USA

Organizer: Theodore Vo

Boston University, USA

4:00-4:25 Subthreshold Amplitude and Phase Resonance in Models of Quadratic Type: Nonlinear Effects Generated by the Interplay of Slow Resonant and Fast Amplifying Currents

Horacio G. Rotstein, New Jersey Institute of Technology, USA

4:30-4:55 Combining Global Parameter Sampling and Bifurcation Analysis to Study Electrical Activity in a Pituitary Cell Model

Patrick A. Fletcher and Arthur S. Sherman, National Institutes of Health, USA

continued in next column

5:00-5:25 Averaging, Folded Singularities and Torus Canards: Investigating Transitions in a Neuronal Model

Kerry-Lyn Roberts and Martin Wechselberger, University of Sydney, Australia; Jon Rubin, University of Pittsburgh, USA

5:30-5:55 A Study of the Synchronization Between Two Coupled Neuron Models Generating Mixed-Mode Oscillations

Alexandre Vidal, University of Evry-Val-d'Essonne, France; Soledad Garcia-Fernandez, INRIA Paris, France; Frederique Clement, Inria Rocquencourt, France; Fabrizio De Vico Fallani, INRIA Paris, France

Tuesday, July 12

MS49

Connecting Network Architecture and Network Computation - Part II of II

4:00 PM-6:00 PM

Room:Webster - Lobby Level

For Part 1 see MS36

Through new experimental techniques as well as high-throughput ventures such as the Allen Institute, we enjoy today a rapidly increasing amount of high-quality data about detailed neural network connectivity. The speakers in this session will connect specific features of network connectivity with network-level computations. Network features such as heterogeneity, clustering, and spatial connectivity structure will be addressed. Network-level computations include inference in the face of changing environments or conflicting evidence.

Organizer: Andrea K. Barreiro

Southern Methodist University, USA

Organizer: Katherine Newhall

University of North Carolina at Chapel Hill, USA

4:00-4:25 Stimulus-Induced Changes in Spiking Co-Variability in Two Populations

Cheng Ly, Virginia Commonwealth University, USA; Andrea K. Barreiro, Southern Methodist University, USA; Shree Gautam and Woodrow Shew, University of Arkansas, USA

4:30-4:55 Conflict Resolution by a Hippocampal Attractor Network

Kathryn Hedrick, Southern Methodist University, USA

5:00-5:25 Metastability of Gene Networks

Jay Newby, University of North Carolina at Chapel Hill, USA

5:30-5:55 Uncovering Cellular Properties from Network Dynamics

Julijana Gjorgjieva, Max Planck Institute for Brain Research, Germany; Eve Marder, Brandeis University, USA

Tuesday, July 12

MS50

Immune Repertoires Models and Analysis - Part II of II

4:00 PM-5:30 PM

Room:Alcott - Mezzanine Level

For Part 1 see MS38

Large scale sequencing experiments of B and T cell receptors are standard in recent years. These observed repertoires represent classical micro-ecologies and can be used to understand the immune system dynamics, but also general arguments in ecology and evolution. New computational and statistical methods have been developed to define these repertoires and extract meaningful information from the clone combination. We present current state of the art data analysis, modeling approaches combining population structure and genetic information to translate observed B and T cell receptor sequences into mechanistic aspects of the immune response. Such methods are applicable in all domains of ecology and evolution.

Organizer: Yoram Louzoun

Bar-Ilan University, Israel

4:00-4:25 Community Detection in Antibody Repertoires

Gur Yaari, Bar-Ilan University, Israel

4:30-4:55 The Complete T Cell Repertoire of the Zebrafish During a Response to Immunological Challenge

Sol Efroni, Massachusetts Institute of Technology, USA

5:00-5:25 Exploring Antibody Recognition by Comparing Mathematical Models with High-Throughput Antibody Binding Data

Michal Or-Guil, Humboldt State University, Germany

Tuesday, July 12

MS51

Predicting Therapeutic Outcomes using Mathematical Models of Cancer - Part II of II

4:00 PM-6:00 PM

Room:Adams - Mezzanine Level

For Part 1 see MS39

Mathematical models are increasingly being employed to elucidate the multi-scale dynamics that drive tumor progression. The formulation of these models depends on the questions being asked and the data available. At times, non-spatial deterministic models (ordinary differential equations, game theoretic approaches) suffice, and in other cases more complexity (spatial models, hybrid approaches, etc.) is required. As models are becoming more proficient at capturing tumor complexity, they are further being used to gain insight into treatment response. In this minisymposium, we will explore how different mathematical models help to improve our understanding of tumor response to anti-cancer drugs.

Organizer: Jana Gevertz

The College of New Jersey, USA

Organizer: Jill Gallagher

H. Lee Moffitt Cancer Center & Research Institute, USA

4:00-4:25 Limiting the Development of Anti-Cancer Drug Resistance in a Spatial Model of Micro-Metastases

Jana Gevertz, The College of New Jersey, USA

4:30-4:55 Cancer Stem Cells, Hierarchically Organized Tumors and Estimating Treatment Outcomes Using Mathematical Modeling and Patient-Specific Tumor Burden

Philipp M. Altrock, Dana-Farber Cancer Institute and Harvard School of Public Health

5:00-5:25 Mathematical Modelling of Cancer Heterogeneity and Drug Resistance

Mohammad Kohandel, University of Waterloo, Canada

5:30-5:55 Mathematical Models of Cancer Vaccines: How to Get the Right Things to the Right Place at the Right Time

Ami Radunskaya, Pomona College, USA

Tuesday, July 12

CP7

Fluid Dynamics

4:00 PM-5:20 PM

Room:Hancock - Lobby Level

Chair: To Be Determined

4:00-4:15 Fluctuating Hydrodynamic Methods for Manifolds: Protein Dynamics in Curved Lipid Bilayer Membranes

Paul J. Atzberger and *Ben J. Gross*, University of California, Santa Barbara, USA

4:20-4:35 Chiari I Malformation Results in Transitional Like Hydrodynamics of the Cerebrospinal Fluid Near Cranio-Vertebral Junction - A Computational Study

Kartik Jain and Sabine P. Roller, Universitaet Siegen, Germany; Kent-Andre Mardal, University of Oslo, Norway

4:40-4:55 Numerical Aspects of Optimal Control for Water Treatment Problem

Mohammed Louaked, Caen University, France

5:00-5:15 Pulsatile Jeffrey Fluid Flow of Blood in Stenotic Arteries

Bhupesh D. Sharma, Motilal Nehru National Institute of Technology, India

Tuesday, July 12

CP8

Evolution

4:00 PM-5:20 PM

Room:Revere - Lobby Level

Chair: Joel D. Nishimura, Arizona State University, USA

4:00-4:15 Cooperative Aging: The Evolutionary Dynamics Balancing Longevity and Evolvability
Joel D. Nishimura, Minette Herrera, and Aaron Miller, Arizona State University, USA

4:20-4:35 Dynamic MaxEnt Method for the Estimation of Quantitative Trait Evolution
Katarina Bodova, Institute of Science and Technology, Austria

4:40-4:55 The Evolution of Lossy Compression
Sarah Marzen, University of California, Berkeley, USA; Simon DeDeo, Indiana University Bloomington, USA

5:00-5:15 Permanence and Chaos in Dynamical Systems
Sherli Koshy Chenthittayil, Clemson University, USA

Tuesday, July 12

CP9

Infection, Disease and Epidemiology - Part I

4:00 PM-5:40 PM

Room:Hale - Mezzanine Level

Chair: Jessica Conway, Pennsylvania State University, USA

4:00-4:15 Predicting Opiate-Induced HIV Risk Increase
Jessica M. Conway, Pennsylvania State University, USA; Naveen K. Vaidya, University of Missouri, Kansas City, USA

4:20-4:35 Quantifying the Effect of Trypsin on Influenza Infections
Hana Dobrovolny and Hana Jaafari, Texas Christian University, USA

4:40-4:55 Mathematical Models of HIV and HPV Coinfection in the Oral Mucosa
Samantha Erwin, Meghna Verma, Vida Abedi, Raquel Hontecillas-Margarzo, Stefan Hoops, Josep Bassaganya-Riera, and Stanca Ciupe, Virginia Tech, USA

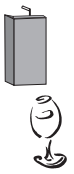
5:00-5:15 Optimal Control for HBV Treatment
Jonathan Forde, Hobart and William Smith Colleges, USA; Stanca Ciupe, Virginia Tech, USA; Suzanne M. Lenhart, University of Tennessee, USA; Ariel Cintron-Arias, East Tennessee State University, USA

5:20-5:35 Identifying Hubs of the 2009 H1N1 Influenza Pandemic in the United States
Stephen M. Kissler and Julia R. Gog, University of Cambridge, United Kingdom; Cecile Viboud, National Institutes of Health, USA; Vivek Charu, Johns Hopkins Bloomberg School of Public Health, USA; Ottar Bjornstad, Pennsylvania State University, USA; Lone Simonsen, George Washington University, USA; Bryan Grenfell, Princeton University, USA

Intermission

6:00 PM-6:15 PM

Tuesday, July 12



SIAM Business Meeting (Class of 2016 Fellows will be recognized.)

6:15 PM-7:15 PM

Room:Grand Ballroom AB- Concourse Level

Complimentary beer and wine will be served.

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

Room:Galleria Level

Mathematical Morphological Distribution Properties Over Union and Intersection
Joseph Ackora-Prah, Kwame Nkrumah University of Science and Technology, Ghana; Robert Acquah, National Institute for Mathematical Sciences, Korea

Macroscopic Dynamics of Heterogeneous Theta Neurons Connected with Chemical Synapses
Akihiko Akao and Yutaro Ogawa, University of Tokyo, Japan; Bard Ermentrout, University of Pittsburgh, USA; Yasuhiko Jimbo and Kiyoshi Kotani, University of Tokyo, Japan

Multiple Chronic Conditions (MCC) Along the US-Mexico Border
Najah Al-Shanableh, Inna Pivkina, and Kristynia Robinson, New Mexico State University, USA

An Age-Structured Model for Cyanobacteria Carboxysome Efficacy
Sabina Altus, David M. Bortz, and Jeffrey Cameron, University of Colorado Boulder, USA

Chains of Differentiation and Tissue Architecture: A Protection Mechanism Against Cancer in Hierarchically Organized Tissues
Cesar Alvarado and Helen Wearing, University of New Mexico, USA; Natalia Komarova, University of California, Irvine, USA

continued on next page

Tuesday, July 12

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

Room:Galleria Level

continued

Protein Dynamics in Curved Lipid Bilayer Membranes: Fluctuating Hydrodynamic Methods for Manifolds

Paul J. Atzberger and Jon Karl Sigurdsson, University of California, Santa Barbara, USA

Symmetric Proteins from Asymmetric Sequences: Lessons from the B-Propeller Fold

Loretta Au, University of Chicago, USA; David Green, State University of New York, Stony Brook, USA

An Inverse Problem for a Time Varying Diffusion Process

Lewis Baker and David M. Bortz, University of Colorado Boulder, USA

Quantifying the Potential of Immunotherapy in Combination with Androgen Ablation for the Treatment of Prostate Cancer

Johnna P. Barnaby and Harsh Jain, Florida State University, USA

Theoretical and Numerical Study of Cardiac Electrophysiology Problems at the Microscopic Scale

Pierre-Elliott Bécue and Florian Caro, Inria Bordeaux Sud-Ouest, France; Mark Potse, University of Lugano, Switzerland; Mostafa Bendahmane, Institut de Mathématiques de Bordeaux, France

Walking of a Single Walker and a Pair of Walkers in the Absence of Orientation Cues

Katarina Bodova, Institute of Science and Technology, Austria

continued in next column

Mathematical Modeling of Endotoxin-Induced Inflammatory Response in Young Men

Renee Brady, North Carolina State University, USA; Dennis Frank-Ito, Duke University Medical Center, USA; Hien Tran, North Carolina State University, USA; Susanne Janum, Frederiksberg Hospital, Denmark; Susanne Brix, Technical University of Denmark, Denmark; Johnny T. Ottesen, Roskilde University, Denmark; Jesper Mehlsen, Frederiksberg Hospital, Denmark; Mette Olufsen, North Carolina State University, USA

Mathematical Modelling Based Hypothesis for the Origins of Cyclical Neutropenia

Tyler Cassidy, Antony Humphries, and Michael Mackey, McGill University, Canada

Polyrhythmic Pattern Generation in Networks with Three-Node CPG Kernels

Jarod Collens, Deniz Alacam, Drake Knapper, Krishna Pusuluri, Justus T. Schwabedal, and Andrey Shilnikov, Georgia State University, USA

A Mathematical Model of Blood Flow Control in the Kidney

Irina Cristali and Anita T. Layton, Duke University, USA

Understanding the Finite State Projection and Related Methods for Solving the Chemical Master Equation

Khanh N. Dinh and Roger Sidje, University of Alabama, USA

A Reduced Model of Cardiac Ion Channel Pharmacology

Steffen S. Docken, Colleen Clancy, and Timothy Lewis, University of California, Davis, USA

Identifying Leading Gene Expression Features to Distinguish Snps Causative of Disease

Shylee Ezroni, Broad Institute of MIT and Harvard University, USA

Sex Differences in the Electrical Properties of Neurons in the Neural Song System of the Zebra Finch

Diana L. Flores, Matthew Ross, Derrick Shaughnessy, Frank Johnson, Richard Hyson, and Richard Bertram, Florida State University, USA

continued in next column

Analysis of Neural Network Models for Sequential Activity

Daniel Galvis, Richard Hyson, Frank Johnson, and Richard Bertram, Florida State University, USA

Nonlinear Microwave Imaging for Breast-Cancer Using a Variational Bayesian Algorithm

Leila Gharsalli, IRSN, France; Hacheme Ayasso, Gipsa-Lab, France; Bernard Duchêne and Ali Mohammad-Djafari, CentraleSupéle, France

Homogenisation Theory with Coupled Cellular Reaction Diffusion Equations

Michelle L. Goodman, Rua Murry, Paul Docherty, and Tim David, University of Canterbury, New Zealand

Recovery Rates in Epidemiological and Ecological Models

Scott W. Greenhalgh and Troy Day, Queen's University, Canada

Numerical Exterior Calculus Approaches for Hydrodynamics on Curved Surfaces

Ben J. Gross and Paul J. Atzberger, University of California, Santa Barbara, USA

A Mathematical Study of Calcium Responses in HSY Cells and Airway Smooth Muscle Cells

Jung Min Han, University of Auckland, New Zealand; Akihiko Tanimura, Hokkaido University, Japan; Michael J. Sanderson, University of Massachusetts Medical School, USA; Martin Wechselberger, University of Sydney, Australia; Vivien Kirk and James Sneyd, University of Auckland, New Zealand

Investigating Experimental Variations in Astrocytes with a Mathematical Model of Calcium Dynamics

Gregory A. Handy, Alla Borisyuk, and Marsa Taheri, University of Utah, USA; John A. White, Boston University, USA

Using the CUR Factorization to Identify Key ECG Morphologies

Emily Hendryx, Rice University, USA; Craig Rusin, Baylor College of Medicine, USA; Beatrice Riviere and Danny C. Sorensen, Rice University, USA

Spatiotemporal Organization of an RNA Polymerase Along a DNA Strand

Seyed Hossein Hosseini and Marc R. Roussel, University of Lethbridge, Canada

continued on next page

A Re-Evaluation of the Concept of Critical Concentration as it Relates to Microtubules

Erin M. Jonasson and Chunlei Li, University of Notre Dame, USA; Ava J. Mauro, University of Massachusetts, Amherst, USA; Shant Mahserejian, University of Notre Dame, USA; Ivan Gregoretti, Cell Signaling Technology, USA; Ellie Norby, Mark S. Alber, and Holly Goodson, University of Notre Dame, USA

Persistant Neural Response in the Aplysia Bag Cell Neuron

Keegan M. Keplinger and Sue Ann Campbell, University of Waterloo, Canada; Neil Magoski, Queen's University, Canada

Chemotactic Response Models for Motile Bacteria

Martin Maxey and *Virginia Kilikian*, Brown University, USA

Onset, Timing, and Exposure Therapy of Stress Disorders: Mechanistic Insight from a Mathematical Model of Oscillating Neuroendocrine Dynamics

Lae U. Kim and Tom Chou, University of California, Los Angeles, USA; Maria D'Orsogna, California State University, Northridge, USA

Altered Excitatory-Inhibitory Dynamics by a Feedback Loop with Long Delays

Christopher Kim, Bernstein Center for Computational Neuroscience, Germany; Arvind Kumar, KTH Stockholm, Sweden; Ulrich Egert, University of Freiburg, Germany

Quasi-Steady State Approximation for Reversible Bimolecular Binding with Application to Alternative Mechanism of Telomere Length Maintenance

Richard Kollar, Comenius University, Bratislava, Slovakia

Determination of Parameters for Chaos in Dynamical Systems

Sherli Koshy Chenthittayil, Elena S. Dimitrova, Brian Dean, Eleanor Jenkins, and Akshay Galande, Clemson University, USA

Rapid Evaluation to Prevent Dangerous Regimens for An Artificial Pancreas Controller

Taisa Kushner, David M. Bortz, and Sriram Sankaranarayanan, University of Colorado Boulder, USA

continued in next column

A Dynamical Analysis of the Transitions to Bursting in Neuronal Cells

Elizaveta Latash, Georgia State University, USA

Modeling Gun Ownership As a Social Disease

Laura Layton, Charles W Stanford Middle School, USA; Anita T. Layton, Duke University, USA

Approaches for Coherent X-Ray Diffraction Imaging of Paramecium Bursaria Chlorella Virus-1

Jing Liu, Uppsala University, Sweden; Akifumi Higashi, Osaka University, Japan; Gijs Schot and Max Hantke, Uppsala University, Sweden; Takashi Yamada, Hiroshima University, Japan; Janos Hajdu, Uppsala University, Sweden; Atsushi Nakagawa, Osaka University, Japan

Image-Based Structural Modeling of the Cardiac Purkinje Network

Benjamin R. Liu, University of Washington, USA

A Novel Approximation Method for Equilibrium Single-Channel Ca^{2+} Domains

Victor Matveev, New Jersey Institute of Technology, USA

Normal Forms and Unfoldings of Conductance-Based Neural Models

Joseph Mckenna, Florida State University, USA

Bidirectionality Induced by Cargo Thermal Fluctuations in Motor-Mediated Transport

Christopher E. Miles and James P. Keener, University of Utah, USA

Noise-Induced Switching in Stochastic Population Models

Garrett Nieddu, Pralhad Burli, Eric Forgoston, and Lora Billings, Montclair State University, USA

Review of Modeling of {cAMP} Action in Pancreatic Beta Cells

Bradford E. Peercy, University of Maryland, Baltimore County, USA

Study of Viral Coinfection Dynamics in Human Respiratory Tract

Lubna Pinky and Hana Dobrovolny, Texas Christian University, USA

Sensory Feedback in a Bump Attractor Model of Path Integration

Daniel Poll, Khanh Nguyen, and Zachary Kilpatrick, University of Houston, USA

continued in next column

One-Dimensional Model of Blood Flow Discretized with Runge-Kutta Discontinuous Galerkin Methods

Charles Puelz and Beatrice Riviere, Rice University, USA; Craig Rusin, Baylor College of Medicine, USA

Mathematical Modeling of the Acute Inflammatory Response and Energy Consumption

Ivan Ramírez Zúñiga, Gilles Clermont, Jonathan Rubin, and David Swigon, University of Pittsburgh, USA

Modeling Baroreflex Regulation of Blood Pressure and Heart Rate During the Valsalva Maneuver

Eric B. Randall, North Carolina State University, USA

Redundancy, Degeneracy, and Robustness in Protein-Interaction Networks

Alice C. Schwarze and Mason A. Porter, University of Oxford, United Kingdom; Jonny Wray, e-Therapeutics Plc, United Kingdom

A Model to Track Density and Average Mass of Brown Shrimp in Gulf of Mexico

Bheemaiah V. Shankaranarayanarao, Jay R Walton, and Masami Fujiwara, Texas A&M University, USA

Host-Pathogen Coevolution Generates Trade-Offs in Complexity Between the Level of the Cell Surface Receptor and the Gene Regulatory Network for Host Resistance

Jeewoen Shin and Thomas MacCarthy, State University of New York, Stony Brook, USA

Global Dynamics of a Mean Field Model of the Neocortex

Farshad Shirani, Wassim Haddad, and Rafael de la Llave, Georgia Institute of Technology, USA

Overcoming Chemotherapy Resistance by Inhibition of Mgmt and Apng in Glioblastoma Multiforme: A Mathematical Approach.

Inmaculada C. Sorribes and Harsh Jain, Florida State University, USA

continued on next page

Tuesday, July 12

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

Room:Galleria Level

continued

Mathematical Modeling of Enzymatic Assays: Incorporating Experimental and Parametric Uncertainty
Michael T. Stobb, University of California, Merced, USA

Abrupt Transitions from Low to High Firing Frequencies in Neurons and Neuronal Networks
Ryusei Melody Takeuchi and Christoph Borgers, Tufts University, USA

Modeling the Distribution of Interspike Intervals of Spontaneous Activity in Afferent Neurons of the Zebrafish Lateral-Line
Nessy Tania, Smith College, USA; Josef Trapani, Amherst College, USA

Asymptotic Phase for Stochastic Oscillators
Peter J. Thomas, Case Western Reserve University, USA; Benjamin Lindner, Bernstein Center for Computational Neuroscience and Humboldt University, Berlin, Germany

Studying the Effects of Antiarrhythmic Drugs on Restitution Properties of Action Potential Duration of Human Ventricular Cells.
Binaya Tuladhar and Hana Dobrovolny, Texas Christian University, USA

Scroll Wave Filaments Pin to Various Objects
Daniel Weingard, Richard Bertram, and Oliver Steinbock, Florida State University, USA

Emergence of Longevity-Dependent Spatial Patterns in the Expression of a Small Heat Shock Protein
Jacqueline M. Wentz and David M. Bortz, University of Colorado Boulder, USA

continued in next column

A PDE-ODE Model of Cell Polarization in Fission Yeast
Bin Xu and Paul C. Bressloff, University of Utah, USA

Numerical Methods for a 2D Convergent Reaction Diffusion Master Equation on Unstructured Mesh
Ying Zhang, Boston University, USA

Modeling Migration of the Zebrafish Posterior Lateral Line Primordium
Leif Zinn-Bjorkman and Frederick Adler, University of Utah, USA

Tuesday, July 12

PP2

Minisymposterium: Mathematical Modeling of the Eye

8:00 PM-10:00 PM

Room:Galleria Level

Kara Maki, Rochester Institute of Technology, USA

The aim of this minisymposterium is to present current mathematical modeling efforts devoted to fundamental understanding of the mechanics and physiology of the eye. The posters address models for the ocular surface with flow of the tear film and its interactions with contact lenses. Posters also address models of the retina. These models are compared closely with in vivo data, and address conditions such as dry eye and glaucoma.

Soft Contact Lens Hydration Modeling
Austin R. Alderete and Daniel M. Anderson, George Mason University, USA

Tear Film Dynamics in Breakup with a Rough Ocular Surface
Amy Janett, University of Delaware, USA

Tear Film Rupture Driven by Locally Elevated Evaporation Rates
Hangjie Ji and Thomas P. Witelski, Duke University, USA

On the Computation of the Wavefront After Contact Lens Motion
Sanjeewa S. Karunarathna and Ram V. Iyer, Texas Tech University, USA

Tear Film Dynamics From a Flexible to a Rigid Blob Model
Christiaan Ketelaar, Lan Zhong, and Richard Braun, University of Delaware, USA; P. Ewen King-Smith, The Ohio State University, USA; Carolyn Begley, Indiana University, USA

An Investigation of the Influence of a Blink on the Tear Film Dynamics
Kara L. Maki, Rochester Institute of Technology, USA; William Henshaw, Rensselaer Polytechnic Institute, USA; Gregory Barron, Rochester Institute of Technology, USA; Dylan Chapp and Richard Braun and Tobin Driscoll, University of Delaware, USA

continued on next page

Tear Film Dynamics: Modeling the Glycocalyx as a Poroelastic Region
Antonio Mastroberardino, The Behrend College, USA; Richard Braun, University of Delaware, USA; Javed Siddique, Pennsylvania State University, York, USA; Daniel M. Anderson, George Mason University, USA

PP3

Electronic Posters

8:00 PM-10:00 PM

Room:Galleria Level

Trafficking-Based Turing Mechanism for Pattern Formation on a Growing Domain
Heather A. Brooks and Paul C. Bressloff, University of Utah, USA

Identification of Significant Gene Via Unconventional Method in Gene Expression for Cancer Classification
Sinan Nazimuddin Fazal, AlHussan Training Center, Saudi Arabia

Wednesday, July 13

Registration

8:00 AM-4:30 PM

Room:Concourse Level

IC5

The Turbulent Life of Plankton

8:30 AM-9:15 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Lisa J. Fauci, Tulane University, USA

Plankton in oceans and lakes is often exposed to turbulence, yet only recently have quantitative models begun to emerge to describe the effects of turbulence on the physiology and behavior of planktonic cells. I will illustrate the unexpected effects of turbulence on plankton by focusing on motile phytoplankton cells - photosynthetic organisms that form the base of most aquatic food webs - through both millifluidic experiments and mathematical models. I will propose that phytoplankton, despite their small size, know more fluid mechanics than we give them credit for, and will highlight how the turbulent life of plankton presents a plethora of opportunities for both the experimenter and the mathematical modeler, who together can help advance our understanding of these pivotal players in some of earth's most vital ecosystems.

Roman Stocker
ETH Zürich, Switzerland

IC6

Follow the Yellow Brick Road: Mathematical insights into Virus Structure Enable Discovery in Virus Assembly and Evolution

9:15 AM-10:00 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Guo-Wei Wei, Michigan State University, USA

Viruses are remarkable examples of order at the nanoscale. The vast majority of viruses package their genomes into protective protein containers that are organised according to icosahedral surface lattices. This has far reaching consequences for many stages of the viral life cycle and the infection process overall. In this talk, I will demonstrate how we have used mathematical approaches, developed in my group for the characterisation of virus architecture, to gain unprecedented insights into how viruses form and evolve. In a recent commentary in the Journal of Molecular Biology (see PubMedID 26707196) Peter Prevelige has described this approach as "following the yellow brick road". In this talk, I will invite you on a journey along the yellow brick road. I will introduce the mathematical tools underpinning our approach and demonstrate how they have contributed, in collaboration with experimentalists, to a paradigm shift in our understanding of virus assembly. I will moreover describe how these results open up a new perspective on viral evolution and anti-viral therapy.

Reidun Twarock
University of York, United Kingdom

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Wednesday, July 13

MS52

Multiscale Modeling of Cellular Dynamics - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom I - Conference Level

For Part 2 see MS65

Cells must perform functions that require highly coordinated chemical and mechanical processes. Regulation of the actin cytoskeleton through signaling proteins is how cells achieve the plasticity needed to accomplish functions such as growth and directed motion. While much is known about the individual components in cells, such as the rate of chemical reaction or the force generated by a single molecular motor, little is known about how these components work together. In this session, we present recent models on multiple time and length scales used to study cellular signaling, cytokinesis, and migration.

Organizer: Wanda Strychalski

Case Western Reserve University, USA

Organizer: Calina A. Copos

University of California, Davis, USA

10:30-10:55 Determining the Rheological Properties of Actin

John A. Loustau and Derrick Brazill, Hunter College, USA

11:00-11:25 Mathematical Modeling of Actin Regulation in Invasive Carcinoma

Nessy Tania, Smith College, USA

11:30-11:55 3D Model of Cytokinetic Contractile Ring Assembly: Node-Mediated and "Backup" Pathways

Tamara Bidone and *Dimitrios Vavylonis*, Lehigh University, USA

12:00-12:25 Mechanical Insights into the Adhesion Dynamics of Amoeboid Cells

Calina A. Copos, University of California, Davis, USA

Wednesday, July 13

MS53

Macroscale Consequences of Microbial Interactions - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom II - Conference Level

For Part 2 see MS66

The heterogeneous microscale environments of bacteria and other microbes are a rich field of study that lends a radical perspective on environments such as the ocean. While laboratory experiments are frequently able to deconstruct these microscale interactions, it is increasingly necessary to turn to mathematical models in order to understand the outcome of these fundamental interactions at levels that directly impact humans. This minisymposium focuses on the mathematical modeling used to study the consequences of physical & chemical interactions of microbes, between themselves and with structured environments. It brings together speakers from a broad range of marine and terrestrial settings.

Organizer: Vicente I. Fernandez

ETH Zürich, Switzerland

Organizer: Gabriel Juarez

University of Illinois at Urbana-Champaign, USA

10:30-10:55 Intersections Between Chemical Signaling, Microbial Interactions, and the Ocean's Biological Carbon Pump

Benjamin Van Mooy, Woods Hole Oceanographic Institution, USA

11:00-11:25 Impacts of the Competition for Phytoplankton Organic Matter in Marine Bacteria

Vicente I. Fernandez and Steven Smriga, ETH Zürich, Switzerland; James Mitchell, Flinders University, Australia; Roman Stocker, ETH Zürich, Switzerland

11:30-11:55 Swimming in Confined Microgeometries

Eva Kanso and Alan C. H. Tsang, University of Southern California, USA

12:00-12:25 Global Estimates of Bacterial Attachment to Particles Sinking in the Ocean

Allison Smith and Curtis Deutsch, University of Washington, USA; Charles Stock, Geophysical Fluid Dynamics Laboratory, USA

Wednesday, July 13

MS54

Celebrating Charles S. Peskin's 70th Birthday: The Immersed Boundary Method and its Extensions - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom III - Conference Level

For Part 2 see MS67

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on methods for modeling fluid-structure interaction, especially the immersed boundary (IB) method and its extensions, and their application to biological fluid dynamics.

Organizer: Boyce E. Griffith

University of North Carolina at Chapel Hill, USA

Organizer: Samuel A. Isaacson

Boston University, USA

10:30-10:55 Vesicle Electrohydrodynamics Simulations by Coupling Immersed Boundary and Immersed Interface Methods

Ming-Chih Lai, National Chiao Tung University, Taiwan

11:00-11:25 A Lubricated Immersed Boundary Method in Two Dimensions

Thomas Fai, Courant Institute of Mathematical Sciences, New York University, USA; Chris H. Rycroft, Harvard University, USA

11:30-11:55 Two Extensions of the Immersed Boundary Method and Their Applications

Yongsam Kim, Chung-Ang University, Korea

12:00-12:25 From IB to IIM, from Solution to Gradient Computations, From Algorithm to Convergence Analysis Convergence Analysis

Zhilin Li, North Carolina State University, USA

Wednesday, July 13

MS55

Molecular Bioscience and Biophysics-multiscale Modeling of Solvation - Part II of II

10:30 AM-12:30 PM

Room:Burroughs - Conference Level

For Part 1 see MS43

The understanding of solvation is an essential prerequisite for the quantitative description and analysis of biomolecular systems because solvation is an elementary process in nature and is of paramount importance to many biomolecular processes. Robust models of polar and nonpolar interactions are vital to understanding the solvation properties of biomolecules and the effects of solvation upon biomolecular folding, binding, enzyme catalysis, and dynamic. Multiscale models of solvation have been used to treat different regions of the molecular systems. In this session, invited speakers will present a wide range of multiscale simulation methodologies in hybrid models of solvation.

Organizer: Zhan Chen
Georgia Southern University, USA

Organizer: Jaydeep Bardhan
Northeastern University, USA

10:30-10:55 Novel Classical Solvation Density Functional Theory for Biomolecular Solvation Calculations
Marcelo Marucho, University of Texas, San Antonio, USA

11:00-11:25 Dynamic Implicit Solvent Model: Understanding Solvent Stokes Flow and Interface Dynamics for Biomolecules
Hui Sun, Bo Li, and Li-Tien Cheng, University of California, San Diego, USA; Shenggao Zhou, Soochow University, China

11:30-11:55 Accounting for Water's Finite Size Using the Mean-Spherical Approximation as a Modified Dielectric Boundary Condition
Amirhossein Molavi Tabrizi and Jaydeep Bardhan, Northeastern University, USA; Matthew G. Knepley, Rice University, USA; Spencer Goossens, Northeastern University, USA

12:00-12:25 Extracting Nonlocal Models from Experimental Measurements and Detailed Atomistic Simulation
Spencer Goossens and Jaydeep Bardhan, Northeastern University, USA

Wednesday, July 13

MS56

Microscale Cellular Modeling and Emergent Macroscale Growth Dynamics

10:30 AM-12:30 PM

Room:Carlton - Conference Level

Individual-based model (IBM) is a microscale simulation approach where each individual is treated as a unique and discrete entity having biophysical and kinetic parameters. IBMs allow one to recreate and predict the appearance of macroscale phenomena from microscale interactions of individuals. Due to its predictive scope, and the increased understanding it offers, IBMs have become a crucial tool in microbiology. This minisymposium will provide a forum for recent advances in the application of IBMs for the study of cellular processes within tumor growth, tissue formation, and microbial growth in wastewater treatment among others.

Organizer: Inom Mirzaev
University of Colorado Boulder, USA

Organizer: David M. Bortz
University of Colorado Boulder, USA

10:30-10:55 Agent-Based Modeling of Cyanobacteria Nitrogen Metabolism and Ecology
Ferdi Hellweger and Neil Fredrick, Northeastern University, USA

11:00-11:25 Open Source Agent-Based Simulations of Large 3-D Multicellular Tumor-Stromal Systems
Paul Macklin, University of Southern California, USA

11:30-11:55 Agent-Based Simulation of Viscoelastic Microbial Aggregate Growth in an Arbitrary Flow Field
Inom Mirzaev and David M. Bortz, University of Colorado Boulder, USA

12:00-12:25 The Virtual Liver: State of the Art and Future Perspectives
Dirk Drasdo, French National Institute for Research, France; Michael Plank, University of Canterbury, New Zealand; Stefan Hoehme, Institute for Computer Science, Germany

Wednesday, July 13

MS57

Dynamics of Spiral and Scroll Wave Patterns in Cardiac Modeling

10:30 AM-12:30 PM

Room:Griffin - Conference Level

Many reaction-diffusion systems exhibit rotating spiral patterns as particular solutions. In addition to many chemical and biological systems, these spiral waves (in 2D) and scroll waves (in 3D) have also been observed in cardiac tissue, both in experiments and numerical simulations. Spiral-shaped patterns of the transmembrane potential occur only during cardiac arrhythmias, and the number of spiral waves together with their dynamics is thought to determine the type of arrhythmia. In this session, we will present recent results on the dynamics of spiral waves, elucidating the roles of anisotropic conduction, external electrical fields and mutual interaction of spirals.

Organizer: Hans Dierckx
Ghent University, Belgium

10:30-10:55 Modification of Scroll Wave Filaments When Electric Fields Are Applied to the Heart
Niels Otani, Rochester Institute of Technology, USA; Valentin Krinski, Max Planck Institute for Dynamics and Self-Organization, Germany; Shuyue Han and Jason Carr, Rochester Institute of Technology, USA; Stefan Luther, Max Planck Institute for Dynamics and Self-Organization, Germany

11:00-11:25 Filament Tension of Meandering Scroll Waves
Hans Dierckx, Ghent University, Belgium

11:30-11:55 Structural Features of Quasi-Stationary Multi-Spiral States in a Simple Model of Atrial Fibrillation
Christopher Marcotte, Georgia Institute of Technology, USA

12:00-12:25 Chaotic Transients in Physiologically Realistic Models of Cardiac Tissue
Greg Byrne, State University of New York, Stony Brook, USA

Wednesday, July 13

MS58

Linking Single Particle Tracking Experiments to Stochastic Diffusion Models

10:30 AM-12:00 PM

Room:Lewis - Conference Level

Fluorescence techniques along with single particle tracking using high speed video cameras and software to automatically analyze the resulting images have revolutionized the study and our understanding of biological fluids at the nanometer up to micrometer spatial scales. Moreover, biological fluids, such as cytoplasm and mucus, are complex with interlocking networks of proteins inducing memories, rendering the classical stochastic model of diffusion—Brownian motion and Brownian driven SDEs—insufficient. In this minisymposium, the speakers will address methods for understanding data from these tracking experiments and how to link them to specific mechanistic and stochastic models of diffusion.

Organizer: John Fricks

Pennsylvania State University, USA

Organizer: Gustavo Didier

Tulane University, USA

10:30-10:55 Scaling Laws and Asymptotics in Single Particle Modeling

Gustavo Didier, Tulane University, USA

11:00-11:25 Diffusion and Transient Binding with a Non-Linear Tether

John Fricks, Pennsylvania State University, USA

11:30-11:55 Linear Regression Analysis on FRAP and FCS and its Application to Anomalous Diffusion Processes on Cell Membranes

Minchul Kang, St. Thomas University, USA

Wednesday, July 13

MS59

Advances in Mathematical Models of Hearing - Part I of II

10:30 AM-12:30 PM

Room:Hancock - Lobby Level

For Part 2 see MS72

The inner ear is an active system, using energy to biomechanically improve and extend its dynamic range of operation. Theoretical study of these processes has been challenging, given limited physiological data due to the difficulty of direct measurement. Recent advancements in measurement technology however have provided crucial new empirical insights that inform and place important constraints on theory. The theme of this symposium is twofold: explore these recent theoretical developments of active auditory function, as well as how such models motivate new directions in applied mathematics (e.g., emergent dynamics from coupled nonlinear oscillators).

Organizer: Christopher Bergevin

York University, Canada

10:30-10:55 Dynamics of Hearing: The Active Ear

Christopher Bergevin, York University, Canada; Christopher Shera, Harvard Medical School, USA

11:00-11:25 Bifurcations of a Noisy Biological Oscillator are Associated with Function

Daibhid O Maoileidigh, Joshua Salvi, and AJ Hudspeth, Rockefeller University, USA

11:30-11:55 The 3D Wkb Method Applied for the Calculation of Cochlear Viscous Fluid Loss and Outer-Hair Cell Power Generation

Yanli Wang, Stanford University, USA

12:00-12:25 Consequences of Organ of Corti Micro-Mechanics

Jong Hoon Nam, University of Rochester, USA

Wednesday, July 13

MS60

Geometric Phylogenetics - Part I of II

10:30 AM-12:30 PM

Room:Paine - Lobby Level

For Part 2 see MS73

One of the great opportunities offered by modern genomics is that phylogenetics applied on a genomic scale (phylogenomics) should be especially powerful for elucidating gene and genome evolution, relationships among species and populations, and processes of speciation and molecular evolution. Several mathematical fields not classically considered part of applied mathematics have contributed in recent years to the study of a variety of biological problems. One such field is algebraic geometry. The minisymposium will be a meeting point for students and leaders in the field.

Organizer: Ruriko Yoshida

University of Kentucky, USA

Organizer: Terrell Hodge

Western Michigan University, USA

10:30-10:55 Convexity in Tree Spaces

Ruriko Yoshida, University of Kentucky, USA

11:00-11:25 Facets and Relaxations of the Balanced Minimal Evolution Polytope

Stefan Forcey, Logan Keefe, and William Sands, University of Akron, USA

11:30-11:55 Stochastic Safety Radius on NJ and BME Methods for Small Trees

Jing Xi, North Carolina State University, USA

12:00-12:25 Statistically-Consistent K-Mer Methods for Phylogenetic Tree Reconstruction

Seth Sullivant, North Carolina State University, USA

Wednesday, July 13

MS61

Advances in Modeling Sleep-wake Behavior and Circadian Rhythms - Part I of II

10:30 AM-12:30 PM

Room:Stone - Lobby Level

For Part 2 see MS74

The past 10 years have seen the development of multiple, biophysically-based models of the neuronal processes regulating sleep-wake cycling, circadian rhythms and their interactions. This minisymposium presents next generation studies based on these models: novel multiscale models for the interaction of the intracellular circadian clock and electrophysiology of clock neurons; new mathematical techniques to analyze the complex coupled oscillator dynamics of these models; and applications that utilize the physiological basis of these models to investigate diverse facets of sleep and circadian regulation, including sleep patterning, temperature regulation, and effects on pain.

Organizer: Victoria Booth

University of Michigan, USA

Organizer: Cecilia Diniz Behn

Colorado School of Mines, USA

10:30-10:55 Reduced Dimensional Map for the Circadian Regulation of Human Sleep

Victoria Booth and Ismael Xique, University of Michigan, USA; Cecilia Diniz Behn, Colorado School of Mines, USA

11:00-11:25 Patterns of Sleep-Wake Behaviour: From Maps to Naps

Anne Skeldon, Matthew Bailey, and Gianne Derks, University of Surrey, United Kingdom

continued in next column

11:30-11:55 Developing Mathematical Models for Circadian and Sleep-Dependent Modulation of Pain

Sofia Piltz, Technical University of Denmark, Denmark; Paige Ferguson, University of Alabama, USA; Jennifer Kile, Rensselaer Polytechnic Institute, USA; Natalia Toporikova, Washington and Lee University, USA; Megan Hastings Hagenauer and Victoria Booth, University of Michigan, USA

12:00-12:25 Modeling the Effects of Temperature on Sleep Patterns

Pamela B. Pyzza, Ohio Wesleyan University, USA; Selenne Banuelos, California State University, Channel Islands, USA; Janet Best, Ohio State University, USA; Gemma Huguet, Universitat Politecnica de Catalunya, Spain; Alicia Prieto Langarica, Youngstown State University, USA; Shelby Wilson, Morehouse College, USA; Markus Schmidt, Ohio Sleep Medicine Institute, USA

Wednesday, July 13

MS62

Modeling Neuronal Dynamics on Complex Networks

10:30 AM-12:30 PM

Room:Webster - Lobby Level

Recent advances in imaging and recording technology have revealed various architectures of neuronal circuits in the healthy and disease brain. Yet, it is unclear how these complex structures of interconnected neurons shape the neuronal dynamics, information transfer, and sensory processing. In the last few years, mathematical models of the network structure and analysis of its dynamics have brought insights to these important issues. In this minisymposium, the speakers will address recent findings on the role that connectivity structure plays in influencing the dynamics and function of neuronal networks.

Organizer: Duane Nykamp

University of Minnesota, USA

Organizer: Christopher Kim

Bernstein Center for Computational Neuroscience, Germany

10:30-10:55 Compressive Sensing Reconstruction of Feed-Forward Connectivity in Pulse-Coupled Nonlinear Neuronal Networks

Victor Barranca, Swarthmore College, USA; Douglas Zhou, Shanghai Jiao Tong University, China; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

11:00-11:25 Rich Club Dynamics in Networks of Cortical Neurons

John M. Beggs, Indiana University, USA

11:30-11:55 Feedback Through Graph Motifs Relates Structure and Function in Complex Networks.

Yu Hu, Harvard University, USA; Steven Brunton, University of Washington, USA; Nicholas Cain and Stefan Mihalas, Allen Institute for Brain Science, USA; J. Nathan Kutz and Eric Shea-Brown, University of Washington, USA

12:00-12:25 The Impact of Complex Network Structures on Seizure Activity Induced by Depolarization Block

Christopher Kim, Bernstein Center for Computational Neuroscience, Germany; Duane Nykamp, University of Minnesota, USA

Wednesday, July 13

MS63

The Role of Immunity in Shaping Disease Dynamics

10:30 AM-12:30 PM

Room:Alcott - Mezzanine Level

Traditional epidemiological models have been successful in elucidating large-scale disease dynamics. However, recent work has demonstrated that the immune status of individual hosts can indeed impact epidemiological patterns. Here, we present a spectrum of models that simultaneously incorporate both immunity and epidemiology. We begin with conventional epidemiological models that separate populations based on infection status and implicitly include immunological dynamics and progress to ones with a more explicit accounting of such within-host processes. The final models focus on the interface of within- host and between-host scales and highlight the resulting mathematical and biological challenges.

Organizer: Lauren Childs

Harvard Chan School of Public Health, USA

10:30-10:55 Rabies Persistence in Vampire Bats: Immunity, Pathogenesis, and Immigration
Julie Blackwood, Williams College, USA

11:00-11:25 Epidemiological Signatures of Imperfect Vaccines in Structured Populations
Felicia Magpantay, University of Manitoba, Canada

11:30-11:55 Inferring Cross-Immunity in Multi-Pathogen Systems
Souray Shrestha, Johns Hopkins University, USA

12:00-12:25 Emerging Disease Dynamics in a Model Coupling Within-Host and Between-Host Systems
Zhilan Feng, Purdue University, USA

Wednesday, July 13

MS64

Applied Mathematics in the Pharmaceutical Industry - Part I of II

10:30 AM-12:30 PM

Room:Adams - Mezzanine Level

For Part 2 see MS77

Applied Mathematics is rapidly emerging as a key technology for the discovery and development of therapeutics within the Pharmaceutical industry. This minisymposium has presentations about a broad spectrum of mathematical applications ranging from modeling and simulation, imaging, optimization and data analytics.

Organizer: Dean C. Bottino

Takeda Pharmaceuticals North America, USA

Organizer: Jeffrey Saltzman

AstraZeneca, USA

Organizer: Andrew Stein

Novartis Institutes for Biomedical Research, USA

10:30-10:55 A Brief Introduction to Some Mathematics of Data Privacy
Jeffrey Saltzman, AstraZeneca, USA

11:00-11:25 Mathematical Modeling to Aid Enterprise Wide Decision Making for Drug Discovery, Manufacturing, and Marketing
Ansu Bagchi, Merck & Co., Inc., USA

11:30-11:55 Stuff I Wish I Had Paid Better Attention to in Grad School: Lessons Learned from Mathematical Modeling in Cancer Drug Development
Dean C. Bottino, Takeda Pharmaceuticals North America, USA

12:00-12:25 Exploring Model and Clinical Trial Uncertainty Using Virtual Populations
Richard Allen, Pfizer Inc., USA

Wednesday, July 13

CP10

Ecology

10:30 AM-11:30 AM

Room:Revere - Lobby Level

Chair: Leah Shaw, College of William and Mary, USA

10:30-10:45 Mathematics Applied To Cacti
Mark J. Debonis, Manhattan College, USA

10:50-11:05 Eco-Epidemiological Model of the Salton Sea
Qamar J. Khan, Sultan Qaboos University, Oman; David Greenhalgh and Joseph Pettigrew, University of Strathclyde, United Kingdom

11:10-11:25 Global Extinction Induced by Asymmetric Dispersal in Two-Patch Model with Allee Effect
Leah Shaw, Margaret Swift, and Junping Shi, College of William & Mary, USA

Wednesday, July 13

CP11

Infection, Disease and Epidemiology - Part II

10:30 AM-12:10 PM

Room:Hale - Mezzanine Level

Chair: Jason Davis, University of California, Merced, USA

10:30-10:45 Modeling Treatment of RSV with TMC353121
Gilberto C. Gonzalez-Parra, Texas Christian University, USA; Filip De Ridder, Dymphy Huntjens, and Gabriela Ispas, Janssen Pharmaceutica, Belgium; Hana Dobrovolny, Texas Christian University, USA

10:50-11:05 A Mathematical Model for the Interactions Between Plasmodium Falciparum Malaria Parasite and Host Immune Response
Baoling Ma, Millersville University of Pennsylvania, USA; Chuan Li, West Chester University, USA; Jack Warner, Millersville University of Pennsylvania, USA; Alicia Parkinson, West Chester University, USA

11:10-11:25 Extinction Pathways in a Stochastic Ebola Model
Garrett Nieddu, Montclair State University, USA; Simone Bianco, IBM Research, USA; Lora Billings and Eric Forgoston, Montclair State University, USA; James Kaufman, IBM Research, USA

11:30-11:45 RNA Recombination Enhances Adaptability and is Required for Virus Spread and Virulence
Simone Bianco, IBM Research, USA; Yinghong Xiao, Igor Rouzine, and Raul Andino, University of California, San Francisco, USA

11:50-12:05 A Stochastic Two-Hit Model of Prion Disease
Jason K. Davis and Suzanne Sindi, University of California, Merced, USA

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Wednesday, July 13

Lee Segel Forum

2:00 PM-2:45 PM

Room:Harbor Ballroom II and III - Conference Level

Intermission

2:45 PM-3:00 PM

SP3

W.T. and Idalia Reid Prize in Mathematics

3:00 PM-3:30 PM

Room:Grand Ballroom - Concourse Level

Chair: Pamela Cook, University of Delaware

Abstract not available at time of publication.

Ioannis Kevrekidis
Princeton University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

Wednesday, July 13

MS65

Multiscale Modeling of Cellular Dynamics - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom I - Conference Level

For Part 1 see MS52
Cells must perform functions that require highly coordinated chemical and mechanical processes. Regulation of the actin cytoskeleton through signaling proteins is how cells achieve the plasticity needed to accomplish functions such as growth and directed motion. While much is known about the individual components in cells, such as the rate of chemical reaction or the force generated by a single molecular motor, little is known about how these components work together. In this session, we present recent models on multiple time and length scales used to study cellular signaling, cytokinesis, and migration.

Organizer: Wanda Strychalski
Case Western Reserve University, USA

Organizer: Calina A. Copos
University of California, Davis, USA

4:00-4:25 The Role of Cytoplasmic Rheology in Blebbing Dynamics
Wanda Strychalski, Case Western Reserve University, USA; Robert D. Guy, University of California, Davis, USA

4:30-4:55 A Computational Model of YAP/TAZ Mechano-Sensing Mechanism
Meng Sun, Boston University, USA

5:00-5:25 A Role of Functional Heterogeneity of Endothelial Cells in Stabilization of Vascular Tube Formations
Denis Tsygankov, Georgia Institute of Technology and Emory University, USA; Adriana Beltran, Christopher Dibble, Tim Elston, and Gary Johnson, University of North Carolina at Chapel Hill, USA

5:30-5:55 Force Generation and Contraction of Random Actomyosin Rings
Dietmar Oelz, Courant Institute of Mathematical Sciences, New York University, USA

Wednesday, July 13

MS66

Macroscale Consequences of Microbial Interactions - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom II - Conference Level

For Part 1 see MS53

The heterogeneous microscale environments of bacteria and other microbes are a rich field of study that lends a radical perspective on environments such as the ocean. While laboratory experiments are frequently able to deconstruct these microscale interactions, it is increasingly necessary to turn to mathematical models in order to understand the outcome of these fundamental interactions at levels that directly impact humans. This minisymposium focuses on the mathematical modeling used to study the consequences of physical & chemical interactions of microbes, between themselves and with structured environments. It brings together speakers from a broad range of marine and terrestrial settings.

Organizer: Gabriel Juarez

University of Illinois at Urbana-Champaign, USA

Organizer: Vicente I. Fernandez

ETH Zürich, Switzerland

4:00-4:25 Biodegradation of Dispersed Crude Oil Droplets by Diffusive Encounters with Non-Motile Microbes in Marine Environments

Gabriel Juarez, University of Illinois at Urbana-Champaign, USA; Vicente I. Fernandez and Roman Stocker, ETH Zürich, Switzerland

4:30-4:55 A Numerical Study of Fluid Transport by Migrating Zooplankton Aggregations

Monica Martinez, University of California, Riverside, USA; John Dabiri, Stanford University, USA; Janna Nawroth, Harvard University, USA

5:00-5:25 Ferromagnetic and Antiferromagnetic Order in Bacterial Vortex Lattices

Jorn Dunkel, Massachusetts Institute of Technology, USA

5:30-5:55 Simulating a Post-Fragmentation Probability Density Function for Microbial Flocculation

Eric Kightley and *David M. Bortz*, University of Colorado Boulder, USA

Wednesday, July 13

MS67

Celebrating Charles S. Peskin's 70th Birthday: The Immersed Boundary Method and its Extensions - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom III - Conference Level

For Part 1 see MS54

Mathematical modeling and computer simulation play an important role in the study of diverse biological systems across a very broad range of scales, from molecular to environmental. This minisymposium is a part of series of minisymposia celebrating Charles Peskin's 70th birthday as well as his many contributions to the development and application of mathematical methods and models in the life sciences. Talks in this minisymposium focus on methods for modeling fluid-structure interaction, especially the immersed boundary (IB) method and its extensions, and their application to biological fluid dynamics.

Organizer: Boyce E. Griffith

University of North Carolina at Chapel Hill, USA

Organizer: Samuel A. Isaacson

Boston University, USA

4:00-4:25 Computing Insect Flight

Jane Wang, Cornell University, USA

4:30-4:55 Error Estimates for Finite Difference Methods Applied to Navier-Stokes Flow with Interfaces

Thomas Beale, Duke University, USA

5:00-5:25 Modeling and Simulation of an Elastic Sheet with a Non-Newtonian Fluid

Luoding Zhu, Indiana University - Purdue University Indianapolis, USA

5:30-5:55 Stochastic Immersed Boundary Methods for Fluid-Structure Interactions Subject to Thermal Fluctuations

Paul J. Atzberger, University of California, Santa Barbara, USA

Wednesday, July 13

MS68

Molecular Biosciences and Biophysics: Electrostatics Computing and Applications

4:00 PM-6:00 PM

Room:Burroughs - Conference Level

Electrostatics, as long rang interactions with abundant presence, are critical in determining biological functions and structures at both the molecular and cellular levels. Structural biologists inevitably consider the effect of electrostatics in studying protein solvation, protein folding, protein-protein interactions, ion-channels, cell-cell interactions, etc. Meanwhile, attracted by electrostatics related scientific significances and computational challenges, numerical analysts actively seek numerical methods for accurate and efficient computing. We bring together experts in addressing different aspects of these problems, methods, and applications.

Organizer: Weihua Geng

Southern Methodist University, USA

4:00-4:25 Quanitfying the Conformational Fluctuation Induced Uncertainty in Biomolecular Solvation

Huan Lei and Nathan Baker, Pacific Northwest National Laboratory, USA; Xiantao Li, Pennsylvania State University, USA

4:30-4:55 Accurate and Reliable Poisson-Boltzmann Solvation and Binding Energy Calculations

Duc Nguyen, Bao Wang, and Guo-Wei Wei, Michigan State University, USA

5:00-5:25 PKa Computing with Treecode Accelerated Boundary Integral (TABI) Poisson-Boltzmann Solver

Weihua Geng, Southern Methodist University, USA; Robert Krasny, University of Michigan, USA

5:30-5:55 Comparison of PB Solvers Using CG and DG Methods

Weishan Deng and Jin Xu, Chinese Academy of Sciences, China

Wednesday, July 13

MS69

Finite Element Methods in the Life Sciences

4:00 PM-6:00 PM

Room:Carlton - Conference Level

The utilization of finite element methods in the life sciences enables efficient, large scale, investigation and medical discovery on complicated geometric domains. We highlight several uses of finite element methods in the life sciences; specifically in applications to the dynamics of bio-fluids and bio-tissue, to coupled bio-fluid / bio-tissue interactions, and to patterning and morphology in developmental biology. Numerical methods will be discussed and computational results, pertinent to medical research collaborators, will be presented.

Organizer: Travis B. Thompson
Rice University, USA

Organizer: Annalisa Quaini
University of Houston, USA

Organizer: Martina Bukac
University of Notre Dame, USA

Organizer: Krishna Garikipati
University of Michigan, Ann Arbor, USA

4:00-4:25 A Discontinuous Galerkin Method for the Poroelastic Modeling of Intestinal Edema Formation
Travis B. Thompson and Beatrice Riviere, Rice University, USA

4:30-4:55 Simulation of Fluid-Structure Interaction Problems Arising Hemodynamics
Annalisa Quaini, University of Houston, USA

5:00-5:25 On Patterning and Morphology in Developmental Biology
Krishna Garikipati, University of Michigan, USA

5:30-5:55 A Numerical Approach to Quantifying Risk Factors for Progression of Aortic Intramural Hemorrhage
Martina Bukac, Zhiliang Xu, and Mark S. Alber, University of Notre Dame, USA

Wednesday, July 13

MS70

Recent Advances in Predicting Cardiovascular Dynamics - Part I of III

4:00 PM-6:00 PM

Room:Griffin - Conference Level

For Part 2 see MS82
Accurate prediction of cardiovascular dynamics remains an important problem, especially with the growing need for trustworthy patient-specific models for use in clinical decision-making. This minisymposium will focus on recent mathematical and computational advances in predicting cardio¬vascular dynamics using a variety of models ranging from system level 0D models to 3D models of blood flow. Topics will include modeling aspects, numerical methods, parameter estimation and uncertainty quantification techniques for a wide range of cardiovascular-related applications, including whole-body modeling of hemorrhagic shock, assimilation of patient data to circulation networks, cardiovascular coupling, developing clinical protocols for noninvasive hemodynamic assessment and neurovascular modeling.

Organizer: Andrea Arnold
North Carolina State University, USA

Organizer: Mette S. Olufsen
North Carolina State University, USA

Organizer: Muhammad U. Qureshi
North Carolina State University, USA

4:00-4:25 In-Silico Models of Neurovascular Coupling
Tim David, University of Canterbury, New Zealand

4:30-4:55 Whole-Body Cardiovascular Systems Modeling of Hemorrhagic Shock
Brian Carlson, Hakam Tiba, and Kevin Ward, University of Michigan, Ann Arbor, USA

5:00-5:25 CLOCK 3111 T/C Genetic Variants Impact Circadian Regulation on Cardiac Autonomic Function
Kun Hu, Harvard Medical School, USA

5:30-5:55 Parametric Uncertainty and Global Sensitivity Analysis in a Model of the Carotid Bifurcation: Identification and Ranking of Most Sensitive Model Parameters
Stefan Bernhard, Pforzheim University of Applied Sciences, Germany; Rahim Gul, Freie Universitaet Berlin, Germany

Wednesday, July 13

MS71

Molecular Bioscience and Biophysics--Topological and Geometric Methods

4:00 PM-6:00 PM

Room:Lewis - Conference Level

In the last couple of decades, an enormous amount of experimental data has been collected from biochemistry and molecular biology. This has allowed for a transition from the traditional qualitative description in biomolecular sciences to quantitative data driven analysis. This minisymposium will focus on recent advances in topological and geometric methods of the macromolecular structure and function, molecular flexibility, and dynamical interactions. The topics include topological characterizations of DNA/RNA structures, including DNA knots and links, DNA self-assembly processes, viral capsids and their assembly, rigidity analysis, and other structural properties. The symposium will emphasize the application of topological and geometric models, their methods and algorithms, in understanding of biomolecular systems.

Organizer: Kelin Xia
Michigan State University, USA

Organizer: Natasha Jonoska
University of South Florida, USA

4:00-4:25 Detection and Modeling of Structural Components Using 3D Images Derived from Cryo-Electron Microscopy
Jing He, Old Dominion University, USA

4:30-4:55 Topological Method for Exploring Low-Density States in Biomolecular Folding Pathways
Yuan Yao, Peking University, China

5:00-5:25 Analyzing Biological Data via Topological Terrain Metaphors
Yusu Wang, Ohio State University, USA

5:30-5:55 Controlling 3D Structure with DNA Information
Nadrian Seeman, New York University, USA

Wednesday, July 13

MS72

Advances in Mathematical Models of Hearing - Part II of II

4:00 PM-5:30 PM

Room:Hancock - Lobby Level

For Part 1 see MS59

The inner ear is an active system, using energy to biomechanically improve and extend its dynamic range of operation. Theoretical study of these processes has been challenging, given limited physiological data due to the difficulty of direct measurement. Recent advancements in measurement technology however have provided crucial new empirical insights that inform and place important constraints on theory. The theme of this symposium is twofold: explore these recent theoretical developments of active auditory function, as well as how such models motivate new directions in applied mathematics (e.g., emergent dynamics from coupled nonlinear oscillators).

Organizer: Christopher Bergevin

York University, Canada

Organizer: Christopher Bergevin

York University, Canada

4:00-4:25 Investigating the Spontaneous Emission of Sounds by the Mammalian Ear Using a Computational Model

Julien Meaud and Thomas Bowling, Georgia Institute of Technology, USA

4:30-4:55 Mode Conversion in the Cochlea

Richard Chadwick, National Institutes of Health, USA; Jessica Lamb, U.S. Food and Drug Administration, USA

5:00-5:25 Intracochlear Pressure and Voltage Measurements Support Dual-Mode Cochlear Models

Elizabeth S. Olson, Columbia University, USA

Wednesday, July 13

MS73

Geometric Phylogenetics - Part II of II

4:00 PM-6:00 PM

Room:Paine - Lobby Level

For Part 1 see MS60

One of the great opportunities offered by modern genomics is that phylogenetics applied on a genomic scale (phylogenomics) should be especially powerful for elucidating gene and genome evolution, relationships among species and populations, and processes of speciation and molecular evolution. Several mathematical fields not classically considered part of applied mathematics have contributed in recent years to the study of a variety of biological problems. One such field is algebraic geometry. The minisymposium will be a meeting point for students and leaders in the field.

Organizer: Ruriko Yoshida

University of Kentucky, USA

Organizer: Terrell Hodge

Western Michigan University, USA

4:00-4:25 Convex Hulls in Tree Space

Megan Owen, Lehman College, CUNY, USA; Anna Lubiw and Daniela Maftuleac, University of Waterloo, Canada

4:30-4:55 Modelling with Brownian Motion on Tree-Space

Tom Nye, Newcastle University, United Kingdom

5:00-5:25 Developing a Statistically Powerful Measure for Phylogenetic Tree Inference Using Phylogenetic and Markov Invariants

Amelia Taylor, Colorado College, USA

5:30-5:55 Improving Quartet Based Approaches in Phylogenetics

Joseph P. Rusinko, Hobart and William Smith Colleges, USA

Wednesday, July 13

MS74

Advances in Modeling Sleep-Wake Behavior and Circadian Rhythms - Part II of II

4:00 PM-6:00 PM

Room:Stone - Lobby Level

For Part 1 see MS61

The past 10 years have seen the development of multiple, biophysically-based models of the neuronal processes regulating sleep-wake cycling, circadian rhythms and their interactions. This minisymposium presents next generation studies based on these models: novel multiscale models for the interaction of the intracellular circadian clock and electrophysiology of clock neurons; new mathematical techniques to analyze the complex coupled oscillator dynamics of these models; and applications that utilize the physiological basis of these models to investigate diverse facets of sleep and circadian regulation, including sleep patterning, temperature regulation, and effects on pain.

Organizer: Victoria Booth

University of Michigan, USA

Organizer: Cecilia Diniz Behn

Colorado School of Mines, USA

4:00-4:25 Mathematical Modeling of Sleep/Wake Architecture in Adolescence

Cecilia Diniz Behn and Nora Stack, Colorado School of Mines, USA; Victoria Booth, University of Michigan, USA

4:30-4:55 Explaining the Fragmentary Nature of Human Sleep Using a Sleep/Wake Model That Includes Orexin Dynamics

Andrew J. Phillips, Sandeep Silwal, and Klerman Elizabeth, Brigham and Women's Hospital and Harvard Medical School, USA; Matt Bianchi, Massachusetts General Hospital and Harvard Medical School, USA

5:00-5:25 Intra- and Intercellular Roles of Hyperexcitation in Circadian Clock Neurons

Casey Diekman, New Jersey Institute of Technology, USA

5:30-5:55 Sleep to Save Energy or to Use Energy? Solving the Paradox

Markus Schmidt, Ohio Sleep Medicine Institute, USA; Theodore Swang, Ian Hamilton, and *Janet Best,* Ohio State University, USA

Wednesday, July 13

MS75

Modeling Olfactory Systems

4:00 PM-6:00 PM

Room:Webster - Lobby Level

Olfaction is arguably the most primitive sense, and thus we find structural and functional similarities among the olfactory systems of many animals, from insects to mammals. The speakers in this session will present several approaches to modeling some of the underlying mechanisms believed to be involved in olfactory process, focusing on the network behaviors of the antennal lobe and olfactory bulb.

Organizer: Pamela B. Pyzza
Ohio Wesleyan University, USA

Organizer: Mainak Patel
College of William & Mary, USA

4:00-4:25 Coding of Odors by Temporal Binding Within the Locust Antennal Lobe
Mainak Patel, College of William & Mary, USA; Aaditya Rangan and David Cai, Courant Institute of Mathematical Sciences, New York University, USA

4:30-4:55 Role of Periglomerular Circuits in Shaping Olfactory Bulb Responses: A Modeling Study
Alla Borisyuk, University of Utah, USA

5:00-5:25 Intrinsic and Network Mechanisms Constrain Neural Synchrony in the Moth Antennal Lobe
Adi Rangan, Courant Institute of Mathematical Sciences, New York University, USA

5:30-5:55 Idealized Models of Insect Olfaction
Gregor Kovacic, Rensselaer Polytechnic Institute, USA; Pamela B. Pyzza, Ohio Wesleyan University, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

Wednesday, July 13

MS76

Population Viability of Endangered Plant Species Subject to Multiple Stressors

4:00 PM-6:00 PM

Room:Alcott - Mezzanine Level

The study of the synergetic effect of multiple simultaneous stressors on the behavior of an endangered plant species system is not well understood and is a challenging but critical task that must be undergone. The response of ecological systems to multiple stressors is a relatively new and exciting topic in ecology and of great importance in conservation for practical reasons. This minisymposium aims to inspire novel ideas and encourage new collaborations between mathematicians, ecologists and conservation biologists at different career stages, facilitate the scientific interactions between young researchers working at the interface of mathematics and ecologists and senior researchers.

Organizer: Maria Leite
University of South Florida, St. Petersburg, USA

Organizer: Benito Chen-Charpentier
University of Texas at Arlington, USA

Organizer: Orou Gaoue
University of Hawaii, Manoa, USA

Organizer: Folashade Agusto
University of Kansas, USA

4:00-4:25 Mathematical Modeling of Plants under Multiple Stressors
Benito Chen-Charpentier, University of Texas at Arlington, USA

4:30-4:55 Collective Intelligence-Based Early Warning in a Multi-Stressor Rice Cultivation Environment
Frederic Andres, National Institute of Informatics, Japan; Oscar Silva Filho, Centro de Tecnologia da Informação Renato Archer - CTI, Brazil

continued in next column

5:00-5:25 Vector-Host Models of Coinfection: Implications of Density Dependence in Vectors
Vrushali A. Bokil, Oregon State University, USA; Margaret-Rose Leung, University of Washington, USA; Elizabeth Borer, University of Minnesota, USA

5:30-5:55 Maximizing Tree Harvesting Benefit from Forests Under Insect Infestation Stressor
Maria Leite, University of South Florida, St. Petersburg, USA; Benito Chen-Charpentier, University of Texas at Arlington, USA; Folashade Agusto, University of Kansas, USA

Wednesday, July 13

MS77

Applied Mathematics in the Pharmaceutical Industry - Part II of II

4:00 PM-6:00 PM

Room:Adams - Mezzanine Level

For Part 1 see MS64

Applied Mathematics is rapidly emerging as a key technology for the discovery and development of therapeutics within the Pharmaceutical industry. This minisymposium has presentations about a broad spectrum of mathematical applications ranging from modeling and simulation, imaging, optimization and data analytics.

Organizer: Dean C. Bottino

Takeda Pharmaceuticals North America, USA

Organizer: Jeffrey Saltzman

AstraZeneca, USA

Organizer: Andrew Stein

Novartis Institutes for Biomedical Research, USA

4:00-4:25 Adapting a Classical TMDD Model into a Systems Pharmacology Approach

Ruth Abrams and Karim Azer, Sanofi, France

4:30-4:55 Mathematics in Cancer Therapy Development

Helen Moore, Bristol-Myers Squibb, USA; Urszula Ledzewicz, Southern Illinois University, USA

5:00-5:25 Assessing the Identifiability of Models for Monoclonal Antibody Target Mediated Drug Disposition (tmdd) Using a New Metric of Drug Potency.

Andrew Stein, Novartis Institutes for Biomedical Research, USA

5:30-5:55 How Complex Do Mathematical Models Need to Be in Order to Be Useful?

Anna Georgieva Kondic, Merck & Co., Inc., USA

Wednesday, July 13

CP12

Neuroscience and Excitable Dynamics

4:00 PM-5:20 PM

Room:Revere - Lobby Level

Chair: Andrea J. Welsh, Georgia Institute of Technology, USA

4:00-4:15 Crowds as an Excitable Medium for Spiral Wave Dynamics

Andrea J. Welsh and Flavio Fenton, Georgia Institute of Technology, USA

4:20-4:35 Analysis of Complex Bursting Patterns in Multiple Time Scale Respiratory Neuron Models

Yangyang Wang, University of Pittsburgh, USA

4:40-4:55 Bifurcation Analysis in the Hypothalamic-Pituitary-Adrenal Axis Including Gulcocorticoid Receptor Complex

Pengcheng Xiao, University of Evansville, USA

5:00-5:15 Triangulating Neurons: Spatial Localization via Extracellular Recordings

Patrick Greene, Kevin K. Lin, and Jean-Marc Fellous, University of Arizona, USA

Wednesday, July 13

CP13

Infection, Disease and Epidemiology - Part III

4:00 PM-5:40 PM

Room:Hale - Mezzanine Level

Chair: To Be Determined

4:00-4:15 Intervention Strategies for Epidemics: Does Ignoring Time Delay Lead to Incorrect Predictions?

Adrienna Bingham and Leah Shaw, College of William & Mary, USA

4:20-4:35 Modeling Transmission Dynamics of Ebola Virus Disease

Mudassar Imran and Ali Ansari, Gulf University for Science and Technology, Kuwait

4:40-4:55 An Optimal Control Strategy for the Spread of Hepatitis B Virus Infection in Areas of High Endemicity

Tunde Tajudeen Yusuf, Clara Ijalana, and Olubode K. Koriko, Federal University of Technology, Akure, Nigeria

5:00-5:15 Investigating the Impact of Hiv and Malaria Co-Infection

Nicholas J. Roberts, Elyse Conley, and Ryan Maziarz, Arizona State University, USA; John D. Nagy, Scottsdale Community College and Arizona State University, USA

5:20-5:35 Fractional-Order SIR Models Derived from a Stochastic Process

Anna V. Mcgann, Bruce I. Henry, and Christopher N. Angstmann, University of New South Wales, Australia

Wednesday, July 13

SP4

I. E. Block Community Lecture: Toy Models

6:15 PM-7:15 PM

Room:Grand Ballroom - Concourse Level

Chair: To Be Determined

Would you like to come see some toys? 'Toys' here have a special sense: objects of daily life which you can find or make in minutes, yet which, if played with imaginatively, reveal surprises that keep scientists puzzling for a while. We will see table-top demos of many such toys and visit some of the science that they open up. The common theme is singularity.

Tadashi Tokieda
University of Cambridge, United Kingdom and Stanford University, USA

Community Reception

7:15 PM-8:15 PM

Room:Pavilion and Grand Ballroom - Concourse Level

Thursday, July 14

Registration

8:00 AM-4:30 PM

Room:Concourse Level

IC7

Title Not Available at Time of Publication

8:30 AM-9:15 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: John M. Burke, Applied Biomath, USA

Abstract not available at time of publication.

Sandy Allerheiligen
Merck Research Laboratories, USA

Thursday, July 14

IC8

Parkinsonian Oscillations: A Computational View

9:15 AM-10:00 AM

Room:Harbor Ballroom II and III - Conference Level

Chair: Peter J. Thomas, Case Western Reserve University, USA

Parkinson's disease is a debilitating condition causing highly disruptive motor complications. It also provides a range of opportunities for the application of computational and mathematical methods to provide a better understanding of the mechanisms involved and to optimize therapeutic approaches. In particular, there are questions to address concerning the origins of parkinsonian changes in neural synchrony, oscillations, and correlations, the translation of these changes into motor pathologies, the effects of therapeutic interventions involving brain stimulation that somehow alter this activity, and the derivation of control strategies. I will discuss my perspective on some of these challenges and highlight some examples of approaches to tackling them.

Jonathan E. Rubin
University of Pittsburgh, USA

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Galleria Level

Coffee Break

10:00 AM-10:30 AM

Room:Galleria Level

Thursday, July 14

MT1

Pharmacological Modeling for Drug Discovery - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom III - Conference Level

Abstract not available at time of publication.

John M. Burke
Applied Biomath, USA

Thursday, July 14

MS78

Cytoskeletal Organization and Growth Dynamics

10:30 AM-12:30 PM

Room:Harbor Ballroom I - Conference Level

The cytoskeleton is a dynamic network of protein filaments and associated proteins that provides cells with structural support and participates in fundamental cellular processes including intracellular transport, cell motility, cell organization, and chromosome partitioning. Much has been accomplished in the study of cytoskeletal components and their interactions, but further predictive understanding of the systems that emerge from these components is needed. Mathematical approaches have contributed to the current understanding, and will be needed to address open questions. In this minisymposium, modelers and experimentalists will present recent work on different aspects of the organization and growth dynamics of cytoskeletal polymers.

Organizer: Ava J. Mauro
University of Massachusetts, Amherst, USA

Organizer: Erin M. Jonasson
University of Notre Dame, USA

Organizer: Holly Goodson
University of Notre Dame, USA

10:30-10:55 Spatial Pattern Formation in Microtubule Post-Translational Modifications and the Tight Localization of Motor-Driven Cargo
Jun Allard, University of California, Davis, USA; Abdon Iniguez, University of California, Irvine, USA

11:00-11:25 Microtubule Nucleation in Mitosis
Daniel Needleman, Harvard University, USA

11:30-11:55 Mesoscopic Modeling of Polymer Transport in an Array of Entropic Barriers
Anastasios Matzavinos, Brown University, USA

12:00-12:25 A Two-Protofilament Markov Chain Model of Microtubule Dynamic Instability
Shant Mahserejian, University of Notre Dame, USA; Ava J. Mauro, University of Massachusetts, Amherst, USA; Erin M. Jonasson, Chunlei Li, Holly Goodson, and Mark S. Alber, University of Notre Dame, USA

Thursday, July 14

MS79

Fluid-Structure Interaction for Propulsion, Transportation and Locomotion - Part I of II

10:30 AM-12:30 PM

Room:Harbor Ballroom II - Conference Level

For Part 2 see MS92

Fluids are the natural environment of almost every organism and fluid structure interaction problems are ubiquitous in many area of biology and geology. As fluid dynamics plays an important role in propulsion, transport and locomotion, many important fluids and material exhibit nonlinearities and other complex properties. The aim of this minisymposium is to present examples of such behavior and the techniques use to address these problems.

Organizer: Longhua Zhao
Case Western Reserve University, USA

10:30-10:55 Volume Effect for Particles Transported in Highly Viscous Fluids
Longhua Zhao, Case Western Reserve University, USA

11:00-11:25 Swimming Speeds of Filaments in Viscous Fluids with Resistance
Nguyenho Ho, Worcester Polytechnic Institute, USA; Karin Leiderman, University of California, Merced, USA; Sarah D. Olson, Worcester Polytechnic Institute, USA

11:30-11:55 How Focused Flexibility Maximizes the Thrust Production of Flapping Wings
Matthew N. Moore, Florida State University, USA

12:00-12:25 Near Wall Motion of Undulatory Swimmers in Non-Newtonian Fluids
Arezoo Ardekani and Gaojin Li, Purdue University, USA

Thursday, July 14

MS80

Molecular Biosciences and Biophysics – Macromolecular Structures and Interactions - Part I of II

10:30 AM-12:30 PM

Room:Burroughs - Conference Level

For Part 2 see MS93

Molecular based mathematical biology has been emerging as one of the most promising interdisciplinary research areas in the interface of mathematics and biology, driven by the fact that most experimental research in the life sciences is based on molecular biology or molecular level understanding. This minisymposium will focus on recent advances on a variety of modeling and computation developments for studying macromolecular structures and interactions. Example topics include molecular dynamics, implicit solvation models, biomolecular solvation, charge transport, protein folding, protein flexibility, protein-protein interaction, molecular docking, protein design, drug design etc. Emphasis will be placed not only on mathematical theories and methods, but also on biomolecular simulations and software developments.

Organizer: Shan Zhao

University of Alabama, USA

Organizer: Julie Mitchell

University of Wisconsin, Madison, USA

10:30-10:55 Data Driven Approaches to Molecular Biophysics

Julie Mitchell, University of Wisconsin, Madison, USA

11:00-11:25 An Energy-Law Preserving Scheme for PNP Equations

Xiaofan Li, Julienne Kabre, and Allen Flavell, Illinois Institute of Technology, USA

11:30-11:55 Quotients of Euclidean Groups by Space Groups with Applications to Protein Crystallography

Gregory Chirikjian, Johns Hopkins University, USA

12:00-12:25 Geometric and Topological Analysis of Molecular Rigidity Functions

Lin Mu, Oak Ridge National Laboratory, USA

Thursday, July 14

MS81

Modeling and Simulation of Viscoelastic Fluid-Structure Interactions in Biomaterials

10:30 AM-12:00 PM

Room:Carlton - Conference Level

Viscoelastic fluid-structure interactions are important in many biological systems such as bacterial biofilms and blood flow. Simulating viscoelastic biological materials is challenging as dynamic effects often occur over a wide range of time scales and, microscale spatial heterogeneity can lead to complicated bulk material properties. Recent advances have lead to several varied approaches to modeling viscoelastic fluid-structure interactions in biological systems. In particular, phase field models and variations of the immersed boundary method have found success in biological fluids applications. In this minisymposium, recent advances in the modeling and simulation of viscoelastic fluid-structure interactions in biomaterials will be presented.

Organizer: Jay A. Stotsky

University of Colorado Boulder, USA

10:30-10:55 An Immersed Boundary Method Biofilm Model with Heterogeneous Rheology

Jay A. Stotsky and David M. Bortz, University of Colorado Boulder, USA

11:00-11:25 Effective Viscoelastic Modulus of Layered Biofilms

Rangarajan Sudarsan, University of Guelph, Canada

11:30-11:55 Numerical Investigation of Evolution of the Biofilm Streamers

Kareem K. Abdelshafy and Alireza Karimi, Northeastern University, USA

Thursday, July 14

MS82

Recent Advances in Predicting Cardiovascular Dynamics - Part II of III

10:30 AM-12:30 PM

Room:Griffin - Conference Level

For Part 1 see MS70
For Part 3 see MS95

Accurate prediction of cardiovascular dynamics remains an important problem, especially with the growing need for trustworthy patient-specific models for use in clinical decision-making. This minisymposium will focus on recent mathematical and computational advances in predicting cardio¬vascular dynamics using a variety of models ranging from system level 0D models to 3D models of blood flow. Topics will include modeling aspects, numerical methods, parameter estimation and uncertainty quantification techniques for a wide range of cardiovascular-related applications, including whole-body modeling of hemorrhagic shock, assimilation of patient data to circulation networks, cardiovascular coupling, developing clinical protocols for noninvasive hemodynamic assessment and neurovascular modeling.

Organizer: Andrea Arnold

North Carolina State University, USA

Organizer: Mette S. Olufsen

North Carolina State University, USA

Organizer: Muhammad U. Qureshi

North Carolina State University, USA

10:30-10:55 Characterizing the Pulmonary Vasculature During the Progression of PAH

Daniela Valdez-Jasso, University of Ilinois at Chicago, USA

11:00-11:25 Advances in 1D Cardiovascular Fluid Dynamics Modeling

Mette S. Olufsen, North Carolina State University, USA

11:30-11:55 On Deriving a New Clinical Protocol for Noninvasive Assessment of the Aortic Blood Pressure Waveform Using 1D Modeling

Samuel Vennin, King's College, United Kingdom

12:00-12:25 Computational Modeling of a New Paradigm for Local Blood Flow Regulation

Laura Ellwein Fix, Virginia Commonwealth University, USA

Thursday, July 14

MS83

Mathematical Analysis of Biochemical Reaction Networks - Part I of II

10:30 AM-12:30 PM

Room:Lewis - Conference Level

For Part 2 see MS96

Mathematical models of biochemical systems arising in systems biology are often difficult to analyze due to parameter uncertainty, high degree of nonlinearity, and the overwhelming size of the involved systems. The focus of our minisymposium will be on systematic mathematical approaches for analyzing and reducing the complexity of such systems. We will consider both the deterministic and stochastic models, and address recent research topics such as: (i) multistationarity/multistability; (ii) parameter identifiability; (iii) model reduction; and (iv) dynamical approaches.

Organizer: Nicolette Meshkat

North Carolina State University, USA

Organizer: Matthew D. Johnston

San Jose State University, USA

10:30-10:55 A Proof of the Global Attractor Conjecture and the Permanence Conjecture

Gheorghe Craciun, University of Wisconsin, Madison, USA

11:00-11:25 Medium Time Behavior of Stochastically Modeled Reaction Networks with Absolute Concentration Robustness

David F. Anderson, University of Wisconsin, Madison, USA

11:30-11:55 Signs of Sensitivities in Post-Translational Modification Systems

Janne Kool, University of Copenhagen, Denmark

12:00-12:25 Multistationarity in Chemical Networks with Generalized Mass-Action Kinetics

Stefan Mueller, RICAM, Austrian Academy of Sciences, Austria

Thursday, July 14

MS84

State of the Art Computational Methodologies for Mathematical Models of Human Brain Electrophysiology, Hemodynamics and Metabolism - Part I of II

10:30 AM-12:30 PM

Room:Hancock - Lobby Level

For Part 2 see MS97

Mathematical models play an increasingly important role in understanding how human brain works because of the intrinsic difficulties of performing direct observations. In recent years, mathematical models have been used to infer on the energetic cost of brain stimulation, to identify regions of brain activity during rest or specific protocols and the mechanism eliciting hemodynamic changes in response to electrophysiological activation. We present state-of-art computational mathematical models to investigate different aspects of human brain, including electrophysiology, metabolism and hemodynamics, their mutual interactions and their relevance to advance our understanding of the brain in normal and diseased states.

Organizer: Luca Gerardo Giorda

Basque Center for Applied Mathematics, Spain

Organizer: Daniela Calvetti

Case Western Reserve University, USA

Organizer: Erkki Somersalo

Case Western Reserve University, USA

10:30-10:55 Quantification of Uncertainty of Cerebral Metabolic Steady State

Erkki Somersalo, Case Western Reserve University, USA

continued in next column

11:00-11:25 State of the Art Combined EEG/MEG Source Analysis for Successful Presurgical Epilepsy Diagnosis

Carsten H. Wolster, University of Muenster, Germany

11:30-11:55 A BeamFormer for Source Localization in ElectroCOrticoGraphy

Annalisa Pascarella, Istituto per le Applicazioni del Calcolo "Mauro Picone", Italy

12:00-12:25 Personalized Simulation of Cortical Spreading Depression

Julia Kroos, Basque Center for Applied Mathematics, Spain

Thursday, July 14

MS85

Combining Measurements, Models and Simulations to Understand Biological Systems

10:30 AM-12:30 PM

Room:Paine - Lobby Level

We discuss the use of experiments, modeling and simulation to understand and characterize systems governed by particle and structure interactions. These systems are fundamental to various physical processes ranging from the regulation of gene expression such as DNA transcription and chromosomal organization to human behavior in crowd dynamics. Although the applications occur on a variety of scales, the underlying challenges of understanding such systems are very similar. Obtaining reliable experimental data, incorporating it into a useful mathematical model and generating insightful simulation results are all important to form a coherent explanation of such systems.

Organizer: Lisa G. Davis

Montana State University, USA

10:30-10:55 Mathematical Models for Transcription and the Data Driving Them

Lisa G. Davis, Tamra Heberling, and Tomas Gedeon, Montana State University, USA

11:00-11:25 They Transcribe with a Little Help from Their Friends: A Mechanistic Model for Cooperative Behavior of RNA Polymerases

Tamra Heberling, Tomas Gedeon, and Lisa G. Davis, Montana State University, USA

11:30-11:55 A Universal Power Law Governing the Interactions Between Pedestrians in a Crowd

Ioannis Karamouzas, University of Minnesota, USA; *Brian Skinner,* Massachusetts Institute of Technology, USA; Stephen J. Guy, University of Minnesota, USA

12:00-12:25 Genome Organization in 3D: Formation of Chromosomal Domains in Interphase

Geoff Fudenberg, Massachusetts Institute of Technology, USA

Thursday, July 14

MS86

Mathematical Neurology and Psychiatry - Part I of II

10:30 AM-12:30 PM

Room:Stone - Lobby Level

For Part 2 see MS99

Neurology and psychiatry are confronted by many chronic and dynamic diseases with complicated pathology. Mathematical models are not only needed to model specific systems, but also to rigorously characterize symptoms and connect them to mechanisms that cause specific diseases. Recent data on neurological and psychiatric diseases combined with advances in computational methods promise to address this demand. This symposium brings together a diverse group of experts in mathematical neurology and psychiatry.

Organizer: Amy L. Cochran

University of Michigan, USA

Organizer: Péter Érdi

Kalamazoo College, USA

10:30-10:55 Connecting Epilepsy and Alzheimer's Disease: A Computational Modeling Framework

Péter Érdi, Kalamazoo College, USA; Tamas Kiss, Wignes Research Centre for Physics, Hungary; Takumi Matsuzawa and Siyuan Zhang, Kalamazoo College, USA; Laszlo Zalanyi, Wignes Research Centre for Physics, Hungary

11:00-11:25 Conformal Brain Mapping

Carolyn M. Drobak and Monica K. Hurdal, Florida State University, USA

11:30-11:55 Cognitive Hierarchy Across the Human Cortical Network

Hava Siegelmann, University of Massachusetts, Amherst, USA

12:00-12:25 Oscillatory Coupling Between Prefrontal Cortex (PFC) and Hippocampus in Rodent Models of Schizophrenia

Bernat Kocsis, Harvard University, USA

Thursday, July 14

MS87

PRCs and Phase Models in Neuroscience - Part I of II

10:30 AM-12:30 PM

Room:Webster - Lobby Level

For Part 2 see MS100

A fundamental question about networks of oscillators is whether the elements with synchronize or phase-lock. Two useful and related tools for studying the synchronization of neural oscillators are phase response curves (PRCs) and phase models. This minisymposium will bring together researchers in this area to discuss recent advances in the theory of PRCs and phase models and their applications to neuroscience.

Organizer: Sue Ann Campbell

University of Waterloo, Canada

Organizer: Xueying Wang

Washington State University, USA

10:30-10:55 Phase Models and Clustering in Networks of Oscillators with Delayed Coupling

Sue Ann Campbell and Zhen Wang, University of Waterloo, Canada

11:00-11:25 Weakly Coupled Oscillators in a Slowly Varying World

Youngmin Park and Bard Ermentrout, University of Pittsburgh, USA

11:30-11:55 Phase Models of Wave Propagation in Stochastic Neural Fields

Zachary Kilpatrick, University of Houston, USA

12:00-12:25 PRC Analysis of Gamma Synchrony and Clustering in Inhibitory Networks of Resonant Interneurons

Carmen Canavier, Louisiana State University Health Sciences Center, USA; Ruben Tikidji-Hamburyan, George Washington University, USA; Joan José Martínez and John A. White, Boston University, USA

Thursday, July 14

MS88

Modeling and Control in Biological Systems - Part I of II

10:30 AM-12:30 PM

Room:Revere - Lobby Level

For Part 2 see MS101

This minisymposium will feature a variety of biology applications ranging from malaria and neural populations to wound healing and feral cat populations. Many of these biological systems are described using agent-based or differential-equation models. The common thread in these models is control actions implemented with methods involving scenario analysis, optimization and optimal and feedback controls.

Organizer: Richard Schugart

Western Kentucky University, USA

Organizer: Suzanne M. Lenhart

University of Tennessee, USA

10:30-10:55 Changing Detectors As Triggers for Immune Responses

Eduardo Sontag, Rutgers University, USA

11:00-11:25 Brain Control - It's Not Just for Mad Scientists

Jeff Moehlis and Dan D. Wilson, University of California, Santa Barbara, USA

11:30-11:55 A Spatial Agent-Based Model for Feral Cats and Analysis of Population and Nuisance Control

Rachael Miller Neilan and Timothy Ireland, Duquesne University, USA

12:00-12:25 Preemptive Intervention Strategies on Community Networks

Michael R. Kelly and Joseph Tien, The Ohio State University, USA

Thursday, July 14

MS89

Mathematical Modeling of Obesity - Part I of II

10:30 AM-12:30 PM

Room:Alcott - Mezzanine Level

For Part 2 see MS102

This minisymposium represents state of the art mathematical models applied to prevent, treat, and reduce obesity. Obesity is a complex problem involving many different layers. This complexity has given rise to novel analytic methods, integrating intensive computational, engineering and statistical techniques. Mathematical models are currently applied to inform clinical practice and policy. Interesting examples include prediction of obesity prevalence with an estimation of economic burden, innovative sensor algorithms to detect physical activity expenditure, and prediction of weight change from changes in energy balance. This proposed sessions will be of interest to students, established mathematical researchers and scientists in public health.

Organizer: Swati Debroy

University of South Carolina, Beaufort, USA

Organizer: Diana M. Thomas

Montclair State University, USA

10:30-10:55 History of Modeling of Obesity

Steven Heymsfield, Pennington Biomedical Research Center, USA

11:00-11:25 Mathematics of Calorimeter

Jon Moon, MEI Research, LTD, USA

11:30-11:55 Calculating Metabolic Rate Using Kleiber's Law

Abdul-Aziz Yakubu, Howard University, USA

12:00-12:25 Energy-Balance Models

Diana M. Thomas, Montclair State University, USA

Thursday, July 14

MS90

Better Medicine Through Mathematics - Part I of II

10:30 AM-12:30 PM

Room:Adams - Mezzanine Level

For Part 2 see MS103

The complexity of human pathologies and the difficulty in determining suitable treatments remains a pressing issue in medicine. While mathematical biologists have long studied diseases, the increasing recognition that interdisciplinary work incorporating mathematical approaches can help to clarify, identify, and suggest potential therapies has underlined the importance of such methodologies. This minisymposium will highlight research in academia and industry using collaborative and innovative approaches which combine mathematical modelling, physiology, and pharmacology. The resulting models encompass dosing regimens which can be compared quantitatively to clinical data. Paramount to all of the featured works is the potential to directly impact patient outcomes.

Organizer: Morgan Craig

Harvard University, USA

Organizer: Michael Mackey

McGill University, Canada

10:30-10:55 Understanding and Treating Periodic Hematological Disease Using Mathematical Models

Michael Mackey, McGill University, Canada

11:00-11:25 Pharmacometric Modeling and Simulation in Psychiatry

Robert R. Bies, State University of New York at Buffalo, USA

11:30-11:55 Physiological Determinants of Response of Gout Patients to Lesinurad, a New Gout Drug, Uncovered by Modeling the Physiology of Uric Acid

Sergey Aksenov and Hongmei Xu, AstraZeneca, USA; Zancong Shen, Ardea Biosciences, Inc., USA; Donald Stanski, AstraZeneca, USA

12:00-12:25 Determinants of the Efficacy of HIV Latency Reversing Agents and Implications for Drug and Treatment Design

Ruian Ke, North Carolina State University, USA

Thursday, July 14

CP14

Physiology (Computational Modeling)

10:30 AM-11:50 AM

Room:Hale - Mezzanine Level

Chair: Angela M. Reynolds, Virginia Commonwealth University, USA

10:30-10:45 Efficient Parallel Simulation of Atherosclerotic Plaque Formation Using Higher Order Discontinuous Galerkin Schemes
Stefan Girke, University of Münster, Germany

10:50-11:05 Computational Model of Ventilator-Induced Lung Injury
Angela M. Reynolds, Virginia Commonwealth University, USA; Ramana Pidaparti, University of Georgia, USA; Rebecca Heise, Racheal Cooper, and Joseph Herbert, Virginia Commonwealth University, USA; Kim Jongwon, University of Georgia, USA

11:10-11:25 Geometrical Constraints on Circulating Red Blood Cells
Roy Malka and Ethan Schonbrun, Harvard University, USA; John Higgins, Harvard University and Massachusetts General Hospital, USA

11:30-11:45 A Turing Model for Stereotypic, Space-Filling Lung Branching Morphogenesis
Robert Croce, ETH Zürich, Switzerland; Sebastian Aland, TU Dresden, Germany; Odysse Michos, Dagmar Iber, and Lada Georgieva, ETH Zürich, Switzerland; Dzianis Menshykau, Bayer Technology Services, Germany

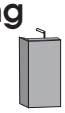
Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Thursday, July 14

SIAG/LS Business Meeting



(Open to SIAG/LS members)

2:00 PM-2:45 PM

Room:Harbor Ballroom II and III - Conference Level

Complimentary beverages will be available.

Coffee Break

3:30 PM-4:00 PM

Room:Galleria Level

MT2

Pharmacological Modeling for Drug Discovery - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom III - Conference Level

Abstract Not Available at Time of Publication

John M. Burke
Applied Biomath, USA

Thursday, July 14

MS91

Modeling of Mechanisms of Intracellular Transport

4:00 PM-6:00 PM

Room:Harbor Ballroom I - Conference Level

Pattern formation through transport of molecules in egg cells and embryos is key in the proper development of a wide range of organisms. Mathematical models have become essential in understanding movement of particles and molecules in these biological systems. This minisymposium will provide an opportunity to make connections between the dynamical systems and stochastic processes techniques used to model intracellular transport mechanisms. It will also highlight methods used to interpret experimental data in the context of cellular transport, as well as avenues for proposing new designs for experiments.

Organizer: Veronica M. Ciocanel
Brown University, USA

4:00-4:25 Mathematical Modeling of Active Transport and Its Role in Cell Polarization
Paul C. Bressloff, University of Utah, USA

4:30-4:55 Intracellular Transport: The Paradox of Codependence among Antagonistic Motors
Scott McKinley, Tulane University, USA

5:00-5:25 Modeling of mRNA Localization in Xenopus Oocytes
Veronica M. Ciocanel, Brown University, USA

5:30-5:55 Mathematical Modeling of Cell Division Mechanics for C. Elegans Embryo
Blerta Shtylla, Pomona College, USA

Thursday, July 14

MS92

Fluid-Structure Interaction for Propulsion, Transportation and Locomotion - Part II of II

4:00 PM-6:00 PM

Room:Harbor Ballroom II - Conference Level

For Part 1 see MS79

Fluids are the natural environment of almost every organism and fluid structure interaction problems are ubiquitous in many area of biology and geology. As fluid dynamics plays an important role in propulsion, transport and locomotion, many important fluids and material exhibit nonlinearities and other complex properties. The aim of this minisymposium is to present examples of such behavior and the techniques use to address these problems.

Organizer: Longhua Zhao

Case Western Reserve University, USA

4:00-4:25 Effects of Shear-Thinning Rheology on Low Reynolds Number Locomotion

Charu Datt, University of British Columbia, Canada; Lailai Zhu, EPFL, France; Gwynn Elfring, University of British Columbia, Canada; *On Shun Pak*, Santa Clara University, USA

4:30-4:55 Patterns of Self-Propelled Rods

Ruhai Zhou, Old Dominion University, USA; M. Gregory Forest, University of North Carolina at Chapel Hill, USA; Qi Wang, University of South Carolina, USA

5:00-5:25 Autonomously Responsive Pumping by a Bacterial Flagellar Forest: A Mean-field Approach

James Martindale and Henry Fu, University of Nevada, Reno, USA

5:30-5:55 Exploring Reynolds Number Limits in the Medusan Morphospace

Alexander Hoover, Tulane University, USA; Laura A. Miller, University of North Carolina at Chapel Hill, USA

Thursday, July 14

MS93

Molecular Biosciences and Biophysics – Macromolecular Structures and Interactions - Part II of II

4:00 PM-6:00 PM

Room:Burroughs - Conference Level

For Part 1 see MS80

Molecular based mathematical biology has been emerging as one of the most promising interdisciplinary research areas in the interface of mathematics and biology, driven by the fact that most experimental research in the life sciences is based on molecular biology or molecular level understanding. This minisymposium will focus on recent advances on a variety of modeling and computation developments for studying macromolecular structures and interactions. Example topics include molecular dynamics, implicit solvation models, biomolecular solvation, charge transport, protein folding, protein flexibility, protein-protein interaction, molecular docking, protein design, drug design etc. Emphasis will be placed not only on mathematical theories and methods, but also on biomolecular simulations and software developments.

Organizer: Shan Zhao

University of Alabama, USA

Organizer: Julie Mitchell

University of Wisconsin, Madison, USA

4:00-4:25 Graph Theory and Virology: Mathematics Underpinning the Discovery of Packaging Signal Mediated Assembly in RNA Viruses

Reidun Twarock and Eric Dykeman, University of York, United Kingdom; Peter Stockley, University of Leeds, United Kingdom

4:30-4:55 Simulating Constrained Random Walks for Applications to Polymer Models

Clayton Shonkwiler, Colorado State University, USA; Jason Cantarella, University of Georgia, USA

5:00-5:25 RNA Profiling: Extracting Structural Signals from Noisy Distributions

Christine Heitsch and Emily Rogers, Georgia Institute of Technology, USA

5:30-5:55 Mathematics in Biomolecular Thermal Uncertainty Quantification

Guowei Wei, Michigan State University, USA

Thursday, July 14

MS94

Mathematical Modeling of Blood Coagulation

4:00 PM-6:00 PM

Room:Carlton - Conference Level

Blood coagulation consists of a network of biochemical reactions, coupled to cellular and biophysical factors. An imbalance in the chemical composition of blood or a perturbation to the cellular or biophysical factors can lead to potentially fatal abnormalities in clot formation. Mathematical models have emerged as powerful computational tools to not only synthesize information within this complex and nonlinear system but also to make quantitative predictions. In this minisymposium, we provide some of the latest research on mathematical blood coagulation by experts in the field.

Organizer: Nicholas A. Danes

University of California, Merced, USA

Organizer: Karin Leiderman

University of California, Merced, USA

4:00-4:25 Modeling Blood Coagulation with Rivaroxaban Under Flow

Nicholas A. Danes and Karin Leiderman, University of California, Merced, USA

4:30-4:55 The Thick and Thin of It: Anticoagulation Treatment Under Flow

Erica J. Graham, Bryn Mawr College, USA; Lisette dePillis, Harvey Mudd College, USA; Kaitlyn Hood, University of California, Los Angeles, USA; Yanping Ma, Loyola Marymount University, USA; Ami Radunskaya, Pomona College, USA; Julie Simons, Tulane University, USA

5:00-5:25 Modeling Coagulation Cascade and Blood Clotting Through a Multifidelity Algorithm

Alireza Yazdani and George Em Karniadakis, Brown University, USA

5:30-5:55 Multi-Scale Modeling of a Blood Clot Interaction with Fluid and Vessel Wall

Shixin Xu, Martina Bukac, Zhiliang Xu, and *Mark S. Alber*, University of Notre Dame, USA

Thursday, July 14

MS95

Recent Advances in Predicting Cardiovascular Dynamics - Part III of III

4:00 PM-6:00 PM

Room:Griffin - Conference Level

For Part 2 see MS82

Accurate prediction of cardiovascular dynamics remains an important problem, especially with the growing need for trustworthy patient-specific models for use in clinical decision-making. This minisymposium will focus on recent mathematical and computational advances in predicting cardio¬vascular dynamics using a variety of models ranging from system level 0D models to 3D models of blood flow. Topics will include modeling aspects, numerical methods, parameter estimation and uncertainty quantification techniques for a wide range of cardiovascular-related applications, including whole-body modeling of hemorrhagic shock, assimilation of patient data to circulation networks, cardiovascular coupling, developing clinical protocols for noninvasive hemodynamic assessment and neurovascular modeling.

Organizer: Muhammad U. Qureshi

North Carolina State University, USA

Organizer: Mette S. Olufsen

North Carolina State University, USA

Organizer: Andrea Arnold

North Carolina State University, USA

4:00-4:25 Predicting Cardiovascular Dynamics for Surgical Planning in Several Congenital Heart Diseases

Irene Vignon-Clementel, Inria Rocquencourt, France

4:30-4:55 Assimilation of Patient Data in Circulation Networks for Precision Medicine in Adults and Children

Daniele E. Schiavazzi, Justin S. Tran, and Alison Marsden, Stanford University, USA

5:00-5:25 A Coupled Left-Ventricle Systemic-Arteries Model

Hao Gao, Weiwei Chen, Xiaoyu Luo, and Nicholas A. Hill, University of Glasgow, Scotland, UK

5:30-5:55 Efficient Numerical Methods for the Variational Estimation of Cardiac Conductivities by Data Assimilation

Alessandro Barone and Alessandro Veneziani, Emory University, USA; Huanhuan Yang, Florida State University, USA

Thursday, July 14

MS96

Mathematical Analysis of Biochemical Reaction Networks - Part II of II

4:00 PM-6:00 PM

Room:Lewis - Conference Level

For Part 1 see MS83

Mathematical models of biochemical systems arising in systems biology are often difficult to analyze due to parameter uncertainty, high degree of nonlinearity, and the overwhelming size of the involved systems. The focus of our minisymposium will be on systematic mathematical approaches for analyzing and reducing the complexity of such systems. We will consider both the deterministic and stochastic models, and address recent research topics such as: (i) multistationarity/multistability; (ii) parameter identifiability; (iii) model reduction; and (iv) dynamical approaches.

Organizer: Nicolette Meshkat

North Carolina State University, USA

Organizer: Matthew D. Johnston

San Jose State University, USA

4:00-4:25 Necessary and Sufficient Conditions for Multistationarity in Networks of Interacting Elements

Casian Pantea, West Virginia University, USA

4:30-4:55 Identifying Multistationary Reaction Networks

Badal Joshi, California State University, San Marcos, USA

5:00-5:25 On the Existence of Positive Steady States for Weakly Reversible Mass Action Systems

Balázs Boros, Johann Radon Institute, Austria

5:30-5:55 Conditions for Multistationarity and Switching in Mass Action Networks

Carsten Conradi, Max Planck Institute for Dynamics of Complex Systems, Germany

Thursday, July 14

MS97

State of the Art Computational Methodologies for Mathematical Models of Human Brain Electrophysiology, Hemodynamics and Metabolism - Part II of II

4:00 PM-6:00 PM

Room:Hancock - Lobby Level

For Part 1 see MS84

Mathematical models play an increasingly important role in understanding how human brain works because of the intrinsic difficulties of performing direct observations. In recent years, mathematical models have been used to infer on the energetic cost of brain stimulation, to identify regions of brain activity during rest or specific protocols and the mechanism eliciting hemodynamic changes in response to electrophysiological activation. We present state-of-art computational mathematical models to investigate different aspects of human brain, including electrophysiology, metabolism and hemodynamics, their mutual interactions and their relevance to advance our understanding of the brain in normal and diseased states.

Organizer: Luca Gerardo Giorda

Basque Center for Applied Mathematics, Spain

Organizer: Daniela Calvetti

Case Western Reserve University, USA

Organizer: Erkki Somersalo

Case Western Reserve University, USA

4:00-4:25 Computation of Brain Deformations for Image-Guided Neurosurgery: Progress and Uncertainty

Adam Wittek, Grand Joldes, and Karol Miller, University of Western Australia, Australia

continued on next page

Thursday, July 14

MS97

State of the Art Computational Methodologies for Mathematical Models of Human Brain Electrophysiology, Hemodynamics and Metabolism - Part II of II

4:00 PM-6:00 PM

Room:Hancock - Lobby Level

continued

4:30-4:55 Electro-Metabolic Activity of the Neuron-Astrocyte Complex: Mathematical and Numerical Coupling
Gabriela Capo, Basque Center for Applied Mathematics, Spain

5:00-5:25 Identification of Vasodilatory Stimulus from Cerebral Blood Flow Data
Jamie Prezioso, Case Western Reserve University, USA

5:30-5:55 Computer Aided Clinical Trials and Surgical Planning in Cerebral Aneurysms: Challenges and Perspectives
Alessandro Veneziani, Emory University, USA

Thursday, July 14

MS98

Zebrafish Stripe Formation: A Collection of Biological and Mathematical Perspectives

4:00 PM-5:30 PM

Room:Paine - Lobby Level

Zebrafish, a black and yellow striped fish, is a widely studied organism in early developmental biology. This minisymposium brings together experimentalists and mathematicians working to understand how zebrafish get their characteristic stripes as the fish develops from larva to adult, and to identify how changes in pigment cell interactions can lead to a diverse array of mutated patterns on the fish skin, including spots and labyrinth curves. Continuum density and discrete models for zebrafish stripe formation will be discussed, as well as the experimental techniques that inform these approaches.

Organizer: Alexandria Volkening
Brown University, USA

4:00-4:25 Agent-Based Models of Stripe Formation on Zebrafish
Alexandria Volkening and Bjorn Sandstede, Brown University, USA

4:30-4:55 Cellular Basis of Color Pattern Formation in Zebrafish
Ajeet Singh, Prateek Mahalwar, Brigitte Walderich, and Christiane Nüsslein-Volhard, Max Planck Institute for Developmental Biology, Germany

5:00-5:25 Turing Patterns from "Differential Growth": A Minimal Model for Pattern Formation in Zebrafish Skin
Domenico Bullara, University of the Balearic Islands, Spain

continued in next column

Thursday, July 14

MS99

Mathematical Neurology and Psychiatry - Part II of II

4:00 PM-6:00 PM

Room:Stone - Lobby Level

For Part 1 see MS86

Neurology and psychiatry are confronted by many chronic and dynamic diseases with complicated pathology. Mathematical models are not only needed to model specific systems, but also to rigorously characterize symptoms and connect them to mechanisms that cause specific diseases. Recent data on neurological and psychiatric diseases combined with advances in computational methods promise to address this demand. This symposium brings together a diverse group of experts in mathematical neurology and psychiatry.

Organizer: Amy L. Cochran
University of Michigan, USA

Organizer: Péter Érdi
Kalamazoo College, USA

4:00-4:25 Mathematical Descriptions of Bipolar I Patients from Longitudinal Patterns of Mood
Amy L. Cochran, University of Michigan, USA; André Schultz, Rice University, USA; Melvin McInnis and Daniel Forger, University of Michigan, USA

4:30-4:55 Interactions Between Electrophysiology and Neuropharmacology
Michael C. Reed, Duke University, USA; Janet Best, Ohio State University, USA; H. Frederik Nijhout, Duke University, USA

5:00-5:25 A Turing Pattern Formation Model of Cortical Folding
Monica K. Hurdal, Florida State University, USA

5:30-5:55 Title Not Available
David Paydarfar, University of Massachusetts Medical School, USA

Thursday, July 14

MS100

PRCs and Phase Models in Neuroscience - Part II of II

4:00 PM-5:30 PM

Room:Webster - Lobby Level

For Part 1 see MS87

A fundamental question about networks of oscillators is whether the elements with synchronize or phase-lock. Two useful and related tools for studying the synchronization of neural oscillators are phase response curves (PRCs) and phase models. This minisymposium will bring together researchers in this area to discuss recent advances in the theory of PRCs and phase models and their applications to neuroscience.

Organizer: Sue Ann Campbell

University of Waterloo, Canada

Organizer: Xueying Wang

Washington State University, USA

4:00-4:25 Clustering in Inhibitory Neural Networks with Nearest Neighbor Coupling

Xueying Wang, Washington State University, USA

4:30-4:55 Title Not Available

Calvin Zhang, Courant Institute of Mathematical Sciences, New York University, USA

5:00-5:25 Synchronization of Spiking and Subthreshold States in Electrically Coupled Networks of Neurons

Thomas Chartrand, Mark Goldman, and Timothy Lewis, University of California, Davis, USA

Thursday, July 14

MS101

Modeling and Control in Biological Systems - Part II of II

4:00 PM-6:00 PM

Room:Revere - Lobby Level

For Part 1 see MS88

This minisymposium will feature a variety of biology applications ranging from malaria and neural populations to wound healing and feral cat populations. Many of these biological systems are described using agent-based or differential-equation models. The common thread in these models is control actions implemented with methods involving scenario analysis, optimization and optimal and feedback controls.

Organizer: Richard Schugart

Western Kentucky University, USA

Organizer: Suzanne M. Lenhart

University of Tennessee, USA

4:00-4:25 Optimal Harvesting Strategies for Timber and Non-Timber Forest Products in Tropical Ecosystems

Orou Gaoue, University of Hawaii, Manoa, USA; Jiang Jiang, National Institute for Mathematical and Biological Synthesis, USA; *Wandi Ding*, Middle Tennessee State University, USA; Folashade Agusto, University of Kansas, USA; Suzanne M. Lenhart, University of Tennessee, USA

4:30-4:55 Using Optimal Control Theory to Analyze the Treatment of a Bacterial Infection in a Wound with Oxygen Therapy

Richard Schugart, Western Kentucky University, USA; Suzanne M. Lenhart, University of Tennessee, USA; K. Renee Fister, Murray State University, USA; Stephen Guffey, University of Memphis, USA

5:00-5:25 Optimal Control Applied to a Differential Equation Model for an Anthrax Epizootic

Buddhi R. Pantha, University of Tennessee and NMBioS, USA; Judy Day and Suzanne M. Lenhart, University of Tennessee, USA

5:30-5:55 Management Strategies in a Malaria Model Combining Human and Transmission-Blocking Vaccines

Jemal Mohammed-Awel, Valdosta State University, USA; Ruijun Zhao, Minnesota State University Mankato, USA; *Eric S. Numfor*, Augusta University, USA; Suzanne M. Lenhart, University of Tennessee, USA

Thursday, July 14

MS102

Mathematical Modeling of Obesity - Part II of II

4:00 PM-6:00 PM

Room:Alcott - Mezzanine Level

For Part 1 see MS89

This minisymposium represents state of the art mathematical models applied to prevent, treat, and reduce obesity. Obesity is a complex problem involving many different layers. This complexity has given rise to novel analytic methods, integrating intensive computational, engineering and statistical techniques. Mathematical models are currently applied to inform clinical practice and policy. Interesting examples include prediction of obesity prevalence with an estimation of economic burden, innovative sensor algorithms to detect physical activity expenditure, and prediction of weight change from changes in energy balance. This proposed sessions will be of interest to students, established mathematical researchers and scientists in public health.

Organizer: Swati Debroy

University of South Carolina, Beaufort, USA

Organizer: Diana M. Thomas

Montclair State University, USA

4:00-4:25 Modeling Accelerometer Signals from Wearable Physical Activity Monitors

Kong Chen, National Institutes of Health, USA

4:30-4:55 An Infectious Disease Modeling Approach Towards Obesity

Marion Weedermann, Dominican University, USA

5:00-5:25 Modeling to Predict Childhood Obesity Trends in School

Swati Debroy, University of South Carolina, Beaufort, USA; Diana M. Thomas, Montclair State University, USA

5:30-5:55 Application of Mathematical Models in Management of Obesity in Prenatal and Postnatal Care

Leanne Redman, Pennington Biomedical Research Center, USA

Thursday, July 14

MS103

Better Medicine Through Mathematics - Part II of II

4:00 PM-5:30 PM

Room:Adams - Mezzanine Level

For Part 1 see MS90

The complexity of human pathologies and the difficulty in determining suitable treatments remains a pressing issue in medicine. While mathematical biologists have long studied diseases, the increasing recognition that interdisciplinary work incorporating mathematical approaches can help to clarify, identify, and suggest potential therapies has underlined the importance of such methodologies. This minisymposium will highlight research in academia and industry using collaborative and innovative approaches which combine mathematical modelling, physiology, and pharmacology. The resulting models encompass dosing regimens which can be compared quantitatively to clinical data. Paramount to all of the featured works is the potential to directly impact patient outcomes.

Organizer: Morgan Craig

Harvard University, USA

Organizer: Michael Mackey

McGill University, Canada

4:00-4:25 Modelling the Pharmacodynamic Effects of Granulocyte Colony-Stimulating Factor on Granulopoiesis

Tony R. Humphries, McGill University, Canada; Morgan Craig, Harvard University, USA; Michael Mackey, McGill University, Canada

4:30-4:55 Granulopoiesis Physiology Determines the Pharmacokinetics of Granulocyte Colony-Stimulating Factor (G-CSF)

Morgan Craig, Harvard University, USA; Tony Humphries and Michael Mackey, McGill University, Canada

5:00-5:25 Web Accessible Population Pharmacokinetics Service - Hemophilia (WAPPS-Hemo): an innovative approach to tailored prophylaxis

Alanna McEneny-King and Andrea N. Edginton, University of Waterloo, Canada; Gary Foster and Alfonso Iorio, McMaster University, Canada

Thursday, July 14

CP15

Physiology

4:00 PM-5:40 PM

Room:Hale - Mezzanine Level

Chair: Cammey Cole Manning, Meredith College, USA

4:00-4:15 Building a Model of Delay-Differential Equations with State-Dependent Delay for Megakaryopoiesis

Loïs Boullu, Université de Montréal, Canada

4:20-4:35 Model-Assisted Assessment of Aging and Hypertension on Cerebral Blood Flow Velocity

Gregory C. Mader, Mette Olufsen, and Adam Mahdi, North Carolina State University, USA

4:40-4:55 Using Network Similarity Models to Address Challenges in Drug Development

Nirmal Keshava, AstraZeneca, USA

5:00-5:15 Modeling the Effects of Body Mass Index on the Blood Concentrations of the Antibiotic Ertapenem

Cammey Cole Manning, Meredith College, USA; Michele Joyner, East Tennessee State University, USA

5:20-5:35 Uncovering Functional Relationships in Leukemia

Reginald Mcgee, The Ohio State University, USA

Exhibit Hall Closes

4:30 PM

Room:Galleria Level

Intermission

6:00 PM-6:15 PM

Thursday, July 14

Professional Development Evening: Landing Your Dream Job

6:15 PM-7:30 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Sven Leyffer, Argonne National Laboratory, USA

Join us for an evening devoted to developing a successful career in the mathematical sciences. Professionals from academia, government, and industry will share their job- search experiences and give advice on how to develop successful application materials tailored to specific job opportunities and how to perform well in job interviews. The target audience for this event includes early career professionals (i.e., less than five years past last degree), postdocs, and students. However, we are also encouraging participation from the senior professional community during the networking session to share their own experience. Part I: Finding and Applying for Jobs

David Brown

Lawrence Livermore National Laboratory, USA

Jennifer Erway

Wake Forest University, USA

Des Higham

University of Strathclyde, United Kingdom

Helen Moore

Bristol-Myers Squibb

Professional Development Evening: Networking Break

7:30 PM-8:15 PM

Room:Grand Ballroom AB- Concourse Level

Thursday, July 14

Professional Development Evening: Landing Your Dream Job

8:15 PM-9:30 PM

Room:Grand Ballroom AB- Concourse Level

Chair: Sven Leyffer, Argonne National Laboratory, USA

Join us for an evening devoted to developing a successful career in the mathematical sciences. Professionals from academia, government, and industry will share their job-search experiences and give advice on how to develop successful application materials tailored to specific job opportunities and how to perform well in job interviews. The target audience for this event includes early career professionals (i.e., less than five years past last degree), postdocs, and students. However, we are also encouraging participation from the senior professional community during the networking session to share their own experience. Part II: The Job Interview

Misha Kilmer
Tufts University, USA

Tamara Kolda
Sandia National Laboratories, USA

John Peach
Massachusetts Institute of Technology, USA

Notes

Notes

STUDENT DAYS

Activities just for you at the 2016 SIAM Annual Meeting in Boston

Registration

Students can register at a discounted rate of $115 ($130 onsite) and also take advantage of reduced hotel room rates (while supplies last)

SUNDAY, JULY 10, 2016

5:00PM-6:00 PM	Student Orientation
6:00 PM-8:00 PM	Welcome Reception

MONDAY, JULY 11, 2016

9:30 AM-4:30 PM	Visit the Student Lounge in the Exhibit Hall
10:30 AM-12:30 PM	Undergraduate Sessions
10:30 AM-12:30 PM	Career Fair
2:45 PM-3:30 PM	Kovalevsky Prize Lecture
4:00 PM-6:00 PM	Undergraduate Sessions
4:00 PM-6:00 PM	Career Fair
6:15 PM-7:15 PM	Industry Panel
7:15 PM-9:15 PM	Career Fair Reception, Graduate Student Reception, Industry Reception

TUESDAY, JULY 12, 2016

9:30 AM-4:30 PM	Visit the Student Lounge in the Exhibit Hall
7:00 AM-8:15 AM	Student Chapter meeting with SIAM Leadership (by invitation only)
10:30 AM-12:30 PM	SIAM Student Chapter Presentations
2:30 PM-3:30 PM	The John von Neumann Lecture
4:00 PM-6:00 PM	Student Informal Meeting with Invited Speakers
8:00 PM-10:00 PM	Poster Session and Dessert Reception

WEDNESDAY, JULY 13, 2016

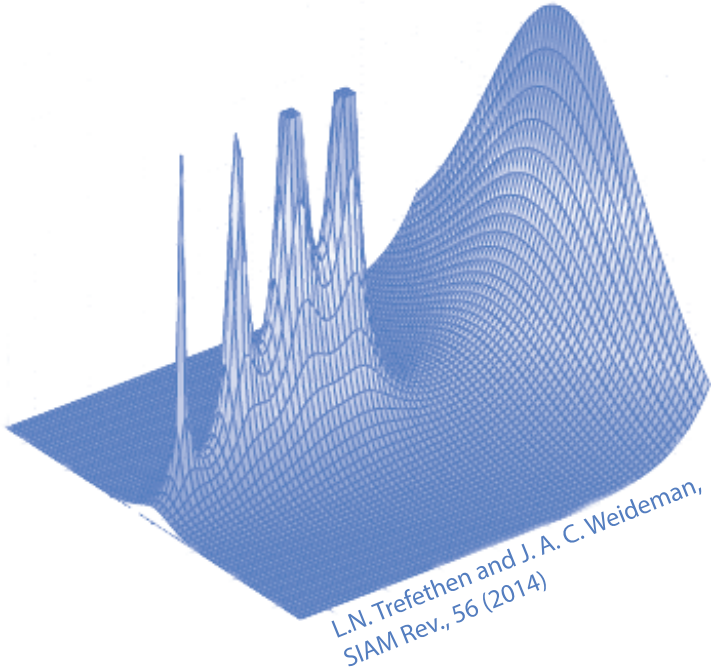
9:30 AM-4:30 PM	Visit the Student Lounge in the Exhibit Hall
10:30 AM-12:30 PM	SIAM Student Chapter Presentations
10:30 AM-12:30 PM	Student Paper Prize Winner/MCM Award Winner
3:00 PM-3:30 PM	Reid Prize Lecture
6:15 PM-8:15 PM	I.E. Block Community Lecture & Reception

THURSDAY, JULY 14, 2016

4:30 PM-5:00 PM	SIAM Book Giveaway – Exhibit Hall – STUDENTS ONLY
6:15 PM-9:15 PM	Professional Development Evening

Speaker and Organizer Index

2016 SIAM Annual Meeting



July 11-15, 2016

The Westin Boston Waterfront
Boston, Massachusetts, USA

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Italicized names indicate session organizers.

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Italicized names indicate session organizers.

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Notes

LS16 Speaker and Organizer Index

Art courtesy of Bourouiba, Gourley, Liu and Wu, SIAP 71-2

Italicized names indicate session organizers.

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Notes

AN16/LS16 Budget

Conference Budget
SIAM Annual Meeting with Life Sciences
July 11-15, 2016
Boston, MA

Expected Paid Attendance: 1,000

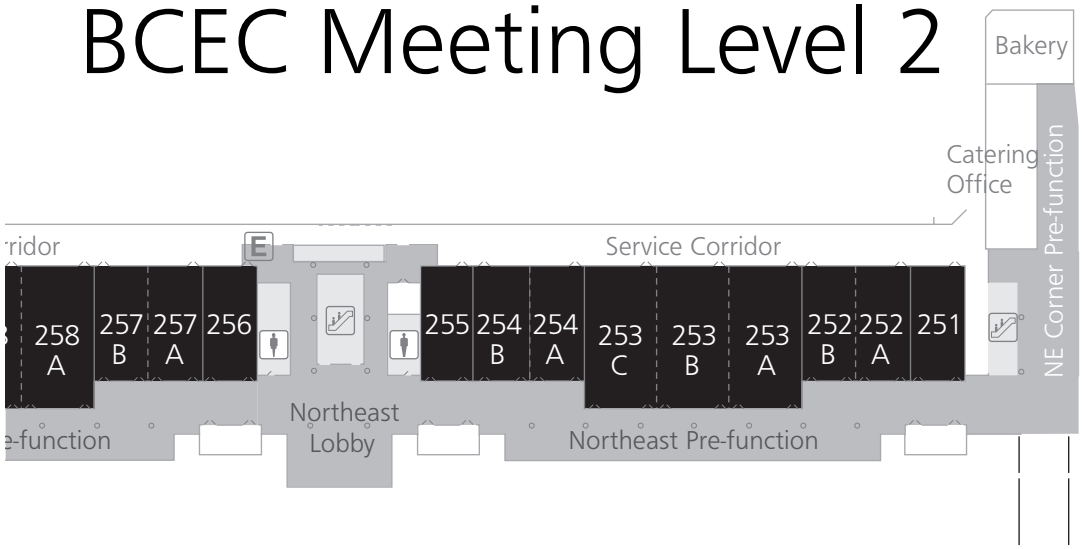
Revenue		
Registration Income		$300,500
	Total	$300,500
Expenses		
Printing		$6,675
Organizing Committee		8,200
Invited Speakers		46,500
Food and Beverage		108,000
AV Equipment and Telecommunication		71,000
Advertising		40,300
Professional Services		8,500
Conference Labor (including benefits)		142,115
Other (supplies, staff travel, freight, misc.)		20,144
Administrative		44,921
Accounting/Distribution & Shipping		24,102
Information Systems		44,672
Customer Service		16,261
Marketing		25,403
Office Space (Building)		16,519
Other SIAM Services		16,798
	Total	$640,110
Net Conference Expense		($339,610)
Support Provided by SIAM		$339,610
		$0

Estimated Support for Travel Awards not included above:

Students and Early Career	108	$75,900

Boston Convention and Exhibition Center (BCEC) Floor Plan

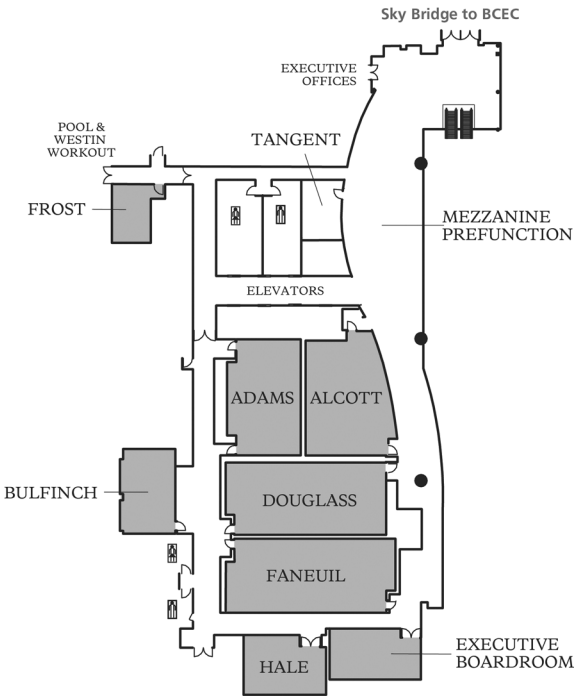
BCEC Meeting Level 2

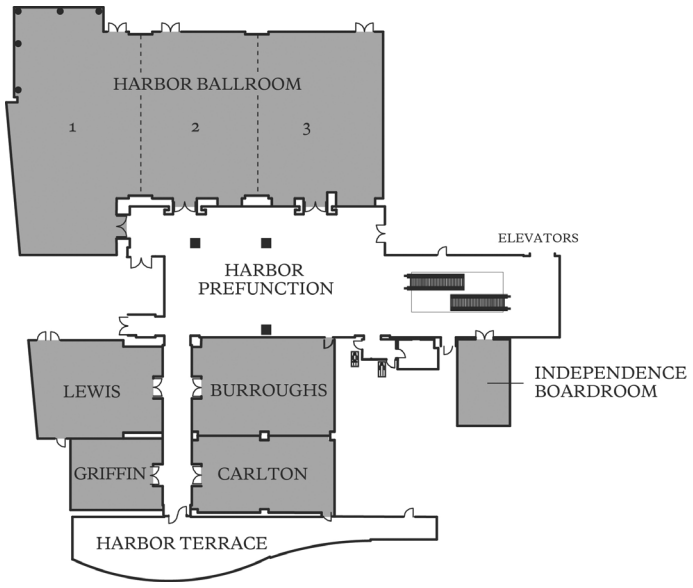


The Westin Boston Waterfront Skybridge Access

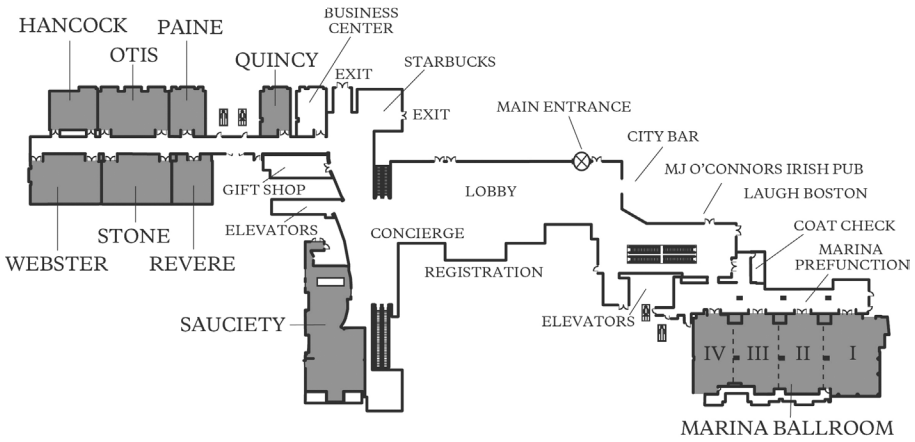
Westin Boston Waterfront Hotel Floor Plan

Mezzanine & Conference Level





Lobby Level



Concourse & Galleria Level