Final Program

2012 SIAM ANNUAL MEETING

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July 9–13

Hyatt Regency Minneapolis
Minneapolis, Minnesota, USA

SIAM Conference on

Financial Mathematics & Engineering

July 9-11, 2012
Hyatt Regency Minneapolis
Minneapolis, Minnesota, USA

The SIAM Conference on Financial Mathematics and Engineering is Sponsored by the SIAM Activity Group on Financial Mathematics and Engineering.

The Special Interest Activity Group on Financial Mathematics and Engineering (SIAG/FME) focuses on research and practice in financial mathematics, computation, and engineering. Its goals are to foster collaborations among mathematical scientists, statisticians, computer scientists, computational scientists, and researchers and practitioners in finance and economics, and to foster collaborations in the use of mathematical and computational tools in quantitative finance in the public and private sector. The activity group promotes and facilitates the development of financial mathematics and engineering as an academic discipline.

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General Information

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Annual Meeting Organizing Committee

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Emory University, USA
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Boston University, USA

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Louisiana State University, USA
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Financial Mathematics and Engineering Organizing Committee

Organizing Committee Co-chairs

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University of California, Santa Barbara, USA

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Jim Gatheral
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Stanford University, USA (AN12 liaison)
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University of Chicago, USA
Jin Ma
University of Southern California, USA
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University of Mannheim, Germany
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Ecole Polytechnique, France

SIAM Registration Desk

The SIAM registration desk is located in the Nicollet Promenade – Level 1. It is open during the following times:

Sunday, July 8
8:00 AM – 8:00 PM

Monday, July 9
7:30 AM – 4:30 PM

Tuesday, July 10
8:00 AM – 4:30 PM

Wednesday, July 11
8:00 AM – 4:30 PM

Thursday, July 12
8:00 AM – 4:30 PM

Friday, July 13
8:00 AM – 4:30 PM

Conference Location

Technical sessions for both conferences will be held at the Hyatt Regency Minneapolis.

Hyatt Regency Minneapolis
1300 Nicollet Mall
Minneapolis, Minnesota, USA 55403
Direct Telephone: +1-612-370-1234
Reservations Telephone:
+1-402-592-6464
Toll Free Reservations
(U.S. and Canada):
+1-888-421-1442
Fax: +1-612-370-1463

Website:minneapolis.hyatt.com

Check-in and Check-out Times for the Hyatt Regency Minneapolis

Check-in time is 3:00 PM.

Check-out time is 12:00 PM.

Telephone Messages

Telephone messages can be left at the SIAM registration desk by calling the Hyatt Regency Minneapolis at +1-612-370-1234 and asking for the SIAM Registration Desk. Messages taken at the SIAM registration desk will be posted to the message board located in the registration area. Messages may also be left for attendees staying at the conference hotel by calling this number.

Childcare

The Hyatt Regency Minneapolis recommends Nanny Professionals, a local child care service. They can be reached at +1-651-221-0587, by fax at +1-651-483-9261 or by e-mail at *nannypro@bevcomm.net.*

SIAM Corporate Members & Sponsors

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 and sponsors. 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

Air Force Office of Scientific Research

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The Boeing Company

CEA/DAM

DSTO- Defence Science and Technology Organisation

Hewlett-Packard

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

Lockheed Martin

Mathematical Sciences Research Institute

Max-Planck-Institute for Dynamics of Complex Technical Systems

Mentor Graphics

The MITRE Corporation

National Institute of Standards and Technology (NIST)

National Security Agency (DIRNSA)

Naval Surface Warfare Center, Dahlgren Division

NEC Laboratories America, Inc.

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

PETROLEO BRASILEIRO S.A. – PETROBRAS

Philips Research

Sandia National Laboratories

Schlumberger-Doll Research

Tech X Corporation

Texas Instruments Incorporated

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

United States Department of Energy

Conference Sponsor

IBM Research

Funding Agency

SIAM and the Conference Organizing Committee wish to extend their thanks and appreciation to the U.S. National Science Foundation for its support of the SIAM Conference on Financial Mathematics and Engineering and the Workshop Celebrating Diversity (WCD), both being held during the 2012 SIAM Annual Meeting.

Leading the applied mathematics community . . .

Join SIAM and save!

SIAM members save $130 on full registration for the 2012 SIAM Annual Meeting and SIAM Conference on Financial Mathematics and Engineering! 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 *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.

If you've already paid the Non-Member registration fee for the conference, we'll deduct the $130 member discount from your dues – join for 18 months of membership through 2013 for $74, or join for the rest of 2012 for just $6.

If you've already paid the Non-Member Mini Speaker/Organizer registration fee for the conference, we'll deduct the $65 member discount from your dues – join for 18 months of membership through 2013 for $139, or join for the rest of 2012 for just $71.

Free Student Memberships are available to students who attend an institution that is an Academic Member of SIAM (*www.siam.org/membership/acadlist.htm)*, 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.

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Postal mail: Society for Industrial and Applied Mathematics, 3600 Market Street, 6th floor, Philadelphia, PA 19104-2688 USA

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.

Each Plenary and Topical Room will have two (2) overhead projectors, two (2) screens and one (1) data projector. Cables or adaptors for Apple computers are not supplied, as they vary for each model. Please bring your own cable/adaptor if using a Mac computer.

All other concurrent/breakout rooms will have one (1) screen and one (1) data projector. Cables or adaptors for Apple computers are not supplied, as they vary for each model. Please bring your own cable/adaptor if using a Mac computer.

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.

E-mail Access

Wireless Internet access is available in the meeting space as well as in sleeping rooms booked within the SIAM block. In addition, computers are available in the Exhibit Hall – Level 1 during registration hours. The complimentary computers in the Exhibit Hall are provided to SIAM meeting attendees for the purpose of reading and responding to e-mail. Please be courteous to your colleagues by limiting your use to no longer than 15 minutes per visit.

Job Postings

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

Please Note

SIAM is not responsible for the safety or security of speakers' computers. Do not leave your computer or any other personal items unattended.

Please remember to turn off cell phones, pagers, etc., when attending sessions.

Conference Registration Fee Includes:

- Welcome Reception, Sunday, 6:00 PM
- SIAM Business Meeting *(for SIAM members; complimentary beer and wine will be served*), Tuesday, 6:15 PM
- SIAG/FME Business Meeting (*for SIAG/FME members; complimentary beer and wine will be served*), Tuesday, 7:30 PM
- Poster Session and Dessert Reception, Tuesday, 8:00 PM
- Access to email facilities
- Admission to all technical sessions
- Coffee breaks daily
- Exhibit Hall Admission
- Room set-ups and audio/visual equipment

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

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

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 SIAM Annual Meeting is #SIAMAN12. The hash tag for the SIAM Conference on Financial Mathematics and Engineering is #SIAMFM12.

Important Notice to Poster Presenters

The poster session is scheduled for Tuesday, July 10, 8:00 PM – 10:00 PM in the Exhibit Hall - Level 1. Poster presenters are requested to set up their poster material on the provided poster boards in the exhibit area after 10:00 AM on Sunday, July 8. All materials must be posted by 8:00 PM on Tuesday, July 10, the official start time of the session. Posters may remain on display through 10:00 AM on Thursday July 12, 2012 at which time they must be removed. Posters remaining after this time will be discarded. SIAM is not responsible for discarded posters.

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. Please visit the SIAM book booths in the Exhibit Hall for more information. The exhibit hall will close at 4:30 PM on Thursday, July 12, 2012.

Get-togethers

- Welcome Reception, Sunday, July 8
- Career Fair, Graduate Student Reception, and Industry Member Reception (running concurrently), Monday, July 9
- Prizes and Awards Luncheon, Tuesday, July 10
- SIAM Business Meeting (*for SIAM members; complimentary beer and wine will be served*), Tuesday, July 10
- SIAG/FME Business Meeting (*for SIAG/FME members; complimentary beer and wine will be served)*, Tuesday, July 10
- Poster Session and Dessert Reception, Tuesday, July 10
- Community Reception, Wednesday, July 11
- Professional Development Evening, Thursday, July 12

(See page 30 for more detail about these special events)

General Information

Introducing the SIAM 2012 Mobile App Powered by TripBuilder®

To enhance your conference experience, we're providing a state-of-the-art mobile app to give you important conference information right at your fingertips. With this TripBuilder Event Mobile app, you can:

- Create your own custom schedule
- View Sessions, Speakers, Exhibitors and more
- Take notes and export them to your email
- View Award-Winning TripBuilder Recommendations for Minneapolis
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You can also visit ***www.tripbuilder.mobi/siam2012*** and bookmark the mobile web app.

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: Sven Leyffer, SIAM Vice President for Programs (*vpp@siam.org*).

Exhibitor Information

Please talk to company representatives about products and services that are important to you! Enjoy free coffee during coffee breaks. Visit the exhibits during these hours:

Monday 9:30 AM-4:30 PM;

Tuesday 9:30 AM-4:30 PM

Wednesday 9:30 AM-4:30 PM

Thursday 9:30 AM-4:30 PM

AAAS Science & Technology Policy Fellowships

Booth #5

http://fellowships.aaas.org/ One-year fellowships that seek to foster scientifically informed, evidence-based policy and practice by engaging scientists and engineers from a broad range of disciplines and career stages. A doctoral level degree (or MS in engineering) is required.

AMS

Booth #11

The American Mathematical Society publishes books, journals (electronic and print), and MathSciNet-the Mathematical Reviews Database. Our top-tier research publications span the entire spectrum of pure and applied mathematics for professionals, graduate students, and advanced undergraduates. For more information or to purchase AMS publications, go to www.ams.org/bookstore.

CRC Press/Taylor & Francis

Booth # 10

CRC Press/Taylor & Francis is a premier books and journals publisher. Stop by our booth #10 to browse our books at a discount of up to 50%, to pick up a journal sample copy, or to meet with our editor Bob Stern if you are interested in developing a new book project.

Cambridge University Press

Booth # 3

Cambridge's publishing in books and journals combines state-of-the-art content with the highest standards of scholarship, writing and production. Visit our stand to browse new titles, available at a 20% discount, and to pick up sample issues of our journals. Visit our website to see everything we do: www.cambridge.org/us/.

MathWorks

Booth # 7

The MATLAB and Simulink product families are fundamental computational tools at the world's educational institutions. Adopted by more than 5000 universities and colleges, MathWorks products accelerate the pace of learning, teaching, and research in engineering and science. MathWorks products also help prepare students for careers in industry worldwide, where the tools are widely used for collaborative new product development. For more information, visit www.mathworks.com/academia.

Oxford University Press

Booth # 3

Oxford University Press publishes some of the most respected and prestigious mathematics books and journals in the world, including the Numerical Mathematics and Scientific Computing series, Metcalf's Modern Fortran Explained and the journals of the Institute of Mathematics and its Applications (IMA). Visit our stand to browse books and to pick up sample copies of our journals, or visit online at www.oup.com for more information.

Princeton University Press

Booth #6

New textbooks include Numerical Methods by Greenbaum and Chartier; Hybrid Dynamical Systems by Goebel, Sanfelice, and Teel; Calculus of Variations and Optimal Control Theory by Liberzon. Adoption copies are available. There are many new monographs and a new series, Princeton Puzzlers. Many of your favorite authors have new titles, including Mark Levi's "Why Cats Land on Their Feet, John Adam's X and the City, and Who's #1?" by Amy Langville and Carl Meyer. Visit us at Booth No. 6.

SIAM

Booth # 23,24,25,26,27

Visit the SIAM booth to check out our many recently published titles along with a large assortment of other acclaimed SIAM books, all available with generous member and attendee discounts. Don't miss our special offer for Annual Meeting – buy two or more books and get a 40% discount. You'll also find sample issues of SIAM's renowned journals, along with information and applications for anyone interested in becoming a SIAM member. Fill out a SIAM survey and receive a free stadium blanket in return (while supplies last). During coffee breaks, stop in and get a SIAM shortbread cookie to snack on. And don't forget to pick up a copy of SIAM News for the road! Be sure to visit SIAM on the Web, too, at www.siam.org.

Springer Science + Business Media, LLC

Booth #9

Come and see the Key Mathematics titles in Applied Mathematics and learn about our Ebook programme including Springer's plans for mobile devices. Follow Springer Math on Twitter and Facebook for the latest updates.

Tabletop Displays

Association of Women in Mathematics

Solar Crest Publishing

Registration Inserts

Association for Computing Machinery

EDP Sciences

Elsevier

Oxford University Press

SIAM

Taylor & Francis Group

This exhibitor list is current at press time (June 1, 2012).

Visit the Exhibits!

Hyatt Regency Minneapolis, Minneapolis, Minnesota, USA

Exhibit Hours

Monday, July 9
9:30 AM–4:30 PM

Tuesday, July 10
9:30 AM–4:30 PM

Wednesday, July 11
9:30 AM–4:30 PM

Thursday, July 12
9:30 AM–4:30 PM

Tabletop Exhibitors

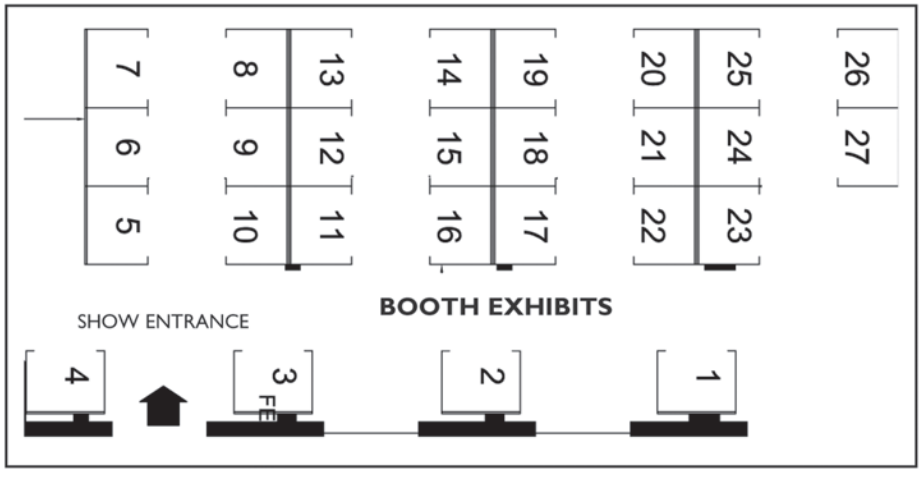
Association for Women in Mathematics (AWM)

Solar Crest Publishing

Booth Exhibitors	Booth #
AAAS Science & Technology Policy Fellowships	5
American Mathematical Society	11
CRC Press-Taylor & Francis Group LLC	10
Cambridge University Press	16
MathWorks	7
Oxford University Press	3
Princeton University Press	6
SIAM	23, 24, 25, 26, 27
Springer Science & Business Media, LLC	9

Coffee breaks will be served only in the exhibit hall.

EXHIBIT HALL



Workshops

Sunday, July 8

COACHing Senior Faculty Women in the Art of Strategic Persuasion

9:30 AM -12:00 PM

Nicollet D2 - Level 1

Workshop Facilitators:
Jane Tucker and Barb Butterfield

This workshop will help professional women be more effective when leading or participating in discussions, meetings, or group negotiations. Learn about strategic rather than reactive behaviors. This workshop, which combines self-presentation, leadership training, and faculty development in an interactive format that encourages highly personal learning, is designed to enhance women's abilities and confidence in such situations. This session will also be centered on professional negotiation skills and its multi-faceted approach includes some pragmatic learning content, case studies, and incorporates the real issues facing those attending the sessions.

Cases will be taken directly from the group and will have the opportunity to role play a case to a successful outcome.

Presented by COACh with support of SIAM.

For more information about COACh contact Priscilla Lewis, COACh Coordinator, *coach@uoregon.edu.*

COACHing Junior Faculty Women in the Art of Strategic Persuasion

1:30 PM -4:00 PM

Nicollet D2 - Level 1

Workshop Facilitators:
Jane Tucker and Barb Butterfield

Presented by: Dr. Barbara Butterfield & Dr. Jane Tucker

In this workshop participants assimilate fundamentals of responsible negotiations and conflict resolution; they learn to be curious about points of view, data, and aspirations of all parties involved. Attendees examine the importance of developing alternatives to agreement that build self-confidence and enhance preparation. They use self-examination to discover personal negotiating styles and in prepared case studies covering current challenges, practice skills to reach highly successful outcomes.

Cases will be taken directly from the group and will have the opportunity to role play a case to a successful outcome.

Presented by COACh with support of SIAM.

For more information about COACh contact Priscilla Lewis, COACh Coordinator, *coach@uoregon.edu.*

Tutorial

Sunday, July 8

1:00 PM – 4:30 PM

FM12 Tutorial:

Mathematical Modeling of Interest Rates: Challenges and New Directions

Room: Nicollet D1 - Level 1
Separate fees apply

Tutorial Outline:

- Interest rate behavior during the financial crisis
- A simple credit model explaining the explosion of the basis
- The multi-curve environment
- A new definition of forward rate
- New pricing of Forward Rate Agreement and interest rate swaps
- Market formulas for caps and swaptions
- Extending the Libor market model to a multi-curve framework
- Joint modeling of interest rates with different tenors
- Modeling the spread between OIS and LIBOR rates
- Extending short rate models

Organizer: Rama Cont
CNRS, France, and Columbia University, USA

Speaker: Fabio Mercurio, Bloomberg LP, USA

Invited Speakers
2012 SIAM Annual Meeting

Monday, July 9

8:30 AM - 9:15 AM

IC1 On the Shape of Data

Gunnar E. Carlsson, *Stanford University, USA*

(AMS-sponsored speaker)
Nicollet ABC - Level 1

9:15 AM - 10:00 AM

IC2 Elliptic Curve Cryptography and Applications

Kristin Lauter, *Microsoft Research, USA*

Nicollet ABC - Level 1

2:00 PM – 2:45 PM

JP1 Systemic Risk

George C. Papanicolaou, *Stanford University, USA*

Nicollet ABC - Level 1

Tuesday, July 10

8:30 AM - 9:15 AM

IC3 Applying Mathematics to Better Understand the Ocean

Emily Shuckburgh, *British Antarctic Survey, United Kingdom*

Nicollet ABC - Level 1

9:15 AM - 10:00 AM

SP6 SIAG/FME Junior Scientist Prize Lecture:
Market-Based Approach to Modeling Derivatives Prices

Sergey Nadtochiy, *Oxford University, United Kingdom*

Nicollet D2/3 - Level 1

Invited Speakers
2012 SIAM Annual Meeting

Wednesday, July 11

8:30 AM - 9:15 AM

IC5 Model-Assisted Effective Large Scale Matrix Computations

Valeria Simoncini, *Universita' di Bologna, Italy*

Nicollet ABC - Level 1

9:15 AM - 10:00 AM

IC6 Multiscale Problems Involving Disorder: A Mathematical Perspective

Claude LeBris, *CERMICS ENPC, France*

Nicollet ABC - Level 1

Thursday, July 12

8:30 AM - 9:15 AM

IC7 Freeform Architecture and Discrete Differential Geometry

Helmut Pottmann, *King Abdullah University of Science and Technology, Saudi Arabia*

Nicollet ABC - Level 1

8:30 AM - 9:15 AM

IC8 Computing Essentials: What SIAM Members Should Know About Emerging Architectures

Michael A. Heroux, *Sandia National Laboratories, USA*

Nicollet D - Level 1

9:15 AM – 10:00 AM

IP1 On Mean Field Games

Pierre-Louis Lions, *Collège de France, France*

Nicollet ABC - Level 1

2:00 PM – 2:45 PM

IP2 Complex Adaptive Systems and the Challenge of Sustainability

Simon Levin, *Princeton University, USA*

Nicollet ABC - Level 1

Invited Speakers
2012 SIAM Annual Meeting

Thursday, July 12

2:45 PM - 3:30 PM

IP3 The Isoperimetric Problem Revisited: Exposing Euler's 1744 Proof of Necessity as a Proof of Sufficiency, as Such the First and Shortest in History

Richard A. Tapia, *Rice University, USA*

Nicollet ABC - Level 1

Friday, July 13

8:30 AM - 9:15 AM

IC9 Overcoming the Tyranny of Scales in Subsurface Flow and Reactive Transport Simulation

Timothy D. Scheibe, *Pacific Northwest National Laboratory, USA*

Nicollet ABC - Level 1

8:30 AM - 9:15 AM

IC10 Network Formation and Ion Conduction in Ionomer Membranes

Keith Promislow, *Michigan State University, USA*

Nicollet D - Level 1

9:15 AM - 10:00 AM

IP4 Complex Networks. A Tour d' Horizon

Ernesto Estrada, *University of Strathclyde, United Kingdom*

Nicollet ABC - Level 1

2:00 PM - 2:45 PM

IP5 Linear Algebra Methods for Data Mining with Applications to Materials Science

Yousef Saad, *University of Minnesota, USA*

Nicollet ABC - Level 1

2:45 PM - 3:30 PM

IP6 Multifidelity Modeling for Identification, Prediction and Optimization of Large-scale Complex Systems

Karen E. Willcox, *Massachusetts Institute of Technology, USA*

(IMA-sponsored speaker)

Nicollet ABC - Level 1

Invited Speakers
SIAM Conference on Financial Mathematics & Engineering

Monday, July 9

8:30 AM - 9:15 AM

IC1 Optimal Execution in a General One-Sided Limit Order Book

Steven E. Shreve, *Carnegie Mellon University, USA*

Nicollet D2/3 - Level 1

9:15 AM - 10:00 AM

IC2 Stable Diffusions With Rank-based Interactions, and Models of Large Equity Markets

Ioannis Karatzas, *Columbia University, USA*

Nicollet D2/3 - Level 1

2:00 PM – 2:45 PM

JP1 Systemic Risk

George C. Papanicolaou, *Stanford University, USA*

Nicollet ABC - Level 1

Tuesday, July 10

8:30 AM - 9:15 AM

IC3 Simulation Schemes for Stopped Lévy Processes

Peter Tankov, *Université Paris-Diderot, France*

Nicollet D2/3 - Level 1

9:15 AM - 10:00 AM

SP6 SIAG/FME Junior Scientist Prize Lecture:
Market-Based Approach to Modeling Derivatives Prices

Sergey Nadtochiy, *Oxford University, United Kingdom*

Nicollet D2/3 - Level 1

Invited Speakers
SIAM Conference on Financial Mathematics & Engineering

Wednesday, July 11

8:30 AM - 9:15 AM

IC5 Optimal Order Placement in Limit Order Books

Xin Guo, *University of California, Berkeley, USA*

Nicollet D2/3 - Level 1

9:15 AM - 10:00 AM

IC6 Quantitative Absence of Arbitrage and Equivalent Changes of Measure

Martin Schweizer, *ETH Zürich, Switzerland*

Nicollet D2/3 - Level 1

Prize and Special Lectures
2012 SIAM Annual Meeting

Monday, July 9

2:45 PM – 3:30 PM

SP1 AWM-SIAM Sonia Kovalevsky Lecture: The Role of Characteristics in Conservation Laws

Barbara Lee Keyfitz, *The Ohio State University, USA*

Nicollet ABC - Level 1

Tuesday, July 10

2:30 PM - 3:30 PM

SP2 The John von Neumann Lecture: Liquid Crystals for Mathematicians

John Ball, *University of Oxford, United Kingdom*

Nicollet ABC - Level 1

Wednesday, July 11

2:00 PM - 3:00 PM

SP3 Past President's Address: Reflections on SIAM, Publishing, and the Opportunities Before Us

Douglas N. Arnold, *University of Minnesota, USA*

Nicollet ABC - Level 1

3:00 PM – 3:30 PM

SP4 W. T. and Idalia Reid Prize Lecture: Large Algebraic Properties of Riccati Equations

Ruth Curtain, *University of Groningen, Netherlands*

Nicollet ABC - Level 1

6:15 PM - 7:15 PM

SP5 I.E. Block Community Lecture: Creating Reality: The Mathematics Behind Visual Effects

Robert Bridson, *University of British Columbia, Canada*

Nicollet ABC - Level 1

Prizes and Awards Luncheon

Tuesday, July 10

12:30 PM – 2:30 PM

The Prizes and Awards Luncheon will be held in the Exhibit Hall at the Hyatt Regency Minneapolis. 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 9.

The following Prizes, Awards and Fellows will be recognized:

The John von Neumann Lecture

John Ball, *University of Oxford, United Kingdom*

I. E. Block Community Lecture

Robert Bridson, *The University of British Columbia, Canada*

The AWM-SIAM Sonia Kovalevsky Lecture

Barbara Lee Keyfitz, *The Ohio State University, USA*

Richard C. DiPrima Prize

Thomas Goldstein, *Stanford University, USA*

George Pólya Prize

Vojtěch Rödl, *Emory University, USA* and **Mathias Schacht**, *University of Hamburg, Germany*

W. T. and Idalia Reid Prize

Ruth F. Curtain, *University of Groningen, The Netherlands*

SIAG/FME Junior Scientist Prize

Sergey Nadtochiy, *Oxford University, United Kingdom*

SIAM Award in the MCM (Mathematical Contest in Modeling)

2011 Recipients
Tsinghua University, P.R. China
Harvey Mudd College, USA

2012 Recipients
Zhejiang University, P.R. China
University of Louisville, USA

SIAM Outstanding Paper Prizes

See Prizes and Awards booklet

SIAM Student Paper Prize (2011 and 2012 winners)

2011 Recipients
Necdet Serhat Aybat, Columbia University, USA
Sungwoo Park, University of Maryland, USA
Xiangxiong Zhang, Brown University, USA

2012 Recipients
Brittany D. Froese, Simon Fraser University, Canada
Stefanie Hollborn, Johannes Gutenberg University Mainz, Germany
Marina Moraiti, University of Pittsburgh, USA

SIAM Prize for Distinguished Service to the Profession

Barbara Lee Keyfitz, *The Ohio State University, USA*

Prizes and Awards Luncheon

The Class of 2012 Fellows will be recognized during the Prizes and Awards Luncheon:

Tamer Basar, University of Illinois at Urbana-Champaign, USA

Michele Benzi, Emory University, USA

Anthony M. Bloch, University of Michigan, USA

Pavel B. Bochev, Sandia National Laboratories, USA

Richard A. Brualdi, University of Wisconsin-Madison, USA, Emeritus

Gui-Qiang G. Chen, University of Oxford, United Kingdom

G. Bard Ermentrout, University of Pittsburgh, USA

Richard S. Falk, Rutgers University, USA

Lisa J. Fauci, Tulane University, USA

David R. Ferguson, Applied Mathematical Analysis and The Boeing Company, USA, Retired

M. Gregory Forest, University of North Carolina Chapel Hill, USA

Susan Friedlander, University of Southern California, USA

Irene M. Gamba, The University of Texas at Austin, USA

Walter Gautschi, Purdue University, USA, Retired

Donald Goldfarb, Columbia University, USA

Sven Hammarling, Numerical Algorithms Group Ltd, Semiretired, and University of Manchester, United Kingdom

Pavol Hell, Simon Fraser University, Canada

Bruce Hendrickson, Sandia National Laboratories, USA

Kirk E. Jordan, IBM Corporation, USA

Michael I. Jordan, University of California, Berkeley, USA

James P. Keener, University of Utah, USA

Naomi Ehrich Leonard, Princeton University, USA

Philip Kumar Maini, University of Oxford, United Kingdom

Geoffrey B. McFadden, National Institute of Standards and Technology, USA

Edward Ott, University of Maryland, College Park, USA

Tamar Schlick, New York University, USA

David B. Shmoys, Cornell University, USA

Mary Silber, Northwestern University, USA

Barry F. Smith, Argonne National Laboratory, USA

Tao Tang, Hong Kong Baptist University, Hong Kong

Edriss S. Titi, Weizmann Institute of Science and University of California, Irvine, USA

Robert J. Vanderbei, Princeton University, USA

Richard S. Varga, Kent State University, USA, Emeritus

Jan C. Willems, K.U. Leuven, Belgium

Thaleia Zariphopoulou, University of Oxford, United Kingdom, and The University of Texas at Austin, USA

Student Days

Students - Activities just for you at the 2012 SIAM Annual Meeting in Minneapolis

Student Days at the 2012 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 (Chaired by Peter Turner, Clarkson University), 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 (AN12) or the SIAM Conference on Financial Mathematics & Engineering (FM12). This year new activities have been added that will enhance the meeting for students including a special orientation prior to Sunday's welcome reception, a student lounge, a session for students with selected conference invited speakers, and sessions on Undergraduate Research in Applied and Computational Mathematics. 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 2012 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 9, features events to help you find a job and develop your career. An industry panel organized by SIAM Vice President for Industry, Thomas Grandine, will offer insights into what it's like to work in industry. The panel will be followed by a Career Fair and a reception for industry representatives and graduate students. The Career Fair 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 is posted online. Professional development evening is Thursday, July 12. In addition to a panel discussion, 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.

NEW Visit the Student Lounge in the Exhibit Hall

Looking to meet up with other students? Stop by the Student Lounge located in the Exhibit Hall. Enjoy refreshments while you network with fellow students.

Student Days

Sunday, July 8, 2012

5:00 PM - 6:00 PM **Student Orientation NEW!**

6:00 PM - 8:00 PM **Welcome Reception**

Monday, July 9, 2012

8:30 AM - 10:00 AM **AN12 & FM12 Invited Speaker Sessions**

10:30 AM - 12:30 PM **MS8 Undergraduate Research in Applied and Computational Mathematics - Part I of II**
Organizer: Peter R. Turner, Clarkson University, USA

Spectral Properties of Neural Network Structures
Jeffry Moulton, University of Pittsburgh, USA

A Multi-numeric Method for Convection-dominated Parabolic Problems Using an Adaptive Region-swapping Approach
Joseph Huchette, Rice University, USA

The Effects of Signal Delay in Gene Regulatory Networks
Sarah Stanley, University of Houston, USA

12:30 PM – 2:00 PM **Lunch break – attendees on their own**

4:00 PM - 6:00 PM **MS19 Undergraduate Research in Applied and Computational Mathematics - Part II of II**
Organizer: Peter R. Turner, Clarkson University, USA

CGPOP Analysis and Optimization
Hongtao Cai, Xiaoxiang Hu, and Haoruo Peng, Tsinghua University, China

Symplectic Methods for an Exactly Solvable Kolmogorov Model of Two Interacting Species
Katherine Ball, University of California, San Diego, USA

Modeling Earth's Temperature and Atmospheric Carbon Dioxide
Emma Cutler, Bowdoin College, USA

Periodic Dispersion
Gong Chen, University of Minnesota, USA

6:15 PM - 7:15 PM **PD1 Panel on BIG Data in Applied Mathematics, Computational Science, and Statistics**
PD2 Industry Panel: Establishing and Nurturing Productive Collaborations

7:15 PM - 9:15 PM **Career Fair / Graduate Student Reception / Industry Reception**

Student Days

Tuesday, July 10, 2012

7:00 AM - 8:15 AM **Student Chapter meeting with SIAM Leadership (by invitation only)**

8:30 AM - 10:00 AM **AN12 and FM12 Invited Speaker sessions**

10:30 AM - 12:30 PM **MS32 SIAM Student Chapter Presentations**
Organizer: Peter Turner, Clarkson University, USA

Numerically Optimal High Order Strong Stability Preserving Multi-step Runge-Kutta Methods
Zachary Grant, University of Massachusetts
Mathematical Modeling of Panama Disease in Cavendish Bananas Plants
Blake Burkett, Shippensburg University, USA
Simulation of Deformations and Shape Recovery of Red Blood Cells Using the Lattice Boltzman Method
John Gounley, Old Dominion University, USA
Modeling of the Dynamic Delamination of L-shaped Unidirectional Laminated Composites
Burak Gozluklu, Middle East Technical University, Turkey
Simulating Two-Phase Flows in Fractured Reservoirs Using a Generic Transfer Function in a Dual-Porosity Model
Christine Maier, Heriot-Watt University, United Kingdom
An Analytical Approach to Green Oxidation
Diego Torrejon, George Mason University, USA

12:30 PM - 2:30 PM **Prizes and Awards Luncheon**

2:30 PM - 3:30 PM **The John von Neumann Lecture**

3:30 PM - 4:00 PM **Coffee break**

4:00 PM - 6:00 PM **MS44 Students informal meeting with Invited Speakers NEW!**

8:00 PM - 10:00 PM **Joint Poster Session (AN12, AWM, FM12) and Dessert Reception**

Student Days

Wednesday, July 11, 2012

8:30 AM - 10:00 AM — **AN12 and FM12 Invited Speaker sessions**

10:30 AM - 12:30 PM — **MS54 SIAM Award in the MCM (Mathematical Contest in Modeling)**

2011 Recipients
Tsinghua University, P.R. China
Harvey Mudd College, USA

2012 Recipients
Zhejiang University, P.R. China
University of Louisville, USA

2:00 PM - 3:00 PM — **AN12 Past President's Lecture**

3:00 PM - 3:30 PM — **AN12 Plenary Reid Prize Lecture**

4:00 PM - 6:00 PM — **MS69 SIAM Student Paper Prize (2011 and 2012 winners)**

2011 Recipients

Necdet Serhat Aybat
Columbia University, USA

Sungwoo Park
University of Maryland, USA

Xiangxiong Zhang
Brown University, USA

2012 Recipients

Brittany D. Froese
Simon Fraser University, Canada

Stefanie Hollborn
Johannes Gutenberg University Mainz, Germany

Marina Moraiti
University of Pittsburgh, USA

6:15 PM - 7:15 PM — **I.E. Block Community Lecture**

7:15 PM - 8:15 PM — **Community Reception**

Thursday, July 12, 2012

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

6:15 PM - 9:15 PM — **Professional Development Evening**

Workshop Celebrating Diversity (WCD)

July 10-12, 2012

Organizers:
Tanya Moore, Building Diversity in Science, USA
Cristina Villalobos, University of Texas-Pan American, USA
Stephen Wirkus, Arizona State University, USA

This annual event provides a chance for students to listen to technical talks presented by minority graduate students. 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.

Look for the WCD designation throughout the program. These sessions are shared with the Workshop Celebrating Diversity.

Tuesday, July 10

10:30 AM - 12:30 PM **MS33 Cut Cell Methods for Solids and Incompressible Fluids** (see page 55)
Greenway A - Level 2

4:00 PM - 6:00 PM **MS45 Computational Mathematics Applied to Scientific Problems** (see page 61)
Greenway A - Level 2

Wednesday, July 11

10:30 AM - 12:30 PM **MS55 Dynamical Systems and Its Applications to Biological Models** (see page 72)
Greenway A - Level 2

12:30 PM – 2:00 PM **Workshop Celebrating Diversity Lunch** (by invitation)
Regency – Level 2

4:00 PM - 6:00 PM **MS70 Analysis and Applications of Optimization**
Greenway A - Level 2

Workshop Celebrating Diversity (WCD)

8:00 PM - 10:05 PM

Workshop Celebrating Diversity (WCD)

Symposium Celebrating the Contributions of Professor Carlos Castillo-Chavez
Nicollet D2 - Level 1

The goal of this session is to honor Professor Castillo-Chavez's lifetime achievements and contributions to mathematical epidemiology. The speakers will provide an overview of Professor Castillo-Chavez's research and highlight his most important contributions. Special thanks to the following individuals who have helped with the organization of this session: Janet Best, Gerardo Chowell, Paula Gonzalez,Christopher Kribs-Zaleta, Miriam Nuno, Leticia Velazquez, Fabio Sanchez, Anuj Mubayi, Eunha Shim and Omayra Ortega.

Thursday, July 12

10:30 AM - 12:30 PM

MS83 New Developments in Mathematical Epidemiology
Greenway A - Level 2

4:00 PM - 6:00 PM

MS95 Operative Research
Greenway A - Level 2

AWM Workshop

Monday, July 9 - Tuesday, July 10, 2012

Association for Women in Mathematics (AWM) Workshop for Women Graduate Students and Recent PhDs
Held in conjunction with the 2012 SIAM Annual Meeting

The Association for Women in Mathematics (AWM) plans a workshop from mid-day Monday, July 9 through Tuesday, July 10, 2012. AWM and SIAM welcome your participation.

The sessions focus on showcasing the research of women graduate students and recent Ph.D. mathematicians and helping individuals to prepare for careers in the mathematical sciences. Our Monday afternoon session is a minisymposium that focuses on career transitions and experiences. The workshop also has two research minisymposia (Tuesday morning and afternoon) presented by recent Ph.D. mathematicians and poster presentations by graduate students. In addition, on Monday, at 2:45 PM, there is the AWM-SIAM Sonia Kovalevsky Lecture presented by Barbara Lee Keyfitz, The Ohio State University, USA.

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 Department of Energy (DOE) for the support of the AWM workshop.

Monday, July 9

2:45 PM - 3:30 PM

SP1 AWM-SIAM Sonia Kovalevsky Lecture: The Role of Characteristics in Conservation Laws
Barbara Lee Keyfitz, The Ohio State University, USA
Room: Nicollet ABC - Level 1

4:00 PM – 6:00 PM

MS12 AWM Workshop: Teaming Up in Tough Times
Organizers: Carol S. Woodward, Lawrence Livermore National Laboratory, USA, Andrea L. Bertozzi, University of California, Los Angeles, USA, Maria Emelianenko, George Mason University, USA, Elebeoba E. May, Sandia National Laboratories, USA, Cammey Cole Manning, Meredith College, USA
Room: Nicollet D1 - Level 1

Tuesday, July 10

10:30 AM - 12:30 PM

MS22 AWM Workshop: Research Talks by Recent Ph.D.s
Organizers: Carol S. Woodward, Lawrence Livermore National Laboratory, USA, Andrea L. Bertozzi, University of California, Los Angeles, USA, Maria Emelianenko, George Mason University, USA, Elebeoba E. May, Sandia National Laboratories, USA, Cammey Cole Manning, Meredith College, USA
Room: Greenway B - Level 2

8:00 PM – 10:00 PM

AWM Poster (joint with AN12 and FM12 poster & dessert reception)
Room: Exhibit Hall - Level 1

4:00 PM - 6:00 PM

MS34 AWM Workshop: Mathematical Biology Research Talks by Recent Ph.D.s
Organizers: Eleboeba E. May, Sandia National Laboratories, USA, Leah Edelstein-Keshet, University of British Columbia, Canada, Cammey Cole Manning, Meredith College, USA
Room: Greenway B - Level 2

Special Events

Sunday, July 8

5:00 PM – 6:00 PM

Student Orientation

Nicollet D3– Level 1

This new 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 Minneapolis, 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.

Organizers: Sven Leyffer, Argonne National Laboratory, USA and Peter Turner, Clarkson University, USA

6:00 PM – 8:00 PM
Welcome Reception

Exhibit Hall

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

Monday, July 9

12:45 PM – 1:45 PM
Funding Agencies Panel

Nicollet ABC - Level 1

Panelists discuss recent trends and future plans for computational and applied mathematics in their agencies, and possibly entertain questions from the audience.

6:15 PM – 7:15 PM

Industry Panel: Establishing and Nurturing Productive Collaborations

Nicollet D2 - Level 1

Success of mathematics in an industrial setting is frequently determined by the extent to which significant mathematical ideas are developed and disseminated through collaboration. In particular, adoption and deployment of those ideas often relies upon the level of confidence non-experts have in those ideas. Collaboration, both inside and outside companies, involving both academic and non-academic collaborators, has proven to be a useful tool for mathematical technology transfer for technical and non-technical reasons. The panelists will probe the ways in which collaboration has strengthened both their companies and the mathematical technologies which have helped to make those companies successful.

Chair: Thomas A. Grandine, The Boeing Company, USA

6:15 PM - 7:15 PM
Panel on BIG Data in Applied Mathematics, Computational Science, and Statistics

Nicollet ABC - Level 1

The ability to collect and interpret ever-growing amounts of data is playing an increasingly important role in scientific and technological progress. New challenges and opportunities abound from big data problems in bioinformatics, computer vision, geophysics, high energy physics, industrial processes, microarrays, networks, neuroscience, object recognition, sensors, scientific computation, signal processing, social science, and other fields. These challenges and opportunities are leading to new analysis, theory, and simulation in diverse areas: algebra, dynamical systems, graph theory, harmonic analysis, linear algebra, machine learning, numerical analysis, optimization, statistics, and topology, etc... This panel centers on the roles of mathematics, computational science, and statistics in 'Big Data.'

Chairs: Michele Benzi, Emory University, USA and Tasso J. Kaper, Boston University, USA

Panelists: Gunnar E. Carlsson, Stanford University, USA, William Harrod , DOE Office of Science, USA,

Tamara G. Kolda, Sandia National Laboratories, USA, Sastry Pantula, National Science Foundation, USA

7:15 PM – 9:15 PM

Career Fair, Graduate Student and Industry Reception

Greenway Promenade - Level 2

The SIAM Applied Mathematics and Computational Science Career Fair* is an informational and interactive event at which employers and prospective employees can discuss careers. It is a great opportunity for prospective employees to meet government and industry representatives and discuss what they are looking for and what each employer has to offer. Complimentary light hors d'oeuvres, beer and wine will be served.

Special Events

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

SIAM is pleased to announce the following organizations are participating in the Career Fair*:

AAAS Science and Technology
MathWorks
MIT Lincoln Laboratory
National Security Agency
The Aerospace Corporation
Sandia National Laboratories

Graduate Student Reception*

Graduate students and new PhDs are especially urged to attend this event.

Industry Member Reception*

This reception is scheduled as a networking opportunity for attendees from industry.

*These three events are designed to be interactive.

Tuesday, July 10

12:30 PM – 2:30 PM

Prizes and Awards Luncheon

Exhibit Hall

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 20 for the list of prizes and awards being presented.

6:15 PM – 7:15 PM

SIAM Business Meeting

(open to SIAM members; *complimentary beer and wine will be served*)

Nicollet ABC - Level 1

7:30 PM – 8:30 PM

SIAG/FME Business Meeting

(open to all SIAG/FME Members;
complimentary beer and wine will be served)
Nicollet D2/3 - Level 1

8:00 PM – 10:00 PM

Joint Poster Session & Dessert Reception

Exhibit Hall - Level 1

The 2012 SIAM Annual Meeting, AWM Workshop, and SIAM Conference on Financial Mathematics and Engineering all have contributed to the posters on display. Presentations are in an informal setting, allowing presenters to discuss their research with individual attendees.

Special Events

Wednesday, July 11

6:15 PM – 8:15 PM

I.E. Block Community Lecture and Reception

Nicollet ABC - Level 1, lecture

Exhibit Hall, reception

This event is open to all attendees, their guests and the local community. Robert Bridson, University of British Columbia, Canada, 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 12

6:15 PM - 9:15 PM

Professional Development Evening

Nicollet ABC - Level 1

Successful Verbal Communication in the Workplace

Join us for an evening devoted to professional development in the area of verbal communication in the workplace. Several professionals from academia, government, and industry will share their work experiences and give advice on professional interactions, giving a good talk, and interviewing for jobs in the mathematical sciences. 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.

Pizza, salad, and soda will be served.

Evening Agenda

6:15-7:15 PM

Panel Discussion on Interviewing

7:15-8:15 PM

Networking Reception

8:15-9:15 PM

Panel Discussion on Professional Interactions and Giving a Good Talk

Prizes will be given to several event attendees chosen at random!

Organizers: Suzanne Shontz, University of Pennsylvania, USA, Cammey Cole Manning, Meredith College, USA, Christopher Siefert, Sandia National Laboratories, USA

Gene Golub g2S3 2013 SIAM Summer School

Matrix Functions and Matrix Equations

July 22–August 2, 2013
Shanghai, China

The fourth Gene Golub SIAM Summer School, with a focus on matrix functions and matrix equations, will take place in Fudan University, Shanghai, China, July 22 to August 2, 2013. It will also be the third International Summer School on Numerical Linear Algebra and the tenth Shanghai Summer School on Analysis and Numerics in Modern Sciences. An extra week of activities from August 5 to August 9, 2013 is planned for interested students.

Matrix functions and matrix equations are widely used in science, engineering and the social sciences, due to the succinct and insightful way they allow problems to be formulated and solutions to be expressed. Applications range from exponential integrators for the solution of partial differential equations to model reduction of dynamical systems. G2S3 2013 will introduce students to the underlying theory, algorithms and applications of matrix functions and matrix equations, and relevant linear solvers and eigenvalue computations.

The summer school will be composed of three main mini-courses:

- Functions of matrices and exponential integrators
- Matrix equations and model reduction
- High performance linear solvers and eigenvalue computations

The primary lecturers for these courses will be:

- Peter Benner, Max Planck Institute, Magdeburg, Germany
- Nicholas Higham, University of Manchester, United Kingdom
- Marlis Hochbruck, Karlsruhe Institute of Technology, Germany
- Ren-Cang Li, University of Texas, Arlington, USA
- Xiaoye (Sherry) Li, Lawrence Berkeley National Laboratory, USA

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

Application deadline: February 1, 2013

For more details on the courses and on how to apply, go to:

g2s3.cs.ucdavis.edu/

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

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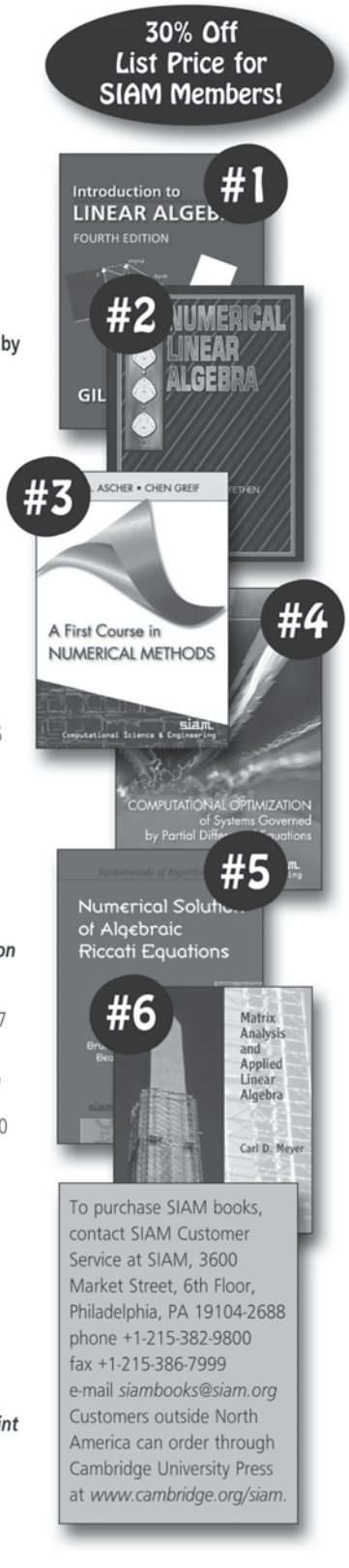

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5/12

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Dario Bini
S. Blackford
Albrecht Böttcher
Stephen Boyd
K. E. Brenan
William L. Briggs
José E. Castillo
Raymond Hon-Fu Chan
Philippe G. Ciarlet
Khosrow Chadan
Françoise Chaitin-Chatelin
Zhangxin Chen
David Colton
L. Pamela Cook
Lawrence Cowsar
Jane K. Cullum
Michael A. Demetriou
J. E. Dennis, Jr.
Jack J. Dongarra
Daniel M. Dunlavy
Martin Ehrendorfer
Bo Einarsson
Lars Eldén
Laurent El Ghaoui
Mauro Fabrizio
Eric Feron
Anthony V. Fiacco
Bernd Fischer
Andrew Fraser
Carl Friedrich Gauss
John Gilbert
Roland Glowinski
Robert Grossman
Sergei M. Grudsky
Willy J. F. Govaerts
Hans Hagen
Per Christian Hansen
Floyd Hanson
J. Haslinger
Bruce Hendrickson
Michael A. Heroux
Roger W. Hockney
Bruno Iannazzo
Michael D. Intriligator
Matthew R. James
Xiao-Qing Jin
T. Kailath
Leonid V. Kalachev
Jeremy Kepner
Hassan K. Khalil
Petar Kokotovic
Tamara G. Kolda
John E. Lagnese
Cornelius Lanczos
Herbert K. H. Lee
R. B. Lehoucq
Patrick Le Tallec
Randall J. LeVeque
Mark Lewis
T. Lin
Peter Linz
Tom Lyche
Stephen F. McCormick
Beatrice Meini
Jorge J. Moré
Alexander Morgan
Michael P. Mortell
Johannes Müller
James G. Nagy
Uwe Naumann
Dianne P. O'Leary
Robert O'Malley
Job Oostveen
Lassi Päivärinta
Beresford N. Partlett
Pablo Pedregal
Aline Pennisi
Alexei Pokrovskii
Friedrich Pukelsheim
Padma Raghavan
V. Ramaswami
Steve Reinhardt
Ulrich Rüde
Robert B. Schnabel
Yair Shapira
Horst D. Simon
Vladimir Sobolev
Joos Vandewalle
Sabine Van Huffel
Charles Van Loan
Edward C. Way

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AN12 Program

2012 SIAM ANNUAL MEETING

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1952 – 2012

July 9 – 13

Hyatt Regency Minneapolis
Minneapolis, Minnesota, USA

Sunday, July 8

Registration
8:00 AM-8:00 PM

Room:Nicollet Promenade - Level 1

COAChing Sr. Faculty Women in the Art of Strategic Persuasion
9:30 AM-12:00 PM

Room:Nicollet D2 - Level 1

MT1
Tutorial:
Mathematical Modeling of Interest Rates: Challenges and New Directions
1:00 PM-4:30 PM

Room:Nicollet D1 - Level 1

Chair: Rama Cont, CNRS, France, and Columbia University, USA

• Interest rate behavior during the financial crisis
• A simple credit model explaining the explosion of the basis
• The multi-curve environment
• A new definition of forward rate
• New pricing of Forward Rate Agreement and interest rate swaps
• Market formulas for caps and swaptions
• Extending the Libor market model to a multi-curve framework
• Joint modeling of interest rates with different tenors
• Modeling the spread between OIS and LIBOR rates
• Extending short rate models

Fabio Mercurio
Bloomberg LP, USA

Sunday, July 8

COAChing Jr. Faculty Women in the Art of Strategic Persuasion
1:30 PM-4:00 PM

Room:Nicollet D2 - Level 1

Student Orientation
5:00 PM-6:00 PM

Room: Nicollet D3

Welcome Reception


6:00 PM-8:00 PM

Room:Exhibit Hall - Level 1

Monday, July 9

Registration
7:30 AM-4:30 PM

Room:Nicollet Promenade - Level 1

Opening Remarks
8:15 AM-8:30 AM

Room:Nicollet ABC - Level 1

IC1
On the Shape of Data
8:30 AM-9:15 AM

Room:Nicollet ABC - Level 1

Chair: Doug Arnold, University of Minnesota, USA

Topology is the mathematical discipline which studies shape. Data sets typically come with a notion of distance which formalizes notions of similarity of data points. The shape of the data is of a great deal of importance in understanding it - cluster decompositions define subpopulations of the data and presence of loops often is a clue to the presence of periodic or recurrent behavior in it. In this talk, we will describe how topological methods can be adapted to the study of data sets, with examples.

Gunnar E. Carlsson
Stanford University, USA

Sponsored by AMS

Monday, July 9

IC2

Elliptic Curve Cryptography and Applications

9:15 AM-10:00 AM

Room:Nicollet ABC - Level 1

Chair: Frank Sottile, Texas A&M University, USA

In the last 25 years, Elliptic Curve Cryptography has become a mainstream primitive for cryptographic protocols and applications. This talk will give a survey of elliptic curve cryptography and its applications, including applications of pairing-based cryptography which are built with elliptic curves. No prior knowledge about elliptic curves is required for this talk. One of the information-theoretic applications I will cover is a solution to prevent pollution attacks in content distribution networks which use network coding to achieve optimal throughput. One solution is based on a pairing-based signature scheme using elliptic curves. I will also discuss some applications to privacy of electronic medical records, and implications for secure and private cloud storage and cloud computing.

Kristin Lauter
Microsoft Research, USA

Exhibits Open

9:30 AM-4:30 PM

Room:Exhibit Hall - Level 1

Coffee Break

10:00 AM-10:30 AM

Room:Exhibit Hall - Level 1

Monday, July 9

MS1

Advances in Coding Theory and Cryptography - Part I of II

10:30 AM-12:30 PM

Room:Greenway H - Level 2

For Part 2 see MS11

Error-correcting codes are ubiquitous in all forms of digital communication. Coding theory also plays a crucial role in computational complexity theory. Meanwhile, cryptology has proven pivotal in the effective performance of most elements of today's e-commerce. Digital security is essential to authentication, privacy, data collection and cloud computing. The minisymposium samples both the most pressing problems in coding theory and cryptography today and the powerful mathematical tools that are being brought to bear on these problems. Presentations will address network coding, distributed storage, locally decodable codes, multiparty computation, pairing-based cryptography, and homomorphic encryption, and their connections to graph theory, algebraic geometry and lattices.

Organizer: William J. Martin
Worcester Polytechnic Institute, USA

Organizer: Iwan Duursma
University of Illinois at Urbana-Champaign, USA

10:30-10:55 New Directions in Algebraic Coding Theory
Iwan Duursma, University of Illinois at Urbana-Champaign, USA

11:00-11:25 Title Not Available at Time of Publication
Elena Grigorescu, Georgia Institute of Technology, USA

11:30-11:55 Deep-LLL Reconsidered
Urs Wagner, Felix Fontein, and Joachim Rosenthal, Universität Zürich, Switzerland

12:00-12:25 Title Not Available at Time of Publication
Salim El Rouayheb, University of California, Berkeley, USA

Sponsored by SIAG/AG

Monday, July 9

MS2

Applied Algebraic Topology — The Next Generation

10:30 AM-12:30 PM

Room:Nicollet ABC - Level 1

Applied algebraic topology as a field has taken off significantly in the past decade, and by now there is an entire generation of researchers emerging completely within this field. We shall take a look at some of the most innovative work on applying algebraic topology produced by this new generation; looking at techniques like persistent homology, sheaf theory and topological simplification, and application areas like periodic systems, network analysis, and sensor coverage.

Organizer: Mikael Vejdemo Johansson
University of St. Andrews, United Kingdom

Organizer: Primoz Skraba
Jozef Stefan Institute, Slovenia

10:30-10:55 Recent Advances and Trends in Applied Algebraic Topology
Mikael Vejdemo Johansson, University of St. Andrews, United Kingdom

11:00-11:25 Generalizing Max Flow and Min Cut: Opportunities from a Topological Proof
Sanjeevi Krishnan, University of Pennsylvania, USA

11:30-11:55 Evasion Paths in Mobile Sensor Networks
Henry Adams, Stanford University, USA

12:00-12:25 Sheaves and Persistence
Amit Patel, Rutgers University, USA

Monday, July 9

MS3

Challenges and Synthesis in Meshfree Methods

10:30 AM-12:30 PM

Room:Greenway D - Level 2

One of the principal advantages in using mesh-free methods to solve differential equations is their natural adaptivity. Since these techniques are not constrained by a mesh, one is free to add, delete, reposition or change basis functions to achieve computational objectives. Outstanding mathematical challenges include interpolating fields onto scattered basis functions, satisfying boundary conditions and systematically boosting the accuracy. Mathematicians working separately in the radial basis function and the particle methods communities have made strides in resolving many of these issues. The purpose of this minisymposium is to bring investigators from these communities together to share recent advances.

Organizer: Tobin Driscoll
University of Delaware, USA

Organizer: Louis F. Rossi
University of Delaware, USA

10:30-10:55 A Partition of Unity Method for Divergence-free Approximation of Vector Fields on the Sphere
Grady B. Wright, Boise State University, USA; Edward J. Fuselier, High Point University, USA

11:00-11:25 Refinement and Remeshing in Particle Simulations
Robert Krasny, University of Michigan, Ann Arbor, USA

11:30-11:55 Stable Computation with Reproducing Kernels
Greg Fasshauer, Illinois Institute of Technology, USA; Michael McCourt, Cornell University, USA

12:00-12:25 Multi-moment Vortex Methods
David T. Uminsky, University of California, Los Angeles, USA

Monday, July 9

MS4

Computational Frameworks and Solution Strategies for Multi-Physics Problems - Part I of II

10:30 AM-12:30 PM

Room:Greenway B - Level 2

For Part 2 see MS13

Simulating complex nonlinear multiphysics multidomain systems requires expertise from a variety of science domains as well as core computational framework capabilities to couple various physics. The complexity of nonlinear multi-physics problems has also spawned a variety of coupling and solution strategies. In this minisymposium we have brought together experts working on computational frameworks and multi-physics solution methodologies to get a snapshot of the state of the art in this rapidly evolving field. Framework capabilities for multi-physics, coupling strategies, and solution methodologies for applications ranging from thermomechanics and flow in nuclear reactors, geodynamics, glaciology, subsurface flow, battery simulations, and magnetohydrodynamics are discussed.

Organizer: Bobby Philip
Oak Ridge National Laboratory, USA

Organizer: Mark Berrill
Oak Ridge National Laboratory, USA

10:30-10:55 The Advanced Multi-Physics (AMP) Package With An Application to Fuel Assemblies in Nuclear Reactors
Bobby Philip, Kevin Clarno, Rahul S. Sampath, Mark Berrill, and Srikanth Allu, Oak Ridge National Laboratory, USA; Gary Dilts, Los Alamos National Laboratory, USA; Pallab Barai, Oak Ridge National Laboratory, USA

11:00-11:25 Development of a Single Domain Framework to Model 3D L-Ion Intercalation Batteries using the AMP Package
Srikanth Allu, Sreekanth Pannala, Partha Mukherjee, Bobby Philip, and John Turner, Oak Ridge National Laboratory, USA

continued in next column

11:30-11:55 A Multiphysics PDE Assembly Engine for Nonlinear Analysis using Template-based Generic Programming Techniques
Roger Pawlowski, Eric C. Cyr, John Shadid, and Eric Phipps, Sandia National Laboratories, USA

12:00-12:25 The Arctic Terrestrial Simulator: Developing a Flexible Multiphysics Simulator based on Amanzi
Ethan T. Coon, Markus Berndt, J. David Moulton, and Scott Painter, Los Alamos National Laboratory, USA

Monday, July 9

MS5

Geometric Approaches to Macromolecular Modeling

10:30 AM-12:30 PM

Room:Nicollet D1 - Level 1

Proteins are molecules that are encoded by genes and play a critical role in the regulation of almost all biological processes. The determination of a protein's conformation is critical to understanding its functionality. Nuclear magnetic resonance (NMR) spectroscopy experiments on proteins yield data sets of sparse inter-atomic distance bounds. This data can be formulated as a distance geometry problem with an ensemble of candidate protein structures as its solution. This symposium will review recent advances in obtaining solutions to distance geometry problems with emphasis on their applicability towards the determination and refinement of protein structures.

Organizer: Zachary D. Voller
Iowa State University, USA

Organizer: Zhijun Wu
Iowa State University, USA

10:30-10:55 An Optimal Solution to the Generalized Distance Geometry Problem
Zachary D. Voller and Zhijun Wu, Iowa State University, USA

11:00-11:25 The Determination and Refinement of Protein Ensembles using Inter-atomic Distance Bounds
Atilla Sit, University of Wisconsin, Madison, USA

11:30-11:55 Coarse Grained Normal Mode Analysis vs. Refined Gaussian Network Model for Protein Residue-Level Structural Fluctuations
Jun-Koo Park, Iowa State University, USA

12:00-12:25 Advances on the Discretizable Distance Geometry Problem
Carlile Lavor, State University of Campinas, Brazil; Leo Liberti, Ecole Polytechnique, France; Nelson Maculan, Universidade Federal de Rio de Janeiro, Brazil; Antonio Mucherino, Université de Rennes 1, France

Monday, July 9

MS6

Homogenization and Model Reduction Methods for Multiscale Phenomena - Part I of III

10:30 AM-1:00 PM

Room:Greenway C - Level 2

For Part 2 see MS14

The minisymposium will assess the use of multiscale reduction methods in analysis of models arising in composites and other heterogeneous media. In particular, issues that will be addressed but not limited to are multiscale model reduction for flows in porous media, upscaling, inverse problems, and computational tools for complex inhomogeneous media. The purpose of this section is to enable contact between researchers working mathematical and computational aspects of multiscale phenomena that found in science and engineering applications with an update on recent progress in this field.

Organizer: Yuliya Gorb
University of Houston, USA

10:30-10:55 An Exponentially Convergent Approximation Theory for Fields Inside Multiscale Heterogeneous Materials
Robert P. Lipton, Louisiana State University, USA

11:00-11:25 Homogenization-based Mortar Methods for Porous Media
Todd Arbogast and Hailong Xiao, University of Texas at Austin, USA

11:30-11:55 Multiscale Model Reduction for Flows in Heterogeneous Porous Media
Yalchin Efendiev, Texas A&M University, USA

12:00-12:25 Modeling Flow and Coupled Transport with Adsorption from Pore to Core
Malgorzata Peszynska, Oregon State University, USA; *Anna Trykozko*, University of Warsaw, Poland

12:30-12:55 Multiscale Mortar Coupling of Multiphase Flow and Reactive Transport on Non-matching Grids
Gergina Pencheva, Mary F. Wheeler, and Mojdeh Delshad, University of Texas at Austin, USA

Sponsored by SIAG/MS

Monday, July 9

MS7

Nonlinear Solution Methods for Implicit Simulations of Emerging Applications

10:30 AM-12:30 PM

Room:Greenway E - Level 2

The growing complexity of emerging applications emphasizes the importance of robust numerical simulation methods. Implicit approximations offer stability at the expense of transferring the underlying stiffness onto an algebraic system of nonlinear equations. The growing stiffness is challenging classic nonlinear solution strategies. This minisymposium explores recent advances in adaptive nonlinear solution alternatives that deliver improved performance by exploiting the specific context of the physics. Topics include developments in safe-guarded Newton-Krylov methods, numerical homotopy, physical preconditioners, and multi-level methods. The scope appeals broadly to Computational Scientists and Engineers interested in the simulation of complex emerging applications.

Organizer: Rami M. Younis
Stanford University, USA

Organizer: Hamdi Tchelepi
Stanford University, USA

10:30-10:55 Anderson Acceleration of Modified Picard Iteration for Variably Saturated Flow
Carol S. Woodward, and Aaron Lott, Lawrence Livermore National Laboratory, USA; Homer F. Walker, Worcester Polytechnic Institute, USA; Ulrike Yang, Lawrence Livermore National Laboratory, USA

continued on next page

Monday, July 9

MS7

Nonlinear Solution Methods for Implicit Simulations of Emerging Applications

10:30 AM-12:30 PM

continued

11:00-11:25 Physics-based Preconditioning within Implicit Simulations of Visco-resistive Tokamak Plasmas
Daniel R. Reynolds, Southern Methodist University, USA; Ravi Samtaney, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Hilari Tiedeman, Southern Methodist University, USA

11:30-11:55 An Optimal Convergence Neighborhood Strategy for an Implicit Timestep Solver That Converges All the Time
Rami M. Younis, Stanford University, USA

12:00-12:25 Composed Solution Methods for General Nonlinear Equations
Peter R. Brune, Argonne National Laboratory, USA; Matthew G. Knepley, University of Chicago, USA; Barry F. Smith, Argonne National Laboratory, USA

Monday, July 9

MS8

Student Days: Undergraduate Research in Applied and Computational Mathematics - Part I of II

10:30 AM-12:00 PM

Room:Greenway F - Level 2

For Part 2 see MS19

Organizer: Peter R. Turner
Clarkson University, USA

10:30-10:55 Spectral Properties of Neural Network Structures
Jeffrey Moulton, University of Pittsburgh, USA

11:00-11:25 A Multi-numeric Method for Convection-dominated Parabolic Problems Using an Adaptive Region-swapping Approach
Joseph Huchette, Rice University, USA

11:30-11:55 The Effects of Signal Delay in Gene Regulatory Networks
Sarah Stanley, University of Houston, USA

Monday, July 9

MS9

Mathematics and Mechanics of Soft Matter - Part I of IV

10:30 AM-1:00 PM

Room:Greenway J - Level 2

For Part 2 see MS21

This minisymposium brings together experts in mathematics, mechanics, and engineering working on challenging problems in analysis, modeling, and simulation of soft matter. The integration of these different disciplines is essential for accelerating groundbreaking discoveries in soft matter mechanics for engineering problems. Emphasis will be placed on bulk soft matter assemblies such as liquid crystals and biological soft matter. Three sessions are expected to be organized that focus on the following topics: (i+ii) mathematical modeling of liquid crystal phases (with one session explicitly devoted to defects in liquid crystals); (iii) mechanical modeling of biological soft matter.

Organizer: Raffaella De Vita
Virginia Polytechnic Institute & State University, USA

Organizer: Paolo Biscari
Politecnico di Milano, Italy

10:30-10:55 Recent Results on Nematic Elastomers
Antonio De Simone, SISSA, Italy

11:00-11:25 Ferronematic Liquid Crystal Composites
Maria-Carme Calderer, University of Minnesota, USA; Dmitry Golovaty, University of Akron, USA; Antonio De Simone, SISSA, Italy; Alexander Panchenko, Washington State University, USA

11:30-11:55 Extrinsic Curvature, and Two-dimensional Nematic Order
Gaetano Napoli, Università del Salento, Italy

12:00-12:25 Electric-Field-Induced Instabilities in Liquid-Crystal Films
Eugene C. Gartland, Kent State University, USA

12:30-12:55 Analysis of Nematic Liquid Crystals with Disclinations
Patricia Bauman, Purdue University, USA; Jinhae Park, Seoul National University, Korea; Daniel Phillips, Purdue University, USA

Monday, July 9

CP1

Control

10:30 AM-12:50 PM

Room:Greenway G - Level 2

Chair: Scarlett S. Bracey, Louisiana Technical University, USA

10:30-10:45 Solving Optimal Control Problems with Control Delays Using Direct Transcription
Karmethia C. Thompson and Stephen L. Campbell, North Carolina State University, USA; John T. Betts, Applied Mathematical Analysis, LLC, USA

10:50-11:05 Steady State Sets of Non-Linear Discrete-Time Control Dynamical Systems with Singular Disturbance
Byungik Kahng, University of North Texas, USA

11:10-11:25 Exact Controllability of the Linear Advection Equation with Interior Controls
Rajeev Rajaram, Kent State University, USA

11:30-11:45 Discrete Approximations of Controlled Stochastic Systems with Memory
Mou-Hsiung Chang, U.S. Army Research Office, USA

11:50-12:05 Modeling and Control of Nanoparticle Delivery to Tumor Sites with Experimental Validation
Scarlett S. Bracey, Katie A. Evans, D. Patrick O'Neal, and Isidro B. Magaña, Louisiana Technical University, USA

12:10-12:25 Sparsity-Promoting Optimal Control of Distributed Systems
Fu Lin, University of Minnesota, USA; Makan Fardad, Syracuse University, USA; Mihailo R. Jovanovic, University of Minnesota, USA

12:30-12:45 A-Posteriori Verification of Optimality Conditions for Control Problems with Finite-Dimensional Control Space
Saheed Ojo Akindeinde, University of Würzburg, Germany; Daniel Wachsmuth, RICAM, Austrian Academy of Sciences, Austria

Monday, July 9

CP2

Geoscience

10:30 AM-12:50 PM

Room:Greenway A - Level 2

Chair: Juan M. Restrepo, University of Arizona, USA

10:30-10:45 How Do You Determine Whether The Earth Is Warming Up?
Juan M. Restrepo, Darin Comeau, and Hermann Flaschka, University of Arizona, USA

10:50-11:05 High Frequency Acoustic Propagation Using Level Set Methods
Sheri L. Martinelli, Brown University, USA

11:10-11:25 A Discrete Dynamical Systems Model to Study the Interaction Between Arctic Sea-Surface Temperature and Sea-Ice Cover
Sukanya Basu, Grand Valley State University, USA

11:30-11:45 Use of Integral Transforms in Analyzing Nmr Data
Lalitha Venkataramanan, Fred Gruber, and Tarek Habashy, Schlumberger-Doll Research, USA

11:50-12:05 An Adaptive Strategy with Unconditional Convergence for Solving Nonlinear Coupled Flow and Transport Equations in Porous Media
Mohammad Shahvali and Hamdi Tchelepi, Stanford University, USA

12:10-12:25 Bregman Iterations for Geosounding Inversion
Hugo Hidalgo and Enrique Gomez-Trevino, CICESE, Mexico

12:30-12:45 Numerical Studies of Eor by Asp-Flooding
Xueru Ding, Texas A&M University at Qatar, Qatar; Prabir Daripa, Texas A&M University, USA

Monday, July 9

CP3

Linear Algebra

10:30 AM-12:30 PM

Room:Greenway I - Level 2

Chair: Timothy A. Davis, University of Florida, USA

10:30-10:45 An Object-Oriented Linear System Solver for Matlab
Timothy A. Davis, University of Florida, USA

10:50-11:05 On Estimating Hitting and Commute Times for Large Dense Digraphs
Gyan Ranjan, Zhi-Li Zhang and Daniel L. Boley, University of Minnesota, USA

11:10-11:25 Matrix Computation and Its Application to Signal Processing
Wei-Da Hao, Texas A&M University, Kingsville, USA; Yih-Chyun Jenq and David H. Chiang, Portland State University, USA

11:30-11:45 Classification of Potentially Eventually Exponentially Positive Sign Patterns of Small Order
Xavier Martinez-Rivera and Marie Archer, Iowa State University, USA; Minerva Catral, Xavier University, USA; Craig Erickson, Iowa State University, USA; Rana Haber, Florida State University, USA; Leslie Hogben, Iowa State University, USA; Antonio Ochoa, California State Polytechnic University, Pomona, USA

11:50-12:05 Positive Semidefinite Zero Forcing
Travis Peters, Iowa State University, USA

12:10-12:25 Sign Patterns That Allow Strong Eventual Nonnegativity
Craig Erickson, Iowa State University, USA; Minerva Catral, Xavier University, USA; Leslie Hogben, Iowa State University, USA; Dale Olesky and Pauline van den Driessche, University of Victoria, Canada

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Monday, July 9

Funding Agencies Panel

12:45 PM-1:45 PM

Room:Nicollet ABC - Level 1

JP1

Systemic Risk

2:00 PM-2:45 PM

Room: Nicollet ABC - Level 1

Chair: Jean-Pierre Fouque, University of California, Santa Barbara, USA

What is systemic risk, how do we model it, how to we analyze it, and what are the implications of the analysis? I will address these issues both in a larger historical context and within current research mathematical finance. The key property of systems subject to systemic risk is their inter-connectivity and the way individual risk can become overall, systemic risk when it is diversified by inter-connectivity. I will discuss theoretical issues that come up with mean-field and other models and will also show results of numerical simulations.

George C. Papanicolaou
Stanford University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Exhibit Hall - Level 1

Monday, July 9

SP1

AWM-SIAM Sonia Kovalevsky Lecture: The Role of Characteristics in Conservation Laws

2:45 PM – 3:30 PM

Room: Nicollet ABC - Level 1

Chair: Jill Pipher, Brown University

Sonya Kovalevsky, in the celebrated Cauchy-Kovalevsky theorem, made clear the significance of characteristics in partial differential equations. In the field of hyperbolic conservation laws, characteristic curves (in one space dimension) and surfaces (in higher dimensions) dominate the behavior of solutions. Some examples of systems exhibit interesting, one might even say pathological, characteristic behavior. This talk will focus on ways that characteristics in systems of conservation laws give information about the systems being modeled.

Barbara Lee Keyfitz
The Ohio State 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 9

MS10

Adaptive Methods for the Numerical Approximation of High-dimensional SPDEs

4:00 PM-6:00 PM

Room:Nicollet ABC - Level 1

Our modern treatment of predicting the behavior of physical and engineering problems relies on approximating solutions in terms of high dimensional spaces, particularly in the case when the input data (coefficients, forcing terms, initial and boundary conditions, geometry) are affected by large amounts of uncertainty. For higher accuracy, simulations must increase the number of random variables (dimensions), and expend more effort resolving smooth or even discontinuous behavior within each individual dimension. The resulting explosion in computational effort is a symptom of the curse of dimensionality and this mini-symposium aims at exploring efforts concerning both global and local adaptive approximations to these stochastic problems.

Organizer: Clayton G. Webster
Oak Ridge National Laboratory, USA

Organizer: Max Gunzburger
Florida State University, USA

Organizer: Rick Archibald
Oak Ridge National Laboratory, USA

4:00-4:25 A Hierarchical Adaptive Sparse Grid Stochastic Wavelet Collocation Method for PDEs with Random Input Data
Guannan Zhang, Florida State University, USA; Clayton G. Webster, Oak Ridge National Laboratory, USA; Max Gunzburger, Florida State University, USA

4:30-4:55 Characterization of Discontinuities in High-dimensional Stochastic Problems on Adaptive Sparse Grids
Rick Archibald, Oak Ridge National Laboratory, USA

5:00-5:25 An Efficient Sparse-grid-based Method for Bayesian Uncertainty Analysis
Max Gunzburger, Florida State University, USA

5:30-5:55 Sparse Grids for Uncertainty Quantification
John Burkardt, Florida State University, USA

Monday, July 9

MS11

Advances in Coding Theory and Cryptography - Part II of II

4:00 PM-6:00 PM

Room:Greenway A - Level 2

For Part 1 see MS1

Error-correcting codes are ubiquitous in all forms of digital communication. Coding theory also plays a crucial role in computational complexity theory. Meanwhile, cryptology has proven pivotal in the effective performance of most elements of today's e-commerce. Digital security is essential to authentication, privacy, data collection and cloud computing. The minisymposium samples both the most pressing problems in coding theory and cryptography today and the powerful mathematical tools that are being brought to bear on these problems. Presentations will address network coding, distributed storage, locally decodable codes, multiparty computation, pairing-based cryptography, and homomorphic encryption, and their connections to graph theory, algebraic geometry and lattices.

Organizer: William J. Martin
Worcester Polytechnic Institute, USA

Organizer: Iwan Duursma
University of Illinois at Urbana-Champaign, USA

4:00-4:25 New Challenges in Cryptology
William J. Martin, Worcester Polytechnic Institute, USA

4:30-4:55 Title Not Available at Time of Publication
Simon Blackburn, University of London, United Kingdom

5:00-5:25 Title Not Available at Time of Publication
Alexander Barg, University of Maryland, USA

5:30-5:55 Sheaves on Graphs
Joel Friedman, University of British Columbia, Canada

Sponsored by SIAG/AG

Monday, July 9

MS12

AWM Workshop: Teaming Up in Tough Times

4:00 PM-6:00 PM

Room:Nicollet D1 - Level 1

For Part 2 see MS22

In times of the economic crisis, mathematicians have to develop new skills in order to survive. How does one secure a job, carry on a successful research program in the era of group funding, or become a part of an interdisciplinary team? How does one push the innovative envelope and explore novel research frontiers? The speakers will share some of their experiences and views on these matters. Special emphasis in the discussion will be placed on possible adjustments that mathematicians, especially women, might have to make to their career paths to remain competitive and thrive in these tough times.

Organizer: Carol S. Woodward
Lawrence Livermore National Laboratory, USA

Organizer: Andrea L. Bertozzi
University of California, Los Angeles, USA

Organizer: Maria Emelianenko
George Mason University, USA

Organizer: Elebeoba E. May
Sandia National Laboratories, USA

Organizer: Cammey Cole Manning
Meredith College, USA

4:00-4:25 Take Initiative, Make Contacts, and Collaborate: My Journey from Graduate Student to Professor
Rachel Ward, University of Texas at Austin, USA

4:30-4:55 Building Relationships in the Tree of Life
Tiffani L. Williams, Texas A&M University, USA

5:00-5:25 Some Perspectives on Teaming from the DOE National Labs
Lori A. Diachin, Lawrence Livermore National Laboratory, USA

5:30-5:55 Panel Discussion: Teaming Up in Tough Times
Lori A. Diachin, Lawrence Livermore National Laboratory, USA; Rachel Ward, University of Texas at Austin, USA; Tiffani L. Williams, Texas A&M University, USA

Monday, July 9

MS13

Computational Frameworks and Solution Strategies for Multi-Physics Problems - Part II of II

4:00 PM-6:00 PM

Room:Greenway B - Level 2

For Part 1 see MS4

Simulating complex nonlinear multiphysics multidomain systems requires expertise from a variety of science domains as well as core computational framework capabilities to couple various physics. The complexity of nonlinear multi-physics problems has also spawned a variety of coupling and solution strategies. In this minisymposium we have brought together experts working on computational frameworks and multi-physics solution methodologies to get a snapshot of the state of the art in this rapidly evolving field. Framework capabilities for multi-physics, coupling strategies, and solution methodologies for applications ranging from thermomechanics and flow in nuclear reactors, geodynamics, glaciology, subsurface flow, battery simulations, and magnetohydrodynamics are discussed.

Organizer: Bobby Philip
Oak Ridge National Laboratory, USA

Organizer: Mark Berrill
Oak Ridge National Laboratory, USA

4:00-4:25 Composable Multilevel Methods for Multiphysics Simulations
Jed Brown, Argonne National Laboratory, USA; Mark Adams, Columbia University, USA; Peter R. Brune, Argonne National Laboratory, USA; Matthew G. Knepley, University of Chicago, USA; Dave May, ETH Zürich, Switzerland; Lois Curfman McInnes and Barry F. Smith, Argonne National Laboratory, USA

4:30-4:55 Tree Based Communication for Scalable Mesh Adaptation in the SAMRAI Framework
Brian Gunney, Abhinav Bhatele, and Todd Gamblin, Lawrence Livermore National Laboratory, USA

continued on next page

Monday, July 9

MS13

Computational Frameworks and Solution Strategies for Multi-Physics Problems - Part II of II

continued

5:00-5:25 Building AMR into a Multiphysics Code Using the SAMRAI Framework
Richard Hornung, Robert Anderson, Noah Elliott, Brian Gunney, and Michael Wickett, Lawrence Livermore National Laboratory, USA

5:30-5:55 Adaptive Magnetohydrodynamics Simulations with SAMRAI
Mark Berrill, Luis Chacon, Bobby Philip, Zhen Wang, and Manuel Rodriguez, Oak Ridge National Laboratory, USA

Monday, July 9

MS14

Homogenization and Model Reduction Methods for Multiscale Phenomena - Part II of III

4:00 PM-6:00 PM

Room:Greenway C - Level 2

For Part 1 see MS6
For Part 3 see MS24

The minisymposium will assess the use of multiscale reduction methods in analysis of models arising in composites and other heterogeneous media. In particular, issues that will be addressed but not limited to are multiscale model reduction for flows in porous media, upscaling, inverse problems, and computational tools for complex inhomogeneous media. The purpose of this section is to enable contact between researchers working mathematical and computational aspects of multiscale phenomena that found in science and engineering applications with an update on recent progress in this field.

Organizer: Yuliya Gorb
University of Houston, USA

4:00-4:25 Acoustic Propagation in a Saturated Piezo-Elastic, Porous Medium
Robert P. Gilbert, University of Delaware, USA

4:30-4:55 On the Integral Representation Formula (IRF) for a Two-parameter Family of Elastic Composites
Yvonne Ou, University of Delaware, USA

5:00-5:25 Efficient Algorithms for Mesoscale Dynamics of Interacting Particle Systems
Lyudmyla Barannyk, University of Idaho, USA; Alexander Panchenko, Washington State University, USA

5:30-5:55 Flux Norm and Finite-dimensional Homogenization Approximation with Non-separated Scales and High Contrast
Leonid Berlyand, Pennsylvania State University, USA

Sponsored by SIAG/MS

Monday, July 9

MS15

Modeling and Analysis of Evolutionary Dynamics

4:00 PM-6:00 PM

Room:Greenway D - Level 2

Modeling evolutionary dynamics presents both theoretical and computational challenges yet also provides alternative approaches to study other biological systems from immunology, ecology etc. In this minisymposium, we bring together a group of active researchers who have particular expertise in modeling challenging problems arising from life sciences. Focusing on modeling and analysis of evolutionary dynamics, the session has a diverse selection of topics including population dynamics, modeling virus dynamics, PDE model of ecological systems.

Organizer: Zhijun Wu
Iowa State University, USA

Organizer: Wen Zhou
Iowa State University, USA

4:00-4:25 Within-host Dynamics of Influenza Virus Infection with Immune Responses
Libin Rong, Oakland University, USA

4:30-4:55 Modeling the Dynamics of Cross-infection of Leishmania Amazonensis and Leishmania Major
Wen Zhou, Zhijun Wu, and Douglas Jones, Iowa State University, USA

5:00-5:25 Computation and Analysis of Evolutionary Game Dynamics
Yiping Hao, Iowa State University, USA

5:30-5:55 Evolutionary Games with Gaussian Structures
Ozgur Aydogmus, Iowa State University, USA

Monday, July 9

MS16

Numerical Methods for Polynomial Systems - Part I of II

4:00 PM-6:00 PM

Room:Greenway H - Level 2

For Part 2 see MS40

Systems of polynomial equations arise naturally in a number of scientific and engineering applications. There has recently been much work in developing numerical algorithms for solving polynomial systems and extracting data from their solution sets. This minisymposium will bring together several experts on these numerical computations.

Organizer: Daniel J. Bates

Colorado State University, USA

4:00-4:25 Real Algebraic Geometry in Combinatorics

Chris Peterson and Eklund David, Colorado State University, USA; Matthew Kahle, Institute for Advanced Study, USA

4:30-4:55 Root Counts, Eigenvectors and Numerical Homotopies

David Eklund and Chris Peterson, Colorado State University, USA

5:00-5:25 Filtering Homotopies for Discretized Boundary Value Problems

Tim M. Mccoy, University of Notre Dame, USA

5:30-5:55 Building a User Friendly Matlab Platform for Numerical Polynomial Algebra

Zhonggang Zeng, Northeastern Illinois University, USA

Sponsored by SIAG/AG

Monday, July 9

MS17

Recent Advances in Analysis and Numerical Methods for Fluid Flow Simulation - Part I of III

4:00 PM-6:00 PM

Room:Greenway E - Level 2

For Part 2 see MS28

This minisymposia will focus on new classes of models recently developed for fluid flow problems, including for turbulence, viscoelastic flows with control, defective boundary conditions, and random input data. The applications of these problems are countless; however, robust solution methodologies remain elusive. Achieving accuracy and efficiency in computations relies on analysis of these models and the design of numerical methods for them. The topics of interest include, but are not limited to, recent improvements in the modeling of fluid flow, high-dimensional integration, development of numerical methods to compute solutions to the models (deterministic and stochastic), mathematical analysis of models, capturing the important physical properties of the problem and applications.

Organizer: Leo Rebholz

Clemson University, USA

Organizer: Alexander Labovsky

Michigan Technological University, USA

4:00-4:25 Multiscale Deconvolution Models of Turbulence

Leo Rebholz, Clemson University, USA; Argus Adrian Dunca, Spiru Haret University, Romania; Monika Neda, University of Nevada, Las Vegas, USA; Kara Kohler, Clemson University, USA

4:30-4:55 Improvements in Adaptive Nonlinear Filtering in Regularization Models for Incompressilbe Flows

Abigail Bowers, Clemson University, USA

5:00-5:25 Coupling Biot and Navier-Stokes Equations for Modelling Fluid-poroelastic Media Interaction

Annalisa Quaini, University of Houston, USA; Santiago Badia, Universitat Politecnica de Catalunya, Spain; Alfio Quarteroni, École Polytechnique Fédérale de Lausanne, Switzerland

5:30-5:55 A Least Squares Approach for the Coupled Stokes-Darcy System

Hyesuk Lee, Clemson University, USA

Monday, July 9

MS18

Recent Advances in Biomedical Modeling, Simulation, and Visualization - Part I of II

4:00 PM-6:00 PM

Room:Greenway G - Level 2

For Part 2 see MS29

The 21st century is seeing, and will see, a rapid, unprecedented aging of the world's population, which has resulted in an increased demand for quality health care. Currently, medical treatment decisions are typically made based on a consensus of how similar patients have previously responded to a particular treatment. However, mathematical models, computational simulations, and visualizations can be used to make predictions about how the body will react to a particular treatment and thus aid designing personalized therapies that reduce health care costs and maximize outcomes. Such advances in biomedical modeling, simulation, and visualization will be explored in this minisymposium.

Organizer: Suzanne M. Shontz

Pennsylvania State University, USA

Organizer: Corina Drapaca

Pennsylvania State University, USA

4:00-4:25 Tracking Brain and CSF Evolution via Level Set/mesh Warping Algorithm during Hydrocephalus Treatment

Jeonghyung Park, Suzanne M. Shontz, and Corina S. Drapaca, Pennsylvania State University, USA

4:30-4:55 Immunotherapy and Aging Effects in Immune Modulated Tumor Growth

Kathleen P. Wilkie and Philip Hahnfeldt, Tufts University, USA

5:00-5:25 Mathematical Models of Gels in Biomedical Applications: Drug Delivery Devices

Maria-Carme Calderer, University of Minnesota, USA

5:30-5:55 Immersive Visualization and Computational Creativity for Biomedicine

Daniel Keefe, University of Minnesota, USA

Monday, July 9

MS19

Student Days: Undergraduate Research in Applied and Computational Mathematics - Part II of II

4:00 PM-6:00 PM

Room:Greenway F - Level 2

For Part 1 see MS8
For Part 3 see MS32

Organizer: Peter R. Turner
Clarkson University, USA

4:00-4:25 CGPOP Analysis and Optimization
Hongtao Cai, Xiaoxiang Hu, and Haoruo Peng, Tsinghua University, China

4:30-4:55 Symplectic Methods for an Exactly Solvable Kolmogorov Model of Two Interacting Species
Katherine Ball, University of California, San Diego, USA

5:00-5:25 Modeling Earth's Temperature and Atmospheric Carbon Dioxide
Emma Cutler, Bowdoin College, USA

5:30-5:55 Periodic Dispersion
Gong Chen, University of Minnesota, USA

Monday, July 9

MS20

Coupled and Hybrid Models and Multiple Scales in Mathematical Geosciences - Part I of III

4:00 PM-6:30 PM

Room:Greenway I - Level 2

For Part 2 see MS35
The topics in this minisymposium include mathematical and computational modeling issues arising when coupling various flow and transport, thermal, mechanical, electrical, and chemical processes occuring simultaneously and at different scales. The talks will be on discretization and solver issues arising for coupled models and when bridging scales or combining models of different type. Applications are to various processes in surface and subsurface

Organizer: Malgorzata Peszynska
Oregon State University, USA

Organizer: Lynn S. Bennethum
University of Colorado, Denver, USA

Organizer: Son-Young Yi
University of Texas at El Paso, USA

4:00-4:25 Coupling Compositional Flow, Transport, and Mechanics in Porous Media for Modeling Carbon Sequestration in Saline Aquifers
Mary F. Wheeler, University of Texas at Austin, USA

4:30-4:55 Analysis of CO2-water Models
Ralph Showalter, Oregon State University, USA

5:00-5:25 Advanced Discretizations for Modeling Flow and Reactive Transport on Highly Distorted Unstructured Grids
Konstantin Lipnikov, Los Alamos National Laboratory, USA

5:30-5:55 Multiscale Models for Coupled Flow and Elasticity
Yalchin Efendiev, and Peter Popov, Texas A&M University, USA; Yulia Gorb, University of Houston, USA; Donald Brown, Texas A&M University, USA

6:00-6:25 Coupled and Hybrid Models for Methane Evolution in Subsurface
Malgorzata Peszynska, Oregon State University, USA

Monday, July 9

MS21

Mathematics and Mechanics of Soft Matter - Part II of IV

4:00 PM-6:00 PM

Room:Greenway J - Level 2

For Part 1 see MS9
For Part 3 see MS56
This minisymposium brings together experts in mathematics, mechanics, and engineering working on challenging problems in analysis, modeling, and simulation of soft matter. The integration of these different disciplines is essential for accelerating groundbreaking discoveries in soft matter mechanics for engineering problems. Emphasis will be placed on bulk soft matter assemblies such as liquid crystals and biological soft matter. Three sessions are expected to be organized that focus on the following topics: (i+ii) mathematical modeling of liquid crystal phases (with one session explicitly devoted to defects in liquid crystals); (iii) mechanical modeling of biological soft matter.

Organizer: Raffaella De Vita
Virginia Polytechnic Institute & State University, USA

Organizer: Paolo Biscari
Politecnico di Milano, Italy

4:00-4:25 Nanoscale Mechanics of Natural Soft Materials
Ishwar Puri and Ravi Kappiyoor, Virginia Polytechnic Institute & State University, USA

4:30-4:55 Anisotropic Diffusion in Swelling Polymer Gels
Alessandro Lucantonio, Università degli Studi di Roma, La Sapienza, Italy; *Paola Nardinocchi*, University of Rome La Sapienza, Italy; Luciano Teresi, Universita Roma Tre, Italy

5:00-5:25 Bending, Twisting, and Snapping: Mechanics and Dynamics of Slender Structures
Douglas Holmes, Virginia Polytechnic Institute & State University, USA; Matthieu Roche, Tarun Sinha, and Howard A. Stone, Princeton University, USA

5:30-5:55 An Electromechanical Model of Tubular Heart Pumping in Ascidians
Laura A. Miller, University of North Carolina, Chapel Hill, USA; Austin Baird and Tiffany King, University of North Carolina, USA

Monday, July 9

CP4

Imaging Science

4:00 PM-5:00 PM

Room:Skyway A - Level 2

Chair: Kainan Wang, Texas A&M University, USA

4:00-4:15 Contour Detection and Completion for Inpainting and Segmentation Based on Topological Gradient and Fast Marching Algorithms

Didier Auroux, University of Nice, France; Laurent D. Cohen, Universite Paris Dauphine and CNRS, France; Mohamed Masmoudi, University of Toulouse, France

4:20-4:35 Iterative Wavefront Reconstruction in Adaptive Optics

Qing Chu and James G. Nagy, Emory University, USA

4:40-4:55 Parallel Markov Chain Monte Carlo Methods in Optical Tomography

Kainan Wang and Wolfgang Bangerth, Texas A&M University, USA

Monday, July 9

CP5

Life Sciences

4:00 PM-5:20 PM

Room:Skyway B - Level 2

Chair: Paula A. Gonzalez Parra, University of Texas at El Paso, USA

4:00-4:15 Interior-Point Methods for An Optimal Control Influenza Model

Paula A. Gonzalez Parra and Leticia Velazquez, University of Texas at El Paso, USA; Sunmi Lee and Carlos Castillo-Chavez, Arizona State University, USA

4:20-4:35 Modeling the Effect of a New Antibiotic on the Transmission of Antimicrobial Resistant Bacteria in a Hospital Setting

Michele Joyner, East Tennessee State University, USA; Cammey Manning, Meredith College, USA; Brandi Canter, East Tennessee State University, USA

4:40-4:55 Modeling Behavior: Using Game Theory and Population Modeling to Explain Sub-Maximal Parasitism

Kathryn Montovan, Cornell University, USA

5:00-5:15 Using An Old Traffic Flow Model to Gain New Insights into a Biological Process

Lisa G. Davis, Montana State University, USA

Intermission

6:00 PM-6:15 PM

Monday, July 9

PD1

Panel on BIG Data in Applied Mathematics, Computational Science, and Statistics

6:15 PM-7:15 PM

Room:Nicollet ABC - Level 1

Chair: Michele Benzi, Emory University, USA

Chair: Tasso J. Kaper, Boston University, USA

The ability to collect and interpret ever-growing amounts of data is playing an increasingly important role in scientific and technological progress. New challenges and opportunities abound from big data problems in bioinformatics, computer vision, geophysics, high energy physics, industrial processes, microarrays, networks, neuroscience, object recognition, sensors, scientific computation, signal processing, social science, and other fields. These challenges and opportunities are leading to new analysis, theory, and simulation in diverse areas: algebra, dynamical systems, graph theory, harmonic analysis, linear algebra, machine learning, numerical analysis, optimization, statistics, and topology, etc. This panel centers on the roles of mathematics, computational science, and statistics in 'Big Data.'

Panelists:

Gunnar Carlsson
Stanford University, USA

William Harrod
DOE Office of Science, USA

Tamara Kolda
Sandia National Laboratories, USA

Sastry Pantula
National Science Foundation, USA

Monday, July 9

PD2

Industry Panel: Establishing and Nurturing Productive Collaborations

6:15 PM-7:15 PM

Room:Nicollet D2 - Level 1

Chair: Thomas A. Grandine, The Boeing Company, USA

Success of mathematics in an industrial setting is frequently determined by the extent to which significant mathematical ideas are developed and disseminated through collaboration. In particular, adoption and deployment of those ideas often relies upon the level of confidence non-experts have in those ideas. Collaboration, both inside and outside companies, involving both academic and non-academic collaborators, has proven to be a useful tool for mathematical technology transfer for technical and non-technical reasons. The panelists will probe the ways in which collaboration has strengthened both their companies and the mathematical technologies which have helped to make those companies successful.

Panelists:

Tor Dokken
SINTEF, Norway

Lalitha Venkataramanan
Schlumberger-Doll Research, USA

Charles Wampler
General Motors Corporation, USA

Career Fair / Graduate Student Reception / Industry Reception

7:15 PM-9:15 PM

Room:Greenway Promenade - Level 2

Tuesday, July 10

Student Days: Student Chapter Meeting with SIAM Leadership (by invitation only)

7:00 AM-8:15 AM

Room:Regency - Level 1

Registration

8:00 AM-4:30 PM

Room:Nicollet Promenade - Level 1

IC3

Applying Mathematics to Better Understand the Ocean

8:30 AM-9:15 AM

Room:Nicollet ABC - Level 1

Chair: Richard McGehee, University of Minnesota, USA

The ocean still represents a realm of discovery in many important respects. We do not, for example, fully understand the magnitude of mixing in the ocean, and this lack of knowledge has real consequences for our ability to model and predict future climate. In this talk I will describe how we have been using ideas from dynamical systems to bring a new degree of clarity to this problem. I will discuss how this has improved our theoretical understanding of some of the key processes driving ocean circulations and how we have been literally applying mathematics to the ocean by deploying floats in the Southern Ocean to map unstable manifolds and calculate Lyapunov exponents.

Emily Shuckburgh
British Antarctic Survey, United Kingdom

Tuesday, July 10

IC4

Image Processing and Computational Mathematics

9:15 AM-10:00 AM

Room:Nicollet ABC - Level 1

Chair: Carol S. Woodward, Lawrence Livermore National Laboratory, USA

Image processing has traditionally been studied as a form of signal processing, and a subfield of electrical engineering. Recently, with the advent of inexpensive and integrated image capturing devices, leading to massive data and novel applications, the field has seen tremendous growth. Within computational mathematics, image processing has emerged not only as an application domain where computational mathematics provide ideas and solutions, but also in spurring new research directions (a "new Computational Fluid Dynamics") in geometry (Total Variation regularization and Level Set methods), optimization (primal-dual, Bregman and Augmented Lagrangian methods, L1 convexification), inverse problems (inpainting, compressive sensing), and graph algorithms (high-dimensional data analysis). This talk gives an overview of these developments.

Tony Chan
Hong Kong University of Science and Technology, Hong Kong

Exhibits Open

9:30 AM-4:30 PM

Room:Exhibit Hall - Level 1

Coffee Break

10:00 AM-10:30 AM

Room:Exhibit Hall - Level 1

Tuesday, July 10

MS22

AWM Workshop: Research Talks by Recent Ph.D.s

10:30 AM-12:30 PM

Room:Greenway B - Level 2

For Part 1 see MS12
For Part 3 see MS34

This minisymposium will feature research talks by female recent Ph.D.s from a variety of mathematical areas. The talks will examine models that look at applications including Einstein's equations, earthquakes, continuum mechanics, and image processing.

Organizer: Carol S. Woodward

Lawrence Livermore National Laboratory, USA

Organizer: Maria Emelianenko

George Mason University, USA

Organizer: Cammey Cole Manning

Meredith College, USA

10:30-10:55 Parametric and Other Exact Solutions to Einstein's Equations in Terms of Special Functions
Jennie D'Ambroise, Bard College, USA

11:00-11:25 A Method for Earthquake Cycle Simulations
Brittany Erickson, Stanford University, USA

11:30-11:55 A Gamma-Convergence Analysis of the Quasicontinuum Method
Malena Ines Espanol, California Institute of Technology, USA

12:00-12:25 Video Stabilization of Atmospheric Turbulence Distortion
Yifei Lou, University of California, Los Angeles, USA

Tuesday, July 10

MS23

Combinatorial Algebraic Geometry - Part I of II

10:30 AM-12:30 PM

Room:Greenway H - Level 2

For Part 2 see MS46

The interaction between combinatorics and algebraic geometry has a fruitful history in the study of toric varieties, lattice polytopes, polyhedral geometry, Schubert calculus, tropical geometry, and more. Combinatorial methods have been central in making algebraic geometry computable and applicable to other areas of mathematics and sciences. This minisymposum will showcase recent developments in combinatorial algebraic geometry and its applications.

Organizer: Josephine Yu

Georgia Institute of Technology, USA

10:30-10:55 Hom-Polytopes
Tristram C. Bogart, Universidad de los Andes, Colombia; Mark Contois, Research in Motion, Canada; Joseph Gubeladze, San Francisco State University, USA

11:00-11:25 The Combinatorial Commutative Algebra of Conformal Blocks
Christopher A. Manon, University of California, Berkeley, USA

11:30-11:55 Singularities of Schubert and Richardson Varieties
Alexander Yong, University of Illinois at Urbana-Champaign, USA

12:00-12:25 Geometry of Exceptional Divisors and the Goemans-Williamson Algorithm
Mauricio Velasco and Mauricio Junca, Universidad de los Andes, Colombia

Sponsored by SIAG/AG

Tuesday, July 10

MS24

Homogenization and Model Reduction Methods for Multiscale Phenomena Part III of III

10:30 AM-12:30 PM

Room:Greenway C - Level 2

For Part 2 see MS14

The minisymposium will assess the use of multiscale reduction methods in analysis of models arising in composites and other heterogeneous media. In particular, issues that will be addressed but not limited to are multiscale model reduction for flows in porous media, upscaling, inverse problems, and computational tools for complex inhomogeneous media. The purpose of this section is to enable contact between researchers working mathematical and computational aspects of multiscale phenomena that found in science and engineering applications with an update on recent progress in this field.

Organizer: Yuliya Gorb

University of Houston, USA

10:30-10:55 Inverse Born Series for the Calderon Problem
Shari Moskow, Drexel University, USA

11:00-11:25 Correctors and Field Fluctuation for the p(x)-Laplacian with Rough Exponents with Sub-Linear Growth
Silvia Jimenez, Worcester Polytechnic Institute, USA

11:30-11:55 A Multiscale Method Coupling Network and Continuum Models in Porous Media
Chia-Chieh Chu, University of Texas at Austin, USA

12:00-12:25 Effective Properties of a Periodic Lattice of Circular Inclusions
Yuri Godin, University of North Carolina, Charlotte, USA

Sponsored by SIAG/MS

Tuesday, July 10

MS25

Imaging and Detecting with Inverse Problems

10:30 AM-12:00 PM

Room:Greenway J - Level 2

Difficult imaging problems abound in applied math and science. Frequent challenges for such imaging emanate from sparse, noisy data. However, exciting additional challenges emerge when applications require inferences concerning causation within physical systems: naturally leading to inverse problems (both deterministic and stochastic). This minisymposium describes important imaging problems in engineering condition assessment and prognosis. Emphasis is on inverse solutions involving linear parabolic operators with nonlinearity arising through Robin conditions and operator parametric dependency on the solution variables. Advances in small volume asymptotic expansion (deterministic) and Bayesian sampling (stochastic) will be treated along with optimal design of the inverse problem itself.

Organizer: Christopher J. Earls
Cornell University, USA

10:30-10:55 Stochastic and Deterministic Inverse Solutions for Crack and Corrosion Imaging
Christopher J. Earls, Cornell University, USA

11:00-11:25 Efficient Computational Methods for Thermal Imaging of Small Cracks in Plates
Kurt Bryan, Rose-Hulman Institute of Technology, Israel

11:30-11:55 Application of Sparse Solutions to Underdetermined Problems in Imaging
C. C. Olson, L. N. Smith, K. P. Judd, J. Waterman, and *Jonathan Nichols*, Naval Research Laboratory, USA

Tuesday, July 10

MS26

Massive Graphs: Big Compute Meets Big Data - Part I of III

10:30 AM-12:30 PM

Room:Nicollet ABC - Level 1

For Part 2 see MS38

Large graph analytics have become an increasingly important in a wide variety of application areas such as internet search, bioinformatics, social media, and cybersecurity. Massive graphs push the state of the art in both big compute and big data. This minisymposium will explore the algorithms, tools and technologies being developed to address these leading edge problems. The minisymposium will include a mix of invited talks from established practitioners and early career professionals.

Organizer: Jeremy Kepner
Massachusetts Institute of Technology, USA

Organizer: John R. Gilbert
University of California, Santa Barbara, USA

Organizer: David A. Bader
Georgia Institute of Technology, USA

10:30-10:55 Streaming Graph Analytics for Massive Graphs
David A. Bader, David Ediger, and Jason Riedy, Georgia Institute of Technology, USA

11:00-11:25 Fast Counting of Patterns in Graphs
Ali Pinar, C. Seshadhri, and Tamara G. Kolda, Sandia National Laboratories, USA

11:30-11:55 Statistical Models and Methods for Anomaly Detection in Large Graphs
Nicholas Arcolano, Massachusetts Institute of Technology, USA

12:00-12:25 Perfect Power Law Graphs: Generation, Sampling, Construction and Fitting
Jeremy Kepner, Massachusetts Institute of Technology, USA

Tuesday, July 10

MS27

Mimetic Discretization Methods

10:30 AM-12:30 PM

Room:Greenway I - Level 2

We will present advancements on the theory and application of Mimetic Discretization Methods. The main goal of this research is to construct local preferably high order difference approximations of differential operators on nonuniform grids that mimic the properties of the continuum operators. Partial differential equations solved with these mimetic difference approximations often automatically satisfy discrete versions of conservation laws and analogies to Stoke's theorem that are true in the continuum and as a consequence are more likely to produce physically faithful results.

Organizer: José Castillo
San Diego State University, USA

10:30-10:55 High Order Mimetic Methods on a Nonuniform Mesh
José E. Castillo, San Diego State University, USA

11:00-11:25 The Mimetic Spectral Element Method in the Community Atmosphere Model (CAM)
Mark A. Taylor, Sandia National Laboratories, USA; Aime Fournier, NCAR, USA

11:30-11:55 Mimetic Library Toolkit
Eduardo Sanchez and Jose Castillo, San Diego State University, USA

12:00-12:25 A Discrete Vector Calculus in Tensor Grids
Stanly L. Steinberg, University of New Mexico, USA; Nicolas Robidoux, Independent Consultant, USA

Tuesday, July 10

MS28

Recent Advances in Analysis and Numerical Methods for Fluid Flow Simulation - Part II of III

10:30 AM-12:30 PM

Room:Greenway E - Level 2

For Part 1 see MS17
For Part 3 see MS41

This minisymposia will focus on new classes of models recently developed for fluid flow problems, including for turbulence, viscoelastic flows with control, defective boundary conditions, and random input data. The applications of these problems are countless; however, robust solution methodologies remain elusive. Achieving accuracy and efficiency in computations relies on analysis of these models and the design of numerical methods for them. The topics of interest include, but are not limited to, recent improvements in the modeling of fluid flow, high-dimensional integration, development of numerical methods to compute solutions to the models (deterministic and stochastic), mathematical analysis of models, capturing the important physical properties of the problem and applications.

Organizer: Leo Rebholz
Clemson University, USA

Organizer: Alexander Labovsky
Michigan Technological University, USA

10:30-10:55 An ANOVA-based Method for High-dimensional Stochastic PDEs
Alexander Labovsky, Michigan Technological University, USA; Max Gunzburger, Florida State University, USA

11:00-11:25 An Adaptive Approach to PDE-constrained Optimization for Random Data Identification Problems
Clayton G. Webster, Oak Ridge National Laboratory, USA; Max Gunzburger, Florida State University, USA; Catalin S. Trenchea, University of Pittsburgh, USA

11:30-11:55 Analysis of Long Time Stability and Errors of Two Partitioned Methods for Uncoupling Evolutionary Groundwater - Surface Water Flows
Catalin S. Trenchea, University of Pittsburgh, USA

12:00-12:25 Defective Boundary Conditions for Viscoelastic Flow Problems
Keith Galvin, Clemson University, USA

Tuesday, July 10

MS29

Recent Advances in Biomedical Modeling, Simulation, and Visualization- Part II of II

10:30 AM-12:30 PM

Room:Greenway G - Level 2

For Part 1 see MS18

The 21st century is seeing, and will see, a rapid, unprecedented aging of the world's population, which has resulted in an increased demand for quality health care. Currently, medical treatment decisions are typically made based on a consensus of how similar patients have previously responded to a particular treatment. However, mathematical models, computational simulations, and visualizations can be used to make predictions about how the body will react to a particular treatment and thus aid designing personalized therapies that reduce health care costs and maximize outcomes. Such advances in biomedical modeling, simulation, and visualization will be explored in this minisymposium.

Organizer: Suzanne M. Shontz
Pennsylvania State University, USA

Organizer: Corina Drapaca
Pennsylvania State University, USA

10:30-10:55 Patient-specific Mesh Generation for Improved Pulmonary Embolism Prevention
Shankar P. Sastry, Jibum Kim, and *Suzanne M. Shontz*, Pennsylvania State University, USA; Brent A. Craven, Frank C. Lynch, Keefe B. Manning, and Thap Panitanarak, Pennsylvania State University, USA

11:00-11:25 Fast Algorithms for Biophysics-based Medical Image Analysis
George Biros, University of Texas at Austin, USA

11:30-11:55 Resolving Topology Ambiguity for Complicated Domain
Yongjie Zhang and Jin Qian, Carnegie Mellon University, USA

12:00-12:25 Data Assimilation in Cardiovascular Mathematics: Toward An Integration of Patient-Specific Measurements and Simulations
Alessandro Veneziani, Emory University, USA; Marta D'Elia, Florida State University, USA; *Alexis Aposporidis*, Emory University, USA

Tuesday, July 10

MS30

Scientific Computing at Million-way Parallelism - Blue Gene/Q Early Science Program - Part I of II

10:30 AM-12:30 PM

Room:Nicollet D1 - Level 1

For Part 2 see MS42

The IBM Blue Gene/Q system is the first computer architecture to support more than one million CPU cores and foreshadows the rapid increase in parallelism expected at exascale. The Argonne Leadership Computing Facility Early Science Program involves advanced users preparing for this system by developing novel mathematics, algorithms and software to exploit much higher parallelism than their present-day platforms. These users come from diverse scientific backgrounds that overlap with many meeting focus areas, including numerical PDEs, materials science and applied linear algebra; and their experiences should inform the SIAM community about how it can prepare for next-generation supercomputers.

Organizer: Jeff R. Hammond
Argonne National Laboratory, USA

10:30-10:55 Results from the Early Science High Speed Combustion and Detonation Project
Alexei Khokhlov, University of Chicago, USA; *Charles Bacon*, Argonne National Laboratory, USA

11:00-11:25 Implementing Hybrid Parallelism in FLASH
Christopher Daley and Vitali Morozov, Argonne National Laboratory, USA; Dongwook Lee, Anshu Dubey, *Jonathan Gallagher*, Don Lamb, and Klaus Weide, University of Chicago, USA

11:30-11:55 A Trillion Particles: Studying Large-Scale Structure Formation on the BG/Q
David Daniel and Patricia Fasel, Los Alamos National Laboratory, USA; *Hal Finkel*, Argonne National Laboratory, USA; Nicholas Frontiere, University of California, Los Angeles, USA; Salman Habib and Katrin Heitmann, Argonne National Laboratory, USA; Zarija Lukic, Lawrence Berkeley National Laboratory, USA; Adrian Pope, Argonne National Laboratory, USA

12:00-12:25 Automatic Generation of the HPCC Global FFT for BlueGene/Q
Franz Franchetti, Carnegie Mellon University, USA

Tuesday, July 10

MS31

Shape Optimization Problems Involving Eigenvalues - Part I of II

10:30 AM-12:30 PM

Room:Greenway D - Level 2

For Part 2 see MS43

Since Lord Rayleigh conjectured that the disk should minimize the first Dirichlet eigenvalue of the Laplace operator amongst all shapes of equal area more than a century ago, shape optimization involving eigenvalues has been an active research topic, with applications in various areas including mechanical vibration, electromagnetic cavities, photonic crystals, and population dynamics. Significant progress has been made on such problems in recent years due to both theoretical and computational developments in optimization methods, sensitivity analysis, and methods for modeling free interfaces. This minisymposium aims to bring together mathematicians and scientists working in this field to share new results and exchange ideas.

Organizer: Chiu-Yen Kao
Ohio State University, USA

Organizer: Braxton Osting
University of California, Los Angeles, USA

10:30-10:55 Overview of Shape Optimization Problems Involving Eigenvalues
Braxton Osting, University of California, Los Angeles, USA; Chiu-Yen Kao, The Ohio State University and Claremont McKenna College, USA

11:00-11:25 Asymptotic Calculation of Resonances
Fadil Santosa, University of Minnesota, USA

11:30-11:55 Shape Optimization of Plasmonic Gratings
David C. Dobson, University of Utah, USA

12:00-12:25 Topology Optimization for Wave-Propagation Problems
Ole Sigmund, Technical University of Denmark, Denmark

Tuesday, July 10

MS32

Student Days: SIAM Student Chapter Presentations

10:30 AM-12:30 PM

Room:Greenway F - Level 2

For Part 2 see MS19
For Part 4 see MS44

Organizer: Peter R. Turner
Clarkson University, USA

10:30-10:45 Numerically Optimal High Order Strong Stability Preserving Multi-step Runge-Kutta Methods
Zachary Grant and Sigal Gottlieb, University of Massachusetts, Dartmouth, USA; David I. Ketcheson, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

10:50-11:05 Mathematical Modeling of Panama Disease in Cavendish Bananas Plants
Blake Burkett, Luis Melara, and Alyssa Bumbaugh, Shippensburg University, USA

11:10-11:25 Simulation of Deformations and Shape Recovery of Red Blood Cells Using the Lattice Boltzman Method
John Gounley and Yan Peng, Old Dominion University, USA

11:30-11:45 Modeling of the Dynamic Delamination of L-shaped Unidirectional Laminated Composites
Burak Gozluklu and Demirkan Coker, Middle East Technical University, Turkey

11:50-12:05 Simulating Two-Phase Flows in Fractured Reservoirs Using a Generic Transfer Function in a Dual-Porosity Model
Christine Maier, Heriot-Watt University, United Kingdom; Karen Schmid, Universität Stuttgart, Germany; Mohamed Ahmed and Sebastian Geiger, Heriot-Watt University, United Kingdom

12:10-12:25 An Analytical Approach to Green Oxidation
Diego Torrejon, George Mason University, USA

Tuesday, July 10

MS33

Workshop Celebrating Diversity (WCD): Cut Cell Methods for Solids and Incompressible Fluids

10:30 AM-12:30 PM

Room:Greenway A - Level 2

For Part 2 see MS45

We will cover a number of new results for simulating solids and incompressible fluids with Cartesian grids. The methods utilize cut cells near irregular features in the domain geometry to achieve optimal order of accuracy. Methods for coupling the two materials will also be presented. This will include rigid solids coupled with incompressible fluids as well as thin elastic (and surface tension) interfaces between fluids with different densities and viscosities.

Organizer: Joseph Teran
University of California, Los Angeles, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Stephen Wirkus
Arizona State University, USA

10:30-10:55 Efficient Symmetric Positive Definite Second-Order Accurate Monolithic Solver for Fluid/Solid Interactions
Frederic Gibou, University of California, Santa Barbara, USA

11:00-11:25 A Second Order Virtual Node Algorithm for Stokes Flow Problems with Interfacial Forces and Discontinuous Material Properties
Diego Cortegoso Assencio, University of California, Los Angeles, USA

11:30-11:55 A Fast Method for Interface and Parameter Estimation in Linear Elliptic PDEs with Piecewise Constant Coefficients
Alejandro Cantarero, University of California, Los Angeles, USA

12:00-12:25 A Second Order Virtual Node Method for Elliptic Interface Problems with Interfaces and Irregular Domains in Three Dimensions
Joseph Teran, University of California, Los Angeles, USA

Sponsored by WCD

Tuesday, July 10

CP6

Life Sciences II

10:30 AM-12:10 PM

Room:Skyway A - Level 2

Chair: Jonathan Rubin, University of Pittsburgh, USA

10:30-10:45 Using Maps to Predict Activation Order in Multiphase Rhythms
Jonathan E. Rubin, University of Pittsburgh, USA

10:50-11:05 An Unbiased Estimator of Noise Correlations under Signal Drift
Keiji Miura, Tohoku University, Japan

11:10-11:25 A Sparse Update Method for the in-Silico Manipulation of Biological Signaling Pathways
Philipp Kuegler, RICAM, Austrian Academy of Sciences, Austria

11:30-11:45 The Influence of Heart Rate Variability on Alternans Formation in the Heart
Elena Tolkacheva, University of Minnesota, USA

11:50-12:05 Modeling Cell Movement Through Collagen Using the Level Set Method
Magdalena Stolarska and *Matthew Fox*, University of St. Thomas, USA

Tuesday, July 10

CP7

Materials Science

10:30 AM-12:30 PM

Room:Skyway B - Level 2

Chair: Likun Tan, Carnegie Mellon University, USA

10:30-10:45 Thermodynamically Compatible Model of Yield Stress Polymeric Fluids
Ilya Peshkov, École Polytechnique de Montréal, Canada; Evgeniy Romenski, Sobolev Institute of Mathematics, Russia; Miroslav Grmela, École Polytechnique de Montréal, Canada

10:50-11:05 Impact of Combined Irregularity on the Torsional Wave Propagation
Sumit K. Vishwakarma and Shishir Gupta, Indian School of Mines, India

11:10-11:25 Estimation of 3D Microstructural Band Properties in Dual Phase Steel Assuming An Oriented Cylinder Model
Kimberly S. McGarrity, Jilt Sietsma, and Geurt Jongbloed, Delft University of Technology, Netherlands

11:50-12:05 Temporal Coarse-Graining of High Frequency Dynamics Using Parameterized Locally Invariant Manifolds
Likun Tan, Amit Acharya, and Kaushik Dayal, Carnegie Mellon University, USA

12:10-12:25 Dynamics of Light Beam Interaction at the Interface of Nonlinear Optical Media
Rajah P. Varatharajah, North Carolina A&T State University, USA

Tuesday, July 10

CP8

Physics & Chemistry

10:30 AM-12:10 PM

Room:Mirage - Level 2

Chair: Joseph D. Fehribach, Worcester Polytechnic Institute, USA

10:30-10:45 Recursive Fermi-Dirac Operator Expansions with Applications in Electronic Structure Theory
Emanuel H. Rubensson, Uppsala University, Sweden

10:50-11:05 Block-Sparse Matrix-Matrix Multiplication with Error Control for Quantum Chemistry Applications
Elias Rudberg, Uppsala University, Sweden

11:10-11:25 Matrices, Kirchhoff Graphs and Reaction Networks
Joseph D. Fehribach, Worcester Polytechnic Institute, USA

11:30-11:45 A Conjecture on the Structure of Mutually Unbiased Bases
Francis C. Motta, Colorado State University, USA

11:50-12:05 Microscopic Theory of Brownian Motion Revisited
Changho Kim and George E. Karniadakis, Brown University, USA

Prizes and Awards Luncheon

12:30 PM-2:30 PM

Room:Exhibit Hall - Level 1

Be sure to bring your ticket to the Luncheon.

Tuesday, July 10

SP2

The John von Neumann Lecture: Liquid Crystals for Mathematicians

2:30 PM - 3:30 PM

Room: Nicollet ABC - Level 1

Chair: Lloyd N. Trefethen, Oxford University, United Kingdom

Liquid crystals form an important class of soft matter systems with properties intermediate between solid crystals and isotropic fluids. They are the working substance of liquid crystal displays, which form the basis of a huge multinational industry. The lecture will describe these fascinating materials, and what different branches of mathematics, such as partial differential equations, the calculus of variations, multiscale analysis, scientific computation, dynamical systems, algebra and topology, can say about them.

John Ball
University of Oxford, United Kingdom

Coffee Break

3:30 PM-4:00 PM

Room:Exhibit Hall - Level 1

Tuesday, July 10

MS34

AWM Workshop: Mathematical Biology Research Talks by Recent Ph.D.s

4:00 PM-6:00 PM

Room:Greenway B - Level 2

For Part 2 see MS22
This minisymposium will feature mathematical biology talks by female recent Ph.D.s. The applications will include the density of bacterial flocs, cell polarity, spread of influenza, and actin regulation.

Organizer: Eleboeba E. May
Sandia National Laboratories, USA

Organizer: Leah Edelstein-Keshet
University of British Columbia, Canada

Organizer: Cammey Cole Manning
Meredith College, USA

4:00-4:25 The Post-Fragmentation Density Function for Bacterial Aggregates
Erin Byrne, Harvey Mudd College, USA

4:30-4:55 Modelling Cell Polarity: Theory to Experiments
Alexandra Jilkine, University of Arizona, USA

5:00-5:25 Epidemic Spread of Influenza Viruses: The Impact of Transient Populations on Disease Dynamics
Karen Rios-Soto, University of Puerto Rico, Mayaguez, Puerto Rico

5:30-5:55 Modeling the Cofilin Pathway and Actin Dynamics in Cell Motility Activity of Mammary Carcinomas
Nessy Tania, Smith College, USA

Tuesday, July 10

MS35

Coupled and Hybrid Models and Multiple Scales in Mathematical Geosciences - Part II of III

4:00 PM-6:00 PM

Room:Greenway I - Level 2

For Part 1 see MS20
For Part 3 see MS48
The topics in this minisymposium include mathematical and computational modeling issues arising when coupling various flow and transport, thermal, mechanical, electrical, and chemical processes occuring simultaneously and at different scales. The talks will be on discretization and solver issues arising for coupled models and when bridging scales or combining models of different type. Applications are to various processes in surface and subsurface

Organizer: Malgorzata Peszynska
Oregon State University, USA

Organizer: Lynn S. Bennethum
University of Colorado, Denver, USA

Organizer: Son-Young Yi
University of Texas at El Paso, USA

4:00-4:25 A Mixed Finite Element Framework for the Biot Model in Poroelasticity
Son-Young Yi, University of Texas at El Paso, USA

4:30-4:55 Multiscale Modeling and Simulation of Fluid Flows in Deformable Porous Media
Yuliya Gorb, University of Houston, USA

5:00-5:25 Coupling Modeling for Compressible Fluid Flow in the Elastic Porous Media
Akif Ibragimov, E. Aulisa, and Y. Kaya, Texas Tech University, USA

5:30-5:55 Multiscale Simulation and Upscaling Multi-Species Reactive Transport from the Pore to Macro Scale
Matthew Balhoff, University of Texas at Austin, USA

Tuesday, July 10

MS36

Differential Equations in the Chebfun System

4:00 PM-6:00 PM

Room:Greenway J - Level 2

Chebfun is a collection of algorithms and an open-source software system in object-oriented MATLAB which extends familiar powerful methods of numerical computation involving numbers to continuous or piecewise-continuous functions. One of the key applications of the system is in the numerical solution of differential and integral equations by adaptive collocation, and the talks in this minisymposium cover some of the recent advances in areas such as automatic differentiation and linearity detection, operator SVDs, and methods for time-dependent problems.

Organizer: Nick Hale

Oxford University, United Kingdom

4:00-4:25 An Overview of Differential Equations in Chebfun
Nick Hale, Oxford University, United Kingdom

4:30-4:55 Spectral Deferred Correction in Chebfun for Time-dependent PDEs
Tobin Driscoll, University of Delaware, USA

5:00-5:25 Automatic Differentiation in Chebfun: Implementation and Usage
Asgeir Birkisson, University of Oxford, United Kingdom

5:30-5:55 Computation of Frequency Responses of PDEs in Chebfun
Mihailo R. Jovanovic, and Binh Lieu, University of Minnesota, USA

Tuesday, July 10

MS37

Dynamics and Applications of Thin Liquid Films - Part I of IV

4:00 PM-6:00 PM

Room:Greenway G - Level 2

For Part 2 see MS49

Thin fluid films are present in a variety of applications including physiology, medicine, phase change, multiphase and non-Newtonian flows. In solving these related problems, various numerical methods are implemented including spectral methods and ChebFun for spatial discretization together with various time stepping schemes in the method of lines, and ADI methods for direct discretization. Analytical methods complement and illuminate the numerical results. The range of problems and approaches highlighted in this minisymposium exhibit the advancement and challenges of thin film dynamics.

Organizer: Richard Braun

University of Delaware, USA

Organizer: Ellen Peterson

Carnegie Mellon University, USA

Organizer: Nicholas Gewecke

University of Delaware, USA

4:00-4:25 Behavior of Droplets on a Thin Film
Ellen Peterson, Carnegie Mellon University, USA

4:30-4:55 Fingering Instability Down the Outside of a Vertical Cylinder
Linda Smolka, Bucknell University, USA

5:00-5:25 Defects and Heterogeneity in Liquid Coatings
Justin Kao, Massachusetts Institute of Technology, USA

5:30-5:55 Two Layer Model for Local Tear Film Dynamics
Nicholas Gewecke and Rich Braun, University of Delaware, USA

Tuesday, July 10

MS38

Massive Graphs: Big Compute Meets Big Data - Part II of III

4:00 PM-6:00 PM

Room:Nicollet ABC - Level 1

For Part 1 see MS26
For Part 3 see MS51

Large graph analytics have become an increasingly important in a wide variety of application areas such as internet search, bioinformatics, social media, and cybersecurity. Massive graphs push the state of the art in both big compute and big data. This minisymposium will explore the algorithms, tools and technologies being developed to address these leading edge problems. The minisymposium will include a mix of invited talks from established practitioners and early career professionals.

Organizer: Jeremy Kepner

Massachusetts Institute of Technology, USA

Organizer: John R. Gilbert

University of California, Santa Barbara, USA

Organizer: David A. Bader

Georgia Institute of Technology, USA

4:00-4:25 Networks, Communities and the Ground-Truth
Jure Leskovec, Stanford University, USA

4:30-4:55 Influence Propagation on Large Graphs
Aditya Prakash, Carnegie Mellon University, USA

5:00-5:25 High-Performance Metagenomic Data Clustering and Assembly
Kamesh Madduri, Pennsylvania State University, USA

5:30-5:55 Scaling Graph Computations at Facebook
John Ugander, Cornell University, USA

Tuesday, July 10

MS39

Multiscale Models of Solids

4:00 PM-6:00 PM

Room:Greenway C - Level 2

Continuum mechanics models of solids have certain limitations as the length scale of interest approaches the atomistic (angstrom) scale. A possible solution in such situations is to use a pure atomistic model, however, when modelling localized lattice defects that interact with long-range elastic effects, atomistic/continuum multiscale models are required for the accurate and efficient treatment of such systems. The aim of this minisymposium is to review the advances in the development and analysis of such multiscale methods that have recently been achieved over the last four years, and to discuss pressing open problems.

Organizer: Mitchell Luskin

University of Minnesota, USA

4:00-4:25 Optimization-Based Decomposition of Multiphysics Problems with Applications

Pavel Bochev and Denis Ridzal, Sandia National Laboratories, USA; Mitchell Luskin, University of Minnesota, USA

4:30-4:55 Blended Energy-based Quasicontinuum Methods

Brian Van Koten and Mitchell Luskin, University of Minnesota, USA; Christoph Ortner, University of Warwick, United Kingdom

5:00-5:25 Blended Force-based Quasicontinuum Methods

Xingjie Li and Mitchell Luskin, University of Minnesota, USA; Christoph Ortner, University of Warwick, United Kingdom

5:30-5:55 Energy-Based A/C Coupling for Pair Interaction

Alexander V. Shapeev, University of Minnesota, USA

Sponsored by SIAG/MS

Tuesday, July 10

MS40

Numerical Methods for Polynomial Systems - Part II of II

4:00 PM-6:00 PM

Room:Greenway H - Level 2

For Part 1 see MS16

Systems of polynomial equations arise naturally in a number of scientific and engineering applications. There has recently been much work in developing numerical algorithms for solving polynomial systems and extracting data from their solution sets. This minisymposium will bring together several experts on these numerical computations.

Organizer: Daniel J. Bates

Colorado State University, USA

4:00-4:25 Extended Precision Path Tracking in Parallel

Jan Verschelde and Genady Yoffe, University of Illinois, Chicago, USA

4:30-4:55 Numerical Algebraic Geometry via Macaulay's Perspective

Barry H. Dayton, Northeastern Illinois University, USA

5:00-5:25 Elimination of Pseudo-components in Numerical Primary Decomposition

Anton Leykin, Georgia Institute of Technology, USA

5:30-5:55 Preconditioning with H-Bases Computed Using Dual Space Operations

Steven L. Ihde and Daniel J. Bates, Colorado State University, USA; Jonathan Hauenstein, Texas A&M University, USA

Sponsored by SIAG/AG

Tuesday, July 10

MS41

Recent Advances in Analysis and Numerical Methods for Fluid Flow Simulation - Part III of III

4:00 PM-6:00 PM

Room:Greenway E - Level 2

For Part 2 see MS28

This minisymposia will focus on new classes of models recently developed for fluid flow problems, including for turbulence, viscoelastic flows with control, defective boundary conditions, and random input data. The applications of these problems are countless; however, robust solution methodologies remain elusive. Achieving accuracy and efficiency in computations relies on analysis of these models and the design of numerical methods for them. The topics of interest include, but are not limited to, recent improvements in the modeling of fluid flow, high-dimensional integration, development of numerical methods to compute solutions to the models (deterministic and stochastic), mathematical analysis of models, capturing the important physical properties of the problem and applications.

Organizer: Leo Rebholz

Clemson University, USA

Organizer: Alexander Labovsky

Michigan Technological University, USA

4:00-4:25 A Nonconforming Finite Element Method for an Acoustic Fluid-Structure Interaction Problem

Susanne Brenner, Louisiana State University, USA; *Aycil Cesmelioglu* and Jintao Cui, University of Minnesota, USA; Li-yeng Sung, Louisiana State University, USA

4:30-4:55 Fluid-fluid Calculations using the Evolve-filter-relax Regularization Strategy

Jeffrey M. Connors, Lawrence Livermore National Laboratory, USA

5:00-5:25 Large Eddy Simulation of the Quasi-Geostrophic Equations of Oceanic Flows

Traian Iliescu, Virginia Polytechnic Institute & State University, USA

5:30-5:55 Uncertainly Quantification for PDEs

Miroslav Stoyanov, Florida State University, USA; Clayton G. Webster, Oak Ridge National Laboratory, USA

Tuesday, July 10

MS42

Scientific Computing at Million-way Parallelism - Blue Gene/Q Early Science Program - Part II of II

4:00 PM-6:00 PM

Room:Nicollet D1 - Level 1

For Part 1 see MS30

The IBM Blue Gene/Q system is the first computer architecture to support more than one million CPU cores and foreshadows the rapid increase in parallelism expected at exascale. The Argonne Leadership Computing Facility Early Science Program involves advanced users preparing for this system by developing novel mathematics, algorithms and software to exploit much higher parallelism than their present-day platforms. These users come from diverse scientific backgrounds that overlap with many meeting focus areas, including numerical PDEs, materials science and applied linear algebra; and their experiences should inform the SIAM community about how it can prepare for next-generation supercomputers.

Organizer: Jeff R. Hammond

Argonne National Laboratory, USA

4:00-4:25 Chemical Applications of the Multiresolution Adaptive Numerical Environment for Scientific Simulation (MADNESS)

Robert Harrison, University of Tennessee, Knoxville, USA; Álvaro Vázquez-Mayagoitia, Argonne National Laboratory, USA

4:30-4:55 Improving Earthquake Ground Motion Estimates with Blue Gene/Q

Geoffrey Ely, Argonne National Laboratory, USA

5:00-5:25 Accelerating and Benchmarking GAMESS on BlueGene/Q

Maricris Mayes and Graham Fletcher, Argonne National Laboratory, USA; Mark Gordon, Iowa State University, USA

5:30-5:55 Blue Gene/Q Architecture and Programming Models

Jeff R. Hammond, Argonne National Laboratory, USA

Tuesday, July 10

MS43

Shape Optimization Problems Involving Eigenvalues - Part II of II

4:00 PM-6:00 PM

Room:Greenway D - Level 2

For Part 1 see MS31
For Part 3 see MS53

Since Lord Rayleigh conjectured that the disk should minimize the first Dirichlet eigenvalue of the Laplace operator amongst all shapes of equal area more than a century ago, shape optimization involving eigenvalues has been an active research topic, with applications in various areas including mechanical vibration, electromagnetic cavities, photonic crystals, and population dynamics. Significant progress has been made on such problems in recent years due to both theoretical and computational developments in optimization methods, sensitivity analysis, and methods for modeling free interfaces. This minisymposium aims to bring together mathematicians and scientists working in this field to share new results and exchange ideas.

Organizer: Chiu-Yen Kao

Ohio State University, USA

Organizer: Braxton Osting

University of California, Los Angeles, USA

4:00-4:25 Shape Recognition Based on Eigenvalues of the Laplacian

Lotfi Hermi, University of Arizona, USA

4:30-4:55 Characterization of Weighted Graphs using Graph Laplacians

Naoki Saito, University of California, Davis, USA

5:00-5:25 An Analytical Level Set Method for Eigenvalue Shape Optimization Problems

Pavel Grinfeld, Drexel University, USA

5:30-5:55 Shape Optimization with the Vector Maxwell Equations

Owen D. Miller and Eli Yablonovitch, University of California, Berkeley, USA

Tuesday, July 10

MS44

Student Days: Students Informal Meeting with Invited Speakers

4:00 PM-6:00 PM

Room:Greeway F - Level 2

For Part 3 see MS32
For Part 5 see MS54

This session gives students an opportunity to meet some of the invited speakers in an informal setting.

Organizer: Tasso J. Kaper

Boston University, USA

Organizer: Michele Benzi

Emory University, USA

Meet Informally with the 2012 SIAM Annual Meeting Co-chairs and Some of the Invited Speakers

Tasso J. Kaper, Boston University, USA; Michele Benzi, Emory University, USA

Tuesday, July 10

MS45

Workshop Celebrating Diversity (WCD): Computational Mathematics Applied to Scientific Problems

4:00 PM-6:00 PM

Room:Greenway A - Level 2

For Part 1 see MS33
For Part 3 see MS55

The scientific disciplines are relying more and more on mathematical, statistical, and computational models to aid in the understanding of various phenomena in their disciplines. Progress in these ventures requires an understanding of the specific scientific discipline so that models and numerical algorithms can be developed that suit the applications. In this minisymposium, we look at mathematical and numerical models that are being developed to investigate complex problems in biology, coastal oceanography, and chemistry.

Organizer: Suzanne L. Weekes
Worcester Polytechnic Institute, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Stephen Wirkus
Arizona State University, USA

4:00-4:25 Multi-frequency Iterative Integral Equations Method for the Shape Reconstruction of an Acoustically Sound-soft Obstacle Using Backscattering
Carlos C. Borges, Worcester Polytechnic Institute, USA

4:30-4:55 A Treecode Algorithm for N-body Interactions with Disjoint Source and Target Particles
Henry A. Boateng, University of Michigan, USA; Robert Krasny, University of Michigan, Ann Arbor, USA

continued in next column

Sponsored by WCD

5:00-5:25 Improving Hurricane Storm Surge Forecasting using Data Assimilation Methods
Talea Mayo and Troy Butler, University of Texas at Austin, USA; Muhammad Altaf, King Abdullah University of Science and Technology, Saudi Arabia; Clint Dawson, University of Texas at Austin, USA; Ibrahim Hoteit, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Xiaodong Luo, King Abdullah University of Science and Technology, Saudi Arabia

5:30-5:55 A Novel Multiscale Model of Glioblastoma Multiforme (gbm)
Gerardo Hernandez, Worcester Polytechnic Institute, USA

Tuesday, July 10

CP9

Inverse Problems

4:00 PM-6:00 PM

Room:Skyway A - Level 2

Chair: Noemi Petra, University of Texas at Austin, USA

4:00-4:15 The Estimation of Uncertainty in the Solution of Ice Sheet Inverse Problems: Gaussian Linear Case versus the Stochastic Newton MCMC Method
Noemi Petra, James R. Martin, Georg Stadler, and Omar Ghattas, University of Texas at Austin, USA

4:20-4:35 A Comparison of Deterministic and Stochastic Means for Damage Parameter Identification in a Multiphysics Context
Heather M. Reed and Christopher J. Earls, Cornell University, USA; Jonathan Nichols, Naval Research Laboratory, USA

4:40-4:55 Reducing Uncertainty in Stochastic Inverse Problems Involving Sparse Data
Jose G. Cano and Christopher J. Earls, Cornell University, USA

5:00-5:15 3-D Constrained Joint Inversion of Geophysical Data for Crustal and Mantle Velocities in the Southern Rio Grande Rift
Anibal Sosa, Aaron Velasco, and Lennox Thompson, University of Texas at El Paso, USA

5:20-5:35 Time Reversed Absorbing Condition (trac): Applications to Inverse Problems
Franck Assous, Ariel University Center of Samaria, Israel; Frederic Nataf, Laboratoire Jacques-Louis Lions, France; Marie Kray, Université Pierre et Marie Curie, France

5:40-5:55 An Application of Particle Swarm Optimization to Identify the Thermal Properties of Materials
Fung-Bao Liu, I-Shou University, Taiwan

Tuesday, July 10

CP10

Probability & Statistics

4:00 PM-6:00 PM

Room:Skyway B - Level 2

Chair: Eric A. Eager, University of Nebraska, Lincoln, USA

4:00-4:15 Finding Trends in Multiscale/ Non-Stationary Time Series
Juan M. Restrepo, Darin Comeau, and Hermann Flaschka, University of Arizona, USA

4:20-4:35 Modeling and Analysis of Plant-Seed Bank Dynamics of a Disturbance Specialist in a Random Environment
Eric A. Eager, University of Nebraska, Lincoln, USA

4:40-4:55 Linear Regression Via the Singular Value Decomposition
Bert W. Rust, National Institute of Standards and Technology, USA

5:00-5:15 Urinary Tract Infections in Meningioma Patients: Analysis of Risk Factors and Outcomes
Miriam Nuno, Cedars-Sinai Medical Center, USA

5:20-5:35 Demonic Fuzzy Operators: Illustration with Fuzzy Logic
Fairouz Tchier, King Saoud University, Saudia Arabia

5:40-5:55 Large Deviations and Importance Sampling for a Feed-forward Network
Leila Setayeshgar and Hui Wang, Brown University, USA

Intermission

6:00 PM-6:15 PM

SIAM Business Meeting

6:15 PM-7:15 PM

Room:Nicollet ABC - Level 1

Complimentary beer and wine will be served.

Tuesday, July 10

Dinner Break

7:15 PM-8:00 PM

Attendees on their own.

PP1

Poster Session and Dessert Reception

8:00 PM-10:00 PM

Room:Exhibit Hall - Level 1

A Gpu Implementation of Von Mises-Fisher Distribution Algorithm for Polymer Conformation Analysis
Bakytzhan Kallemov and *Aidos Abzhanov*, Nazarbayev University, Kazakhstan

Pollutants Transport Simulation in Atmospheric Boundary Layer Using Stabilized Finite Element Formulations
Roseane A. Albani, Universidade Federal do Rio De Janeiro, Brazil; Antônio Cruz, Eduardo Carmo, and Fernando Duda, COPPE/Federal University of Rio de Janeiro, Brazil

Advanced Optimization Techniques for Entropy-Based Closures in Slab Geometry
Graham Alldredge, University of Maryland, USA; Cory Hauck, Oak Ridge National Laboratory, USA; André Tits and Dianne P. O'Leary, University of Maryland, College Park, USA

High Order Numerical Method for the Nearly Singular Integration of the Stokes Kernel
Walid Ben Romdhane, George Biros, and Bryan D. Quaife, University of Texas at Austin, USA

An Axisymmetric Boundary Element Method for Modeling Biphasic Articular Cartilage Mechanics
Brandy A. Benedict, Merrimack College, USA

Predicting Bifurcations in Dynamical Systems
Jesse Berwald, College of William & Mary, USA; Tomas Gedeon and Kelly Spendlove, Montana State University, USA

Faraday Waves on Surfactant-Covered Thin Films
Lake Bookman, Michael Shearer, Karen Daniels, and Stephen Strickland, North Carolina State University, USA

Multi-Frequency Iterative Integral Equations Method for the Shape Reconstruction of An Acoustically Sound-Soft Obstacle in the Presence of Multiple Scatterers
Carlos C. Borges, Worcester Polytechnic Institute, USA; Marcus Sarkis, Worcester Polytechnic Institute and Instituto de Matematica Pura e Aplicada (IMPA), Brazil

Particle Methods for Geophysical Flows on the Sphere
Peter A. Bosler, University of Michigan, USA; Robert Krasny, University of Michigan, Ann Arbor, USA; Christiane Jablonowski, University of Michigan, USA

Software Development for a Three Dimensional Gravity Inversion and Application to Study of the Border Ranges Fault System, South Central Alaska
Rolando Cardenas and Diane Doser, University of Texas at El Paso, USA; Mark Baker, Geomedia R&D, USA

Numerical Solution of Integral Equations in Solidification and Laser Melting
Elizabeth Case and Johannes Tausch, Southern Methodist University, USA

Stochastic Approximated-Gradient Optimization Methods for Oilfield Well Placement
Yuqing Chang and Deepak Devegowda, University of Oklahoma, USA

Spatio-Temporal Calcium Smoothing in Dendritic Trees
Rebecca Chen and Kresimir Josic, University of Houston, USA; Peter Saggau, Baylor College of Medicine, USA; Keith Kelleher, University of Houston, USA; Liam Paninski and Eftychios Pnevmatikakis, Columbia University, USA

Singular Limits of Geophysical Fluid Dynamics in Spherical and Bounded Domains
Bin Cheng, Arizona State University, USA

Crossover Design for Studying Obstructive Sleep Apnea
Hyung Wook Chun, University of Texas at Arlington, USA

Modeling and Simulating Flow-Induced Fluctuations in Polymer Solutions
Michael Cromer, Michael Villet, Glenn Fredrickson, and Gary Leal, University of California, Santa Barbara, USA

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A Finite-Element Mmoc Groundwater Model for Gpu's on the Cloud
Mark C. Curran, University of St. Thomas, USA

Stochastic Heterogeneous Multiscale Modeling of Single Phase Flow in a Porous Media
Paul M. Delgado, University of Texas at El Paso, USA

Probabilistic Divide-and-Conquer: a New Method for Exact Sampling with Integer Partitions as an Example
Stephen Desalvo, University of Southern California, USA

Numerical Methods for Delay Differential Equations with Applications to Biology
Ibrahim O. Diakite and Benito Chen-Charpentier, University of Texas at Arlington, USA

A Predictive Model for Geographic Statistical Data
Jorge Diaz-Castro, University of Puerto Rico, Puerto Rico

Investigations of Cai's Power Law for Strong Tornados
Doug Dokken, University of St. Thomas, USA; Pavel Belik, Augsburg College, USA; Kurt Scholz and Misha Shvartsman, University of St. Thomas, USA

Convergence in Mallows-Wasserstein Distance of Randomly Indexed Partial Sums and Upper Bounds for the Ruin Probabilities
Chang C. Dorea, Universidade de Brasília, Brazil

Statistical Methods for Detecting Fraudulent Prescriptions
Jessica Doud, Brigham Young University, USA

Unsupervised Methods to Detect Health Care Waste
Ben Ehlert, Brigham Young University, USA

Fast Algorithms for Inverse Problems of Reaction-Diffusion-Advection Equations
Amir Gholaminejad and George Biros, University of Texas at Austin, USA

A Fast Algorithm to Solve Slow Incompressible Steady Flows
Aditi Ghosh, Texas A&M University, USA

Analysis of Interfaces for the Nonlinear Diffusion-Convection Equations
Jonathan Goldfarb and Nathan Mertins, Florida Institute of Technology, USA

Identifying Fraud with Bayesian Networks
Ryan Grout, Brigham Young University, USA

Minimizing Rational Functions by Exact Jacobian SDP Relaxation Applicable to Finite Real Singularities
Feng Guo and Li Wang, University of California, San Diego, USA; Guangming Zhou, Xiangtan University, China

Statistics of Solar Cycle-La Nina Connection: Correlation of Two Autocorrelated Time Series
Eddie Haam, Harvard University, USA; Ka-Kit Tung, University of Washington, USA

Topic Analysis and Grouping of Insurance Claims
Danielle Hanks and Mason Victors, Brigham Young University, USA

Computation and Analysis of Evolutionary Game Dynamics
Yiping Hao, Wen Zhou, and Zhijun Wu, Iowa State University, USA

Explicit Update Scheme for Inverse Elliptic Problems
Jan Hegemann, University of Muenster, Germany; Alejandro Cantarero, University of California, Los Angeles, USA; Casey Richardson, Johns Hopkins University, USA; Joseph Teran, University of California, Los Angeles, USA

A Bayesian Approach to Uncertainty Quantification for Stochastic Epidemic Models
Kyle S. Hickmann and Mac Hyman, Tulane University, USA

A Family of Euler-Maclaurin Formulae for N-Point Gaussian Quadrature
Andrew M. Hofstrand, Hunter College, USA

A Slow Pushed Front in a Lotka-Volterra Competition Model
Matt Holzer and Arnd Scheel, University of Minnesota, USA

Convergence of a Gauss Pseudospectral Method for Optimal Control
Hongyan Hou, William Hager, and Anil Rao, University of Florida, USA

A Fast Spectral Algorithm for the Quantum Boltzmann Collision Operator
Jingwei Hu, University of Texas at Austin, USA; Lexing Ying, University of Texas, USA

Device Modeling for Organic Solar Cells
Lunmei Huang, University of Michigan, USA; Robert Krasny, University of Michigan, Ann Arbor, USA; Kyle Renshaw and Stephen Forrest, University of Michigan, USA

Shortest Path for High-Dimensional Data Representation
Sung Jin Hwang, University of Michigan, USA; Steven Damelin, Georgia Southern University, USA; Alfred Hero, University of Michigan, USA

Analysis of Optimal Mortgage Termination Under the Cox-Ingersoll-Ross Model
Christopher S. Jones, University of Pittsburgh, USA

Computing Characteristic Classes in Algebraic Geometry
Christine Jost, Stockholm University, Sweden; David Eklund and Chris Peterson, Colorado State University, USA

Minimizing Communication in Sparse Matrix-Vector Multiplication Using a Novel Representation
Ramaseshan Kannan, University of Manchester, United Kingdom

Deforming Cylindrical Hypersurfaces in Hyperbolic Space by their Harmonic Mean Curvature
Christopher Kim and Robert Gulliver, University of Minnesota, USA

Deforming Cylindrical Hypersurfaces in Hyperbolic Space by Their Harmonic Mean Curvature
Chris Kim and Robert Gulliver, University of Minnesota, USA

Mechanism of Default Contagion with Graph Representations
Katherine Kime, University of Nebraska at Kearney, USA; Shuangshi Han, University of Nebraska, Kearney, USA and Lanzhou University of Finance and Economics, China

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A Delay-Differential Equation Approach to Determine Insulin Sensitivity
Stephen M. Kissler, University of Colorado at Boulder, USA

Linear Response Closure Approximation for Multiscale Systems
Marc Kjerland and Rafail Abramov, University of Illinois, Chicago, USA

Accuracy-Enhancing Moving Grid Method for Stratified Flow Calculations
Sergey Koltakov and Oliver Fringer, Stanford University, USA

Reduced Order Modeling for Dynamic Earthquake Simulations
Jeremy E. Kozdon and Paul Constantine, Stanford University, USA

Approximating the Singularities of a Function by Means of Its Fourier-Jacobi Coefficients: An Enhanced Power Method
George Kvernadze, Weber State University, USA

Computational Docking of Molecular Wires to the Reaction Center of Rhodobacter Sphaeroides
Byong Y. Kwon, George Mason University, USA

Mixed Methods of Viscoelastic Wave Propagation
Jeonghun Lee, University of Minnesota, USA

Vector-Valued Parametric Kernel-Based Interpolation for Two-Dimensional Facial Animations
Barrett A. Leslie, Illinois Institute of Technology, USA

A Neuronal Network Model of Drosophila Antennal Lobe
Dori Luli and Sharon M. Crook, Arizona State University, USA

SmartGrid Pricing and Consumer Privacy Constraints
Shaudi Mahdavi Hosseini, University of Pennsylvania, USA

Massively Parallel Adaptive Fast Multipole Method for Volume Potentials
Dhairya Malhotra and George Biros, University of Texas at Austin, USA

A Network-Patch Model for the Transmission and Emergence of Mosquito-Borne Pathogens
Carrie A. Manore and James Hyman, Tulane University, USA; Christopher Mores, Louisiana State University, USA; Sarah DelValle and Susan Mniszewski, Los Alamos National Laboratory, USA; Kyle S. Hickmann, Tulane University, USA; Rebecca Christofferson, Louisiana State University, USA; Helen Wearing, University of New Mexico, USA; Reid Priedhorsky, Los Alamos National Laboratory, USA

High-Order Nodal Formulation of the Mimetic Finite Difference Method for Elliptic Problems
Gianmarco Manzini, Los Alamos National Laboratory, USA

Meshfree Quadratures for Planar Regions
Jordan M. Martel, Arizona State University, USA

Numerical Modeling of Flow Over Flexible Vegetation
Steven A. Mattis and Clint Dawson, University of Texas at Austin, USA; Christopher Kees and Matthew Farthing, U.S. Army Engineer Research and Development Center, USA

Systems of Conservation Laws for Thermodynamically Consistent Adsorption with Subscale Diffusion
Francis P. Medina and Malgorzata Peszysnka, Oregon State University, USA

Multiscale Seismic Imaging
Susan E. Minkoff, University of Maryland, Baltimore County, USA

Pandemic Influenza:Best Strategies to Minimize Transmission Despite Parameter Uncertainty
Romarie Morales, Arizona State University, USA

The Case for Exponential Time Differencing for Neuronal Network Simulations
Alexander Nectow, Rockefeller University, USA; Christoph Borgers, Tufts University, USA

Highly Accurate 3D Nearly Singular Integration
Mike Nicholas, Carthage College, USA

Application of Fractional Calculus to Domain Wall Motion
Abdalla A. Obeidat, Wesam Al-Sharoa, and Manal Al-Ali, Jordan University of Science and Technology, Jordan

Applying Stochasticity to Models of Rotavirus Disease and Vaccination
Omayra Ortega, Arizona State University, USA

Cost Benefit Analysis of Vector Control Strategies for Dengue in Bangkok
Abhishek Pandey, Clemson University, USA; Anuj Mubayi, Northeastern Illinois University; Jan Medlock, Oregon State University, USA

The Behaviour of a Thin Ridge Or Rivulet of Fluid
Colin Paterson, Stephen Wilson, and Brian Duffy, University of Strathclyde, United Kingdom

Use of the String Method to Find Minimal Energy Paths of Droplets on Superhydrophobic Surfaces
Kellen Petersen, Courant Institute of Mathematical Sciences, New York University, USA

Exact Chirped Soliton Solutions for 1D Gross-Pitaevskii Equation with Time-Dependent Parameters
Zhenyun Qin, Fudan University, China; Gui Mu, Qujing Normal University, China

Small Steady Self-Similar Inviscid Flow
Joseph P. Roberts and Volker W. Elling, University of Michigan, USA

Computing An Approximation to the Helmholtz Equation with a High Contrast Thin Scatterer Present
Scott Rome, Drexel University, USA

Snakes and Ladders: Stability of Fronts and Pulses
Bjorn Sandstede, Brown University, USA

On the Spectral Stability of Soltion Solutions of the Vector Nonlinear Schrödinger Equation
Natalie Sheils and Bernard Deconinck, University of Washington, USA; Nghiem Nguyen and Rushun Tian, Utah State University, USA

Detecting And Using Stable Communities For Modularity Maximization
Sriram Srinivasan and Sanjukta Bhowmick, University of Nebraska, Omaha, USA

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Quantized Vortex Dynamics in Complex Ginzburg-Landau Equation in Bounded Domain
Qinglin Tang, National University of Singapore, Singapore

Statistical Test and Simulation for Multi-Scale Computation of 2D Polymer Model
Sunli Tang, Rensselaer Polytechnic Institute, USA

An Analytical Approach to Green Oxidation
Diego Torrejon, George Mason University, USA

Conditional Stochastic Simulations and Error Estimates for Flow and Transport in Porous Media
Veronika S. Vasylkivska, Mina E. Ossiander, and Malgorzata Peszynska, Oregon State University, USA

A Method of Lines Approach to Solving Pdes on Surfaces
Ingrid Von Glehn and Colin Macdonald, University of Oxford, United Kingdom

Proper Orthogonal Decomposition Reduced Order Models For Complex Flows
Zhu Wang, Traian Iliescu, Jeff Borggaard, and Imran Akhtar, Virginia Polytechnic Institute & State University, USA

Computing Positive Semidefinite Minimum Rank for Small Graphs
Nathan Warnberg and Steven Osborne, Iowa State University, USA

Improving Certainty Using Informed Markov Models
Jared Webb, Brigham Young University, USA

Improving Hidden Markov Models that use Classified Observations
Matthew Webb, Danielle Hanks, Mason Victors, and Jared Webb, Brigham Young University, USA

Diversification Effect of Distributed Solar Energy Upon Energy Generation Volatility
Matthew K. Williams, Shawn Kerrigan, Alex Thornton, and Sergey Koltakov, Locus Energy, USA

Restructuring the Ppm Gas Dynamics Algorithm for Many-Core Cpu Devicces
Paul R. Woodward, Jagan Jayaraj, and Pei-Hung Lin, University of Minnesota, USA

A Radial Basis Function Partition of Unity Method for Transport on the Sphere
Grady B. Wright and Kevin Aiton, Boise State University, USA

Grain Boundaries in Turing Patterns
Qiliang Wu, University of Minnesota, USA; Arnd Scheel, University of Minnesota, Minneapolis, USA

Parallel Cardiac Image Segmentation with Random Projection Tree
Bo Xiao, Georgia Institute of Technology, USA; Geroge Biros, University of Texas at Austin, USA

Local Convergence of Newton-Type Methods for Degenerate Eigenvalues of Nonlinear Algebraic Eigenvalue Problems
Fei Xue and Daniel B. Szyld, Temple University, USA

Computation of Harmonic Forms of the Vector Laplacian
Bo Yang, University of Minnesota, USA

Partially Parallel Magnetic Resonance Image Reconstruction Using Bregmanized Operator Splitting with Variable Stepsize
Maryam Yashtini, William Hager and Yumni Chen, University of Florida, USA; Xiaojing Ye, Georgia Institute of Technology, USA

Stochastic Simulation and Power-Law Relaxation of Highly Entangled Wormlike Micellar Solutions
Yun Zeng and Pamela Cook, University of Delaware, USA; Lin Zhou, New York City College of Technology, USA

How to Compute Transition States/ saddle Points?
Jiangyan Zhang and Qiang Du, Pennsylvania State University, USA

Multi-Layer and Multi-Resolution Large Population Stochastic Games
Quanyan Zhu and Tamer Basar, University of Illinois at Urbana-Champaign, USA

Dynamics and Noise Minimization of Femto-Second Similariton Pulses in a Fiber Laser with Zero Average Disperion
John W. Zweck and Curtis R. Menyuk, University of Maryland, Baltimore County, USA

Alternate Powers in Serrin's Swirling Vortex Solutions
Doug Dokken, University of St. Thomas, USA; Pavel Belik, Augsburg College, USA; Kurt Scholz and Misha Shvartsman, University of St. Thomas, USA

AWM - Time Asymptotic of Non-Darcy Flows with Total Boundary Flux
Lidia Bloshanskaya, Texas Tech University, USA

AWM - Tumor Growth in Complex, Evolving Geometries: A Diffuse Domain Approach
Ying Chen and John Lowengrub, University of California, Irvine, USA

AWM - Curve Matching Using Discrete Integral Invariants
Susan Crook, North Carolina State University, USA

AWM - Polyhedral Combinatorics For Phylogenetic Trees
Ruth E. Davidson and Seth Sullivant, North Carolina State University, USA

AWM - Inferring Gang Affiliation for Violent Events with Incomplete Data
Rachel Hegemann, University of California, Los Angeles, USA

AWM – Variance Reduction for Monte Carlo Simulation for European Call Options Under the Coupled Additive-Multiplicative Noise Model
Wanwan Huang and Brian Ewald, Florida State University, USA

AWM - A Stochastic Delay Model for Pricing
Elisabeth Kemajou, Southern Illinois University, Carbondale, USA

AWM – Physiologically-Based Pharmacokinetic (pbpk) Modeling of Metabolic Pathways of Bromochloromethane in Rats
Megan Sawyer, North Carolina State University, USA

AWM - A New Approach to Understanding the Dynamics of the Formation of Magnetic Domains
Haley Yaple, Northwestern University, USA

AWM - Min-Max Game Theory Problem for the Fluid-Structure Interaction Model: An Application to the Medicine Effect on Blood Flow in Human Body
Jing Zhang, University of Virginia, USA

Three-Dimensional High-Resolution Simulation of Convective Mixing
Xiaojing Fu, Luis Cueto-Felgueroso, and Ruben Juanes, Massachusetts Institute of Technology, USA

A POD Study for a Coupled Burgers Equation
Boris Kraemer and John A. Burns, Virginia Polytechnic Institute & State University, USA

Hold the Date!

2013 SIAM Annual Meeting
July 8-12, 2013
Town and Country Resort and Convention Center
San Diego, California, USA

Wednesday, July 11

Registration

8:00 AM-4:30 PM

Room:Nicollet Promenade - Level 1

IC5

Model-Assisted Effective Large Scale Matrix Computations

8:30 AM-9:15 AM

Room:Nicollet ABC - Level 1

Chair: Pavel Bochev, Sandia National Laboratories

Advanced mathematical models very often require the solution of (sequences of) large algebraic linear systems, whose numerical treatment should incorporate problem information in order to be computationally effective. For instance, matrices and vectors usually inherit crucial (e.g., spectral) properties of the underlying continuous operators. In this talk we will discuss a few examples where the performance of state-of-the-art iterative linear system solvers can be dramatically enhanced by exploiting these properties. Our presentation will focus on structured linear systems stemming from the numerical discretization of systems of partial differential equations, as well as of optimal control problems constrained by partial differential equations.

Valeria Simoncini
Universita' di Bologna, Italy

Wednesday, July 11

IC6

Multiscale Problems Involving Disorder: A Mathematical Perspective

9:15 AM-10:00 AM

Room:Nicollet ABC - Level 1

Chair: Mitchell Luskin, University of Minnesota, USA

The talk will review a series of recent works, including works in collaboration with X. Blanc, F. Legoll, PL. Lions addressing various aspects, both mathematical and numerical in nature,of some multiscale problems involving non periodic and random modelling. The problems considered all originate from materials science at different scales. The common motivation of the approaches presented is the wish to keep the computational workload as limited as possible, despite the presence of disorder (non periodicity, defects, randomness) in the problems.

Claude LeBris
CERMICS ENPC, France

Exhibits Open

9:30 AM-4:30 PM

Room:Exhibit Hall - Level 1

Coffee Break

10:00 AM-10:30 AM

Room:Exhibit Hall - Level 1

Wednesday, July 11

MS46

Combinatorial Algebraic Geometry - Part II of II

10:30 AM-12:30 PM

Room:Greenway H - Level 2

For Part 1 see MS23

The interaction between combinatorics and algebraic geometry has a fruitful history in the study of toric varieties, lattice polytopes, polyhedral geometry, Schubert calculus, tropical geometry, and more. Combinatorial methods have been central in making algebraic geometry computable and applicable to other areas of mathematics and sciences. This minisymposum will showcase recent developments in combinatorial algebraic geometry and its applications.

Organizer: Josephine Yu
Georgia Institute of Technology, USA

10:30-10:55 Stable Intersections of Ttropical Varieties
Anders Jensen, Aarhus University, Denmark; Josephine Yu, Georgia Institute of Technology, USA

11:00-11:25 Computer-aided Design – Algebra and Combinatorics
Audrey Lee-St.John and *Jessica Sidman*, Mount Holyoke College, USA

11:30-11:55 Finiteness Theorems and Algorithms for Polynomial Equations in an Infinite Number of Variables
Christopher Hillar, University of California, Berkeley, USA

12:00-12:25 Orbits of Projective Point Configurations
Alex Fink, North Carolina State University, USA; Andrew Berget, University of California, Davis, USA

Sponsored by SIAG/AG

Wednesday, July 11

MS47

Control of Systems Governed by Partial Differential Equations - Part I of III

10:30 AM-12:30 PM

Room:Greenway B - Level 2

For Part 2 see MS59

This minsymposium features three sessions in an area which merges advances in the theory of PDE's with modern technological applications. The area is synergistic within science and complementary to other areas of PDE's and engineering applications represented by more classical control theory rooted in ODE's. Topics include: Controls with geometric constraints; Applications in fluid - structure interaction models; Inverse problems for PDE's; Optimal control of biological systems; Modeling and control of multilayer flexible structures. This minisymposium will also be a timely occasion to offer a tribute to Professor Walter Littman, who recently retired from the University of Minnesota after a long and distinguished career.

Organizer: Irena M. Lasiecka
University of Virginia, USA

Organizer: Steve Taylor
University of Auckland, New Zealand

Organizer: Roberto Triggiani
University of Virginia, USA

10:30-10:55 Conservation Laws in Mathematical Biology
Avner Friedman, Ohio State University, USA

11:00-11:25 A Global Holmgren Theorem for Hyperbolic PDE
Matthias Eller, Georgetown University, USA

11:30-11:55 Some Absolutely Continuos Schrödinger Operators With Oscillating Potentials
Peter Rejto, University of Minnesota, USA

12:00-12:25 Controllability and Regularity of Some 1-d Elastic Systems with Internal Point Masses
Scott Hansen, Iowa State University, USA

Wednesday, July 11

MS48

Coupled and Hybrid Models and Multiple Scales in Mathematical Geosciences - Part III of III

10:30 AM-12:30 PM

Room:Greenway I - Level 2

For Part 2 see MS35

The topics in this minisymposium include mathematical and computational modeling issues arising when coupling various flow and transport, thermal, mechanical, electrical, and chemical processes occuring simultaneously and at different scales. The talks will be on discretization and solver issues arising for coupled models and when bridging scales or combining models of different type. Applications are to various processes in surface and subsurface

Organizer: Malgorzata Peszynska
Oregon State University, USA

Organizer: Lynn S. Bennethum
University of Colorado, Denver, USA

Organizer: Son-Young Yi
University of Texas at El Paso, USA

10:30-10:55 Modeling Evaporation and Transport in Porous Media. Comparing Models Using Different Dependent Variables
Lynn S. Bennethum, University of Colorado, Denver, USA

11:00-11:25 Title Not Available at Time of Publication
Clint Dawson, University of Texas at Austin, USA

11:30-11:55 Numerical Methods for Shallow Water Models
Yekaterina Epshteyn, University of Utah, USA

12:00-12:25 A Comparison of Finite Element Methods for Strongly Density Dependent Flows
Chris Kees and Matthew Farthing, U.S. Army Engineer Research and Development Center, USA; Clint Dawson, University of Texas at Austin, USA; Timothy Povich, United States Military Academy at West Point, USA

Wednesday, July 11

MS49

Dynamics and Applications of Thin Liquid Films - Part II of IV

10:30 AM-12:30 PM

Room:Greenway G - Level 2

For Part 1 see MS37
For Part 3 see MS60

Thin fluid films are present in a variety of applications including physiology, medicine, phase change, multiphase and non-Newtonian flows. In solving these related problems, various numerical methods are implemented including spectral methods and ChebFun for spatial discretization together with various time stepping schemes in the method of lines, and ADI methods for direct discretization. Analytical methods complement and illuminate the numerical results. The range of problems and approaches highlighted in this minisymposium exhibit the advancement and challenges of thin film dynamics.

Organizer: Richard Braun
University of Delaware, USA

Organizer: Ellen Peterson
Carnegie Mellon University, USA

Organizer: Nicholas Gewecke
University of Delaware, USA

10:30-10:55 Delaying Wetting Failure In Coating Flows Via Meniscus Confinement
Satish Kumar and Eric Vandre, University of Minnesota, USA; Marcio Carvalho, Pontificia Universidade Catolica Do Rio de Janeiro, Brazil

11:00-11:25 Tear Film Dynamics with Surfactant Transport and Osmolarity
Javed Siddique, Pennsylvania State University, York, USA; Richard Braun, University of Delaware, USA

11:30-11:55 Effective Slip for An Upper Convected Maxwell Fluid
Barbara Wagner, Technische Universität Berlin, Germany; Pamela Cook and Richard Braun, University of Delaware, USA; Andreas Muench, University of Oxford, United Kingdom

12:00-12:25 Tear Film Dynamics on an Eye Shaped Domain
Longfei Li and Richard Braun, University of Delaware, USA

Wednesday, July 11

MS50

Low Rank and Sparse Modeling - Part I of III

10:30 AM-12:30 PM

Room:Greenway C - Level 2

For Part 2 see MS63

Low-rank and sparse modeling are two of the most ubiquitous paradigms of data analysis. Low-rank modeling reduces the dimension of the data, whereas sparse modeling reduces the description of the data by selecting a few features from a large dictionary. These two paradigms can be combined, e.g., when modeling data with a few low-rank models or with a single low-rank model having sparse residual. The goal of these minisymposia is to discuss some of the very recent and exciting developments of such modeling and highlight fundamental mathematical theories related to these explorations. Furthermore, interesting areas of applications for these developments will be discussed.

Organizer: Gilad Lerman
University of Minnesota, USA

10:30-10:55 Robust Image Recovery via Total Variation Minimization
Rachel Ward, University of Texas at Austin, USA; Deanna Needell, Claremont McKenna College, USA

11:00-11:25 Fast Global Convergence of Gradient Methods for High-dimensional Statistical Recovery
Sahand Negahban, Massachusetts Institute of Technology, USA

11:30-11:55 Sharp Recovery Bounds for Convex Deconvolution, With Applications
Michael McCoy and Joel A. Tropp, California Institute of Technology, USA

12:00-12:25 Exploiting Saliency in Compressive and Adaptive Sensing
Jarvis Haupt, University of Minnesota, USA

Wednesday, July 11

MS51

Massive Graphs: Big Compute Meets Big Data - Part III of III

10:30 AM-12:30 PM

Room:Nicollet ABC - Level 1

For Part 2 see MS38

Large graph analytics have become an increasingly important in a wide variety of application areas such as internet search, bioinformatics, social media, and cybersecurity. Massive graphs push the state of the art in both big compute and big data. This minisymposium will explore the algorithms, tools and technologies being developed to address these leading edge problems. The mini-symposium will include a mix of invited talks from established practitioners and early career professionals.

Organizer: Jeremy Kepner
Massachusetts Institute of Technology, USA

Organizer: John R. Gilbert
University of California, Santa Barbara, USA

Organizer: David A. Bader
Georgia Institute of Technology, USA

10:30-10:55 Graph Analytics for Subject-Matter Experts: Balancing Standards, Simplicity, and Complexity
Steve Reinhardt, Cray, Inc., USA

11:00-11:25 Extended Sparse Matrices as Tools for Graph Computation
Adam Lugowski, University of California, Santa Barbara, USA

11:30-11:55 Version 2.0 of the Parallel Boost Graph Library: Message-Driven Solutions to Data-Driven Problems
Nick Edmonds, Indiana University, USA

12:00-12:25 Massive Graphs: The Way Forward
John R. Gilbert, University of California, Santa Barbara, USA

Wednesday, July 11

MS52

Numerical Approximation of Viscous Flows - Part I of III

10:30 AM-12:00 PM

Room:Greenway E - Level 2

For Part 2 see MS67

The construction and implementation of accurate and faithful approximations of fluid flows is a classical problem in numerical PDEs. Despite years of study, there are still many unresolved fundamental issues. Examples include construction of numerical methods with strong mass conservation, efficient computation of multi-physics problems, associated absorbing boundary conditions, and point-wise estimates. The aim of this minisymposium is to bring together researchers to discuss computational results of the numerical approximation of viscous flows using a variety of methods. Topics include, but not are limited to, the (Navier) Stokes equation, the Oseen Equation, Darcy-Stokes and the Brinkman problem.

Organizer: Michael J. Neilan
University of Pittsburgh, USA

Organizer: Francisco J. Sayas
University of Delaware, USA

10:30-10:55 Transparent Boundary Conditions and the Gap Condition for Stokes Elements
Francisco J. Sayas, University of Delaware, USA; Johnny Guzman, Brown University, USA; Salim Meddahi and Virginia Selgas, University of Oviedo, Spain

11:00-11:25 Conforming and Divergence Free Stokes Elements
Michael J. Neilan, University of Pittsburgh, USA; Johnny Guzman, Brown University, USA

11:30-11:55 Pointwise Estimates for Stokes Equation
Dmitriy Leykekhman, University of Connecticut, USA

Wednesday, July 11

MS53

Shape Optimization Problems Involving Eigenvalues - Part III of III

10:30 AM-12:00 PM

Room:Greenway D - Level 2

For Part 2 see MS43

Since Lord Rayleigh conjectured that the disk should minimize the first Dirichlet eigenvalue of the Laplace operator amongst all shapes of equal area more than a century ago, shape optimization involving eigenvalues has been an active research topic, with applications in various areas including mechanical vibration, electromagnetic cavities, photonic crystals, and population dynamics. Significant progress has been made on such problems in recent years due to both theoretical and computational developments in optimization methods, sensitivity analysis, and methods for modeling free interfaces. This minisymposium aims to bring together mathematicians and scientists working in this field to share new results and exchange ideas.

Organizer: Chiu-Yen Kao
Ohio State University, USA

Organizer: Braxton Osting
University of California, Los Angeles, USA

10:30-10:55 Microcavity Optimization via the Frequency-averaged Local Density of States
Xiangdong Liang and Steven Johnson, Massachusetts Institute of Technology, USA

11:00-11:25 Optimal Bilaplacian Eigenvalues
Pedro R. S. Antunes, University of Lisbon, Portugal

11:30-11:55
Speaker TBA

12:00-12:25 Principal Eigenvalue Minimization for an Elliptic Problem with Indefinite Weight
Michael Hintermüller, Humboldt University Berlin, Germany; *Chiu-Yen Kao*, The Ohio State University and Claremont McKenna College, USA; Antoine Laurain, Humboldt University Berlin, Germany

Wednesday, July 11

MS54

Student Days: SIAM/ MCM Award Winners Presentations (2011, 2012)

10:30 AM-12:30 PM

Room:Greenway F - Level 2

For Part 4 see MS44
For Part 6 see MS69

Organizer: Peter R. Turner
Clarkson University, USA

SIAM Award in the MCM (Mathematical Contest in Modeling)

2011 Recipients
Tsinghua University, P.R. China
Harvey Mudd College, USA

2012 Recipients
Zhejiang University, P.R. China
University of Louisville, USA

Wednesday, July 11

MS55

Workshop Celebrating Diversity (WCD): Dynamical Systems and Its Applications to Biological Models

10:30 AM-12:30 PM

Room:Greenway A - Level 2

For Part 2 see MS45
For Part 4 see MS70

Mathematicians have been able to shed light on a variety of real-world problems with a plethora of dynamical systems techniques. Modeling has become an increasingly important application within mathematics. Applications of nonlinear dynamics to biology has brought significant advances in both areas, with nonlinear dynamics providing a tool for understanding biological phenomena and biology stimulating developments in the theory of dynamical systems. This minisymposium presents methods of modeling and analysis for dynamics occurring at a wide range of biological levels such as oscillation criteria in dynamic models, interactions of photoreceptors in retinal dynamics, and a mathematical model of Type-2 Diabetes.

Organizer: Erika T. Camacho
Arizona State University, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Stephen Wirkus
Arizona State University, USA

10:30-10:55 Oscillation Criteria for Nonlinear Dynamic Equations
Raegan Higgins, Texas Tech University, USA

11:00-11:25 A Mathematical Modeling Approach to the Reversal of Type 2 Diabetes and β-Cell Compensation
Anarina Murillo, Arizona State University, USA

11:30-11:55 Order of Events and Optimal Control in Discrete Time Biological Models
Suzanne M. Lenhart, University of Tennessee, USA

12:00-12:25 Tracing the Progression of Retinitis Pigmentosa via Photoreceptor Interactions
Erika T. Camacho, Arizona State University, USA

Sponsored by WCD

Wednesday, July 11

MS56

Mathematics and Mechanics of Soft Matter - Part III of IV

10:30 AM-12:30 PM

Room:Greenway J - Level 2

For Part 2 see MS21
For Part 4 see MS64

This minisymposium brings together experts in mathematics, mechanics, and engineering working on challenging problems in analysis, modeling, and simulation of soft matter. The integration of these different disciplines is essential for accelerating groundbreaking discoveries in soft matter mechanics for solving challenging engineering problems. Three sessions are expected to be organized that focus on bulk soft matter assemblies such as liquid crystals and biological soft matter.

Organizer: Raffaella De Vita
Virginia Polytechnic Institute & State University, USA

Organizer: Paolo Biscari
Politecnico di Milano, Italy

10:30-10:55 Jet Flows in Active Nematic Fluids
Nigel Mottram, University of Strathclyde, United Kingdom

11:00-11:25 Shear Flow in Smectic A Liquid Crystals
Iain W. Stewart, University of Strathclyde, United Kingdom

11:30-11:55 Analysis of Smectic C* Films with Defects
Daniel Phillips and Sean Colbert-Kelly, Purdue University, USA

12:00-12:25 Anisotropic Wave Propagation in Nematic Liquid Crystals
Antonio Di Carlo, Universita Roma Tre, Italy; Paolo Biscari, Politecnico di Milano, Italy; *Stefano Turzi*, Universitá degli Studi eCampus, Italy

Wednesday, July 11

MS57

Nonlinear Elasticity and Dimensional Reduction - Part I of II

10:30 AM-12:30 PM

Room:Nicollet D1 - Level 1

For Part 2 see MS65

Recently, a lot of phenomena related to the dimensional reduction of nonlinear elasticity have attracted the attention of many scientists. Examples of such phenomena include wrinkling, buckling and heteroepitaxial growth of thin films. This minisymposium will present some recent developments on the understanding of these phenomena.

Organizer: Maria-Carme Calderer
University of Minnesota, USA

Organizer: Hoai Minh Nguyen
University of Minnesota, USA

10:30-10:55 Pattern Formation in Compressed Elastic Films on Compliant Substrates: An Explanation of the Herringbone Structure
Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University, USA; Hoai-Minh Nguyen, University of Minnesota, USA

11:00-11:25 On the Inability of Continuum Theory to Predict the Elastic Energy of a Strained Alloy Film
Peter Smereka, University of Michigan, USA; Christian Ratsc, University of California, Los Angeles, USA; Arvind Baskaran, University of California, Irvine, USA

11:30-11:55 Energy Scaling Laws for Conically Constrained Thin Elastic Sheets
Jeremy Brandman and Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University, USA; Hoai-Minh Nguyen, University of Minnesota, USA

12:00-12:25 Quasistatic Nonlinear Viscoelasticity and Gradient Flows
John Ball, University of Oxford, United Kingdom; Yasemin Sengul, Ozyegin University, Turkey

Sponsored by SIAG/MS

Wednesday, July 11

CP11

Computational Science and Applications I

10:30 AM-12:30 PM

Room:Skyway A - Level 2

Chair: Bobby Philip, Oak Ridge National Laboratory, USA

10:30-10:45 Dynamic Implicit 3D Adaptive Mesh Refinement For Non-Equilibrium Radiation Diffusion
Bobby Philip, Zhen Wang, Manuel Rodriguez, and Mark Berrill, Oak Ridge National Laboratory, USA; Michael Pernice, Idaho National Laboratory, USA

10:50-11:05 Recursive Schur Decomposition
Rahul S. Sampath, Bobby Philip, and Srdjan Simunovic, Oak Ridge National Laboratory, USA

11:10-11:25 Fast Computation of the Zeros of a Polynomial
Jared Aurentz and David S. Watkins, Washington State University, USA; Raf Vandebril, Katholieke Universiteit Leuven, Belgium

11:30-11:45 Nonoverlapping Domain Decomposition Preconditioners for Isogeometric Analysis
Luca F. Pavarino, University of Milan, Italy; Lourenco Beirao Da Veiga, Universita degli Studi di Milano, Italy; Durkbin Cho, Universita di Milano, Italy; Simone Scacchi, Universita degli Studi di Milano, Italy

11:50-12:05 A One-Sided Convex Area Function for Improved Variational Grid Generation
Guilmer Gonzalez and Pablo Barrera, UNAM, Mexico; Francisco Dominguez-Mota, Universidad Michoacana de San Nicolás de Hidalgo, Mexico

12:10-12:25 A Scalable Reformulation of the Parallel Algorithm for the Mixed Volume Computation
Tsung-Lin Lee, National Sun Yat-Sen University, Taiwan; Tien-Yien Li and Tianran Chen, Michigan State University, USA

Wednesday, July 11

CP12

Numerical PDE I

10:30 AM-12:50 PM

Room:Skyway B - Level 2

Chair: Louis F. Rossi, University of Delaware, USA

10:30-10:45 Using the Reverse Heat Equation to Approximate Fields Using Gaussian Basis Functions
Louis F. Rossi, University of Delaware, USA

10:50-11:05 Schur Complements and Block Preconditioners for Coupled Diffusion Systems
Geoffrey Dillon and Rob Kirby, Texas Tech University, USA

11:10-11:25 Uniform Numerical Approximation of Integrable Equations via Riemann-Hilbert Problems
Thomas D. Trogdon, University of Washington, USA; Sheehan Olver, University of Sydney, Australia

11:30-11:45 Instability of the Finite-Difference Split-Step Method on a Non-Constant-Amplitude Background in the Nonlinear Schrödinger Equation (nls)
Taras Lakoba, University of Vermont, USA

11:50-12:05 On the Numerical Solution of Initial-Boundary Problem to One Nonlinear Parabolic Equation
Mikheil Tutberidze, Ilia State University, Georgia

12:10-12:25 Investigations on Performances of Electromagnetic Solvers
Jin Xu, Chinese Academy of Sciences, China; MiSun Min, Argonne National Laboratory, USA

12:30-12:45 Absolutely Stable Explicit Difference Schemes Possessing Unconditional Approximation. Parabolic Equation Case.
Isom Jurayev, Unaffiliated

Wednesday, July 11

Workshop Celebrating Diversity (WCD) Luncheon (by invitation only)

12:30 PM-2:00 PM

Room:Regency - Level 2

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

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).

Wednesday, July 11

SP3

Past President's Address: Reflections on SIAM, Publishing, and the Opportunities Before Us

2:00 PM - 3:00 PM

Room: Nicollet ABC - Level 1

Chair: Lloyd N. Trefethen, Oxford University, United Kingdom

Upon taking up the post of president I had, of course, formulated my priorities for SIAM. This talk provides a good occasion to revisit some of those. One area turned out to play a vastly larger role than I would have anticipated, namely mathematical publishing and many issues associated with it, ethical, technological, economic, political, and scientific. The future of scholarly publishing is far from clear, but one thing seems certain: big changes are needed and will be coming. We, as mathematicians, are major stakeholders. We should also be major agents in guiding these changes. I will present some of my observations and thoughts as we confront the opportunities before us.

Douglas N. Arnold

University of Minnesota, USA

Wednesday, July 11

SP4

W. T. and Idalia Reid Prize Lecture: Large Algebraic Properties of Riccati Equations

3:00 PM - 3:30 PM

Room: Nicollet ABC - Level 1

Chair: Lloyd N. Trefethen, Oxford University, United Kingdom

In the eighties there was considerable interest in the algebraic properties of the following Riccati equation

$$A^*X+XA-XBB^*X+C^*C=0,$$

where A,B,C $\in \mathfrak{A}$, a Banach algebra with identity, and the involution operation *. Conditions are sought to ensure that the above equation has a solution in A. The results were disappointing and the problem was forgotten until this century when engineers studied the class of spatially distributed systems. One application was to control formations of vehicles where the algebraic property was essential. This case involves matrices A,B,Cwith components in a scalar Banach algebra. Positive results are obtained for both commutative and noncommutative algebras.

Ruth Curtain

University of Groningen, Netherlands

Coffee Break

3:30 PM-4:00 PM

Room:Exhibit Hall - Level 1

Wednesday, July 11

MS58

Advances in Theory and Application of Operator Splitting Methods - Part I of II

4:00 PM-6:00 PM

Room:Greenway D - Level 2

For Part 2 see MS72

Operator splitting methods are widely employed in multi-scale and multi-physics codes both to improve algorithmic efficiency and to accommodate the coupling of or addition of code modules. A variety of approaches are currently in use. There is a growing need to understand how the splitting affects the model and how these methods could be improved upon. This minisymposium will explore the various operator splitting methods used in applications, assess what theoretical results exist and determine what is understood about splitting effects. The goal is to bring together practitioners and theoreticians, identify critical future research paths and encourage collaborations.

Organizer: Jeffrey M. Connors
Lawrence Livermore National Laboratory, USA

Organizer: Carol S. Woodward
Lawrence Livermore National Laboratory, USA

4:00-4:25 Consistency and Stability Considerations for Implicit-explicit Additive Splittings
Emil M. Constantinescu, Argonne National Laboratory, USA

4:30-4:55 Quantification of Operator Splitting Effects in Finite Volume Calculations of Advection-diffusion
Jeffrey M. Connors, Jeffrey W. Banks, Jeffrey A. Hittinger, and Carol S. Woodward, Lawrence Livermore National Laboratory, USA

5:00-5:25 Aposteriori Analysis of Multirate and Multiscale Evolution Systems
Jehanzeb H. Chaudhry and Don Estep, Colorado State University, USA; Victor E. Ginting, University of Wyoming, USA; Simon Tavener, Colorado State University, USA

5:30-5:55 Coupling for a Virtual Nuclear Reactor
John Turner, Oak Ridge National Laboratory, USA

Wednesday, July 11

MS59

Control of Systems Governed by Partial Differential Equations - Part II of III

4:00 PM-6:00 PM

Room:Greenway B - Level 2

For Part 1 see MS47
For Part 3 see MS75

This minsymposium features three sessions in an area which merges advances in the theory of PDE's with modern technological applications. The area is synergistic within science and complementary to other areas of PDE's and engineering applications represented by more classical control theory rooted in ODE's. Topics include: Controls with geometric constraints; Applications in fluid - structure interaction models; Inverse problems for PDE's; Optimal control of biological systems; Modeling and control of multilayer flexible structures. This minisymposium will also be a timely occasion to offer a tribute to Professor Walter Littman, who recently retired from the University of Minnesota after a long and distinguished career.

Organizer: Irena M. Lasiecka
University of Virginia, USA

Organizer: Steve Taylor
University of Auckland, New Zealand

Organizer: Roberto Triggiani
University of Virginia, USA

4:00-4:25 Ensemble Dynamics and Bred Vectors
George Sell, University of Minnesota, USA

4:30-4:55 Mathematical Challenges Arising from the Questions of Controllability for Linked Elastic Structures
Mary Ann Horn, Vanderbilt University, USA, and National Science Foundation, USA

5:00-5:25 A Problem of Boundary Controllability for a Plate
Orazio Arena, Universita' di Firenze, Italy

5:30-5:55 Limitations on Control and Stabilization of Certain Hybrid Systems
David Russell, Virginia Polytechnic Institute & State University, USA

Wednesday, July 11

MS60

Dynamics and Applications of Thin Liquid Films - Part III of IV

4:00 PM-6:00 PM

Room:Greenway G - Level 2

For Part 2 see MS49
For Part 4 see MS88

Thin fluid films are present in a variety of applications including physiology, medicine, phase change, multiphase and non-Newtonian flows. In solving these related problems, various numerical methods are implemented including spectral methods and ChebFun for spatial discretization together with various time stepping schemes in the method of lines, and ADI methods for direct discretization. Analytical methods complement and illuminate the numerical results. The range of problems and approaches highlighted in this minisymposium exhibit the advancement and challenges of thin film dynamics.

Organizer: Richard Braun
University of Delaware, USA

Organizer: Ellen Peterson
Carnegie Mellon University, USA

Organizer: Nicholas Gewecke
University of Delaware, USA

4:00-4:25 Asymptotics of a Thermally Driven Thin Film
Harrison Potter and Thomas P. Witelski, Duke University, USA

4:30-4:55 Heated Tear Film in One Dimension with a Moving Boundary
Quan Deng, University of Delaware, USA

5:00-5:25 A Multiple Scales Approach to Evaporation induced Marangoni Convection
Andreas Muench and Matthew Hennessy, University of Oxford, United Kingdom

5:30-5:55 Fingering Instability of Evaporating Thin Films
Jill Klentzman, University of Arizona, USA; Vladimir Ajaev, Southern Methodist University, USA; Tatiana Gambaryan-Roisman and Peter Stephan, TU Darmstadt, Germany

Wednesday, July 11

MS61

Graph Sparsification: Theory and Applications

4:00 PM-6:00 PM

Room:Greenway I - Level 2

Graph sparsification is a general method that reduces the size of a larger original graph while retaining its critical properties. With an increasing prevalence of massive graphs and a need to extract information from them using compute intensive algorithms, the need for graph sparsification is becoming a critical enabling tool in the analysis of large datasets. The area of graph sparsification is a new and upcoming field. Through this minisymposium we aim to bring to fore leading research on sparsification and its applications. In particular, we will invite talks on randomization and spectral strategies for sparsification, and applications in data mining and network analysis problems across a variety of domains.

Organizer: Sanjukta Bhowmick
University of Nebraska, Omaha, USA

Organizer: Mahantesh Halappanavar
Pacific Northwest National Laboratory, USA

4:00-4:25 Application of Graph Scaffolding in Approximating the Chromatic Number
Sanjukta Bhowmick, University of Nebraska, Omaha, USA

4:30-4:55 Graph Sparsification Methods in Cybersecurity
Emilie Hogan, John Johnson, and Mahantesh Halappanavar, Pacific Northwest National Laboratory, USA

5:00-5:25 Sparse Graph Realization from a Metric Space
Chad Scherrer, Pacific Northwest National Laboratory, USA

5:30-5:55 Sparsification Techniques for Metaphor Comprehension
Mahantesh Halappanavar, Pacific Northwest National Laboratory, USA

Wednesday, July 11

MS62

Isogeometric Analysis (IGA) - Part I of II

4:00 PM-6:00 PM

Room:Nicollet ABC - Level 1

For Part 2 see MS78

Isogeometric Analysis (IGA), introduced in 2005 by T.J.R. Hughes, replaces traditional Finite Elements by NonUniform Rational B-splines (NURBS), thus aligning FEA and CAD shape representation. While CAD-models focus on the overall shape accuracy and allow adjacent surfaces to not match exactly, FEA-models are required to have elements that match exactly with the element structure strongly influencing the quality of the analysis to be performed. The mini-symposium will address state-of-the-art and identified research challenges of IGA as well as present selected research topics in more detail.

Organizer: Tor Dokken
SINTEF, Norway

4:00-4:25 Challenges in Isogeometric Analysis (IGA)
Tor Dokken, SINTEF, Norway

4:30-4:55 Locally Refined B-splines
Tom Lyche, University of Oslo, Norway

5:00-5:25 Isogeometric Analysis for Shape Optimization
Jens Gravesen, Technical University of Denmark, Denmark

5:30-5:55 On Local Refinement via T-splines
Annalisa Buffa, Consiglio Nazionale delle Ricerche, Italy

Sponsored by SIAG/GD

Wednesday, July 11

MS63

Low Rank and Sparse Modeling - Part II of III

4:00 PM-6:00 PM

Room:Greenway C - Level 2

For Part 1 see MS50
For Part 3 see MS79

Low-rank and sparse modeling are two of the most ubiquitous paradigms of data analysis. Low-rank modeling reduces the dimension of the data, whereas sparse modeling reduces the description of the data by selecting a few features from a large dictionary. These two paradigms can be combined, e.g., when modeling data with a few low-rank models or with a single low-rank model having sparse residual. The goal of these minisymposia is to discuss some of the very recent and exciting developments of such modeling and highlight fundamental mathematical theories related to these explorations. Furthermore, interesting areas of applications for these developments will be discussed.

Organizer: Gilad Lerman
University of Minnesota, USA

4:00-4:25 The Challenges of Robustness in High Dimensions
Constantine Caramanis, University of Texas at Austin, USA

4:30-4:55 A Novel M-Estimator for Robust PCA
Teng Zhang and Gilad Lerman, University of Minnesota, USA

5:00-5:25 Compressive Principal Component Pursuit
Yi Ma, University of Illinois at Urbana-Champaign, USA; John Wright, Columbia University, USA

5:30-5:55 Robust Locally Linear Analysis with Applications to Image Denoising and Blind Inpainting
Yi Wang, University of Minnesota, USA; Arthur Szlam, New York University, USA; Gilad Lerman, University of Minnesota, USA

Wednesday, July 11

MS64

Mathematics and Mechanics of Soft Matter - Part IV of IV

4:00 PM-6:00 PM

Room:Greenway J - Level 2

For Part 3 see MS56

This minisymposium brings together experts in mathematics, mechanics, and engineering working on challenging problems in analysis, modeling, and simulation of soft matter. The integration of these different disciplines is essential for accelerating groundbreaking discoveries in soft matter mechanics for engineering problems. Emphasis will be placed on bulk soft matter assemblies such as liquid crystals and biological soft matter. Three sessions are expected to be organized that focus on the following topics: (i+ii) mathematical modeling of liquid crystal phases (with one session explicitly devoted to defects in liquid crystals); (iii) mechanical modeling of biological soft matter.

Organizer: Raffaella De Vita
Virginia Polytechnic Institute & State University, USA

4:00-4:25 Title Not Available at Time of Publication
Greg Forest, University of North Carolina at Chapel Hill, USA

4:30-4:55 A Ginzburg-Landau-type Model for Liquid Crystals
Dmitry Golovaty, University of Akron, USA; Alberto Montero, Pontificia Universidad Católica de Chile, Chile

5:00-5:25 Relaxation Results for Nematic Elastomers
Pierluigi Cesana, California Institute of Technology, USA

5:30-5:55 Hypertractions and Hyperstresses in Second Gradient Continua
Maurizio Vianello, Politecnico di Milano, Italy

Wednesday, July 11

MS65

Nonlinear Elasticity and Dimensional Reduction - Part II of II

4:00 PM-6:00 PM

Room:Nicollet D1 - Level 1

For Part 1 see MS57

Recently, a lot of phenomena related to the dimensional reduction of nonlinear elasticity have attracted the attention of many scientists. Examples of such phenomena include wrinkling, buckling and heteroepitaxial growth of thin films. This minisymposium will present some recent developments on the understanding of these phenomena.

Organizer: Hoai Minh Nguyen
University of Minnesota, USA

Organizer: Maria-Carme Calderer
University of Minnesota, USA

4:00-4:25 Conical Singularities in Thin Elastic Sheets
Heiner Olbermann and Stefan Müller, University of Bonn, Germany

4:30-4:55 Wrinkling of a Floating Elastic Film: Energy and Pattern
Hoai-Minh Nguyen, University of Minnesota, USA; Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University, USA

5:00-5:25 Pseudo-spectral Simulations of Models for Regularized Dynamic Models in Nonlinear Elasticity
Benson K. Muite, University of Michigan, USA

5:30-5:55 Nucleation and Motion of Crystals in a Binary Solution
Dmitry Golovaty, University of Akron, USA

Sponsored by SIAG/MS

Wednesday, July 11

MS66

Numerical Algebraic Geometric Algorithms for Kinematics and PDE Applications

4:00 PM-6:00 PM

Room:Greenway H - Level 2

Polynomial systems naturally arise in many applications including kinematics and biological models. These applications yield large-scale polynomial systems and have lead to the development of many new algorithms. This minisymposium will bring together experts in these applications to discuss many recent results.

Organizer: Jonathan Hauenstein

Texas A&M University, USA

4:00-4:25 Quasi Steady State Solution and Bifurcation for a Cell Cycle Model

Wenrui Hao, Andrew Sommese, and Bei Hu, University of Notre Dame, USA

4:30-4:55 Searching for Exceptional Mechanisms with Fiber Products

Daniel J. Bates and *Eric Hanson*, Colorado State University, USA; Jonathan Hauenstein, Texas A&M University, USA; Charles Wampler, General Motors Research Laboratories, USA

5:00-5:25 Real Solutions to Polynomial Systems Arising in Mechanism Design

Jonathan Hauenstein and Zachary Griffin, Texas A&M University, USA

5:30-5:55 Cell Decomposition of Real Surfaces Defined by Mechanism Motions

Charles Wampler, General Motors Corporation, USA

Sponsored by SIAG/AG

Wednesday, July 11

MS67

Numerical Approximation of Viscous Flows - Part II of III

4:00 PM-6:00 PM

Room:Greenway E - Level 2

For Part 1 see MS52
For Part 3 see MS80

The construction and implementation of accurate and faithful approximations of fluid flows is a classical problem in numerical PDEs. Despite years of study, there are still many unresolved fundamental issues. Examples include construction of numerical methods with strong mass conservation, efficient computation of multi-physics problems, associated absorbing boundary conditions, and point-wise estimates. The aim of this minisymposium is to bring together researchers to discuss computational results of the numerical approximation of viscous flows using a variety of methods. Topics include, but not are limited to, the (Navier) Stokes equation, the Oseen Equation, Darcy-Stokes and the Brinkman problem.

Organizer: Michael J. Neilan

University of Pittsburgh, USA

Organizer: Francisco J. Sayas

University of Delaware, USA

4:00-4:25 An Alternative Multigrid Method for Incompressible Flow

Youli Mao and Guido Kanschat, Texas A&M University, USA

4:30-4:55 Multilevel Algorithms for Stokes Type Systems

Constantin Bacuta and Lu Shu, University of Delaware, USA

5:00-5:25 HDG Methods for the Vorticity-Velocity-Pressure Formulation of the Stokes Problem

Jintao Cui and Bernardo Cockburn, University of Minnesota, USA

5:30-5:55 Flow in Pebble Bed Geometries

Aziz Takhirov, University of Pittsburgh, USA

Wednesday, July 11

MS68

Recent Advances in Continuum Models of Brittle Fracture

4:00 PM-6:00 PM

Room:Mirage - Level 2

Classical models of the fracture of brittle materials are set in the linearized theory of elasticity. Such theories predict stress/strain singularities at a crack-tip while being predicated upon the assumption that strains remain infinitesimal throughout the material body. Crack-tip stress/strain singularities are also predicted in the setting of finite strain elasticity (Cauchy or Green) unless very specialized theories of material behavior are employed. This mini-symposium presents recent results from two different approaches to preventing crack-tip singularities: (1) the introduction of crack-surface mechanics into classical linear elasticity; (2) modeling fracture within the peridynamic description of material behavior.

Organizer: Jay R. Walton

Texas A&M University, USA

4:00-4:25 The Effect of Surface Tension on the Stress Field near a Curvilinear Crack

Anna Zemlyanova and Jay R. Walton, Texas A&M University, USA

4:30-4:55 The Importance of the Inner-problem in Computational Models of Dynamic Brittle Fracture and why Peridynamics Works

Florin Bobaru, University of Nebraska, Lincoln, USA

5:00-5:25 Peridynamic Energy Balance and Damage

Richard B. Lehoucq, Sandia National Laboratories, USA

5:30-5:55 The Peridynamic J-integral

Stewart Silling, Sandia National Laboratories, USA; Florin Bobaru and Wenke Hu, University of Nebraska, Lincoln, USA

Wednesday, July 11

MS69

Student Days: SIAM Student Paper Prize Winner Presentations (2011, 2012)

4:00 PM-6:00 PM

Room:Greenway F - Level 2

For Part 5 see MS54

Organizer: Peter R. Turner
Clarkson University, USA

SIAM Student Paper Prize

2011 Recipients

Necdet Serhat Aybat
Columbia University, USA

Sungwoo Park
University of Maryland, USA

Xiangxiong Zhang
Brown University, USA

2012 Recipients

Brittany D. Froese
Simon Fraser University, Canada

Stefanie Hollborn
Johannes Gutenberg University
Mainz, Germany

Marina Moraiti
University of Pittsburgh, USA

Wednesday, July 11

MS70

Workshop Celebrating Diversity (WCD): Analysis and Applications of Optimization

4:00 PM-6:00 PM

Room:Greenway A - Level 2

For Part 3 see MS55
For Part 5 see MS0

This session highlights current applications and theoretical results of optimization found in various fields. Whether studying cocircuits of linear matriods, the KKT matrix equations and preconditioners, image processing, or the smallest enclosing or smallest intersecting ball problem, optimization spans each of these topics.

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Stephen Wirkus
Arizona State University, USA

4:00-4:25 Cocircuits of Linear Matroids
John David Arellano, Rice University, USA

4:30-4:55 Approximate Murphy-Golub-Wathen Preconditioning for KKT Matrices
Josef Sifuentes, Courant Institute of Mathematical Sciences, New York University, USA

5:00-5:25 Recent Advances in Optimization Methods for Image Processing
Roummel F. Marcia, University of California, Merced, USA

5:30-5:55 Recent Results on the Smallest Enclosing Ball Problem and the Smallest Intersecting Ball Problem
Cristina Villalobos, University of Texas - Pan American, USA

Sponsored by WCD

Wednesday, July 11

CP13

Numerical PDE II

4:00 PM-6:00 PM

Room:Skyway A - Level 2

Chair: Prince Chidyagwai, Temple University, USA

4:00-4:15 Runge-Kutta Discontinuous Galerkin Method for 2D Nonlinear Moment Closures for Radiative Transfer
Prince Chidyagwai and Benjamin Seibold, Temple University, USA; Philipp Monreal, Aachen University of Technology, Germany; Martin Frank, RWTH - Aachen University of Technology, Germany

4:20-4:35 Introduction to the Exterior Matrix Method
William Paulsen and Matthew Manning, Arkansas State University, USA

4:40-4:55 Highly Accurate Algorithm for Time-Dependent Pde's
Hillel Tal-Ezer, Academic College of Tel-Aviv Yaffo, Israel

5:00-5:15 Applying the Exterior Matrix Method to the Inclined Cable Problem
Matthew Manning and William Paulsen, Arkansas State University, USA

5:20-5:35 Data Mining Methods Applied to Numerical Approximations for Pde's
Joel Chaskalovic, UPMC, France; Franck Assous, Ariel University Center of Samaria, Israel

5:40-5:55 The Ghost Solid Method Based Algorithms for Elastic Solid-Solid Interaction
Abouzar Kaboudian, National University of Singapore, Republic of Singapore; Boo Cheong Khoo, Singapore MIT Alliance, Singapore

Wednesday, July 11

CP14

Simulation

4:00 PM-6:00 PM

Room:Skyway B - Level 2

Chair: Brandon Chabaud, Los Alamos National Laboratory, USA

4:00-4:15 Application of a Perturbation Method to Nonlinear Parabolic Stochastic PDEs
Kevin Lenth, Victor E. Ginting, and Peter Polyakov, University of Wyoming, USA

4:20-4:35 Reweighted ℓ_1 Minimization Method for SPDEs
Xiu Yang and George E. Karniadakis, Brown University, USA

4:40-4:55 Small Deformation Viscoplastic Dynamic Sphere Problem
Brandon Chabaud, Jerry Brock, and Todd Williams, Los Alamos National Laboratory, USA

5:00-5:15 Lime: Software for Robust and Flexible Multiphysics Coupling
Russell W. Hooper, Rodney Schmidt, and Kenneth Belcourt, Sandia National Laboratories, USA

5:20-5:35 Tensor Product Decomposition Methods for Noise Reduction, Data Compression, and Projective Integration
Diego Del-Castillo-Negrete, Oak Ridge National Laboratory, USA

5:40-5:55 Discontinuous Galerkin Methods for Modelling and Simulation of Transcription Processes
Jennifer Thorenson, Montana State University, USA

Intermission

6:00 PM-6:15 PM

Wednesday, July 11

SP5

I.E. Block Community Lecture: Creating Reality: The Mathematics Behind Visual Effects

6:15 PM - 7:15 PM

Room: Nicollet ABC - Level 1

Chair: Lloyd N. Trefethen, Oxford University, United Kingdom

Film-makers have long realized one of the best ways to convince audiences that a computer-generated effect, like a stormy ocean, is real is to numerically solve physical equations describing the motion, bringing mathematics and scientific computing into the forefront of animation. As we progress to solving more physics more accurately and faster, a whole new way of working has emerged, "virtual practical effects", where artists set up shots virtually as they'd want to in the real world and let simulated physics take over. I'll demonstrate how a little mathematical analysis can make a world of difference to making a film.

Robert Bridson
University of British Columbia, Canada

Community Reception

7:15 PM-8:15 PM

Room:Exhibit Hall - Level 1

Wednesday, July 11

Workshop Celebrating Diversity (WCD)

(continues)

Symposium Celebrating the Contributions of Carlos Castillo-Chavez

8:00 PM-10:05 PM

Room:Nicollet D2 - Level 1

For Part 4 see MS70
For Part 6 see MS83

This session is to honor Professor Castillo-Chavez's lifetime achievements and contributions to mathematical epidemiology. The speakers will provide an overview of Professor Castillo-Chavez's research and highlight his most important contributions. Special thanks to the following individuals who have helped with the organization of this session: Janet Best, Gerardo Chowell, Paula Gonzalez,Christopher Kribs-Zaleta, Miriam Nuno, Leticia Velazquez, Fabio Sanchez, Anuj Mubayi, Eunha Shim and Omayra Ortega.

Organizer: Erika T. Camacho
Arizona State University, USA

Organizer: Sara Del Valle
Los Alamos National Laboratory, USA

Organizer: James (Mac) Hyman
Tulane University, USA

Organizer: Karen Rios-Soto
University of Puerto Rico, Mayaguez, Puerto Rico

8:00-8:20 Influenza and Other Infectious Diseases
Simon Levin, Princeton University, USA

8:25-8:45 Continuous and Discrete Models for Infectious Diseases
Zhilan Feng, Purdue University, USA

8:50-9:10 Insights Gained from Modeling Epidemics
James (Mac) Hyman, Tulane University, USA

9:15-9:35 Modeling and Quantifying the Transmission Dynamics and Control of Infectious Diseases
Gerardo Chowell, Los Alamos National Laboratory, USA

9:40-10:00 From Rockstar Researcher to Selfless Mentor: An Overview of the Achievements of Carlos Castillo Chavez
Melissa Castillo-Garsow, Yale University, USA

Thursday, July 12

Registration
8:00 AM-4:30 PM

Room:Nicollet Promenade - Level 1

IC7

Freeform Architecture and Discrete Differential Geometry
8:30 AM-9:15 AM

Room:Nicollet ABC - Level 1

Chair: Jorg Peters, University of Florida, USA

The emergence of freeform structures in contemporary architecture raises numerous challenging research problems many of which are related to the actual fabrication and are of a mathematical nature. The speaker will report on recent progress in geometric computing for freeform architecture, with special emphasis on the close relation to discrete differential geometry. Specific topics to be addressed include: meshes with planar quadrilateral faces and corresponding supporting structures, semi-discrete representations for structures from single curved panels, paneling algorithms and the design of self supporting surfaces. The transfer of research into the architectural practice will be illustrated at hand of selected projects.

Helmut Pottmann
King Abdullah University of Science and Technology, Saudi Arabia

IC8

Computing Essentials: What SIAM Members Should Know About Emerging Architectures
8:30 AM-9:15 AM

Room:Nicollet D - Level 1

Chair: Misha E. Kilmer, Tufts University, USA

For most of computing history programmers have experienced steady performance improvement with little effort, primarily due to increased clock speed and instruction level parallelism: Riding the commodity performance curve was easy. This has changed. Multicore and GPU processors promise terascale laptop, petascale deskside and exascale center systems. But realizing this potential is challenging: Riding the new commodity performance curve requires parallel execution. Furthermore, the number of components in high-end systems will increase soft and hard system errors. We discuss the essentials of how to develop algorithms and software in order to realize parallel performance today and prepare for the future.

Michael A. Heroux
Sandia National Laboratories, USA

IP1

On Mean Field Games
9:15 AM-10:00 AM

Room:Nicollet ABC - Level 1

Chair: Alfio Quarteroni, École Polytechnique Fédérale de Lausanne, Switzerland

This talk will be a general presentation of Mean Field Games (MFG in short), a new class of mathematical models and problems introduced and studied in collaboration with Jean-Michel Lasry. Roughly speaking, MFG are mathematical models that aim to describe the behavior of a very large number of “agents” who optimize their decisions while taking into account and interacting with the other agents. The derivation of MFG, which can be justified rigorously from Nash equilibria for N players games, letting N go to infinity, leads to new nonlinear systems involving ordinary differential equations or partial differential equations. Many classical systems are particular cases of MFG like, for example, compressible Euler equations, Hartree equations, porous media equations, semilinear elliptic equations, Hamilton-Jacobi-Bellman equations, Vlasov-Boltzmann models... In this talk we shall explain in a very simple example how MFG models are derived and present some overview of the theory, its connections with many other fields and its applications.

Pierre-Louis Lions
Collège de France, France

Exhibits Open
9:30 AM-4:30 PM

Room:Exhibit Hall - Level 1

Coffee Break
10:00 AM-10:30 AM

Room:Exhibit Hall - Level 1

Thursday, July 12

MS71

Advances in Stochastic Analysis: Pathwise and Functional Ito Calculus

10:30 AM-12:30 PM

Room:Greenway J - Level 2

This Minisymposium presents a panorama of recent results which extend the classical tools of stochastic analysis and stochastic control theory to the study of path-dependent functionals of stochastic processes beyond the well-known Markovian setting, using recently developed concepts of "Functional Ito calculus", pathwise integration, Markovian projection techniques, quasi-sure analysis and second-order Backward Stochastic Differential equations.

Organizer: Rama Cont

CNRS, France, and Columbia University, USA

10:30-10:55 Functional Ito Calculus and PDEs on Function Spaces

Rama Cont, CNRS, France, and Columbia University, USA

11:00-11:25 Viscosity Solutions of Path Dependent PDEs

Ibrahim Ekren and Christian Keller, University of Southern California, USA; Nizar Touzi, Ecole Polytechnique, France; Jianfeng Zhang, University of Southern California, USA

11:30-11:55 Control of Non-Markovian Stochastic Differential Equations

Marcel Nutz, Columbia University, USA

12:00-12:25 Markovian Projection of Stochastic Processes

Amel Bentata, Université Pierre et Marie Curie, France; Rama Cont, CNRS, France, and Columbia University, USA

Thursday, July 12

MS72

Advances in Theory and Application of Operator Splitting Methods - Part II of II

10:30 AM-12:30 PM

Room:Greenway H - Level 2

For Part 1 see MS58

Operator splitting methods are widely employed in multi-scale and multi-physics codes both to improve algorithmic efficiency and to accommodate the coupling of or addition of code modules. A variety of approaches are currently in use. There is a growing need to understand how the splitting affects the model and how these methods could be improved upon. This minisymposium will explore the various operator splitting methods used in applications, assess what theoretical results exist and determine what is understood about splitting effects. The goal is to bring together practitioners and theoreticians, identify critical future research paths and encourage collaborations.

Organizer: Jeffrey M. Connors

Lawrence Livermore National Laboratory, USA

Organizer: Carol S. Woodward

Lawrence Livermore National Laboratory, USA

10:30-10:55 Operator Splitting Integration Factor Methods for Complex Biological Systems

Qing Nie, University of California, Irvine, USA

11:00-11:25 Adaptive Split-operator Methods for Modeling Flow and Transport Phenomena in Porous Medium Systems

Sarah Gasda, University of North Carolina at Chapel Hill, USA; *Matthew Farthing*, U.S. Army Engineer Research and Development Center, USA; Christopher Kees, US Army Engineer Research and Development Center, USA; Cass Miller, University of North Carolina, USA

continued in next column

11:30-11:55 An IMEX Method for the Euler Equations That Posses Strong Non-Linear Heat Conduction and Stiff Source Terms (Radiation Hydrodynamics)

Samet Y. Kadioglu, Idaho National Laboratory, USA; Dana Knoll, Los Alamos National Laboratory, USA

12:00-12:25 Reduced Description of Reactive Flows with Tabulation of Chemistry

Zhuyin Ren, University of Connecticut, USA

Thursday, July 12

MS73

Advancing Infrastructure for Materials Design and Application: The Materials Genome Initiative - Part I of II

10:30 AM-12:30 PM

Room:Nicollet D1 - Level 1

For Part 2 see MS84

The recent Materials Genome Initiative advocated by the Office of Science and Technology seeks to accelerate the process between materials discovery and their industrial application. This effort will foster enhanced computational capabilities, data management, and an integrated engineering approach for materials deployment. Applied mathematics and computational science can play a key role in this initiative. The goal of this minisymposium is to inform the SIAM community about the initiative and offer new perspectives in materials innovation and application.

Organizer: Robert P. Lipton
Louisiana State University, USA

Organizer: Maria-Carme Calderer
University of Minnesota, USA

10:30-10:55 Materials Genome: An Opportunity for Applied Mathematics and Computational Science
Robert P. Lipton, Louisiana State University, USA

11:00-11:25 The Role of SIAM As An Advocate for the Mathematical Science Community
Reinhard Laubenbacher, Virginia Bioinformatics Institute, USA

11:30-11:55 Development of Computational Algorithms for Materials Simulation and Design
Qiang Du and Jingyan Zhang, Pennsylvania State University, USA; Lei Zhang, University of California, Irvine, USA; Long-qing Chen and Zikui Liu, Pennsylvania State University, USA

12:00-12:25 Multiscale Engineering for Heterogeneous Media and Structures
Timothy D. Breitzman, Air Force Research Laboratory, USA

Sponsored by SIAG/MS

Thursday, July 12

MS74

Algorithms for High Frequency Waves and Related Inverse Problems - Part I of III

10:30 AM-12:30 PM

Room:Greenway E - Level 2

For Part 2 see MS86

Wave propagation and inverse problems are essential for many different applications. Inverse problems for wave propagation are especially interesting for many applications. The purpose of this minisymposium is to gather researchers who are engaged in mathematical methods to solve problems related to high frequency asymptotic wave phenomena and their inverse problems. Presentations of this minisymposium include asymptotic methods, computationally efficient and high order numerical approaches to wave propagation, and various inverse problems including traveltime tomography and boundary rigidity.

Organizer: Shingyu Leung
Hong Kong University of Science and Technology, Hong Kong

Organizer: Jianliang Qian
Michigan State University, USA

Organizer: Susana Serna
Universitat Autònoma de Barcelona, Spain

10:30-10:55 HDG Methods for Wave Propogation
Bernardo Cockburn, University of Minnesota, USA

11:00-11:25 Is a Curved Flight Path in SAR Better than a Straight One?
Plamen Stefanov, Purdue University, USA

11:30-11:55 Eulerian Gaussian-beams in the Viscosity Sense for Multidimensional Schrodinger Equation in the Semi-classical Regime
Susana Serna, Universitat Autònoma de Barcelona, Spain

12:00-12:25 Staggered Discontinuous Galerkin Method for Wave Transmission Between Dielectric and Meta-materials
Eric Chung, The Chinese University of Hong Kong, Hong Kong

Thursday, July 12

MS75

Control of Systems Governed by Partial Differential Equations - Part III of III

10:30 AM-12:30 PM

Room:Greenway B - Level 2

For Part 2 see MS59

This minsymposium features three sessions in an area which merges advances in the theory of PDE's with modern technological applications. The area is synergistic within science and complementary to other areas of PDE's and engineering applications represented by more classical control theory rooted in ODE's. Topics include: Controls with geometric constraints; Applications in fluid - structure interaction models; Inverse problems for PDE's; Optimal control of biological systems; Modeling and control of multilayer flexible structures. This minisymposium will also be a timely occasion to offer a tribute to Professor Walter Littman, who recently retired from the University of Minnesota after a long and distinguished career.

Organizer: Irena M. Lasiecka
University of Virginia, USA

Organizer: Steve Taylor
University of Auckland, New Zealand

Organizer: Roberto Triggiani
University of Virginia, USA

10:30-10:55 Investigating through Optimal Control of Parabolic PDEs: Does Movement Toward a Better Resource Benefit a Population?
Suzanne M. Lenhart, University of Tennessee, USA

11:00-11:25 Quasi-Stationary Limit and Landau-Lifshitz Equations Without Exchange Energy
Baisheng Yan and Wei Deng, Michigan State University, USA

11:30-11:55 Stabilization of Wave Equations with Wentzell Boundary Conditions
Marcelo Cavalcanti, Universidade Estadual de Maringa, Brazil; Irena M. Lasiecka, University of Virginia, USA; *Daniel Toundykov*, University of Nebraska-Lincoln, USA

12:00-12:25 Asymptotic Behavior in a 2-allele Genetic Model with Population Control
Hans Weinberger, University of Minnesota, USA

Thursday, July 12

MS76

Convex Algebraic Geometry and Optimization - Part I of II

10:30 AM-12:30 PM

Room:Nicollet D3 - Level 1

For Part 2 see MS99

Convex algebraic geometry is a rapidly developing research area at the intersection of convex optimization and real algebraic geometry, focussed on convex sets with algebraic structure. Such sets have been studied independently in convex geometry, real algebraic geometry, optimization and analysis, but only recently a unified perspective has emerged that systematically takes advantage of the interactions between algebra and convexity. This viewpoint provides rich connections across the mathematical sciences and novel tools for applied mathematics and engineering. The first part of the proposed mini-symposium will feature talks on sums of squares relaxations and exploiting structure in polynomial optimization.

Organizer: Greg Blekherman

Georgia Institute of Technology, USA

10:30-10:55 Positive Gorenstein Ideals

Greg Blekherman, Georgia Institute of Technology, USA

11:00-11:25 Algebraic Structure in Optimization

Cordian B. Riener, University of Konstanz, Germany

11:30-11:55 Quadratic Sum of Squares Relaxations

Chris Aholt, University of Washington, USA

12:00-12:25 Regularization Methods for SDP Relaxations in Large Scale Polynomial Optimization

Li Wang and Jiawang Nie, University of California, San Diego, USA

Sponsored by SIAG/AG

Thursday, July 12

MS77

Graph Partitioning and Vertex Separators

10:30 AM-12:30 PM

Room:Nicollet D2 - Level 1

The minisymposium focuses on exact algorithms and heuristic algorithms based on exact quadratic programming formulations. An optimization formulation of the graph partitioning problem is combined with multilevel techniques in one talk. Another algorithm is a fully combinatorial branch and bound approach with stong lower bounds and a new decomposition technique that retains optimality guarantees. Another approach for obtaining lower bound uses semidefinite programming. Finally, a new continuous optimization-based formulation of the vertex separator problem reveals its close connection to the graph partitioning problem.

Organizer: William Hager

University of Florida, USA

Organizer: Timothy A. Davis

University of Florida, USA

10:30-10:55 A Continuous Multilevel Solver for the Vertex Separator Problem

James T. Hungerford and William W. Hager, University of Florida, USA; Ilya Safro, Argonne National Laboratory, USA

11:00-11:25 Exact Combinatorial Branch-and-bound for Graph Bisection

Daniel Delling and Andrew Goldberg, Microsoft Research Silicon Valley, USA; Ilya Razenshteyn, Lomonosov Moscow State University, Russia; *Renato F. Werneck*, Microsoft Research Silicon Valley, USA

11:30-11:55 Multi-Level Edge Separator Using a Hybrid Combinatorial-Quadratic Programming Approach

Nuri Yeralan and Timothy A. Davis, University of Florida, USA

12:00-12:25 An Exact Algorithm for Graph Partitioning based on Quadratic Programming

Dzung Phan, IBM Corporation, USA

Thursday, July 12

MS78

Isogeometric Analysis (IGA)- Part II of II

10:30 AM-12:30 PM

Room:Nicollet ABC - Level 1

For Part 1 see MS62

Isogeometric Analysis (IGA), introduced in 2005 by T.J.R. Hughes, replaces traditional Finite Elements by NonUniform Rational B-splines (NURBS), thus aligning FEA and CAD shape representation. While CAD-models focus on the overall shape accuracy and allow adjacent surfaces to not match exactly, FEA-models are required to have elements that match exactly with the element structure strongly influencing the quality of the analysis to be performed. The mini-symposium will address state-of-the-art and identified research challenges of IGA as well as present selected research topics in more detail.

Organizer: Tor Dokken

SINTEF, Norway

10:30-10:55 Applications of Isogeometric Analysis at Boeing

Michael A. Epton and *Thomas A. Grandine*, The Boeing Company, USA

11:00-11:25 Analysis Aware Representations, Parameterizations, and Models

Elaine Cohen, University of Utah, USA

11:30-11:55 Solid T-spline Construction from Boundary Representations

Yongjie Zhang, Carnegie Mellon University, USA

12:00-12:25 The Geometry of Interpolation Error Estimates for Isogeometric Analysis

Chandrajit Bajaj and Alex Rand, University of Texas at Austin, USA; Andrew Gillette, University of California, San Diego, USA

Sponsored by SIAG/GD

Thursday, July 12

MS79

Low Rank and Sparse Modeling - Part III of III

10:30 AM-12:30 PM

Room:Greenway C - Level 2

For Part 2 see MS63

Low-rank and sparse modeling are two of the most ubiquitous paradigms of data analysis. Low-rank modeling reduces the dimension of the data, whereas sparse modeling reduces the description of the data by selecting a few features from a large dictionary. These two paradigms can be combined, e.g., when modeling data with a few low-rank models or with a single low-rank model having sparse residual. The goal of these minisymposia is to discuss some of the very recent and exciting developments of such modeling and highlight fundamental mathematical theories related to these explorations. Furthermore, interesting areas of applications for these developments will be discussed.

Organizer: Gilad Lerman
University of Minnesota, USA

10:30-10:55 Poisson Tensor Factorization for Sparse Count Data
Tamara G. Kolda, Sandia National Laboratories, USA; Eric Chi, University of California, Los Angeles, USA

11:00-11:25 Posterior Rates of Contraction for Sparse Bayesian Models
Larry Carin, Duke University, USA

11:30-11:55 Clustering and Embedding of High-Dimensional Multi-Manifold Data using Sparse Representation
Ehsan Elhamifar and Rene Vidal, Johns Hopkins University, USA

12:00-12:25 Performance Limits of Non-local Means
Ery Arias-Castro, University of California, San Diego, USA; Joseph Salmon and *Rebecca Willett*, Duke University, USA

Thursday, July 12

MS80

Numerical Approximation of Viscous Flows Part III of III

10:30 AM-12:00 PM

Room:Greenway G - Level 2

For Part 2 see MS67

The construction and implementation of accurate and faithful approximations of fluid flows is a classical problem in numerical PDEs. Despite years of study, there are still many unresolved fundamental issues. Examples include construction of numerical methods with strong mass conservation, efficient computation of multi-physics problems, associated absorbing boundary conditions, and point-wise estimates. The aim of this minisymposium is to bring together researchers to discuss computational results of the numerical approximation of viscous flows using a variety of methods. Topics include, but not are limited to, the (Navier) Stokes equation, the Oseen Equation, Darcy-Stokes and the Brinkman problem.

Organizer: Michael J. Neilan
University of Pittsburgh, USA

Organizer: Francisco J. Sayas
University of Delaware, USA

10:30-10:55 Local Pointwise a posteriori Gradient Error Bounds for the Stokes Equations
Alan Demlow, University of Kentucky, USA; Stig Larsson, Chalmers University of Technology, Sweden, and University of Gothenburg, Sweden

11:00-11:25 Mixed Finite Elements for the Coupling of Fluid Flow with Porous Media Flow
Gabriel N. Gatica, Universidad de Concepcion, Chile; *Ricardo Oyarzua*, University of British Columbia, Canada; Francisco J. Sayas, University of Delaware, USA

11:30-11:55 A Space-Time Hybridizable Discontinuous Galerkin (HDG) Method for Incompressible Flows on Deforming Domains
Sander Rhebergen and Bernardo Cockburn, University of Minnesota, USA

Thursday, July 12

MS81

Panel: Mathematical Modeling Across The K-16 Curriculum

10:30 AM-12:00 PM

Room:Greenway F - Level 2

This is an opportunity to learn about, and contribute to, initiatives to increase the diffusion of mathematical modeling/applied mathematics throughout K-16 curricula at schools, colleges and universities. After the panel there will be an hour-long audience discussion on other initiatives, such as planning a future Advanced Placement exam in applied mathematics/mathematical modeling; development of a multidisciplinary STEM undergraduate degree; incorporation of modeling in pre-service and in-service teacher education; impact of the Common Core State Standards in Mathematics on inclusion of applied mathematics/mathematical modeling in K-12 curricula; a planned NSF-SIAM Workshop in Washington, D.C. to promote/plan/frame/discuss these developments and others.

Organizer: Ron Buckmire
National Science Foundation, USA

Organizer: Peter R. Turner
Clarkson University, USA

10:30-10:55 SIAM-NSF Workshop on Modeling across the Curriculum
Ron Buckmire, National Science Foundation, USA; Peter R. Turner, Clarkson University, USA

11:00-11:25 Math modeling as the core of Applied Math undergraduate Curricula
Jeffrey Humpherys, Brigham Young University, USA

11:30-11:55 Mathematical Modeling in Biological Sciences
Angela B. Shiflet and George W. Shiflet, Wofford College, USA

Thursday, July 12

MS82

Programming Paradigms, Algorithms and Frameworks for High Performance Scalable Manycore Systems Part I of III

10:30 AM-12:30 PM

Room:Greenway I - Level 2

For Part 2 see MS94

Manycore processors are available as both collections of homogeneous standard microprocessors and as attached heterogeneous co-processors. Application and library software developers are making progress analyzing how to effectively use clusters of such processors and some general approaches have emerged. It is widely recognized that careful design of software and data structures, with effective memory management and communication optimizations are the most critical issues for optimal performance on scalable manycore systems. In this series of minisymposia we discuss current experiences and development of applications, libraries and frameworks using a variety of hardware. Speakers will address performance results and software design.

Organizer: Serge G. Petiton
CNRS/LIFL and INRIA, France

Organizer: Michael A. Heroux
Sandia National Laboratories, USA

Organizer: Kengo Nakajima
University of Tokyo, Japan

10:30-10:55 Auto-Tuned Hybrid Asynchronous Krylov Iterative Eigensolvers on Petascale Supercomputers
Serge G. Petiton, CNRS/LIFL and INRIA, France; Christophe Calvin, CEA Saclay, France; Jerome Dubois, CEA, France; France Boillod, CNRS, France

11:00-11:25 Asynchronous, Performance-portable Krylov Methods on Accelerators
Kurtis L. Nusbaum, University of Illinois at Urbana-Champaign, USA

continued in next column

11:30-11:55 Manycore-portable Multidimensional Arrays for Finite Element Computations
H. Carter Edwards and Daniel Sunderland, Sandia National Laboratories, USA

12:00-12:25 Retrofitting a Production Sparse Linear Algebra Library for Accelerators
Benjamin Seefeldt, St. John's University, USA

Thursday, July 12

MS83

Workshop Celebrating Diversity (WCD): New Developments in Mathematical Epidemiology

10:30 AM-12:30 PM

Room:Greenway A - Level 2

For Part 5 see MS0
For Part 7 see MS95

This session presents recent applications of mathematical and statistical methods for uncertainty quantification, parameter estimation, and network-based epidemiological analyses in the context of disease transmission and control.

Organizer: Gerardo Chowell
Los Alamos National Laboratory, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Stephen Wirkus
Arizona State University, USA

10:30-10:55 Spatio-temporal Dynamics of 2009 A/H1N1 Influenza
Gerardo Chowell, Los Alamos National Laboratory, USA

11:00-11:25 Modeling the Effect of Hospital Acquired Infections in the Outcomes of Neurosurgical Patients
Miriam Nuno, Cedars-Sinai Medical Center, USA

11:30-11:55 Game Theory and Vaccination with a Network Epidemiology Approach
Ariel Cintron-Arias, East Tennessee State University, USA

12:00-12:25 The Implications of Different Probability Density Functions for Disease Stages from Sir Epidemiological Models on the Effectiveness of Public Health Interventions
Emmanuel J. Morales-Butler, Arizona State University, USA

Sponsored by WCD

Thursday, July 12

CP15

Approximation & Interpolation

10:30 AM-12:50 PM

Room:Greenway D - Level 2

Chair: Jeremy Wade, Pittsburgh State University, USA

10:30-10:45 Summability of Expansions on the Cylinder
Jeremy Wade, Pittsburgh State University, USA

10:50-11:05 Finite Difference Weights and Superconvergence
Burhan Sadiq, University of Michigan, Ann Arbor, USA; Divakar Viswanath, University of Michigan, USA

11:10-11:25 Jacobi 1825, Cauchy 1826, Poisson 1827
Lloyd N. Trefethen, Oxford University, United Kingdom

11:30-11:45 Chebyshev Interpolation for Functions with Endpoint Singularities.
Mark Richardson, University of Oxford, United Kingdom

11:50-12:05 Barycentric Hermite Interpolation
Divakar Viswanath, University of Michigan, USA

12:10-12:25 Identity Issues in Radial Basis Functions: RBFs As Modulated Sinc Functions in the Near-Equivalence of Exponentially Convergent RBF Species
John P. Boyd, University of Michigan, Ann Arbor, USA

12:30-12:45 Error Bounds for Spline Interpolation Based Parametric Model Order Reduction
Angelika Bunse-Gerstner and Than Son Nguyen, Universität Bremen, Germany

Thursday, July 12

CP16

Stochastic PDE

10:30 AM-12:10 PM

Room:Skyway A - Level 2

Chair: David Horntrop, New Jersey Institute of Technology, USA

10:30-10:45 Variance Reduction in the Simulation of Stochastic Differential Equations
David J. Horntrop, New Jersey Institute of Technology, USA

10:50-11:05 A Convergence Study for Spdes Using Combined Polynomial Chaos and Dynamically Orthogonal Schemes
Minseok Choi, Brown University, USA; Themis Sapsis, New York University, USA; George E. Karniadakis, Brown University, USA

11:10-11:25 Numerical Methods for High-Dimensional Pdf Equations
Heyrim Cho, Daniele Venturi, and George E. Karniadakis, Brown University, USA

11:30-11:45 Stochastic Collocation Methods for Stochastic Differential Equations Driven by White Noise
Zhongqiang Zhang and Xiu Yang, Brown University, USA; Guang Lin, Pacific Northwest National Laboratory, USA; Boris Rozovsky and George E. Karniadakis, Brown University, USA

11:50-12:05 Variance-Reduced Equation-Free Newton-Krylov Methods for Stochastic Fine-Scale Simulations
Giovanni Samaey, Katholieke Universiteit Leuven, Belgium

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Thursday, July 12

IP2

Complex Adaptive Systems and the Challenge of Sustainability

2:00 PM-2:45 PM

Room:Nicollet ABC - Level 1

Chair: Nick Trefethen, Oxford University, United Kingdom

The continual increase in the human population, magnified by increasing per capita demands on Earth's limited resources, raise the urgent mandate of understanding the degree to which these patterns are sustainable. The scientific challenges posed by this simply stated goal are enormous, and cross disciplines. What measures of human welfare should be at the core of definitions of sustainability, and how do we discount the future and deal with problems of intra-generational and inter-generational equity? How do environmental and socioeconomic systems become organized as complex adaptive systems, and what are the implications for dealing with public goods at scales from the local to the global? How does the increasing interconnectedness of coupled natural and human systems affect the robustness of aspects of importance to us, and what are the implications for management. What is the role of social norms, and how do we achieve cooperation at the global level? All of these issues have parallels in evolutionary biology, and this lecture will explore what lessons can be learned from ecology and evolutionary theory for addressing the problems posed by achieving a sustainable future.

Simon Levin
Princeton University, USA

Thursday, July 12

IP3

The Isoperimetric Problem Revisited: Exposing Euler's 1744 Proof of Necessity as a Proof of Sufficiency, as Such the First and Shortest in History

2:45 PM-3:30 PM

Room:Nicollet ABC - Level 1

Chair: Maria Cristina Villalobos, University of Texas - Pan American, USA

In this talk the speaker will outline the remarkable life of the isoperimetric problem (Determine, from all simple closed planar curves of the same perimeter, the one that encloses the greatest area) and argue that it has been the most influential mathematics problem of all time. In 1744 Euler constructed multiplier theory to solve the isoperimetric problem; however he concluded that his theory was only necessary and not sufficient to prove that the circle was the solution. Some 130 years later Weierstrass constructed his elegant sufficiency theory for problems in the calculus of variations and used it to give the first complete proof that the circle solved the isoperimetric problem. The speaker will demonstrate that Euler's original proof was merely an observation away from establishing sufficiency. As such it should be viewed as the first and shortest solution to the isoperimetric problem in history.

Richard A. Tapia
Rice University, USA

Coffee Break

3:30 PM-4:00 PM

Room:Exhibit Hall - Level 1

Thursday, July 12

MS84

Advancing Infrastructure for Materials Design & Application: The Materials Genome Initiative - Part II of II

4:00 PM-6:00 PM

Room:Nicollet D1 - Level 1

For Part 1 see MS73

The recent Materials Genome Initiative advocated by the Office of Science and Technology seeks to accelerate the process between materials discovery and their industrial application. This effort will foster enhanced computational capabilities, data management, and an integrated engineering approach for materials deployment. Applied mathematics and computational science can play a key role in this initiative. The goal of this minisymposium is to inform the SIAM community about the initiative and offer new perspectives in materials innovation and application.

Organizer: Robert P. Lipton
Louisiana State University, USA

Organizer: Maria-Carme Calderer
University of Minnesota, USA

4:00-4:25 Mesoscale Description of Defected Materials
Jorge Vinals, University of Minnesota, USA

4:30-4:55 Atomic Properties Database Development and Mining for Materials Genome Applications
Da Gao and Yousef Saad, University of Minnesota, USA; James R. Chelikowsky, University of Texas at Austin, USA

5:00-5:25 Renewable Polymers for a Sustainable Future
William B. Tolman, University of Minnesota, USA

5:30-5:55 Title Not Available at Time of Publication
Eray Aydil, University of Minnesota, USA

Sponsored by SIAG/MS

Thursday, July 12

MS85

Algebraic and Combinatorial Aspects of Mathematical Biology - Part I of II

4:00 PM-6:00 PM

Room:Greenway H - Level 2

For Part 2 see MS109

Discrete structures play a fundamental role in mathematical biology, from DNA sequences to phylogenetic trees. Increasingly, methods from combinatorics and applied algebraic geometry are being used to address the challenges that arise in the analysis of these biological structures. This minisymposium will highlight recent advances in this area.

Organizer: Seth Sullivant
North Carolina State University, USA

4:00-4:25 Reverse Engineering of Regulatory Networks Using Algebraic Geometry
Alan Veliz Cuba, University of Nebraska, Lincoln, USA

4:30-4:55 Non-parametric Species Delimitation Based on Branching Rates
Edward Roualdes, University of Kentucky, USA

5:00-5:25 Some New Combinatorial Problems from RNA
Matthew Macauley, Clemson University, USA

5:30-5:55 Coverage Statistics for Sequence Census Methods
Valerie Hower, University of Miami, USA

Sponsored by SIAG/AG

Thursday, July 12

MS86

Algorithms for High Frequency Waves and Related Inverse Problems - Part II of III

4:00 PM-6:00 PM

Room:Greenway E - Level 2

For Part 1 see MS74
For Part 3 see MS96

Wave propagation and inverse problems are essential for many different applications. Inverse problems for wave propagation are especially interesting for many applications. The purpose of this minisymposium is to gather researchers who are engaged in mathematical methods to solve problems related to high frequency asymptotic wave phenomena and their inverse problems. Presentations of this minisymposium include asymptotic methods, computationally efficient and high order numerical approaches to wave propagation, and various inverse problems including traveltime tomography and boundary rigidity.

Organizer: Shingyu Leung
Hong Kong University of Science and Technology, Hong Kong

Organizer: Jianliang Qian
Michigan State University, USA

Organizer: Susana Serna
Universitat Autònoma de Barcelona, Spain

4:00-4:25 Efficient Computation of the Semi-Classical Limit of the Schroedinger Equation
Peter Smereka, University of Michigan, USA

4:30-4:55 A Fast Iterative Method for Solving the Eikonal Equation on Triangular and Tetrahedral Domains using GPUs
Mike Kirby, University of Utah, USA

5:00-5:25 Acceleration of a Multiple Scattering High Frequency Iterative Method
Yassine Boubendir, New Jersey Institute of Technology, USA

5:30-5:55 High Frequency Wave Propagation with Geometrical Optics and Beyond
Songting Luo and Jianliang Qian, Michigan State University, USA

Thursday, July 12

MS87

Applications of Integral Equation Methods - Part I of II

4:00 PM-6:00 PM

Room:Greenway D - Level 2

For Part 2 see MS97

Integral equation methods have been successfully used to simulate problems in fluid dynamics, scattering theory, and other applications. Handling large-scale problems and complex domains requires linear or near-linear complexity, while still attaining high-order accuracy. This minisymposium will discuss recent developments in preconditioning, complex geometries, high-order methods, and fast summation methods.

Organizer: Bryan D. Quaife
University of Texas at Austin, USA

Organizer: George Biros
University of Texas at Austin, USA

4:00-4:25 Boundary Integral Methods for Inextensible Vesicle Dynamics in Two Dimensions
Bryan D. Quaife and George Biros, University of Texas at Austin, USA

4:30-4:55 Fast, High-order Accurate Methods for Evaluating Layer Heat Potentials
Shravan Veerapaneni, University of Michigan, USA

5:00-5:25 Discretization of Integral Operators on Complicated Surfaces
James Bremer, University of California, Davis, USA

5:30-5:55 Integral Equation Methods for Unsteady Stokes Flow in Two Dimensions
Shidong Jiang, New Jersey Institute of Technology, USA

Thursday, July 12

MS88

Dynamics and Applications of Thin Liquid Films - Part IV of IV

4:00 PM-6:00 PM

Room:Greenway G - Level 2

For Part 3 see MS60

Thin fluid films are present in a variety of applications including physiology, medicine, phase change, multiphase and non-Newtonian flows. In solving these related problems, various numerical methods are implemented including spectral methods and ChebFun for spatial discretization together with various time stepping schemes in the method of lines, and ADI methods for direct discretization. Analytical methods complement and illuminate the numerical results. The range of problems and approaches highlighted in this minisymposium exhibit the advancement and challenges of thin film dynamics.

Organizer: Richard Braun
University of Delaware, USA

Organizer: Ellen Peterson
Carnegie Mellon University, USA

Organizer: Nicholas Gewecke
University of Delaware, USA

4:00-4:25 A Comparison of Numerical Methods for Models of Thin Liquid Films
Rachel Levy, Harvey Mudd College, USA

4:30-4:55 Modeling Tear Films, Contact Lenses and Evaporation
Daniel M. Anderson and Matt Gerhart, George Mason University, USA

5:00-5:25 Settling of a Contact Lens
Kara L. Maki and David S. Ross, Rochester Institute of Technology, USA

5:30-5:55 New Models of Two-phase Flow in Porous Media
Michael Shearer, Kim Spayd, and Zhengzheng Hu, North Carolina State University, USA

Thursday, July 12

MS89

Geometric Patterns and Constructions

4:00 PM-6:00 PM

Room:Nicollet D3 - Level 1

Naturally occurring patterns in geometry allow more efficient exploration of shape space and the construction of semi-regular fields and surfaces. The minisymposium looks at applications in architecture, high dimensional visualization and splines for non-tensored crystallographic tri-variate fields.

Organizer: Jorg Peters

University of Florida, USA

4:00-4:25 Shape Space Exploration of Constrained Meshes

Yongliang Yang, Yijun Yang, Helmut Pottmann, and Niloy Mitra, King Abdullah University of Science and Technology, Saudi Arabia

4:30-4:55 Patterns in Free Form Architecture and Discrete Differential Geometry

Helmut Pottmann, King Abdullah University of Science and Technology, Saudi Arabia

5:00-5:25 Approximation on Non-Cartesian Lattices

Mahsa Mirzargar, University of Florida, USA

5:30-5:55 Box-Splines on Crystallographic Lattices

Jorg Peters, University of Florida, USA; Minho Kim, Seoul National University, Korea

Thursday, July 12

MS90

Hyperspectral and High-Dimensional Image Processing

4:00 PM-6:00 PM

Room:Greenway B - Level 2

With an increase in computational power comes the ability to handle new high-dimensional data, with hyperspectral imaging being one of the most consequential. Still of vital importance, however, is to process such high-dimensional data in an efficient manner. Dimension reduction techniques play an important role in projecting the data onto a lower dimensional space while preserving as much structural information as possible. An interesting subfield in hyperspectral image processing is object classification using both spatial and spectral information. This session will review important principles and introduce novel methods for these emerging fields in high-dimensional data processing.

Organizer: Alex Chen

SAMSI and UNC at Chapel Hill

4:00-4:25 Classification of Hyperspectral Images by Variational Methods

Alex Chen, SAMSI and UNC at Chapel Hill

4:30-4:55 Learning to Classify HSI

Guillermo Sapiro, University of Minnesota, Minneapolis, USA; *Alexey Castrodad*, University of Minnesota, USA

5:00-5:25 Social Network Clustering of High Dimensional Sparse Data

Blake Hunter and Yves van Gennip, University of California, Los Angeles, USA

5:30-5:55 Robust Computation of Linear Models

Gilad Lerman, University of Minnesota, USA; Michael McCoy and Joel Tropp, California Institute of Technology, USA; Teng Zhang, University of Minnesota, USA

Thursday, July 12

MS91

Mathematical Models of Cancer Development and Treatment

4:00 PM-6:00 PM

Room:Greenway F - Level 2

Cancer development progresses in multiple stages from tumor genesis to metastasis and evasion of the immune system. Understanding these processes will lead to new insights into cancer therapy by aiding the design of innovative treatments, such as anti-tumor vaccines, cancer virotherapy, and cytokine therapy. Current mathematical models consider cancer deterministically and stochastically from the whole tumor population level scale to the level of individual cells. This minisymposium presents an opportunity to gather speakers who are investigating cancer development and treatment using a variety of modeling approaches, including ordinary and delayed differential equations, partial differential equations, and probabilistic agent-based models.

Organizer: Peter S. Kim

University of Sydney, Australia

Organizer: Joanna Wares

University of Richmond, USA

4:00-4:25 Modeling Preventative Breast Cancer Vaccines using an Agent-based Approach

Peter S. Kim, University of Sydney, Australia; Peter Lee, City of Hope Cancer Center, USA

4:30-4:55 Determinants of Successful Cancer Therapy with Cytokine-expressing Oncolytic Viruses

Joseph J. Crivelli, Weill Medical College of Cornell University, USA; Peter S Kim, University of Sydney, Australia; Joanna R Wares, University of Richmond, USA

5:00-5:25 The Role of Biomechanics in the Early Development of Breast Cancer: A Hybrid Model

Yangjin Kim, Konkuk University, Korea; Hans G. Othmer, University of Minnesota, Minneapolis, USA

5:30-5:55 Traveling Waves in a Model of Tumor Angiogenesis

Zhian Wang, Hong Kong Polytechnic University, China

Thursday, July 12

MS92

Matrices and Graphs - Part I of II

4:00 PM-6:00 PM

Room:Nicollet D2 - Level 1

For Part 2 see MS102

The relationship between matrices and graphs plays a vital role in both matrix theory and graph theory, and has applications to a variety of fields. This mini-symposium will focus on recent results related to the interaction between matrices and graphs, including properties of matrices having a nonzero pattern described by a given graph, information about a graph provided by specific matrices associated with the graph, and applications.

Organizer: Leslie Hogben

Iowa State University, USA

4:00-4:25 The Extended Combinatorial Inverse Eigenvalue Problem

Wayne Barrett, John Sinkovic, Curtis Nelson, Nicole Malloy, William Sexton, Robert Yang, and Anne Lazenby, Brigham Young University, USA

4:30-4:55 Zero Forcing, Minimum Rank, and Applications to Control of Quantum Systems

Leslie Hogben, Iowa State University, USA

5:00-5:25 Positive Semidefinite Zero Forcing

Michael Young, Iowa State University, USA

5:30-5:55 Lower Bounds for Minimum Semidefinite Rank

Sivaram Narayan, Central Michigan University, USA

Thursday, July 12

MS93

On the Interface of Biology and Mathematics: Challenges and Opportunities in Undergraduate Education

4:00 PM-6:00 PM

Room:Nicollet ABC - Level 1

There is a growing need for quantitative training for students intending to pursue careers in biology and medicine. Numerous reports (e.g. Bio2010, National Research Council) have recommended a change in the traditional biology curriculum, and most recently, both the Harvard Medical School and the new MCAT guidelines have called for a curriculum emphasizing data analysis and mathematical modeling. This minisymposium will present recent experiences in developing and teaching innovative quantitative courses aimed at biology and premedical students, and discuss the pedagogical, curricular, and institutional challenges facing these endeavors.

Organizer: Hannah L. Callender

University of Portland, USA

Organizer: Dmitry A. Kondrashov

University of Chicago, USA

4:00-4:25 Assessing Beliefs and Content Knowledge in First Semester Biocalculus

Hannah L. Callender, University of Portland, USA

4:30-4:55 A New Quantitative Modeling Course for First-year Biology Students

Dmitry A. Kondrashov, University of Chicago, USA

5:00-5:25 Calculus II for Biology Students

David Gammack, Marymount University, USA

5:30-5:55 Introducing Quantitative Thinking into an Introductory Biology Curriculum

Susan Hester, University of Arizona, USA; Lisa Elfring and Lisa Nagy, Arizona State University, USA

Thursday, July 12

MS94

Programming Paradigms, Algorithms and Frameworks for High Performance Scalable Manycore Systems - Part II of III

4:00 PM-6:00 PM

Room:Greenway I - Level 2

For Part 1 see MS82
For Part 3 see MS105

Manycore processors are available as both collections of homogeneous standard microprocessors and as attached heterogeneous co-processors. Application and library software developers are making progress analyzing how to effectively use clusters of such processors and some general approaches have emerged. It is widely recognized that careful design of software and data structures, with effective memory management and communication optimizations are the most critical issues for optimal performance on scalable manycore systems. In this series of minisymposia we discuss current experiences and development of applications, libraries and frameworks using a variety of hardware. Speakers will address performance results and software design.

Organizer: Serge G. Petiton

CNRS/LIFL and INRIA, France

Organizer: Michael A. Heroux

Sandia National Laboratories, USA

Organizer: Kengo Nakajima

University of Tokyo, Japan

4:00-4:25 Multi-precision Inner/outer Solvers via Generic Programming Libraries

Christopher G. Baker, Oak Ridge National Laboratory, USA

4:30-4:55 Design and Development of Sustainable Libraries for Numerical Computation on Many Core Architectures

Nahid Emad and Makarem Dandouna, University of Versailles, France

5:00-5:25 Cray Scientific Library for Accelerators

Keita Teranishi and Adrian Tate, Cray, Inc., USA

5:30-5:55 Incorporation of Multicore FEM Integration Routines into Scientific Libraries

Matthew G. Knepley, University of Chicago, USA; Andy Terrel, University of Texas, USA

Thursday, July 12

MS95

Workshop Celebrating Diversity (WCD): Operations Research

4:00 PM-6:00 PM

Room:Greenway A - Level 2

For Part 6 see MS83

Operations Research is as diverse as the researchers in the field. This minisymposium highlights some of the diverse research and researchers in the field.

Organizer: Illya Hicks
Rice University, USA

Organizer: Tanya Moore
Building Diversity in Science, USA

Organizer: Cristina Villalobos
University of Texas - Pan American, USA

Organizer: Stephen Wirkus
Arizona State University, USA

4:00-4:25 Matroidal Branchwidth
Illya Hicks, Rice University, USA

4:30-4:55 Optimal Toll Design: A Lower Bound Framework for the Traveling Salesman Problem
Alejandro Toriello, University of Southern California, USA

5:00-5:25 Resilience of Small Social Networks with Multiple Relations
Taniecea Arceneaux, U.S. Census Bureau, USA

5:30-5:55 Price Optimization under the Nested Logit Model With Multiple No-Purchase Options
William Z. Rayfield, Cornell University, USA; Paat Rusmevichientong, University of Southern California, USA

Sponsored by SIAG/WCD

Thursday, July 12

CP17

Numerical PDE III

4:00 PM-6:00 PM

Room:Greenway C - Level 2

Chair: Andreas Aristotelous, Duke University, USA

4:00-4:15 Application of Compact-Reconstruction WENO Schemes to the Navier-Stokes Equations
Debojyoti Ghosh and James Baeder, University of Maryland, USA

4:20-4:35 A Fast Perturbation Approach in Ensemble Level Upscaling
Yan Li, Chevron Corporation, USA; Yalchin Efendiev, Texas A&M University, USA; Yuguang Chen, Chevron Energy Technology Company, USA; Louis Durlofsky, Stanford University, USA

4:40-4:55 Partitioned Algorithms for the Numerical Solution of the Fluid-Structure Interaction Problem in Haemodynamics
Christian Vergara, Universita' degli Studi di Bergamo, Italy; Fabio Nobile, EPFL, France; Matteo Pozzoli, Universita' degli Studi di Bergamo, Italy

5:00-5:15 Summation-by-Parts Operators and Weak Initial Conditions for Time-Discretisation
Jan Nordstrom and Tomas Lundquist, Linköping University, Sweden

5:20-5:35 Multigrid, Adaptive Discontinuous Galerkin Methods for the Cahn-Hilliard Equation and a Diffuse Interface Model of Tumor Growth
Andreas Aristotelous, Duke University, USA; Ohannes Karakashian and Steven M. Wise, University of Tennessee, USA

5:40-5:55 An Efficient Scheme Involving Only Constant Coefficient Matrices for Coupled Navier-Stokes/ Cahn-Hilliard Equations with Large Density Ratios
Suchuan Dong, Purdue University, USA

Thursday, July 12

CP18

Optimization

4:00 PM-6:20 PM

Room:Greenway J - Level 2

Chair: Brendan P. Ames, University of Minnesota, USA

4:00-4:15 Guaranteed Biclustering Via Semidefinite Programming
Brendan P. Ames, University of Minnesota, USA

4:20-4:35 Solving Sup-$\mathcal{T}$ Equation Constrained Optimization Problems
Cheng-Feng Hu, I-Shou University, Taiwan

4:40-4:55 Optimal Small Wind Turbine Placement in Constrained Spaces
Vincent Winstead, Minnesota State University Mankato, USA

5:00-5:15 A Minty Variational Principle for Set-Valued Optimization
Giovanni Crespi, Université de la Vallée d'Aoste, Italy; Carola Schrage, Martin-Luther-Universität, Germany

5:20-5:35 Cyber-Insurance in Internet Security: The Problem of Resolving Information Asymmetry
Ranjan Pal, University of Southern California, USA

5:40-5:55 A Joint Economic Production and Delivery Quantity Model With a General Transportation Cost Structure
Shine-Der Lee and Yen-Chen Fu, National Cheng Kung University, Taiwan

6:00-6:15 Solving Games by Differential Equations in Finite Time
Koba Gelashvili, Ivane Javakhishvili Tbilisi State University, Georgia

Intermission

6:00 PM-6:15 PM

Thursday, July 12

PD3

Professional Development Evening: Successful Verbal Communication in the Workplace - Interviewing

6:15 PM-7:15 PM

Room:Nicollet ABC - Level 1

For Part 2 see PD4

Chair: Suzanne M. Shontz, Pennsylvania State University, USA

Chair: Cammey Cole Manning, Meredith College, USA

Chair: Christopher Siefert, Sandia National Laboratories, USA

Join us for an evening devoted to professional development in the area of verbal communication in the workplace. Several professionals from academia, government, and industry will share their work experiences and give advice on professional interactions, giving a good talk, and interviewing for jobs in the mathematical sciences. 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.

Panel 1: Interviewing

George Biros
Georgia Institute of Technology, USA

Ariel Cintron-Arias
East Tennessee State University, USA

Amr El-Bakry
ExxonMobil Upstream Research Company, USA

Michael Heroux
Sandia National Laboratories, USA

Matthew Richey
St. Olaf College, USA

Professional Development Evening: Networking with Reception

7:15 PM-8:15 PM

Room:Nicollet ABC - Level 1

Thursday, July 12

PD4

Professional Development Evening: Successful Verbal Communication in the Workplace - Professional Interactions and Giving a Good Talk

8:15 PM-9:15 PM

Room:Nicollet ABC - Level 1

For Part 1 see PD3

Chair: Suzanne M. Shontz, Pennsylvania State University, USA

Chair: Cammey Cole Manning, Meredith College, USA

Chair: Christopher Siefert, Sandia National Laboratories, USA

Join us for an evening devoted to professional development in the area of verbal communication in the workplace. Several professionals from academia, government, and industry will share their work experiences and give advice on professional interactions, giving a good talk, and interviewing for jobs in the mathematical sciences. 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.

Panel 2: Professional Interactions and Giving a Good Talk

James Chelikowsky
University of Texas at Austin, USA

Tamara Kolda
Sandia National Laboratories, USA

Miriam Nuno
Cedars-Sinai Medical Center, USA

Keita Teranishi
Cray, Inc., USA

Friday, July 13

Registration

8:00 AM-4:30 PM

Room:Nicollet Promenade - Level 1

Closing Remarks

8:15 AM-8:30 AM

Room:Nicollet ABC - Level 1

IC9

Overcoming the Tyranny of Scales in Subsurface Flow and Reactive Transport Simulation

8:30 AM-9:15 AM

Room:Nicollet ABC - Level 1

Chair: Thomas Hou, California Institute of Technology, USA

A grand challenge facing subsurface modelers is the disparity between length and time scales at which fundamental processes are controlled and those at which predictions are needed. This presentation will describe the application of multiscale simulation methods to this challenge. Particular focus will be given to 1) hybrid multiscale simulations, which directly couple pore- and continuum-scale models, and 2) integration of genome-scale microbial metabolism models into field-scale bioremediation analyses. We will present our multiscale analysis platform (or MAP), a community resource for navigating the breadth of multiscale methods and identifying which tools are best suited to specific problems.

Timothy D. Scheibe
Pacific Northwest National Laboratory, USA

Friday, July 13

IC10

Network Formation and Ion Conduction in Ionomer Membranes

8:30 AM-9:15 AM

Room:Nicollet D - Level 1

Chair: Tasso J. Kaper, Boston University, USA

Selective charge transport is an essential step in efficient energy conversion. Ionomer membranes are formed from cross-linked, charged polymers. They imbibe solvent to form nanoscaled network structures which lie at the heart of many energy conversion devices. Experimental data shows that the networks are hysteretic, evolving on time scales of minutes and hours, far outside the reach of molecular simulations. We present a novel reformulation of the classical Cahn-Hilliard free energy that permits the inclusion of solvation energy and counter-ion entropy within a continuum model. Gradient flows on the Functionalized Cahn-Hilliard energy show bi-stability of bilayer, pore, and micelle dominated networks. We present sharp interface reductions, including classes of curvature driven flows that couple to the network structure.

Keith Promislow
Michigan State University, USA

Friday, July 13

IP4

Complex Networks. A Tour d' Horizon

9:15 AM-10:00 AM

Room:Nicollet ABC - Level 1

Chair: Nick Higham, University of Manchester, United Kingdom

The field of complex network is gently introduced. The classical concepts of 'small-world' and 'scale-freeness' are briefly discussed. Then, the problem of communicability in complex networks is motivated and analyzed by considering the use of matrix functions. The concept of network communicability is then applied to a few real-world situations. It motivates a new Euclidean metric for networks, which allows to embed every network into a hypersphere of certain radius. Finally we discuss dynamical processes on networks. In particular we show how to extend these concepts to the consideration of long-range interactions among the agents in complex networks. The consequences of these extensions for real-world situations are briefly discussed.

Ernesto Estrada
University of Strathclyde, United Kingdom

Coffee Break

10:00 AM-10:30 AM

Room:Exhibit Hall - Level 1

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).

Friday, July 13

MS96

Algorithms for High Frequency Waves and Related Inverse Problems - Part III of III

10:30 AM-12:30 PM

Room:Greenway E - Level 2

For Part 2 see MS86

Wave propagation and inverse problems are essential for many different applications. Inverse problems for wave propagation are especially interesting for many applications. The purpose of this minisymposium is to gather researchers who are engaged in mathematical methods to solve problems related to high frequency asymptotic wave phenomena and their inverse problems. Presentations of this minisymposium include asymptotic methods, computationally efficient and high order numerical approaches to wave propagation, and various inverse problems including traveltime tomography and boundary rigidity.

Organizer: Shingyu Leung
Hong Kong University of Science and Technology, Hong Kong

Organizer: Jianliang Qian
Michigan State University, USA

Organizer: Susana Serna
Universitat Autònoma de Barcelona, Spain

10:30-10:55 Simulation of Light Waves in Large Scale Photonic Crystal Devices
Ya Yan Lu, City University of Hong Kong, Hong Kong

11:00-11:25 Unformization of WKB Solutions via Wigner Transform
George Makrakis, University of Crete, Greece

11:30-11:55 Randomized Structured Direct Solvers for Seismic Problems
Jianlin Xia, Purdue University, USA

12:00-12:25 Eulerian Approaches for Transmission Traveltime Tomography with Discontinuous Slowness
Wenbin Li, Hong Kong University of Science and Technology, Hong Kong

Friday, July 13

MS97

Applications of Integral Equation Methods - Part II of II

10:30 AM-12:30 PM

Room:Greenway H - Level 2

For Part 1 see MS87

Integral equation methods have been successfully used to simulate problems in fluid dynamics, scattering theory, and other applications. Handling large-scale problems and complex domains requires linear or near-linear complexity, while still attaining high-order accuracy. This minisymposium will discuss recent developments in preconditioning, complex geometries, high-order methods, and fast summation methods.

Organizer: Bryan D. Quaife
University of Texas at Austin, USA

Organizer: George Biros
University of Texas at Austin, USA

10:30-10:55 Fast Computation of Eigenfrequencies of Planar Domains via the Spectrum of the Neumann-to-Dirichlet Map
Alexander H. Barnett, Dartmouth College, USA; Andrew Hassell, Australian National University, Australia

11:00-11:25 Fast Methods for Boundary Integral Equations on the Sphere
Nilima Nigam and Mary-Catherine Kropinski, Simon Fraser University, Canada

11:30-11:55 A Fast Direct Solver for Non-oscillatory Integral Equations
Kenneth L. Ho and Leslie Greengard, Courant Institute of Mathematical Sciences, New York University, USA

12:00-12:25 Mathematical and Numerical Aspects of the Adaptive Fast Multipole Poisson-Boltzmann Solver
Jingfang Huang, University of North Carolina at Chapel Hill, USA; *Bo Zhang*, Duke University, USA; Xiaolin Cheng, Oak Ridge National Laboratory, USA; Benzhuo Lu, Institute of Computational Mathematics, China; Nikos Pitsianis, Aristotle University of Thessaloniki, Greece; Xiaobai Sun, Duke University, USA; J. Andrew McCammon, University of California, San Diego, USA

Friday, July 13

MS98

Best Practices for Introducing Undergraduate Students to Computational and Interdisciplinary Research - Part I of II

10:30 AM-12:30 PM

Room:Nicollet D1 - Level 1

For Part 2 see MS111

This minisymposium brings together faculty who have experience guiding undergraduate students in research with a computational focus and an early introduction to collaborative research with scientists from application areas. Such research requires a large set of skills to get started being productive, from knowledge about computers to programming languages and post-processing tools. The speakers will share their experiences from guiding REU Sites, CSUMS programs, and similar on how to get students started, for instance, with boot camps, short courses, or other techniques, and discuss what research results could be obtained with this often limited background and how the results could be documented in publications.

Organizer: Matthias K. Gobbert
University of Maryland, Baltimore County, USA

Organizer: Nagaraj Neerchal
University of Maryland, Baltimore County, USA

10:30-10:55 Undergraduate Research on the Fast Track: From Nothing to Publication in Eight Weeks
Matthias K. Gobbert and Nagaraj Neerchal, University of Maryland, Baltimore County, USA

11:00-11:25 Multidisciplinary Undergraduate Research in Computational Mathematics and Nonlinear Dynamics of Biological, Bio-inspired and Engineering Systems
Padmanabhan Seshaiyer, George Mason University, USA

11:30-11:55 Models for Undergraduate Research, Best Practices, and Questions
Jennifer Pearl, National Science Foundation, USA

12:00-12:25 Building An Applied and Computational Math Degree Program from the Ground Up
Jeffrey Humpherys, Brigham Young University, USA

Friday, July 13

MS99

Convex Algebraic Geometry and Optimization - Part II of II

10:30 AM-12:30 PM

Room:Nicollet D3 - Level 1

For Part 1 see MS76

Convex algebraic geometry is a rapidly developing research area at the intersection of convex optimization and real algebraic geometry, focussed on convex sets with algebraic structure. Such sets have been studied independently in convex geometry, real algebraic geometry, optimization and analysis, but only recently a unified perspective has emerged that systematically takes advantage of the interactions between algebra and convexity. This viewpoint provides rich connections across the mathematical sciences and novel tools for applied mathematics and engineering. The second part of the proposed mini-symposium will feature talks on symmetric tensor decompositions and spectral properties of matrices.

Organizer: Greg Blekherman
Georgia Institute of Technology, USA

10:30-10:55 Klein's Idea and Identities for Powers of Polynomials
Bruce Reznick, University of Illinois, Urbana-Champaign, USA

11:00-11:25 Mapping the Connectome with Convex Algebraic Geometry
Lek-Heng Lim, University of Chicago, USA; Thomas Schultz, Max Planck Institute for Intelligent Systems, Germany

11:30-11:55 A Sums of Squares Relaxation for Hyperbolicity Cones
Cynthia Vinzant, University of Michigan, USA; Daniel Plaumann, University of Konstanz, Germany

12:00-12:25 Linearization Functors on Real Convex Sets
Mauricio Velasco, Universidad de los Andes, Colombia

Sponsored by SIAG/AG

Friday, July 13

MS100

Approximation for Modeling and Visualization

10:30 AM-12:30 PM

Room:Greenway B - Level 2

Topological anomalies from approximation in geometric modeling are often first seen in graphics display. Contemporary problems in scientific visualization expose further approximation sensitivities in molecular simulations, medical diagnosis and material science. Approximation is a unifying mathematical issue, as presented on examples of spline models and volume rendering integrals.

Organizer: Thomas J. Peters
University of Connecticut, USA

10:30-10:55 Volume Rendering Verification Using Discretization Errors Analysis
Tiago Etiene Queiroz, New York University

11:00-11:25 Spline Operators for Subdivision and Differentiation
Hugh Cassidy, University of Connecticut, USA

11:30-11:55 Knot Theorems and Counterexamples for Splines
Thomas Peters, University of Connecticut, USA

12:00-12:25 The Case Against Interactivity in Geometric Design
Thomas A. Grandine, The Boeing Company, USA

Sponsored by SIAG/GD

Friday, July 13

MS101

Mathematical Models of Gels and Non-Newtonian Fluids

10:30 AM-12:00 PM

Room:Greenway F - Level 2

Gels are interactive mixtures of fluid and polymeric networks. As such, gels have mechanical features that come from viscous fluid and (visco-)elastic features that originate from the elastic polymer network. In this minisymposium, we shall address the rheology of gels touching upon surface effects as well as computational issues arising in numerical simulation of gel mechanics.

Organizer: Yoichiro Mori
University of Minnesota, USA

Organizer: Lingxing Yao
University of Minnesota, USA

10:30-10:55 Regularized Two-phase Models for Gels
Longhua Zhao, University of Minnesota, USA

11:00-11:25 Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids: A Possible Route to Elastic Turbulence?
Satish Kumar, University of Minnesota, USA

11:30-11:55 Title Not Available at Time of Publication
Thomas Pence, Michigan State University, USA

Friday, July 13

MS102

Matrices and Graphs - Part II of II

10:30 AM-12:30 PM

Room:Nicollet D2 - Level 1

For Part 1 see MS92

The relationship between matrices and graphs plays a vital role in both matrix theory and graph theory, and has applications to a variety of fields. This minisymposium will focus on recent results related to the interaction between matrices and graphs, including properties of matrices having a nonzero pattern described by a given graph, information about a graph provided by specific matrices associated with the graph, and applications.

Organizer: Leslie Hogben
Iowa State University, USA

10:30-10:55 A Colin de Verdiere-type Invariant and odd-K_4- and odd-K2_3-free Signed Graphs
Hein van der Holst, Georgia State University, USA

11:00-11:25 Minor Monotone Floors and Ceilings of Graph Parameters
Thomas Milligan, University of Central Oklahoma, USA

11:30-11:55 Spectrally Arbitrary Patterns over Finite Fields
Judith J. McDonald, Washington State University, USA

12:00-12:25 2-Matching Covered Loopy Graphs
Adam Berliner, St. Olaf College, USA; Richard A. Brualdi, University of Wisconsin, USA

Friday, July 13

MS103

Modeling and Computation of Multiscale Phenomena in Materials Science and Biology - Part I of II

10:30 AM-12:30 PM

Room:Greenway A - Level 2

For Part 2 see MS113

Many biological and materials science systems, such as network morphology in functionalized polymers-solvent mixtures, cancer growth, and fluid-gel interactions, possess complex multi-scale behavior. At a modeling level these effects arise from electrostatic interactions coupled to momentum and mass balances, complex nonlinear elasticity, or from higher-order diffusive effects. These systems exhibit complex behavior spanning multiple time and space scales. Developing models and the associated computational schemes requires a rich variational framework that admits adaptive discretizations. We present models and computational schemes for systems with complex coupling between components, with variational structure requiring specialized numerical techniques.

Organizer: Keith Promislow
Michigan State University, USA

Organizer: Brian R. Wetton
University of British Columbia, Canada

10:30-10:55 A General Framework for High Accuracy Solutions to Energy Gradient Flows from Material Science Models
Brian R. Wetton, University of British Columbia, Canada

11:00-11:25 Liquid Crystal Phase Transitions in Elastic Networks
Maria-Carme Calderer, University of Minnesota, USA; Chong Luo, Oxford University, United Kingdom

11:30-11:55 Dynamic Density Functional Theory (DDFT) Model for Freezing of a Pair Potential Fluid: The Effect of Fluid Flow
Arvind Baskaran, University of California, Irvine, USA; Aparna Baskaran, Brandeis University, USA; John Lowengrub, University of California, Irvine, USA

12:00-12:25 Energy Stable Scheme for Phase Field Models
Zhengfu Xu, Michigan Technological University, USA

Friday, July 13

MS104

Modeling of Rare Events - Part I of II

10:30 AM-12:30 PM

Room:Nicollet ABC - Level 1

For Part 2 see MS115

Dynamics of complex systems often involve thermally activated barrier-crossing events that allow the system to move between different basins of attractions on the energy surface. Such events are ubiquitous and important in physics, material sciences, chemistry and biology, but difficult to analyze and simulate using conventional techniques because of the rare probability of occurrence. Modeling and understanding of such rare events has been a subject of mathematical interest because of the possible critical applications. This mini-symposium will bring together experts from different areas to discuss the current status of this exciting field. Theoretical, algorithmic and application issues will all be addressed.

Organizer: Amit Samanta
Princeton University, USA

Organizer: Xiang Zhou
Brown University, USA

10:30-10:55 Some Interacting Particle Methods for Sampling Complex Energy Landscapes
Jonathan Weare, University of Chicago, USA

11:00-11:25 Failure of Random Materials: Asymptotic Analysis and Importance Sampling
Jingchen Liu, Columbia University, USA; Xiang Zhou, Brown University, USA

11:30-11:55 Sampling Transition States Using Gentlest Ascent Dynamics
Amit Samanta and Weinan E, Princeton University, USA

12:00-12:25 Nucleation Events in Soft Condensed Matter Using the String Method
Daniel Appelo, University of New Mexico, USA; Christina Ting and Zhen-Gang Wang, California Institute of Technology, USA

Friday, July 13

MS105

Programming Paradigms, Algorithms and Frameworks for High Performance Scalable Manycore Systems - Part III of III

10:30 AM-12:30 PM

Room:Greenway I - Level 2

For Part 2 see MS94

Manycore processors are available as both collections of homogeneous standard microprocessors and as attached heterogeneous co-processors. Application and library software developers are making progress analyzing how to effectively use clusters of such processors and some general approaches have emerged. It is widely recognized that careful design of software and data structures, with effective memory management and communication optimizations are the most critical issues for optimal performance on scalable manycore systems. In this series of minisymposia we discuss current experiences and development of applications, libraries and frameworks using a variety of hardware. Speakers will address performance results and software design.

Organizer: Serge G. Petiton
CNRS/LIFL and INRIA, France

Organizer: Michael A. Heroux
Sandia National Laboratories, USA

Organizer: Kengo Nakajima
University of Tokyo, Japan

10:30-10:55 ppOpen-HPC: Open Source Infrastructure for Development and Execution of Large-Scale Scientific Applications with Automatic Tuning
Kengo Nakajima, Masaki Satoh, Takashi Furumura, and Hiroshi Okuda, University of Tokyo, Japan; Takeshi Iwashita, Kyoto University, Japan; Hide Sakaguchi, Japan Agency for Marine-Earth Science and Technology, Japan

continued on next page

Friday, July 13

MS105

Programming Paradigms, Algorithms and Frameworks for High Performance Scalable Manycore Systems - Part III of III

continued

11:00-11:25 Promise Chaining for Automatic Kernel Fusion and Avoiding Data Movement on Accelerators
Mark Hoemmen, Sandia National Laboratories, USA

11:30-11:55 Parametric Steering for Autotuning Numerical Kernels and Scientific Codes in Multicore Environments
Leroy A. Drummond, Lawrence Berkeley National Laboratory, USA; Serge G. Petiton, CNRS/LIFL and INRIA, France; Christophe Calvin, Commissariat à l'Energie Atomique, France

12:00-12:25 Adaptation of ppOpen-AT To Numerical Kernels on Explicit Method
Takahiro Katagiri, Satoshi Itoh, and Satoshi Ohshima, University of Tokyo, Japan

Friday, July 13

MS106

Surface and Thin Film Evolution: Self-assembly, Instability, Pattern Formation

10:30 AM-12:30 PM

Room:Greenway C - Level 2

Thin film deposition underlies much of current nanotechnology and also fabrication techniques in microelectronics and related areas. However, there remain fundamental unresolved issues regarding the initial stages of thin film deposition (self-assembly and directed assembly of nanostructures), subsequent multilayer growth (kinetic roughening and strain-induced self-assembly of quantum dots), and post-deposition stability of nanostructures. The related phenomena involve several length and time scales. A rigorous foundation is typically lacking for connecting the discrete atomistic descriptions to semi-continuous "step dynamics" models to fully continuum PDEs for the surface morphological evolution. This symposium will showcase related advances in analysis and simulation.

Organizer: Jim W. Evans
Iowa State University, USA

Organizer: Dionisios Margetis
University of Maryland, College Park, USA

10:30-10:55 Self-assembly of Islands during the Initial Stages of Film Growth: Sizes and Spatial Arrangements
Jim W. Evans, Iowa State University, USA

11:00-11:25 Strain Dependence of Microscopic Parameters and its Effect on Ordering during Epitaxial Growth
Christian Ratsch, University of California, Los Angeles, USA

11:30-11:55 On the Dynamics of Crystal Facets in Materials Surface Relaxation
Dionisios Margetis and Kanna Nakamura, University of Maryland, College Park, USA

12:00-12:25 Kinetic Monte Carlo Simulation of Heteroepitaxial Growth: Wetting Layers, Quantum Dots, Capping, and NanoRings
Peter Smereka, University of Michigan, USA

Sponsored by SIAG/MS

Friday, July 13

MS107

Propagation, Scattering and Inverse Scattering of Optical Waves - Part I of II

10:30 AM-1:00 PM

Room:Greenway D - Level 2

For Part 2 see MS116
Propagation and Scattering of optical waves through inhomogeneous and random media, as well as the related inverse problem, have been posing great challenge to mathematical analysis and numerical simulation. More recently, optical response of nano scale structures, which involves multi-physical modelling and multi-scale computation, has received a great deal of attentions. Progress has been made on these subjects. The proposed minisymposium will get together researchers in the field and update the most recent results.

Organizer: Di Liu
Michigan State University, USA

10:30-10:55 Phase Retrieval for Diffractive Imaging
Chao Yang, Lawrence Berkeley National Laboratory, USA

11:00-11:25 Numerical Methods for the Complex Helmholtz Equation and Scattering from a Lossy Inclusion
Russell B. Richins, Michigan State University, USA

11:30-11:55 Resoance of 1D Phototic Crystal with Finite Extent
Junshan Lin and Fadil Santosa, University of Minnesota, USA

12:00-12:25 Numerical Solution of An Inverse Diffraction Grating Problem
Gang Bao, Michigan State University, USA; P*eijun Li*, Purdue University, USA; Haijun Wu, Nanjing Normal University, China

12:30-12:55 Mathematical Analysis in Quantifying Mechanical Properties for Nano-Materials
Xiang Xu, Michigan State University, USA

Friday, July 13

CP19

Fluids I

10:30 AM-11:50 PM

Room:Greenway G - Level 2

Chair: Mehdi Vahab, University of California, Davis, USA

10:30-10:45 A Front-Tracking Method For Moving Fronts And Hyperbolic Conservation Laws
Mehdi Vahab and Greg Miller, University of California, Davis, USA

10:50-11:05 Simulation of Parachute Inflation Using the Front Tracking Method
Joungdong Kim, Xiaolin Li, and Yan Li, State University of New York, Stony Brook, USA

11:10-11:25 Drops Settling in Sharp Stratification with and Without Marangoni Effects
Avi Shapiro and Francois Blanchette, University of California, Merced, USA

11:30-11:45 A Nitsche Method for a Stokes Interface Problem
Sara Zahedi, Uppsala University, Sweden; Peter Hansbo, Jönköping University, Sweden; Mats G. Larson, Umeå University, Sweden

Friday, July 13

CP20

Computational Science and Applications - II

10:30 AM-12:30 PM

Room:Greenway J - Level 2

Chair: Sergey Koltakov, Stanford University, USA

10:30-10:45 Optical Flow Computations for Solar Irradiance Prediction
Sergey Koltakov, Stanford University, USA; Matthew K. Williams and Shawn Kerrigan, Locus Energy, USA

10:50-11:05 Perceptual Grouping of Characters in Antarctica Maps
Ravishankar N. Chityala, University of Minnesota, USA; Sridevi Pudipeddi, South Central College, USA

11:10-11:25 A Multiobjective Mesh Optimization Framework for Mesh Quality Improvement and Mesh Untangling
Jibum Kim, Thap Panitanarak, and Suzanne M. Shontz, Pennsylvania State University, USA

11:30-11:45 Sparse Support Vector Machines for Classification on Grassmannians
Sofya Chepushtanova and Michael Kirby, Colorado State University, USA

11:50-12:05 Adaptive Outlier Pursuit in 1-Bit Compressive Sensing and Matrix Completion
Yi Yang, Ming Yan, and Stanley J. Osher, University of California, Los Angeles, USA

12:10-12:25 Gpu Accelerated Greedy Algorithms for Compressed Sensing
Jeffrey D. Blanchard, Grinnell College, USA; Jared Tanner, University of Edinburgh, United Kingdom

Lunch Break

12:30 PM-2:00 PM

Attendees on their own.

Friday, July 13

IP5

Linear Algebra Methods for Data Mining with Applications to Materials Science

2:00 PM-2:45 PM

Room:Nicollet ABC - Level 1

Chair: Michele Benzi, Emory University, USA

The field of data mining is the source of many new, interesting, and sometimes challenging, linear algebra problems. In fact, one can say that data mining and machine learning are now beginning to shape a “new chapter” in numerical linear algebra. We will illustrate the key concepts and discuss dimension reduction methods which play a major role in machine learning. The synergy between high-performance computing, efficient electronic structure algorithms, and data mining, may potentially lead to major discoveries in materials. We will report on our first experiments in `materials informatics’, a methodology which blends data mining and materials science.

Yousef Saad
University of Minnesota, USA

Friday, July 13

IP6

Multifidelity Modeling for Identification, Prediction and Optimization of Large-scale Complex Systems

2:45 PM-3:30 PM

Room:Nicollet ABC - Level 1

Chair: Fadil Santosa, University of Minnesota, USA

Often we have available several numerical models that describe a system of interest. These numerical models may vary in "fidelity" or "skill," encompassing different resolutions, different physics, and different modeling assumptions; they may also include surrogates such as reduced-order models. A multifidelity approach seeks to exploit optimally all available models and data. This talk discusses the key elements of multifidelity modeling: constructing reduced-order models, quantifying model uncertainties, selecting models with appropriate fidelity for the prediction/decision task at hand, and synthesizing multifidelity information. We show the benefit of multifidelity modeling for the tasks of prediction, design optimization, and uncertainty quantification.

Karen E. Willcox
Massachusetts Institute of Technology, USA

Sponsored by IMA

Coffee Break

3:30 PM-4:00 PM

Room:Exhibit Hall - Level 1

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).

Friday, July 13

MS108

Abrupt and Gradual Transitions in Paleoclimate: Observations and Conceptual Models

4:00 PM-6:00 PM

Room:Nicollet D3 - Level 1

Known rapid climatic changes include the effects of Milankovitch cycles and the Paleocene-Eocene Thermal Maximum event which demonstrates the role of CO2 in the global temperature increase. One example of a gradual change is the "transition problem" referring to the switch in frequency in climate oscillations occurring in the late Pleistocene. Questions include: What are the mechanisms for change? Are the changes reversible? Can one identify mechanisms for rapid or dramatic changes (tipping points)? Dynamical systems theory provides a natural framework to study such transitions. This minisymposium highlights the interface between scientific explanations and mathematical approaches to this topic.

Organizer: Esther Widiasih
University of Arizona, USA

4:00-4:25 Climate Tipping Points: Overview and Outlook
Mary Silber, Northwestern University, USA

4:30-4:55 Abrupt and Gradual Transitions from the Deep Past
Samantha Oestreicher, University of Minnesota, USA

5:00-5:25 A Dynamical Systems Perspective on Period Transitions in Glacial Cycles
Richard McGehee, University of Minnesota, USA

5:30-5:55 Climate Transitions in a Conceptual Model with Multiple Time Scales
Anna Barry, Boston University, USA

Friday, July 13

MS109

Algebraic and Combinatorial Aspects of Mathematical Biology - Part II of II

4:00 PM-6:00 PM

Room:Greenway H - Level 2

For Part 1 see MS85
Discrete structures play a fundamental role in mathematical biology, from DNA sequences to phylogenetic trees. Increasingly, methods from combinatorics and applied algebraic geometry are being used to address the challenges that arise in the analysis of these biological structures. This minisymposium will highlight recent advances in this area.

Organizer: Seth Sullivant
North Carolina State University, USA

4:00-4:25 WNT Signaling in Melanoma Cells
Reinhard Laubenbacher, Virginia Bioinformatics Institute, USA

4:30-4:55 A Differential Algebra Method for Finding Identifiable Parameter Combinations of Nonlinear ODE Models
Nicolette Meshkat, Santa Clara University, USA

5:00-5:25 Optimality of the Neighbor Joining Algorithm and Faces of the Balanced Minimum Evolution Polytope
David Haws, University of Kentucky, USA

5:30-5:55 Disentangling Phylogenetic Mixture Models
Seth Sullivant, North Carolina State University, USA

Sponsored by SIAG/AG

Friday, July 13

MS110

Automatic Differentation and Nonlinear Optimization

4:00 PM-6:00 PM

Room:Greenway C - Level 2

Derivative computation is crucial to nonlinear optimization algorithms, sensitivity analysis and uncertainty quantification. Automatic Differentiation (AD) is increasingly establishing itself as the technique of choice for derivative computation. This minisymposium will feature talks discussing recent developments in AD technology and showcase their use in numerical optimization.

Organizer: Assefaw H. Gebremedhin

Purdue University, USA

4:00-4:25 Exploiting Sparsity in Derivative Computation

Assefaw H. Gebremedhin, Purdue University, USA

4:30-4:55 Automating Sparse Gradient Computations in Optimization of Partially Separable Functions

Boyana Norris, Sri Hari K. Narayanan, and Todd Munson, Argonne National Laboratory, USA; Assefaw H. Gebremedhin, Purdue University, USA

5:00-5:25 An Efficient Overloaded Method for Computing Analytic Derivatives of Mathematical Functions in MATLAB

Michael Patterson, Matthew Weinstein, and *Anil Rao*, University of Florida, USA

5:30-5:55 Computing Higher-order Derivatives: Approaches, Tools and Uses

Jean Utke, Argonne National Laboratory, USA

Friday, July 13

MS111

Best Practices for Introducing Undergraduate Students to Computational and Interdisciplinary Research - Part II of II

4:00 PM-6:00 PM

Room:Nicollet D1 - Level 1

For Part 1 see MS98

This minisymposium brings together faculty who have experience guiding undergraduate students in research with a computational focus and an early introduction to collaborative research with scientists from application areas. Such research requires a large set of skills to get started being productive, from knowledge about computers to programming languages and post-processing tools. The speakers will share their experiences from guiding REU Sites, CSUMS programs, and similar on how to get students started, for instance, with boot camps, short courses, or other techniques, and discuss what research results could be obtained with this often limited background and how the results could be documented in publications.

Organizer: Matthias K. Gobbert

University of Maryland, Baltimore County, USA

Organizer: Nagaraj Neerchal

University of Maryland, Baltimore County, USA

4:00-4:25 Undergraduate CSE Programs in the U.S.

Peter R. Turner, Clarkson University, USA

4:30-4:55 Experiences in Running the STAGE Program

Nabendu Pal, University of Louisiana, Lafayette, USA

5:00-5:25 Weather, Uncertainty, Supercomputing, and Cancer: Research Experiences for Math Majors at Arizona State University

Eric J. Kostelich, Arizona State University, USA

5:30-5:55 Excel-lent Experiences: Computational Research Internships

Angela B. Shiflet, Wofford College, USA

Friday, July 13

MS112

Material Informatics: Data, Methodologies, and Applications

4:00 PM-6:00 PM

Room:Nicollet D2 - Level 1

Material informatics is concerned with the application of data analysis methods to materials science. Its main goal is to enhance classical methods by enabling accurate and fast discovery of materials and their properties. While a huge amount of data has been generated in the past, advanced methods to exploit such data is lagging behind. Recent initiatives by NSF, and the US government, hold promise that this will likely change. This mini-symposium will address the challenges in (1) materials data usage, generation, and databases; (2) incorporation of data mining tools into standard computational methods; (3) applications to knowledge discovery in materials.

Organizer: Da Gao

University of Minnesota, USA

Organizer: Yousef Saad

University of Minnesota, USA

Organizer: James R. Chelikowsky

University of Texas at Austin, USA

4:00-4:25 Informatics for the Materials Genome: a Minimalist Perspective

Krishna Rajan, Iowa State University, USA

4:30-4:55 Addressing the Materials Genome Initiative through the AFLOWLIB.ORG Consortium: Thermoelectric Properties of Sintered Compounds with High-throughput Ab-initio Calculations

Stefano Curtarolo, Duke University, USA

5:00-5:25 Data Mining Applications for Knowledge Discovery in Materials Science: Promises and Challenges

Da Gao and Yousef Saad, University of Minnesota, USA; James R. Chelikowsky, University of Texas at Austin, USA

5:30-5:55 USPEX: Evolutionary Crystal Structure Prediction as a Tool in Materials Design

Qiang Zhu, State University of New York, Stony Brook, USA

Friday, July 13

MS113

Modeling and Computation of Multiscale Phenomena in Materials Science and Biology - Part II of II

4:00 PM-6:00 PM

Room:Greenway A - Level 2

For Part 1 see MS103

Many biological and materials science systems, such as network morphology in functionalized polymers-solvent mixtures, cancer growth, and fluid-gel interactions, possess complex multi-scale behavior. At a modeling level these effects arise from electrostatic interactions coupled to momentum and mass balances, complex nonlinear elasticity, or from higher-order diffusive effects. These systems exhibit complex behavior spanning multiple time and space scales. Developing models and the associated computational schemes requires a rich variational framework that admits adaptive discretizations. We present models and computational schemes for systems with complex coupling between components, with variational structure requiring specialized numerical techniques.

Organizer: Keith Promislow
Michigan State University, USA

Organizer: Brian R. Wetton
University of British Columbia, Canada

4:00-4:25 Variational Multiscale Models for Biomolecular Systems
Guowei Wei, Michigan State University, USA

4:30-4:55 Using GPUs to Compute Solutions to the Functionalized Cahn-Hilliard Equation
Jaylan S. Jones, Andrew Christlieb, and Keith Promislow, Michigan State University, USA

5:00-5:25 Efficient Spectral-Galerkin Methods for High-order Equations and Systems of Coupled Elliptic Equations with Applications to Phase-field Models
Feng Chen and Jie Shen, Purdue University, USA

5:30-5:55 Computational Issues for Multi-physics, Multi-Phase Equations
Andrew Chrislieb and Keith Promislow, Michigan State University, USA

Friday, July 13

MS114

Modeling of Polyelectrolyte Gels in Biology and Bioengineering

4:00 PM-5:30 PM

Room:Greenway E - Level 2

Polyelectrolyte gels abound in nature, especially in physiological systems and in artificial biomedical device systems. A salient feature of polyelectrolyte gels is that they exhibit volume phase transitions responding to the ambient chemical or physical environment, a phenomenon of great practical use and theoretical interest. The minisymposium will feature both application-oriented and theoretical work that seek to capture the dynamics of polyelectrolyte gels with the goal of understanding and harnessing the unique features of polyelectrolyte gels.

Organizer: Yoichiro Mori
University of Minnesota, USA

Organizer: Lingxing Yao
University of Minnesota, USA

4:00-4:25 A Dynamic Model of Polyelectrolyte Gels
Yoichiro Mori, University of Minnesota, USA

4:30-4:55 Computations of Moving and Deforming Objects in Biological Flows
Lingxing Yao, University of Minnesota, USA; Aaron L. Fogelson, University of Utah, USA

5:00-5:25 Models with Increasing Complexity for Hydrogel/enzyme Feedback Oscillations
Ronald Siegel, University of Minnesota, USA

Friday, July 13

MS115

Modeling of Rare Events - Part II of II

4:00 PM-5:30 PM

Room:Nicollet ABC - Level 1

For Part 1 see MS104

Dynamics of complex systems often involve thermally activated barrier-crossing events that allow the system to move between different basins of attractions on the energy surface. Such events are ubiquitous and important in physics, material sciences, chemistry and biology, but difficult to analyze and simulate using conventional techniques because of the rare probability of occurrence. Modeling and understanding of such rare events has been a subject of mathematical interest because of the possible critical applications. This mini-symposium will bring together experts from different areas to discuss the current status of this exciting field. Theoretical, algorithmic and application issues will all be addressed.

Organizer: Amit Samanta
Princeton University, USA

Organizer: Xiang Zhou
Brown University, USA

4:00-4:25 Noise-induced Transitions of Barotropic Flow over Topography
Weiqing Ren, National University of Singapore, Singapore

4:30-4:55 Analysis of Parallel Replica Dynamics
Gideon Simpson and Mitchell Luskin, University of Minnesota, USA

5:00-5:25 Escape from An Attractor: Importance Sampling and Rest Point
Xiang Zhou, Paul Dupuis, and Konstantinos Spiliopoulos, Brown University, USA

Friday, July 13

MS116

Propagation, Scattering and Inverse Scattering of Optical Waves - Part II of II

4:00 PM-6:00 PM

Room:Greenway D - Level 2

For Part 1 see MS107

Propagation and Scattering of optical waves through inhomogeneous and random media, as well as the related inverse problem, have been posing great challenge to mathematical analysis and numerical simulation. More recently, optical response of nano scale structures, which involves multi-physical modelling and multi-scale computation, has received a great deal of attentions. Progress has been made on these subjects. The proposed minisymposium will get together researchers in the field and update the most recent results.

Organizer: Di Liu

Michigan State University, USA

4:00-4:25 Some Reconstruction Algorithms in Quantiative Photoacoustic Tomography

Kui Ren, University of Texas at Austin, USA

4:30-4:55 Scattering and Resonances of Thin High Contrast Dielectrics

Shari Moskow, Drexel University, USA

5:00-5:25 Multiscale Modeling and Model Computation for Scanning Near-Field Optical Microscopy

Songting Luo, Michigan State University, USA

5:30-5:55 The Adaptive Finite Element Simulations for the Electronic Structures

Guanghui Hu, Michigan State University, USA

Friday, July 13

MS117

Solvers for the Extreme Scale

4:00 PM-6:00 PM

Room:Greenway F - Level 2

Future high-concurrency HPC systems will be power-constrained and memory-poor. Energy efficiency and memory cost considerations for these extreme-scale computing systems will most likely lead to major changes in the modeling and simulations of multi-physics applications. In this minisymposium, we will articulate the need for a new approach in the designs of hardware, algorithms, and software. We will also explore several mathematical and computer science research areas in numerical algorithms that will respond to the challenges posed by the hardware, take advantage of the hardware capabilities and innovations, and maintain high productivity for science applications.

Organizer: Karen I. Pao

U.S. Department of Energy, USA

4:00-4:25 Linear Solvers at Extreme Scale: Challenges and Opportunities

Michael A. Heroux, Sandia National Laboratories, USA

4:30-4:55 A Heterogenous Scale-bridging Kinetic Solver for Emerging Architectures

Dana Knoll, C.N. Newman, H. Park, and R. Rauenzahn, Los Alamos National Laboratory, USA; L. Chacon and G. Chen, Oak Ridge National Laboratory, USA; W. Taitano, University of New Mexico, USA; Jeffrey A. Willert, North Carolina State University, USA

5:00-5:25 Liszt: A Domain Specific Language for Partial Differential Equations

Eric F. Darve, Zach Devito, Niels Joubert, and Pat Hanrahan, Stanford University, USA

5:30-5:55 Co-Design and You

Karen I. Pao, U.S. Department of Energy, USA

Friday, July 13

CP21

Fluids II

4:00 PM-5:40 PM

Room:Greenway G - Level 2

Chair: Prabir Daripa, Texas A&M University, USA

4:00-4:15 An Efficient Numerical Method for Solving Coupled Systems of Elliptic Interface and Hyperbolic Partial Differential Equations with Applications to Enhanced Oil Recovery

Liqun Wang and Prabir Daripa, Texas A&M University, USA

4:20-4:35 Universal Stability Properties for Multi-Layer Hele-Shaw Flows and Its Application to Instability Control

Prabir Daripa, Texas A&M University, USA

4:40-4:55 Effect of Permeability Anisotropy on Density-Driven Flow for CO_2 Sequestration in Saline Aquifers

Philip Cheng, Yale University, USA; Michael Bestehorn, Brandenburg University of Technology, Germany; Abbas Firoozabadi, Yale University, USA

5:00-5:15 Internal Gravity Waves and Their Generation

Paul A. Martin, Colorado School of Mines, USA; Stefan Llewellyn Smith, University of California, San Diego, USA

5:20-5:35 A Computational Framework for the Solution of Multi-Material Fluid-Structure Interaction Problems with Crack Propagation

Kevin Wang, Stanford University, USA

Friday, July 13

CP22

ODEs and Dynamical Systems

4:00 PM-5:00 PM

Room:Greenway B - Level 2

Chair: Benjamin Seibold, Temple University, USA

4:00-4:15 Connections Between Phantom Traffic Jams, Jamitons, and Congested Traffic Flow
Benjamin Seibold, Temple University, USA; Rodolfo Ruben Rosales, Massachusetts Institute of Technology, USA; Morris Flynn, University of Alberta, Canada; Aslan R. Kasimov, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Jean-Christophe Nave, McGill University, Canada

4:20-4:35 Mathematical Analysis of Chikungunya Model With Discrete Delays
Salisu M. Garba, University of Pretoria, South Africa

4:40-4:55 Supercritical And Subcritical Hopf Bifurcations On the Van Der Pol Nonlinear Differential Equation
Tarini K. Dutta, Gauhati University, India

Friday, July 13

CP23

PDEs

4:00 PM-6:00 PM

Room:Greenway I - Level 2

Chair: To Be Determined

4:00-4:15 Boundary Trace Inequalities
Giles Auchmuty, University of Houston, USA

4:20-4:35 Γ-Convergence of Inhomogeneous Functionals and Applications to Dielectric Breakdown
Marian Bocea, Loyola University Chicago, USA

4:40-4:55 Uniform Estimate for Non-Uniform Elliptic Equations with Discontinuous Coefficients
Li-Ming Yeh, National Chiao Tung University, Taiwan

5:00-5:15 Well-Posedness for Euler 2D in Non-Smooth Domains
Christophe Lacave and David Gerard-Varet, Universite Paris 7-Denis Diderot, France

5:20-5:35 Lattice Differential Equation Analysis of Schloegl's Second Model for Particle Creation and Annihilation
Chi-Jen Wang, Iowa State University, USA; Xiaofang Guo, Ames Laboratory, USA; Da-Jiang Liu, Iowa State University, USA; Jim W. Evans, Iowa State University, USA

5:40-5:55 Traveling Waves of an Angiogenesis Model
Zhian Wang, Hong Kong Polytechnic University, China