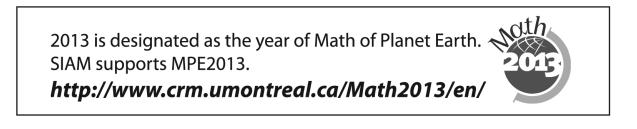
## **Final Program and Abstracts**



December 7-10, 2013 Hilton Orlando Lake Buena Vista Lake Buena Vista, Florida USA

Sponsored by the SIAM Activity Group on Analysis of Partial Differential Equations

The Activity Group on Analysis of Partial Differential Equations fosters activity in the analysis of partial differential equations (PDE) and enhances communication between analysts, computational scientists and the broad PDE community. Its goals are to provide a forum where theoretical and applied researchers in the area can meet, to be an intellectual home for researchers in the analysis of PDE, to increase conference activity in PDE, and to enhance connections between SIAM and the mathematics community.





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### Organizing Committee Co-Chairs

Suncica Canic University of Houston, USA

Keith Promislow Michigan State University, USA

### **Organizing Committee**

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Lenya Ryzhik Stanford University, USA

Michael Shearer North Carolina State University, USA

## **SIAM Registration Desk**

The SIAM registration desk is located in the Palm Foyer - Lobby Level. It is open during the following hours:

> **Friday, December 6** 5:00 PM – 7:00 PM

Saturday, December 7 7:00 AM – 5:30 PM

**Sunday, December 8** 7:30 AM – 2:30 PM

Monday, December 9 7:30 AM – 4:00 PM

**Tuesday, August 10** 7:30 AM – 3:30 PM

### Hotel Address

Hilton Orlando Lake Buena Vista 1751 Hotel Plaza Blvd. Lake Buena Vista, FL 32830 Phone Number: +1-407-827-4000 Toll Free Reservations: (USA and

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Hotel Website: http://www.hiltonorlandolakebuenavista. com

### Hotel Telephone Number

To reach an attendee or to leave a message, call +1-407-827-4000. The hotel operator can either connect you with the SIAM registration desk or to the attendee's room. Messages taken at the SIAM registration desk will be posted to the message board located in the registration area.

### Hotel Check-in and Check-out Times

Check-in time is 3:00 PM and check-out time is 11:00 AM.

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A Kid's Night Out can be reached at +1-407-828-0920. All About Kids can be reached at +1-407-812-9300.

Both companies have experience working in the hotel and come highly recommended.

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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.

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## **Funding Agencies**

SIAM and the conference organizing committee wish to extend their thanks and appreciation to the U.S. National Science Foundation and the U.S. Department of Energy for their support of this conference.





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If you are not a SIAM member and paid the Non-Member or Non-Member

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If you are a SIAM member, it only costs \$10 to join the SIAM Activity Group on the Analysis of Partial Differential Equations (SIAG/APDE). As a SIAG/ APDE member, you are eligible for an additional \$10 discount on this conference, so if you paid the SIAM member rate to attend the conference, you might be eligible for a free SIAG/ APDE membership. Check at the registration desk.

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

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## Standard Audio/Visual Set-Up in Meeting Rooms

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

The Plenary Session Room will have two (2) screens, one (1) data projector and one (1) overhead projector. Cables or adaptors for Apple computers are not supplied, as they vary for each model. Please bring your own cable/adaptor if using an Apple 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 an Apple computer. Overhead projectors will be provided only if requested.

If you have questions regarding availability of equipment in the meeting room of your presentation, or to request an overhead projector for your session, please see a SIAM staff member at the registration desk.

## **E-mail Access**

SIAM attendees booked within the SIAM room block will have complimentary wireless internet access in their guest rooms. Complimentary wireless internet access in the hotel lobby will also be available. Additionally, complimentary wireless internet access will be available in the conference meeting space. This service is being provided at no additional cost to attendees.

## **Registration Fee Includes**

- Admission to all technical sessions
- Business Meeting (open to SIAG/ APDE members)
- Coffee breaks daily
- Room set-ups and audio/visual equipment
- Welcome Reception

## Job Postings

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

## SIAM Books and Journals

Display copies of books and complimentary copies of journals are available on site. SIAM books are available at a discounted price during the conference. If a SIAM books representative is not available, completed order forms and payment (credit cards are preferred) may be taken to the SIAM registration desk. The books table will close at 1:30 PM on Tuesday, December 10.

## 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*)

### Get-togethers

• Welcome Reception Saturday, December 7

4:15 PM – 6:15 PM

Business Meeting (open to SIAG/APDE members)

Sunday, December 8

4:30 PM – 5:00 PM

Complimentary beer and wine will be served.



SIAM is not responsible for the safety and security of attendees' computers. Do not leave your laptop computers unattended. Please remember to turn off your cell phones, pagers, etc. during sessions.

## **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 this meeting is #SIAMPD13.

# SIAM Activity Group on Analysis of Partial Differential Equations (SIAG/APDE)

A GREAT WAY

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www.siam.org/activity/pde



#### **ACTIVITIES INCLUDE:**

- Special sessions at SIAM meetings
- Biennial conference
- SIAG/Analysis of Partial Differential Equations Prize
- SIAG APDE newsletter
- Website

#### **BENEFITS OF SIAG/DS MEMBERSHIP:**

- · Listing in the SIAG's online-only membership directory
- Additional \$10 discount on registration at the SIAM Conference on Analysis of Partial Differential Equations (excludes students)
- · Electronic communications about recent developments in your specialty
- Eligibility for candidacy for SIAG/APDE office
- Participation in the selection of SIAG/APDE officers

#### **ELIGIBILITY:**

Be a current SIAM member.

#### COST:

- \$10 per year
- Student members can join 2 activity groups for free!

#### 2013-14 SIAG/APDE OFFICERS

Chair: Edris Titi, Weizmann Institute of Science Vice Chair: Catherine Sulem, University of Toronto Program Director: Suncica Canic, University of Houston Secretary: Anna Mazzucato, Pennsylvania State University

#### TO JOIN:

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the analysis of partial differential equations. SIAM Conference on Analysis of Partial Differential Equations December 7-10, 2013 Hilton Orlando Lake Buena Vista

Lake Buena Vista, Florida USA

## Minitutorial

### MT1: Game Theoretical Methods in PDEs

#### Sunday, December 8

7:30 PM - 9:30 PM

#### Room: Palm Ballroom I - Lobby Level

Chair: Keith Promislow, Michigan State University, USA

The objective of these lectures is to give a brief self-contained introduction to how random tug-of-war games are applied to gain new proofs and insights in the theory of nonlinear partial differential equations. We first revisit the classical linear case, where an interplay between harmonic functions and martingales is based on a common cancellation property, expressed via the mean value property. We then pass to the nonlinear case and explain the connection between tug-of-war games and the, so called, infinity harmonic functions as established by Peres, Schramm, Sheffield and Wilson in 2009, followed by the case of p-harmonic functions due to Peres and Sheffield and furthered by Manfredi, Parviainen and Rossi in 2011. We shall see how solutions to these and certain other well-known Pdes can be interpreted as values of a game, in the limit when the distance that the token is allowed to be 'tugged' by players in their preferred directions at each turn of the game, decreases to zero. This observation allows replacing some classical techniques in the study of nonlinear Pdes by relying instead on suitable choices of strategies for the competing players. Such approach has also inspired further studies in different directions, e.g. asymptotic mean value properties, a new proof of Harnack's inequality for p-harmonic functions, connections with the optimal Lipschitz extension problem, control theory and economic modeling.

Organizer and Speaker: Marta Lewicka University of Pittsburgh, USA

## MT2: Kinetic Descriptions of Multiscale Phenomena in Collective Dynamics

#### Monday, December 9

#### 7:30 PM - 9:30 PM

Room: Palm Ballroom I - Lobby Level

#### Chair: Doren Levy, University of Maryland, USA

We begin our discussion with a series of prototype models for self-propelled collective dynamics encountered in human and mobile networks and in biological organisms, such as opinion dynamics, flocking, swarming, and bacterial self-organization driven by chemotaxis and phototaxis. The dynamics of such systems is governed solely by interactions among individuals or "agents', with the tendency to adjust to their environmental averages through finite repulsion, alignment and attraction. This, in turn, leads to the emergence of clusters, such as colonies of bacteria, flocks of birds, parties of people, etc. Natural questions which arise in this context are to understand when and how clusters emerge and what type of "rules of engagement" influence the formation of such clusters. Of particular interest to us are cases in which the self-organized behavior tends to concentrate into one cluster, reflecting a consensus of opinions or concentration of other positions intrinsic to the dynamics. Kinetic descriptions provide a particularly effective framework for studying the emergence of such macroscopic clusters. We will give a concise overview on the passage from agent-based models to a mean-field limit, and show how the overall methodology carries over to a kinetic description and thereby can be cast into hydrodynamic equations. Questions which arise in this context include pattern formation, their phase transition, equilibrium and its (meta-)stability.

Organizer and Speaker: Eitan Tadmor University of Maryland, USA

## **Invited Plenary Speakers**

\*\* All Invited Plenary Presentations will take place in Palm Ballroom 1 - Lobby Level.\*\*

## Saturday, December 7 8:00 AM – 8:45 AM

IP1 Coupling Between Internal and Surface Waves in a Two-layers Fluid Catherine Sulem, University of Toronto, Canada

### 8:45 AM - 9:30 AM

IP2 Partial Regularity for Monge-Ampère Type Equations Alessio Figalli, University of Texas at Austin, USA

## Sunday, December 8

## 8:00 AM - 8:45 AM

IP3 Waves in Honeycomb Structures Michael I. Weinstein, Columbia University, USA

### 8:45 AM - 9:30 AM

IP4 Granular Experiments of Discrete Nonlinear Systems Chiara Daraio, California Institute of Technology, USA

## **Invited Plenary Speakers**

### Monday, December 9

8:00 AM - 8:45 AM

**IP5** Tug-of-war and Infinity Laplacian with Neumann Boundary Conditions **Yuval Peres**, *Microsoft Research, USA* 

## 8:45 AM - 9:30 AM

IP6 Models for Neural Networks; Analysis, Simulations and Qualitative Behavior Benoit Perthame, Université Pierre et Marie Curie - Paris VI, France

Tuesday, December 10

## 8:15 AM - 9:00 AM

IP7 A PDE Approach to Computing Viscosity Solutions of the Monge-Kantorovich Problem Jean-David Benamou, INRIA Rocquencourt, France

## 1:30 PM - 2:15 PM

**IP8** Modelling Collective Cell Motion in Biology **Philip K. Maini**, University of Oxford, United Kingdom

## **Prize Lecture**

\*\* Prize Lecture will take place in Palm Ballroom I - Lobby Level \*\*

The SIAG/Analysis of Partial Differential Equations Prize Lecture

Monday, December 9 2:00 PM – 2:45 PM

### SP1 Weak Solutions of the Euler Equations: Non-Uniqueness and Dissipation László Székelyhidi, Jr., Universität Leipzig, Germany and Camillo De Lellis, University of Zurich, Switzerland

There are two aspects of weak solutions of the incompressible Euler equations which are strikingly different to the behaviour of classical solutions. Weak solutions are not unique in general and do not have to conserve the energy. Although the relationship between these two aspects is not clear, both seem to be in vague analogy with Gromov's h-principle. In the talk I will explore this analogy in light of recent results concerning both the non-uniqueness, the search for selection criteria, as well as the dissipation anomaly and the conjecture of Onsager.



## Simulation, Optimization, and Identification in Solid Mechanics

## August 4-August 15, 2014 *Linz, Austria*



The fifth Gene Golub SIAM Summer School, with a focus on solid mechanics, will take place in the Johann Radon Institute for Computational and Applied Mathematics (RICAM), located at the Johannes Kepler University Linz, Austria.

This summer school will foster advanced knowledge for the participating graduate students in several areas related to simulated materials in solid mechanics. Within this broad field the summer school will concentrate on four key issues, namely

- 1. Identification of material parameters from measurements
- 2. Material- and topology-optimization

3. Optimization subject to variational inequalities

4. Adaptive discretization

The first two topics will provide a platform for in-depth discussions on the relation of the areas of identification and optimization. The third topic will augment the first two, by providing insight into the behavior of those problems for which variational inequalities are required for the modeling of the materials. Finally, the summer school will look at adaptive discretization of optimization problems for the purpose of reducing the computational costs involved in the solution of the problems encountered in the first three key topics.

#### The primary lecturers for these courses will be:

- Roland Herzog, TU Chemnitz, Germany
- Esther Klann, JKU Linz, Austria
- Michael Stingl, FAU Erlangen-Nürnberg, Germany
- Winnifried Wollner, University of Hamburg, Germany

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

Graduate students in applied and computational mathematics and related fields are encouraged to apply.

#### Application deadline: February 1, 2014

For more detail on the courses and on how to apply, go to: <u>http://www.math.uni-hamburg.de/g2s3</u>

## www.siam.org/students/g2s3/

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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## **Program and Abstracts**

SIAM Conference on Analysis of Partial Differential Equations

December 7-10, 2013 Hilton Orlando Lake Buena Vista Lake Buena Vista, Florida USA

## Friday, December 6

Registration 5:00 PM-7:00 PM Room:Palm Foyer - Lobby Level

## Saturday, December 7

Registration 7:00 AM-5:30 PM Room:Palm Foyer - Lobby Level

## Welcome Announcements

7:45 AM-8:00 AM Room:Palm Ballroom I - Lobby Level Saturday, December 7

## IP1

## Coupling Between Internal and Surface Waves in a Two-layers Fluid

8:00 AM-8:45 AM

Room:Palm Ballroom I - Lobby Level Chair: Rustum Choksi, McGill University, Canada

Internal waves occur within a fluid that is stratifed by temperature or salinity variation. They are commonlygenerated in the oceans. They have the form of large-amplitude, long-wavelength nonlinear waves that propagate over large distances. In some physically realistic situations, internal waves give rise to characteristic features on the surface, a signature of their presence, in the form of narrow bands of rough water, sometimes referred to as a 'rip', which propagates at the same velocity as the internal wave, followed after its passage, by the complete calmness of the sea, the 'mill pond' effect. Our starting point is the two or three-dimensional Euler equations for an incompress-ible, irrotational fluid composed of two immiscible layers of different densities. We propose an asymptotic analysis in a scaling regime chosen to capture the observations described above. The analysis of the asymptotic model shows that the rip region of the free surface is generated by the resonant coupling between an internal soliton and the free-surface wave modes while the mill pond effect is the result of a dominant reflection coeffcient for free-surface waves in a frame of reference moving with the internal soliton

Catherine Sulem University of Toronto, Canada

## IP2 Partial Regularity for Monge-Ampère Type Equations

8:45 AM-9:30 AM

Room:Palm Ballroom I - Lobby Level Chair: Suncica Canic, University of Houston, USA

Monge-Ampère type equations arise in several problems from analysis and geometry, and understanding their regularity is an important question. In particular, this kind of equations arises in the regularity theory of optimal transport maps. In the 90's Caffarelli developed a regularity theory on  $R^n$  for the classical Monge-Ampère equation, which was then extended by Ma-Trudinger-Wang and Loeper to a more general class of equations which satisfy a suitable structural condition. Unfortunately, this condition is very restrictive and it is satisfied only in very particular cases. Hence the need to develop a partial regularity theory: is it true that solutions are always smooth outside a "small" singular set? The aim of this talk is first to review the "classical" regularity theory, and then to describe some recent results about partial regularity.

Alessio Figalli University of Texas at Austin, USA

## Coffee Break

9:30 AM-10:00 AM



Room:Palm Ballroom II - Lobby Level

Saturday, December 7

## MS1

### Modeling, Analysis and Control of Fluid / Flow-Structure Interactions -Part I of V

10:00 AM-12:00 PM

#### Room:Palm Ballroom I - Lobby Level

For Part 2 see MS13 This is the first part of the minisymposium on PDE systems describing fluids/flows interacting with other types of dynamics, e.g. plates or elasticity (with fixed or moving interfaces). Questions on modeling, well-posedness, control, stability, optimization and numerical simulations of such coupled systems will be of primary interest. The session participants will have research interests and expertise in the Navier-Stokes and wave equations, mathematical control and numerical analysis of PDE dynamics (particularly those of hyperbolic or "composite" characteristics), and in modeling of complex physical processes.

Organizer: Lorena Bociu North Carolina State University, USA Organizer: Irena M. Lasiecka

University of Virginia, USA

Organizer: Daniel Toundykov University of Nebraska-Lincoln, USA

Organizer: Justin Webster Oregon State University, USA

10:00-10:25 Concerning the Rational Decay of Certain Fluid-Structure PDE Models

George Avalos, University of Nebraska, Lincoln, USA

#### 10:30-10:55 Flutter of a Cantilever Beam in Low Speed Axial Air Flow:Theory and Experi Ment

A.V. Balakrishnan, University of California, Los Angeles, USA

## 11:00-11:25 Fluid-Structure Interaction with Multiple Structural Layers

Suncica Canic, University of Houston, USA; Boris Muha, University of Zagreb, Croatia; Martina Bukac, University of Pittsburgh, USA

#### 11:30-11:55 On a Free Boundary Fluid-Elasticity Interaction

Lorena Bociu, North Carolina State University, USA

## Saturday, December 7

## MS2

### Deterministic and Stochastic Methods in Fluid Mechanics -Part I of II

10:00 AM-12:00 PM

Room:Palm Ballroom III - Lobby Level For Part 2 see MS14

Fluid dynamics is a rich field of classical and modern scientific investigation due to important applications in engineering and meteorology and because of certain fundamental open questions of mathematical and physical nature. It is natural to introduce stochastic evolution equations to model physical systems whenever relevant sources of noise, instability and perturbations are present, for example, in modeling of complex ocean-atmospheric phenomena. We aim to bring together researchers, some of which uses probabilistic and others deterministic methods, working on nonlinear PDEs with application to fluids, having a common goal of understanding the behavior of turbulent flows and their coherent structures.

Organizer: Hakima Bessaih University of Wyoming, USA

Organizer: Evelyn Lunasin University of Michigan, USA

Organizer: Anna L. Mazzucato Pennsylvania State University, USA

10:00-10:25 Optimal Stirring and Maximal Mixing

Charles R. Doering, University of Michigan, Ann Arbor, USA

#### 10:30-10:55 The Stochastic Navier-Stokes Equation and the Statistical Theory of Turbulence

*Bjorn Birnir*, University of California, Santa Barbara, USA

#### 11:00-11:25 Ergodic Control for Stochastic Navier-Stokes Equations

*P. Sundar*, Louisiana State University, USA; S.S. Sritharan, Naval Postgraduate School, USA

continued on next page

## MS2

Deterministic and Stochastic Methods in Fluid Mechanics - Part I of II continued

#### 11:30-11:55 Determining Form for the 2D Navier-Stokes Equations Via Feedback Control.

Ciprian Foias, Texas A&M University, USA; *Michael S. Jolly*, Indiana University, USA; Rostyslav Kravchenko, University of Chicago, USA; Edriss S. Titi, University of California, Irvine, USA and Weizmann Institute of Science, Israel Saturday, December 7

## MS3

### Dynamics of Multidimensional Coherent Structures - Part I of III 10:00 AM-12:00 PM

Room: Palm Ballroom IV - Lobby Level

#### For Part 2 see MS15

Coherent structures play an organizing role in the dynamics of many dissipative and dispersive PDEs, posed on large or unbounded domains. This minisymposium will feature contributions that investigate intrinsically multi-dimensional aspects of the dynamics of coherent structures, including their existence, stability, instability, slow evolution, and interaction. Examples include interfaces between patterned and un-patterned state, point defects or vortices, and line defects. We expect to bring together researchers with a variety of backgrounds, employing a variety of techniques, such as diffusive and dispersive stability estimates, energy methods from the calculus of variations, or spatial dynamics and bifurcation methods.

Organizer: Keith Promislow Michigan State University, USA

Organizer: Scheel Arnd University of Minnesota, USA

10:00-10:25 The Stability of Periodic Patterns of Localized Spots for Reaction-Diffusion Systems in  $R^2$ 

Michael Ward, University of British Columbia, Canada; David Iron and John Rumsey, Dalhousie University, Canada; Juncheng Wei, Chinese University of Hong Kong, Hong Kong

## 10:30-10:55 Rigorous Computation of Connecting Orbits

Jan Bouwe Van Den Berg, VU University, Amsterdam, Netherlands; Jean-Philippe Lessard, Université Laval, Canada

11:00-11:25 Spectral Stability for Transition Fronts in Multidimensional Cahn-Hilliard Systems

Peter Howard, Texas A&M University, USA

11:30-11:55 Morphological Competition in Amphiphilic Systems *Keith Promislow*, Michigan State University, USA

## Saturday, December 7

## MS4

## High Order Numerical Methods for Hyperbolic and Kinetic Equations -Part I of IV

10:00 AM-12:00 PM

Room:Palm Ballroom V - Lobby Level

#### For Part 2 see MS16

This minisymposium is to address the recent advances in algorithm design, analysis, application and implementations of high order numerical methods (e.g. discontinuous Galerkin method, finite difference/volume weighted essentially non-oscillatory method, high order time integrators) for solving hyperbolic and kinetic equations.

Organizer: Yingda Cheng Michigan State University, USA

Organizer: Jingmei Qiu University of Houston, USA

#### 10:00-10:25 A New Discontinuous Galerkin Finite Element Method for Directly Solving the Hamilton-Jacobi Equations

*Yingda Cheng* and Zixuan Wang, Michigan State University, USA

#### 10:30-10:55 Higher order O(N) schemes for hyperbolic problems using successive convolution

Matthew F. Causley and Andrew J. Christlieb, Michigan State University, USA

#### 11:00-11:25 Optimal energy conserving local discontinuous Galerkin methods for second-order wave equation in heterogeneous media

Ching-Shan Chou, The Ohio State University, USA; Yulong Xing, University of Tennessee and Oak Ridge National Laboratory, USA; Chi-Wang Shu, Brown University, USA

11:30-11:55 Tba - Christlieb Andrew J. Christlieb, Michigan State University, USA

## MS5 Reaction-diffusion

## Equations and Applications

10:00 AM-12:00 PM

Room:Camelia/Dogwood - Mezzanine Level

In this session, elliptic and parabolic equations and systems with applications in Mathematical Biology and Fluid Mechanics will be studied. In particular, recent results in global dynamics in Age-Structured Cholera Model, Multiple Solutions to an Elliptic Problem Related to Vortex Pairs, Traveling Fronts and Free-Boundary problems will be reported.

Organizer: Yuanwei Qi University of Central Florida, USA

#### 10:00-10:25 Multiple Solutions to An Elliptic Problem Related to Vortex Pairs

Yi Li, Wright State University, USA

#### 10:30-10:55 Global Dynamical Analysis of An Age-Structured Cholera Model

Zhisheng Shuai, University of Central Florida, USA

#### 11:00-11:25 Front Propagation in Isothermal Diffsuion Systems

Yuanwei Qi, University of Central Florida, USA

#### 11:30-11:55 A Nonlinear Problem from the Flow Between Two Counter-Rotating Disks

Weiqing Xie, California Polytechnic State University, Pomona, USA

### Saturday, December 7

## MS6 Advances in Analysis of PDEs from Image Processing

10:00 AM-12:00 PM

#### Room:Narcissus/Orange Blossom Blossom - Mezzanine Level

PDE based image processing is now a well-established area. Starting with the works of Perona and Malik and to the total variation PDE of Rudin, Osher, Fatemi (ROF model), geometric PDE based schemes have been widely used in variety of image processing tasks. Analysis of the nonlinear PDEs involved is interesting on its own and has been the subject of study in recent years in the mathematical community. This minisymposium talks will be based on recent advances made in the analysis of such PDEs. The aim is to update the status of state of the art and to provide an overview of analysis done for PDE based schemes.

Organizer: Surya Prasath University of Missouri, Columbia, USA

Organizer: Dmitry A. Vorotnikov Universidade de Coimbra, Portugal

Organizer: Kannappan Palaniappan

University of Missouri, Columbia, USA

#### 10:00-10:25 A Forward-backward Regularization of the Perona-Malik Equation

Patrick Guidotti, University of California, Irvine, USA

## 10:30-10:55 Denoising an Image by Denoising its Curvature Image

*Stacey Levine*, Duquesne University, USA; Marcelo Bertalmio, Universitat Pompeu Fabra

#### 11:00-11:25 Numerical Implementation of a New Class of Forward-backwardforward Diffusion Equations for Image Restoration

James V. Lambers, University of Southern Mississippi, USA; Patrick Guidotti, University of California, Irvine, USA; Yunho Kim, Yale University, USA

11:30-11:55 The Influence of Pde Based Image Processing in Analysis: Modern Developments

Surya Prasath, University of Missouri, Columbia, USA

## Saturday, December 7

## MS7

### Recent Advances in Nonlinear Dispersive Partial Differential Equations -Part I of II

10:00 AM-12:00 PM

Room:Fuschia/Gardenia - Mezzanine Level

### For Part 2 see MS19

Nonlinear dispersive partial differential equations appear in many fields, including fluid mechanics, plasma physics and optics, where they can characterize wave phenomenon such as solitons, wave collapse and turbulence. Nonlinear dispersive wave equations provide a variety of challenges, ranging from well-posedness to numerical methods. This session will survey recent advances in nonlinear dispersive wave equations, including nonlinear Schroödiner type equations and water wave equations.

Organizer: Gideon Simpson University of Minnesota, USA

Organizer: Catherine Sulem University of Toronto, Canada

#### 10:00-10:25 Well-Posedness Results for a Derivative Nonlinear Schrödinger Equation

*Gideon Simpson*, University of Minnesota, USA

#### 10:30-10:55 Low Regularity Wellposedness for the 2D Maxwell-Klein-Gordon Equation

Magda Czubak, Binghamton University, USA

11:00-11:25 Overturning Traveling Waves in Interfacial Fluid Dynamics David Ambrose, Drexel University, USA

#### 11:30-11:55 The Discrete Schrödinger Equation on Triangular Lattices

Vita Borovyk and *Michael Goldberg*, University of Cincinnati, USA

## MS8

## Analysis of Navier-Stokes Equations and Related Fluid Models - Part I of III

10:00 AM-12:00 PM

Room:Kahili/Lily - Mezzanine Level

#### For Part 2 see MS20

The incompressible Navier-Stokes (NS) and Euler equations are the fundamental equations governing the motion of fluids. They appear, either alone or coupled with other equations, in the study of many phenomena in aerodynamics, geophysics, meteorology, plasma physics, etc. Despite all the important work done on these equations, our mathematical understanding of them is still incomplete. This minisymposium will bring together researchers at all career stages to share their recent results on various deterministic and stochastic fluid models. It will focus on (but not restricted to) issues regarding analyticity in space and time, well-posedness, spectral analysis, boundary layers and vortex stretching.

Organizer: Aseel Farhat Indiana University Bloomington, USA

Organizer: Michael S. Jolly Indiana University, USA

#### 10:00-10:25 Global Well-Posedness of Boussinesq Equations

Chongsheng Cao, Florida International University, USA

#### 10:30-10:55 Vortex Stretching and Sub-Criticality for the 3D Navier-Stokes Equations

Zoran Grujic, University of Virginia, USA

#### 11:00-11:25 The Navier-Stokes-Voight Model for Image Inpainting

Moe Ebrahimi and Michael Holst, University of California, San Diego, USA; *Evelyn Lunasin*, US Naval Academy, USA

11:30-11:55 On the Navier-Stokes Limit of the Navier-Stokes-Voigt Equations

Michele Coti Zelati, Indiana University Bloomington, USA Saturday, December 7

## MS9

### Asymptotically Preserving Numerical Methods for Time-Dependent PDEs -Part I of II

10:00 AM-12:00 PM

### Room: Hibiscus - Mezzanine Level

#### For Part 2 see MS21

Many physical systems contain small parameters such as Mach number, mean free path, relaxing time. These parameters represent small-scale behaviors and impose stiffness in numerical simulation while requiring high resolutions. The use of standard numerical schemes for such problems requires very fine grids, which may be computationally unaffordable. Asymptotic preserving schemes are highly efficient and accurate for all ranges of the parameters. The main feature of these schemes is that they permit a parameter-independent resolution of the stiff problem and vield a consistent discretization of the corresponding limit problem (as the parameters tends to zero) with no excessive computational effort.

Organizer: Alina Chertock North Carolina State University, USA

Organizer: Alexander Kurganov *Tulane University, USA* 

Organizer: Jian-guo Liu Duke University, USA

10:00-10:25 Asymptotically Preserving Scheme for Some Kinetic and Fluids Equation with Multi-Scale Behaviors *Jian-guo Liu*, Duke University, USA

#### 10:30-10:55 High Order Semi-Implicit Runge-Kutta Finite Difference Methods and Application to Non-Linear Parabolic Relaxation Problems *Giovanni Russo* and Sebastiano

Boscarino, University of Catania, Italy

11:00-11:25 The Unified Gas Kinetic Scheme of K. Xu Applied to Linear Transport in Diffusion Regimes *Luc Mieussens*, Universite de Bordeaux I, France

11:30-11:55 On the Efficiency of Asymptotic Preserving Schemes Jochen Schütz, RWTH Aachen University, Germany

### Saturday, December 7

## MS10 Topics in Reaction-Diffusion Systems - Part I of II

10:00 AM-12:00 PM

Room: Iris - Mezzanine Level

#### For Part 2 see MS22

Reaction-diffusion systems play an important role in description and quantitative analysis of wide variety of phenomena arising in physics, chemistry, biology and other disciplines. The theory of such systems is far from being complete. The minisymposium will address new results in analysis of reaction-diffusion systems. Specifically, regularity, existence and qualitative properties of ground states, singular limits, propagation and threshold phenomena, regimes with blow up, existence, multiplicity and stability of traveling fronts. The minisymposium aims to bring together researchers in the area of reaction-diffusion systems to present new results and exchange new ideas in the field.

Organizer: Peter Gordon University of Akron, USA

10:00-10:25 Traveling Waves in Coupled Reaction-Diffusion Models with Degenerate Source Terms Jonathan J. Wylie, City University of

Hong Kong, Hong Kong

10:30-10:55 Coherent Structures in a Model for Mussel-Algae Interaction Vahagn Manukian, Miami University, USA

#### 11:00-11:25 Threshold Phenomena for Symmetric Decreasing Solutions of Reaction-Diffusion Equations

*Cyrill B. Muratov*, New Jersey Institute of Technology, USA

11:30-11:55 Wave Fronts in a Model for Gasless Combustion with Heat Loss Anna Ghazaryan, Miami University, USA

## MS11

### Dynamics of Nonlinear Dispersive Wave Equations -Part I of III

10:00 AM-12:00 PM

Room:Magnolia - Mezzanine Level

#### For Part 2 see MS23

We consider global-in-time asymptotic behavior, dynamics of solitary waves and asymptotic analysis of blow-up solutions, for a number of physically important nonlinear dispersive equations. These include the nonlinear Schroedinger equation (NLS), Korteweg-de Vries equation, Schrödinger maps, Navier-Stokes equation, nonlinear wave equation, and the Zakharov system. Major progress has been made in these problems in the last few decades by applying harmonic analysis techniques. In addition, we discuss the Klainerman-Machedon approach to quantum meanfield convergence problems.

Organizer: Justin Holmer Brown University, USA

Organizer: Nikolaos Tzirakis University of Illinois at Urbana-Champaign, USA

#### 10:00-10:25 Talbot Effect for the Cubic Nonlinear Schrödinger Equation on the Torus

Nikolaos Tzirakis, University of Illinois at Urbana-Champaign, USA

#### **10:30-10:55 A New Approach to Soliton Stability for the KdV Equation** Brian Pigott and *Sarah Raynor*, Wake

Forest University, USA

#### 11:00-11:25 Relaxation of Exterior Wave Maps to Harmonic Maps

Andrew Lawrie, University of California, Berkeley, USA

#### 11:30-11:55 Dispersive Estimates for Schrödinger Operators in Dimension Two

Burak Erdogan, University of Illinois at Urbana-Champaign, USA; William Green, Rose-Hulman Institute of Technology, Israel

### Saturday, December 7

# MS12

### Recent Developments in Geometric Partial Differential Equations -Part I of II

10:00 AM-12:00 PM

#### Room:Begonia - Mezzanine Level

#### For Part 2 see MS24

For the past decades, Geometric PDEs (Partial Differential Equations) have been a topic of high interest for mathematicians working in different fields within the analysis of PDEs. Our goal for this SIAM meeting is to bring together mathematicians working on different topics and present recent advances and connections between optimal transportation, free boundaries, regularity theory, homogenization, Hamilton Jacobi equations, numerical analysis and modern applications in computer science

Organizer: Betul Orcan-Ekmekci *Rice University, USA* 

Organizer: Adina Ciomaga University of Chicago, USA

10:00-10:25 A Geometric Approach for Mean Curvature Motion in 2D

Adina Ciomaga, University of Chicago, USA

#### 10:30-10:55 The Thin One Phase-Problem

Daniela De Silva, Columbia University, USA

#### 11:00-11:25 Numerical Methods for Geometric Elliptic Partial Differential Equations

Adam Oberman, Simon Fraser University, Canada

#### 11:30-11:55 On Congested Crowd Motion

Inwon Kim, University of California, Los Angeles, USA; Yao Yao, University of Wisconsin, USA; Damon Alexander, University of California, Los Angeles, USA

### Saturday, December 7

## **CP1** Fluid Dynamics and Thin Films

10:00 AM-11:20 AM

Room:Azalea - Mezzanine Level

Chair: Sebastian Jachalski, Weierstrass Institute, Germany

#### 10:00-10:15 Weak Solutions to Lubrication Systems Describing the Evolution of Bilayer Thin Films

Sebastian Jachalski, Weierstrass Institute, Germany; Georgy Kitavtsev, Max Planck Institute for Mathematics in the Sciences, Germany; Roman Taranets, National Academy of Science, Ukraine

#### 10:20-10:35 Stability Analysis of Thin Film Problems with Non-Constant Base States

Dziwnik Marion and Maciek Korzec, Technische Universität Berlin, Germany; Andreas Muench, University of Oxford, United Kingdom; Barbara Wagner, Technische Universität Berlin, Germany

#### 10:40-10:55 A New Mixed Formulation For a Sharp Interface Model of Stokes Flow and Moving Contact Lines

Shawn Walker, Louisiana State University, USA

11:00-11:15 A Comparison Analysis of q-Homotopy Analysis Method (q-HAM) and Variational Iteration Method (VIM) to Fingero Imbibition Phenomena in Double Phase Flow through Porous Media

*Olaniyi S. Iyiola*, King Fahd University of Petroleum and Minerals, Saudi Arabia

## Lunch Break

12:00 PM-2:00 PM

Attendees on their own

## **MS13**

### Modeling, Analysis and Control of Fluid / Flow-Structure Interactions -Part II of V

2:00 PM-4:00 PM

Room:Palm Ballroom I - Lobby Level

#### For Part 1 see MS1 For Part 3 see MS25

This is the second part of the minisymposium on PDE systems describing fluids/flows interacting with other types of dynamics, e.g. plates or elasticity (with fixed or moving interfaces). Questions on modeling, wellposedness, control, stability, optimization and numerical simulations of such coupled systems will be of primary interest. The session participants will have research interests and expertise in the Navier-Stokes and wave equations. mathematical control and numerical analysis of PDE dynamics (particularly those of hyperbolic or ``composite" characteristics), and in modeling of complex physical processes.

Organizer: Lorena Bociu North Carolina State University, USA

Organizer: Irena M. Lasiecka University of Virginia, USA

Organizer: Daniel Toundykov University of Nebraska-Lincoln, USA

Organizer: Justin Webster Oregon State University, USA

#### 2:00-2:25 Gevrey Regularity of Strongly Damped Wave Equations with Hyperbolic Dynamic Boundary Conditions

Jameson Graber, INRIA, France; Irena M. Lasiecka, University of Virginia, USA

continued in next column

#### 2:30-2:55 Analysis of the Ericksen-Leslie System for Liquid Crystals Matthias Hieber, TU Darmstadt,

#### Germany

#### 3:00-3:25 Feedback Stabilization of Boussinesq Equations and Numerical Simulations

*Weiwei Hu*, University of Southern California, USA

#### 3:30-3:55 Well-Posedness and Small Data Global Existence for An Interface Damped Free Boundary Fluid-Structure Model

*Mihaela Ignatova*, Stanford University, USA; Igor Kukavica, University of Southern California, USA; Irena Lasiecka, University of Virginia, USA; Amjad Tuffaha, The Petroleum Institute of Abu Dhabi, United Arab Emirates

#### Saturday, December 7

## **MS14**

### Deterministic and Stochastic Methods in Fluid Mechanics - Part II of II

2:00 PM-4:00 PM

Room: Palm Ballroom III - Lobby Level

#### For Part 1 see MS2

Fluid dynamics is a rich field of classical and modern scientific investigation due to important applications in engineering and meteorology and because of certain fundamental open questions of mathematical and physical nature. It is natural to introduce stochastic evolution equations to model physical systems whenever relevant sources of noise, instability and perturbations are present, for example, in modeling of complex ocean-atmospheric phenomena. We aim to bring together researchers, some of which uses probabilistic and others deterministic methods, working on nonlinear PDEs with application to fluids, having a common goal of understanding the behavior of turbulent flows and their coherent structures.

Organizer: Hakima Bessaih University of Wyoming, USA

Organizer: Evelyn Lunasin University of Michigan, USA

Organizer: Anna L. Mazzucato Pennsylvania State University, USA

2:00-2:25 On Inviscid Limits for the Stochastic Navier-Stokes Equations and Related Systems

Nathan Glatt-Holtz, Indiana University, USA

#### 2:30-2:55 Generalized Gevrey Norms with Applications to Dissipative Equations

Animikh Biswas, University of North Carolina, Charlotte, USA

continued on next page

# 3:00-3:25 Bounds on Energy and Enstrophy for the 3D Navier-Stokes- $\alpha$ and Leray- $\alpha$ Models

Aseel Farhat, Indiana University Bloomington, USA; Michael S. Jolly, Indiana University, USA; Evelyn Lunasin, United States Naval Academy, USA

#### 3:30-3:55 Stability of Compressible Viscous Waves in a Moving Domain

Juhi Jang, University of California, Riverside, USA; Ian Tice, Carnegie Mellon University, USA; Yanjin Wang, Xiamen University, China

## Saturday, December 7 MS15

## Dynamics of Multidimensional Coherent Structures - Part II of III

2:00 PM-4:00 PM

Room: Palm Ballroom IV - Lobby Level

#### For Part 1 see MS3 For Part 3 see MS27

Coherent structures play an organizing role in the dynamics of many dissipative and dispersive PDEs, posed on large or unbounded domains. This minisymposium will feature contributions that investigate intrinsically multi-dimensional aspects of the dynamics of coherent structures, including their existence, stability, instability, slow evolution, and interaction. Examples include interfaces between patterned and un-patterned state, point defects or vortices, and line defects. We expect to bring together researchers with a variety of backgrounds, employing a variety of techniques, such as diffusive and dispersive stability estimates, energy methods from the calculus of variations, or spatial dynamics and bifurcation methods.

Organizer: Keith Promislow Michigan State University, USA

Organizer: Scheel Arnd University of Minnesota, USA

2:00-2:25 Nonlinearity Saturation as a Singular Perturbation of the Nonlinear Schrödinger Equation

*Karl Glasner* and Jordan Allen-Flowers, University of Arizona, USA

## 2:30-2:55 Stability of Line Solitons for the KP-II Equation

Tetsu Mizumachi, Kyushu University, Japan

#### 3:00-3:25 Spots and Stripes in NLStype Equations with Nearly Onedimensional Potentials

*Todd Kapitula*, Calvin College, USA; Mariana Haragus, Universite de Franche-Comte, France

#### 3:30-3:55 Spectra of Functionalized Operators Arising from Hypersurfaces

*Gurgen Hayrapetyan*, Carnegie Mellon University, USA; Keith Promislow, Michigan State University, USA

## Saturday, December 7

## MS16

### High Order Numerical Methods for Hyperbolic and Kinetic Equations -Part II of IV

2:00 PM-4:00 PM

Room: Palm Ballroom V - Lobby Level

#### For Part 1 see MS4 For Part 3 see MS29

This minisymposium is to address the recent advances in algorithm design, analysis, application and implementations of high order numerical methods (e.g. discontinuous Galerkin method, finite difference/ volume weighted essentially nonoscillatory method, high order time integrators) for solving hyperbolic and kinetic equations.

Organizer: Yingda Cheng Michigan State University, USA

Organizer: Jingmei Qiu University of Houston, USA

#### 2:00-2:25 Convected Scheme Solution of the Boltzmann-Poisson System with Spectrally Accurate Phase-Space Resolution

Yaman Guclu, Michigan State University, USA

#### 2:30-2:55 A High Order Time Splitting Method Based on Integral Deferred Correction for Semi-Lagrangian Vlasov Simulations

Andrew Christlieb, Michigan State University, USA; *Wei Guo*, University of Houston, USA; Maureen Morton, Kent State University, USA; Jingmei Qiu, University of Houston, USA

#### 3:00-3:25 High Order Operator Splitting Methods Based on an Integral Deferred Correction Framework

Andrew Christlieb and *Yuan Liu*, Michigan State University, USA; Zhengfu Xu, Michigan Technological University, USA

#### 3:30-3:55 Analysis of Optimal Superconvergence of Discontinuous Galerkin Method

Yang Yang and Chi-Wang Shu, Brown University, USA

## MS17 Reduced Order Models for Partial Differential Equations

2:00 PM-4:00 PM

Room:Camelia/Dogwood - Mezzanine Level

The increasing power of computers allows to address more and more complex models for real-worl applications. Nevertheless, the need to solve reduced order models still exist in many situations: real-time solution, rapid prototyping, PDE solvers for mobile devices, fast evaluation of cost functions for optimization problems, etc. This minisymposium will address various numerical methods, including Reduced Basis Methods and Proper Orthogonal Decomposition, used to approximate the solutions of PDEs with a reduced number of degrees of freedom.

Organizer: Jean-Frederic Gerbeau INRIA Paris-Rocquencourt, France

#### 2:00-2:25 Rectification Procedure for Improved Accuracy in Reduced Basis Context

*Yvon Maday*, Université Pierre et Marie Curie, France

#### 2:30-2:55 Reduced-Order Models for Nonlinear Systems with Time-Periodic Solutions

*Jeff Borggaard*, Virginia Polytechnic Institute & State University, USA

#### 3:00-3:25 Reduced-Order Modeling for Adjoint Equations

*Florian De Vuyst*, Ecole Normale Superieur de Cachan, France

#### 3:30-3:55 Reduced Order Model Based on Approximated Lax Pairs

*Jean-Frederic Gerbeau* and Damiano Lombardi, INRIA Paris-Rocquencourt, France

### Saturday, December 7

## MS18 Nonlocal Models in PDEs and Applications -Part I of III

2:00 PM-4:00 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

#### For Part 2 see MS30

Nonlocal models based on integrodifferential equations behave in fundamentally different ways than their local PDE-based counterparts, requiring new and novel analytical and numerical techniques to analyze and utilize them. In this minisymposium we focus on recent advances in nonlocal theories, including theoretical results (wellposedness, regularity and asymptotic behavior of solutions) numerical methods and analysis (such as convergence and conditioning), and practical application (modeling, simulation, engineering analysis) related to nonlocal theories that have appeared in fracture modeling (peridynamics), nonlocal diffusion, biology, image processing, and more.

Organizer: Petronela Radu University of Nebraska, Lincoln, USA

Organizer: Michael L. Parks Sandia National Laboratories, USA

2:00-2:25 Quadrature Methods in Peridynamics

Michael L. Parks, Sandia National Laboratories, USA

#### 2:30-2:55 Asymptotic Behavior for Solutions in Diffusion Models with Peridynamic-Type Nonlocality

Petronela Radu, University of Nebraska, Lincoln, USA

#### 3:00-3:25 Origin and Effect of Nonlocality in a Composite

Stewart Silling, Sandia National Laboratories, USA

#### 3:30-3:55 A Nonlocal Vector Calculus with Applications to Diffusion and Mechanics

Max Gunzburg, Florida State University, USA

## Saturday, December 7

## MS19

### Recent Advances in Nonlinear Dispersive Partial Differential Equations -Part II of II

2:00 PM-4:00 PM

Room:Fuschia/Gardenia - Mezzanine Level

#### For Part 1 see MS7

Nonlinear dispersive partial differential equations appear in many fields, including fluid mechanics, plasma physics and optics, where they can characterize wave phenomenon such as solitons, wave collapse and turbulence. Nonlinear dispersive wave equations provide a variety of challenges, ranging from well-posedness to numerical methods. This session will survey recent advances in nonlinear dispersive wave equations, including nonlinear Schroödiner type equations and water wave equations.

Organizer: Gideon Simpson University of Minnesota, USA

Organizer: Catherine Sulem University of Toronto, Canada

#### 2:00-2:25 Well-posedness of the Linear KdV Equation on a Real Line

*Timur Akhunov*, University of Rochester, USA

#### 2:30-2:55 Coherent Frequency Dynamics for the Periodic Nonlinear Schrodinger Equation

Zaher Hani, Courant Institute of Mathematical Sciences, New York University, USA; Pierre Germain, New York University, USA; Erwan Foau, INRIA, France

#### 3:00-3:25 Existence and Symmetry of Ground States to a Boussinesq Abcd System

Ming Chen, University of Pittsburgh, USA

#### 3:30-3:55 Approximation of Polyatomic FPU Lattices by KdV Equations

J. Douglas Wright, Drexel University, USA

## **MS20**

### Analysis of Navier-Stokes Equations and Related Fluid Models - Part II of III

2:00 PM-4:00 PM

Room:Kahili/Lily - Mezzanine Level

#### For Part 1 see MS8 For Part 3 see MS32

The incompressible Navier-Stokes (NS) and Euler equations are the fundamental equations governing the motion of fluids. They appear, either alone or coupled with other equations, in the study of many phenomena in aerodynamics, geophysics, meteorology, plasma physics, etc. Despite all the important work done on these equations, our mathematical understanding of them is still incomplete. This minisymposium will bring together researchers at all career stages to share their recent results on various deterministic and stochastic fluid models. It will focus on (but not restricted to) issues regarding analyticity in space and time, well-posedness, spectral analysis, boundary layers and vortex stretching.

Organizer: Aseel Farhat Indiana University Bloomington, USA

Organizer: Michael S. Jolly Indiana University, USA

2:00-2:25 On a Stochastic Leray-Alpha Model of Euler Equations *Hakima Bessaih*, University of

Wyoming, USA

#### 2:30-2:55 Asymptotic Algebraic Spiral Solutions to the 2D Incompressible Euler Equations

Michael Dabkowski and Volker Elling, University of Michigan, USA

#### 3:00-3:25 III-Posedness for a Class of Equations Arising in Hydrodynamics

*Tarek M. Elgindi*, Courant Institute of Mathematical Sciences, New York University, USA

#### 3:30-3:55 Well-Posedness of Euler-Like Evolution Equations in Nonsmooth Domains and Relations to the Vertical Normal Modes Expansion of the Inviscid Primitive Equations

*Francesco Di Plinio*, University of Rome, Italy; Roger M. Temam, Indiana University, USA

# Saturday, December 7

Asymptotically Preserving Numerical Methods for Time-Dependent PDEs -Part II of II

2:00 PM-4:00 PM

#### Room: Hibiscus - Mezzanine Level

#### For Part 1 see MS9

Many physical systems contain small parameters such as Mach number, mean free path, relaxing time. These parameters represent small-scale behaviors and impose stiffness in numerical simulation while requiring high resolutions. The use of standard numerical schemes for such problems requires very fine grids, which may be computationally unaffordable. Asymptotic preserving schemes are highly efficient and accurate for all ranges of the parameters. The main feature of these schemes is that they permit a parameter-independent resolution of the stiff problem and yield a consistent discretization of the corresponding limit problem (as the parameters tends to zero) with no excessive computational effort.

Organizer: Alina Chertock North Carolina State University, USA

Organizer: Alexander Kurganov Tulane University, USA

Organizer: Jian-guo Liu Duke University, USA

#### 2:00-2:25 Uniform Stability and Wellbalancing for Asymptotic Preserving Schemes

Sebastian Noelle and Jochen Schuetz, RWTH - Aachen University of Technology, Germany

#### 2:30-2:55 Asymptotic Preserving Imex-Type Finite Volume Methods for Some Geophysical Flows

Maria Lukacova, University of Mainz, Germany

continued in next column

#### 3:00-3:25 An Asymptotic-Preserving Scheme for the Semiconductor Boltzmann Equation toward the Energy-Transport Limit

Jingwei Hu, University of Texas at Austin, USA; Li Wang, University of California, Los Angeles, USA

#### 3:30-3:55 Asymptotic Preserving Scheme Based on Hyperbolic Decomposition for Compressible Euler Equations

Alina Chertock, North Carolina State University, USA; Shi Jin, Shanghai Jiao Tong University, China, and the University of Wisconsin-Madison, USA; *Alexander Kurganov*, Tulane University, USA; Jian-Guo Liu, Duke University, USA

## MS22 Topics in Reaction-Diffusion Systems - Part II of II

2:00 PM-4:00 PM

Room: Iris - Mezzanine Level

#### For Part 1 see MS10

Reaction-diffusion systems play an important role in description and quantitative analysis of wide variety of phenomena arising in physics, chemistry, biology and other disciplines. The theory of such systems is far from being complete. The minisymposium will address new results in analysis of reaction-diffusion systems. Specifically, regularity, existence and qualitative properties of ground states, singular limits, propagation and threshold phenomena, regimes with blow up, existence, multiplicity and stability of traveling fronts. The minisymposium aims to bring together researchers in the area of reaction-diffusion systems to present new results and exchange new ideas in the field.

Organizer: Peter Gordon University of Akron, USA

#### 2:00-2:25 A Local Regularity Theorem for Varifold Mean Curvature Flow

*Yoshihiro Tonegawa*, Hokkaido University, Japan

#### 2:30-2:55 Existence and Qualitative Properties of Grounds States to the Non-Local Choquard-Type Equations

Vitaly Moroz, Swansea University of South Wales, United Kingdom

#### 3:00-3:25 A Reaction-Diffusion Approach to the Existence of Gravity Water Waves

Georg Weiss, Heinrich-Heine Universitaet Duesseldorf, Germany

#### 3:30-3:55 Dynamics of Fronts in Multistable Reaction-diffusion Equations

Ken-Ichi Nakamura, Kanazawa University, Japan

Saturday, December 7

## MS23

## Dynamics of Nonlinear Dispersive Wave Equations -Part II of III

2:00 PM-4:00 PM

Room: Magnolia - Mezzanine Level

#### For Part 1 see MS11 For Part 3 see MS35

We consider global-in-time asymptotic behavior, dynamics of solitary waves and asymptotic analysis of blow-up solutions, for a number of physically important nonlinear dispersive equations. These include the nonlinear Schroedinger equation (NLS), Korteweg-de Vries equation, Schroedinger maps, Navier-Stokes equation, nonlinear wave equation, and the Zakharov system. Major progress has been made in these problems in the last few decades by applying harmonic analysis techniques. In addition, we discuss the Klainerman-Machedon approach to quantum mean-field convergence problems.

Organizer: Justin Holmer Brown University, USA

Organizer: Nikolaos Tzirakis University of Illinois at Urbana-Champaign, USA

## 2:00-2:25 Local Well-posedness of KdV with Potential

Justin Holmer and Mamikon Gulian, Brown University, USA

#### 2:30-2:55 Focusing Quantum Manybody Dynamics: The Rigorous Derivation of the 1D Focusing Cubic Nonlinear Schrödinger Equation

*Xuwen Chen* and Justin Holmer, Brown University, USA

#### 3:00-3:25 The Gross-Pitaevskii Hierarchy on the Three-dimensional Torus

Vedran Sohinger and Philip Gressman, University of Pennsylvania, USA; Gigliola Staffilani, Massachusetts Institute of Technology, USA

#### 3:30-3:55 Scattering for Nonlinear Schrödinger Equation with a Potential

Younghun Hong, University of Texas at Austin, USA

## Saturday, December 7

## **MS24**

### Recent Developments in Geometric Partial Differential Equations - Part II of II 2:00 PM-4:00 PM

Room:Begonia - Mezzanine Level

#### For Part 1 see MS12

For the past decades, Geometric PDEs (Partial Differential Equations) have been a topic of high interest for mathematicians working in different fields within the analysis of PDEs. Our goal for this SIAM meeting is to bring together mathematicians working on different topics and present recent advances and connections between optimal transportation, free boundaries, regularity theory, homogenization, Hamilton Jacobi equations, numerical analysis and modern applications in computer science

Organizer: Betul Orcan-Ekmekci *Rice University, USA* 

Organizer: Adina Ciomaga University of Chicago, USA

#### 2:00-2:25 Geometric Partial Differential Equations in Random Media

Betul Orcan-Ekmekci, Rice University, USA

#### 2:30-2:55 Stochastic Homogenization for Porous Medium Type Equations

Stefania Patrizi, University of Rome, Italy

#### 3:00-3:25 A New PDE Approach for Large Time Behavior of Hamilton-Jacobi Equations

Hung Tran, University of Chicago, USA; Filippo Cagnetti and Diego Gomes, Instituto Superior Tecnico, Portugal; Hiroyoshi Mitake, Fukuoka University, Japan

#### 3:30-3:55 Boundary Regularity for a Class of Degenerate Monge-Ampere Equations

Ovidiu Savin, Columbia University, USA

## CP2 Hyperbolic PDEs

2:00 PM-4:00 PM

Room: Azalea - Mezzanine Level

Chair: Dmitry A. Altshuller, Dassault Systèmes, USA 2:00-2:15 Two-Point Riemann Problem for Inhomogeneous Nonconvex Conservation Laws: Geometric Construction of Solutions

Dmitry A. Altshuller, Dassault Systèmes, USA

## 2:20-2:35 A Nonlocal Hyperbolic Pde for Chaotic Shocks

Aslan R. Kasimov and *Luiz Faria*, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Rodolfo R. Rosales, Massachusetts Institute of Technology, USA

## 2:40-2:55 A Riemann Problem at a Junction of Open Canals

Mouhamadou S Goudiaby, Université Gaston Berger, Senegal; Gunilla Kreiss, Uppsala University, Sweden

#### 3:00-3:15 Stability of Viscous Strong and Weak Detonation Waves for Majda's Model

*Gregory Lyng*, University of Wyoming, USA

#### 3:20-3:35 Transitional Wave-Dynamics for Hyperbolic Relaxation Systems

Susanne Solem and Peder Aursand, Norwegian University of Science and Technology, Norway; Tore Flåtten, SINTEF, Norway

#### 3:40-3:55 Glancing Weak Mach Reflection

Allen Tesdall, City University of New York, Staten Island, USA

### **Welcome Reception**

4:15 PM-6:15 PM



Room:Grand Pool Deck

## Sunday, December 8

**Registration** 7:30 AM-2:30 PM Room:Palm Foyer - Lobby Level

### Announcements

7:55 AM-8:00 AM Room:Palm Ballroom I - Lobby Level

### Sunday, December 8

## IP3 Waves in Honeycomb Structures

8:00 AM-8:45 AM

Room:Palm Ballroom I - Lobby Level Chair: Keith Promislow, Michigan State University, USA

I will discuss the propagation of waves in honeycomb-structured media. The (Floquet-Bloch) dispersion relations of such structures have conical singularities which occur at the intersections of spectral bands for high-symmetry quasimomenta. These conical singularities, also called Dirac points or diabolical points, are central to the remarkable electronic properties of graphene and the light-propagation properties in honeycomb structured dielectric media. Examples of such properties are: quasi-particles which behave as massless Dirac Fermions, tunability between conducting and insulating states and topologically protected edge states. Most theoretical work on honeycomb structures (going back to 1947) has centered on the tight-binding approximation, a solvable discrete limit corresponding to infinite medium contrast. We present results (with CL Fefferman) for the Schroedinger equation with a honeycomb lattice potential with no assumptions on medium contrast showing: a) the existence of conical singularities in dispersion surfaces for generic honeycomb lattice potentials b) the persistence of such conical singularities under perturbations which preserve time-reversal and spatial inversion symmetries, e.g. a linear strain of the honeycomb structure c) that wave-packet initial conditions, which are spectrally localized about a Dirac point are governed, on very long timescales, by a system of homogeneous 2-dimensional Dirac equations. Finally, we discuss the question of topologically protected edge states and recent work in this direction (with CL Fefferman and J. Lee-Thorpe).

Michael I. Weinstein Columbia University, USA

## IP4

## Granular Experiments of Discrete Nonlinear Systems

### 8:45 AM-9:30 AM

Room:Palm Ballroom I - Lobby Level Chair: Marta Lewicka, University of Pittsburgh, USA

Ordered and disordered arrangements of granular particles are governed by highly nonlinear contact interactions that confer to the particles' assembly unique dynamic properties. We study how stress waves propagate in lattices composed of particles in close contact, and exploit this understanding to create novel materials and devices at different scales (for example, for application in energy conversion, vibration absorption and acoustic rectification). We control the constitutive behavior of these new materials selecting the particles' geometry, their arrangement and materials properties. We assemble and test experimental systems and inform our experiments with discrete numerical simulations.

Chiara Daraio California Institute of Technology, USA



9:30 AM-10:00 AM



Room:Palm Ballroom II - Lobby Level

Sunday, December 8

## **MS25**

Modeling, Analysis and Control of Fluid / Flow-Structure Interactions -Part III of V

### 10:00 AM-12:00 PM

Room:Palm Ballroom I - Lobby Level

#### For Part 2 see MS13 For Part 4 see MS37

This the third part of the minisymposium on PDE systems describing fluids/ flows interacting with other types of dynamics, e.g. plates or elasticity (with fixed or moving inter- faces). Questions on modeling, well-posedness, control, stability, optimization and numerical simulations of such coupled systems will be of primary interest. The session participants will have research interests and expertise in the Navier-Stokes and wave equations, mathematical control and numerical analysis of PDE dynamics (particularly those of hyperbolic or "composite" characteristics), and in modeling of complex physical processes.

Organizer: Daniel Toundykov University of Nebraska-Lincoln, USA

Organizer: Lorena Bociu North Carolina State University, USA

Organizer: Irena M. Lasiecka University of Virginia, USA

Organizer: Justin Webster Oregon State University, USA

10:00-10:25 Nonlinear Stability for Fluid-Structure Interaction Models

Steve Shkoller, University of California, Davis, USA; Mahir Hadzic, Massachusetts Institute of Technology, USA

#### 10:30-10:55 Uniform Stability of a Fluid-Structure Interaction with Interface and Interior Controls in the Fluid Inside Structure Setting

*Yongjin Lu*, Virginia State University, USA; Irena M. Lasiecka, University of Virginia, USA

11:00-11:25 Shape Optimization with Nonlinear PDE Constraints. Compressible Navier-Stokes Equations Jan Sokolowski, Institut Elie Cartan, France

*Jan Sokolowski*, Institut Elie Cartan, France

11:30-11:55 Stability Analysis of Fluidstructure Interaction Models *Roberto Triggiani*, University of Virginia,

#### USA

## Sunday, December 8

## MS26 Recent Progress on the

Incompressible Euler Equations - Part I of III

10:00 AM-12:00 PM

Room:Palm Ballroom III - Lobby Level

#### For Part 2 see MS38

The incompressible Euler equations are a model for nearly inviscid fluid flow in the incompressible regime. There are many challenging open problems regarding these equations, including but not limited to: existence of weak solutions, uniqueness and non-uniqueness of weak solutions, the vanishing viscosity problem, qualitative properties of solutions to these equations, stability of stationary or steady states, solutions with rough initial data, interaction with boundaries, passage to turbulence. In recent years there has been substantial progress in several of these directions. In this minisymposium we will address some of the new results in the field.

Organizer: Helena J. Nussenzveig Lopes

Universidade Federal do Rio De Janeiro, Brazil

Organizer: James P. Kelliher University of California, Riverside, USA

10:00-10:25 Vortex Sheets in Domains with Boundaries

Dragos Iftimie, Universite de Lyon 1, France; Milton Lopes Filho and *Helena J. Nussenzveig Lopes*, Universidade Federal do Rio De Janeiro, Brazil; Franck Sueur, Universite de Paris VI, France

#### 10:30-10:55 Mathematical Models of Intermittency in Fully Developed Turbulence

Roman Shvydkoy, University of Illinois, Chicago, USA

continued on next page

#### 11:00-11:25 Inviscid Limit for Invariant Measures of the 2D Stochastic Navier-Stokes Equations

Nathan Glatt-Holtz, Virginia Tech, USA; Vladmir Sverak, University of Minnesota, USA; *Vlad C. Vicol*, Princeton University, USA

#### 11:30-11:55 Non-Uniqueness Phenomena for Weak Solutions of the Euler Equations

*Emil Wiedemann*, University of British Columbia, Canada

#### Sunday, December 8

## MS27 Dynamics of Multidimensional Coherent Structures - Part III of III

10:00 AM-12:00 PM

Room:Palm Ballroom IV - Lobby Level

#### For Part 2 see MS15

Coherent structures play an organizing role in the dynamics of many dissipative and dispersive PDEs, posed on large or unbounded domains. This minisymposium will feature contributions that investigate intrinsically multi-dimensional aspects of the dynamics of coherent structures, including their existence, stability, instability, slow evolution, and interaction. Examples include interfaces between patterned and un-patterned state, point defects or vortices, and line defects. We expect to bring together researchers with a variety of backgrounds, employing a variety of techniques, such as diffusive and dispersive stability estimates, energy methods from the calculus of variations, or spatial dynamics and bifurcation methods.

Organizer: Keith Promislow Michigan State University, USA

Organizer: Scheel Arnd University of Minnesota, USA

## 10:00-10:25 Pattern Selection in the Wake of Fronts

Arnd Scheel, University of Minnesota, Minneapolis, USA

#### 10:30-10:55 Existence and Stability of Solutions in the Multi-dimensional Swift--Hohenberg Equation

*Scott McCalla*, University of California, Los Angeles, USA; Bjorn Sandstede, Brown University, USA

#### 11:00-11:25 Small-amplitude Grain Boundaries of Arbitrary Angle in the Swift-Hohenberg Equation

*Qiliang Wu*, University of Minnesota, USA

#### 11:30-11:55 Stationary Co-Dimension One Structures in the Functionalized Cahn-Hilliard Model

Arjen Doelman, Leiden University, Netherlands; Keith Promislow, Michigan State University, USA; Brian R. Wetton, University of British Columbia, Canada

## Sunday, December 8

## MS28 Water Waves - Part I of II

10:00 AM-12:00 PM

Room:Palm Ballroom V - Lobby Level For Part 2 see MS40

This minisymposium is concerned with classical water waves acted upon by gravity. Although it has a venerable history, there has been a great deal of very recent activity. One recent exciting discovery is that in both two and three dimensions, small enough initial data lead to solutions that exist for all time. Another discovery is the proof of existence of solitary water waves of large amplitude. There are new discoveries on the relationship between the pressure and the surface wave. Both analytical and numerical studies are included in this minisymposium.

Organizer: Vera Mikyoung Hur University of Illinois at Urbana-Champaign, USA

Organizer: Walter Strauss Brown University, USA

#### 10:00-10:25 Global Existence for Water Wave Equations

Pierre Germain, New York University, USA

#### 10:30-10:55 Global Existence for Gravity Waves in 2 Dimension

Fabio Pusateri, Princeton University, USA

#### 11:00-11:25 A Boundary Perturbation Method for Reconstruction of Layered Media via Constrained Quadratic Optimization

David P. Nicholls, University of Illinois, Chicago, USA; Alison Malcolm, Massachusetts Institute of Technology, USA

#### 11:30-11:55 On the Finite-time Splash and Splat Singularities for the 3-D Freesurface Euler Equations

*Steve Shkoller*, University of California, Davis, USA; Daniel Coutand, Heriot-Watt University, Scotland

## **MS29**

### High Order Numerical Methods for Hyperbolic and Kinetic Equations -Part III of IV

10:00 AM-12:00 PM

Room:Camelia/Dogwood - Mezzanine Level

#### For Part 2 see MS16 For Part 2 see MS41

This minisymposium is to address the recent advances in algorithm design, analysis, application and implementations of high order numerical methods (e.g. discontinuous Galerkin method, finite difference/volume weighted essentially non-oscillatory method, high order time integrators) for solving hyperbolic and kinetic equations.

Organizer: Yingda Cheng Michigan State University, USA

Organizer: Jingmei Qiu University of Houston, USA

#### 10:00-10:25 High Order Fast Sweeping and Homotopy Methods with Linear Computational Complexity for Solving Steady State Problems of Hyperbolic PDEs

*Yungtao Zhang*, University of Notre Dame, USA

#### 10:30-10:55 A High Order Weno Scheme for Detonation Waves

*Wei Wang*, Florida International University, USA

#### 11:00-11:25 Asymptotic Preserving Discontinuous Galerkin Method for the Radiative Transfer Equation

*Yulong Xing*, University of Tennessee and Oak Ridge National Laboratory, USA

#### 11:30-11:55 On the Bound of DG and Central DG Operators

*Fengyan Li* and Matthew Reyna, Rensselaer Polytechnic Institute, USA Sunday, December 8

## MS30

Nonlocal Models in PDEs and Applications -Part II of III

10:00 AM-12:00 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

#### For Part 1 see MS18 For Part 3 see MS42

Nonlocal models based on integrodifferential equations behave in fundamentally different ways than their local PDE-based counterparts, requiring new and novel analytical and numerical techniques to analyze and utilize them. In this minisymposium we focus on recent advances in nonlocal theories, including theoretical results (wellposedness, regularity and asymptotic behavior of solutions) numerical methods and analysis (such as convergence and conditioning), and practical application (modeling, simulation, engineering analysis) related to nonlocal theories that have appeared in fracture modeling (peridynamics), nonlocal diffusion, biology, image processing, and more.

Organizer: Petronela Radu University of Nebraska, Lincoln, USA

Organizer: Michael L. Parks Sandia National Laboratories, USA

#### 10:00-10:25 Adaptive Numerical Methods for Periydnamics

*Qiang Du*, Pennsylvania State University, USA

#### 10:30-10:55 Differentiability for Solutions of Nonlocal Models with Weakly Singular Kernels

*Mikil Foss*, University of Nebraska, Lincoln, USA

#### 11:00-11:25 Surface Effects and Affects on Ordinary Isotropic Peridynamics Models

John A. Mitchell, Sandia National Laboratories, USA

#### 11:30-11:55 Conditioning of Nonlocal Operators in Fractional Sobolev Spaces

Burak Aksoylu and Zuhal Unlu, Louisiana State University, USA

### Sunday, December 8

## MS31

### Homogenization and Multiscale Modeling of Heterogeneous Media -Part I of II

10:00 AM-12:00 PM

Room:Fuschia/Gardenia - Mezzanine Level

#### For Part 2 see MS43

This minisymposium is aimed to present recent developments in multiscale modeling of composites and other heterogeneous media. In particular, the minisymposium will bring together experts focusing on multiscale modeling of flow in porous media, upscaling, inverse problems, homogenization, and computational tools for modeling complex inhomogeneous media.

Organizer: Ana Vasilic United Arab Emirates University, United Arab Emirates

Organizer: Silvia Jimenez Bolanos Colgate University, USA

10:00-10:25 Acoustic Propagation in a Saturated Piezo-Elastic, Porous Medium *Robert P. Gilbert*, University of Delaware, USA

10:30-10:55 Dynamic Brittle Fracture as a Small Horizon Limit of Peridynamics *Robert P. Lipton*, Louisiana State University, USA

#### 11:00-11:25 Homogenization of Rigid Suspensions with Highly Oscillatory Velocity-Dependent Surface Forces

Yuliya Gorb, University of Houston, USA; Florin Maris, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Bogdan M. Vernescu, Worcester Polytechnic Institute, USA

#### 11:30-11:55 Nonlinear Neutral Inclusions: Assemblages of Spheres and Confocal Coated Ellipsoids

Silvia Jimenez Bolanos, Colgate University, USA; Bogdan M. Vernescu, Worcester Polytechnic Institute, USA

## MS32

### Analysis of Navier-Stokes Equations and Related Fluid Models - Part III of III

10:00 AM-11:30 AM

Room: Kahili/Lily - Mezzanine Level

#### For Part 2 see MS20

The incompressible Navier-Stokes (NS) and Euler equations are the fundamental equations governing the motion of fluids. They appear, either alone or coupled with other equations, in the study of many phenomena in aerodynamics, geophysics, meteorology, plasma physics, etc. Despite all the important work done on these equations, our mathematical understanding of them is still incomplete. This minisymposium will bring together researchers at all career stages to share their recent results on various deterministic and stochastic fluid models. It will focus on (but not restricted to) issues regarding analyticity in space and time, well-posedness, spectral analysis, boundary layers and vortex stretching.

Organizer: Aseel Farhat Indiana University Bloomington, USA

Organizer: Michael S. Jolly Indiana University, USA

#### 10:00-10:25 On the Well-Posedness of the 3D Navier-Stokes Equations in the Largest Critical Space

Alexey Cheskidov, University of Illinois, Chicago, USA

#### 10:30-10:55 Initial-Boundary Layer in the Nonlinear Darcy-Brinkman System

Daozhi Han and Xiaoming Wang, Florida State University, USA

#### 11:00-11:25 Gevrey Regularity of the Critical and Supercritical Quasi-Geostrophic Equations

Animikh Biswas, University of North Carolina, Charlotte, USA; *Vincent Martinez* and Prabath Silva, Indiana University Bloomington, USA

### Sunday, December 8

## MS33 Finite Element Methods for Wave Equations - Part I of II

10:00 AM-12:00 PM

Room: Hibiscus - Mezzanine Level

#### For Part 2 see MS45

Computational wave propagation constitutes a perennial challenge owing to the very wide range of applications, multiple scales behaviour and geometry. Even amongst the finite element community, there is still no firm consensus on which of the many alternative formulations should be preferred. Recent years has seen considerable progress on the understanding of traditional FEM formulations including mixed, lumped, consistent and discontinuous finite element schemes for first- and second- order formulations, but also the emergence of new schemes including hybridised DG, discontinuous Petrov-Galerkin methods in addition to formulations based on plane waves. The symposium will bring together leading researchers from many of these areas.

Organizer: Robert C. Kirby Baylor University, USA

Organizer: Mark Ainsworth Brown University, USA

10:00-10:25 Mixed Finite Elements for Wave Equations

Robert C. Kirby, Baylor University, USA

#### 10:30-10:55 Dissipative Methods for Wave Equations in Second Order Form *Thomas M. Hagstrom*, Southern

Methodist University, USA; Daniel Appelo, University of New Mexico, USA

#### 11:00-11:25 High Order Finite Elements for Wave Propagation: Like It Or Lump It?

Mark Ainsworth, Brown University, USA

#### 11:30-11:55 An Element Conservative Dpg Method for Convection-Dominated Problems

Truman E. Ellis, University of Texas at Austin, USA

## Sunday, December 8

## MS34 The Directional Diffusion: Models and Analysis

10:00 AM-12:00 PM

#### Room: Iris - Mezzanine Level

The Nature prefers specific directions. This is clearly seen in many phenomena. Modeling them leads to mathematical difficulties. We concentrate on problems, where the diffusion plays a significant role. This yields PDE's of parabolic type, like weighted mean curvature flow, crystalline flow, phase field models and among others. The aim of the session is to present the cutting edge research related to topics mentioned above and also image processing. In particular, properties of solutions shall be discussed.

Organizer: Piotr Rybka Warsaw University, Poland

Organizer: Piotr Mucha Warsaw University, Poland

#### 10:00-10:25 Crystal Facets: From Microscale Motion to Singular-Diffusion Pdes

Dionisios Margetis, University of Maryland, College Park, USA

#### 10:30-10:55 Analysis of the Two-Phase Flow in Rotating Hele-Shaw Cells with Coriolis Effects

Patrick Guidotti, University of California, Irvine, USA; Joachim Escher and Christoph Walker, Leibniz University Hannover, Germany

#### 11:00-11:25 Examples of Singular Diffusion Equations in One and Two Dimension: Facets and More

Mucha Piotr, Warsaw University, Poland; Muszkieta Monika, Wroclaw University of Technology, Poland; *Piotr Rybka*, Warsaw University, Poland

11:30-11:55 On Singular Perturbation Limit of the Allen-Cahn Equation Yoshihiro Tonegawa, Hokkaido

University, Japan

## **MS35**

## Dynamics of Nonlinear Dispersive Wave Equations -Part III of III

10:00 AM-12:00 PM

#### Room: Magnolia - Mezzanine Level

#### For Part 2 see MS23

We consider global-in-time asymptotic behavior, dynamics of solitary waves and asymptotic analysis of blow-up solutions, for a number of physically important nonlinear dispersive equations. These include the nonlinear Schroedinger equation (NLS), Korteweg-de Vries equation, Schroedinger maps, Navier-Stokes equation, nonlinear wave equation, and the Zakharov system. Major progress has been made in these problems in the last few decades by applying harmonic analysis techniques. In addition, we discuss the Klainerman-Machedon approach to quantum mean-field convergence problems.

Organizer: Justin Holmer Brown University, USA

Organizer: Nikolaos Tzirakis University of Illinois at Urbana-Champaign, USA

#### 10:00-10:25 The 2d Schrödinger Equation on Irrational Tori

Seckin Demirbas, University of Illinois at Urbana-Champaign, USA

10:30-10:55 Blow Up Solutions in the Focusing NLS

Svetlana Roudenko, George Washington University, USA

11:00-11:25 Unconditional Uniqueness for the Cubic Gross-Pitaevskii Hierarchy via Quantum de Finetti-Part I

Natasa Pavlovic, University of Texas at Austin, USA

#### 11:30-11:55 Unconditional Uniqueness for the Cubic Gross-Pitaevskii Hierarchy via Quantum de Finetti -Part II

*Thomas Chen*, University of Texas, Austin, USA

Sunday, December 8

## MS36

## Optimal Transport : Extensions Applications and Numerical Methods

10:00 AM-12:00 PM

#### Room:Begonia - Mezzanine Level

The minisymposium will present exciting new applications, numerical methods and extensions in optimal transport.

Organizer: Jd Benamou INRIA, France

#### 10:00-10:25 Optimal Transportation with Infinitely Many Marginal

Brendan Pass, University of Alberta, Canada

#### 10:30-10:55 Optimal Transport for Illumination Optics

*Corien Prins* and Jan Ten Thije Boonkkamp, Eindhoven University of Technology, Netherlands; Wilbert IJzerman, Philips Lighting, Eindhoven, the Netherlands; Teus Tukker, Philips Research, Eindhoven, the Netherlands; Jarno van Roosmalen, Eindhoven University of Technology, Netherlands

#### 11:00-11:25 Wide-Stencil and Filter Schemes for Monge Ampere Equations

Adam Oberman, McGill University, Canada

#### 11:30-11:55 Optimal Transport with Proximal Splitting

Nicolas Papadakis, CNRS, France

### Sunday, December 8

## CP3

## Dispersive and Wave Equations - Part I

10:00 AM-12:20 PM

Room:Azalea - Mezzanine Level

Chair: Nikhila Chaudhari, Embry-Riddle Aeronautical University, USA

#### 10:00-10:15 Reconstruction of Nonlinear Water Waves by Generalized SfS Method

Andrei Ludu, *Nikhila Chaudhari*, Muhammad Abdul Aziz, and Ilteris Demirkiran, Embry-Riddle Aeronautical University, USA

#### 10:20-10:35 Existence and Symmetry of Ground States to the Boussinesq Abcd Systems

Ming Chen, Shiting Bao, and Qing Liu, University of Pittsburgh, USA

#### 10:40-10:55 Orbital Stability of Solitary Waves of Moderate Amplitude in Shallow Water

Nilay Duruk Mutlubas, Istanbul Kemerburgaz University, Turkey; *Anna Geyer*, University of Vienna, Austria

#### 11:00-11:15 Sharp Thresholds of Global Existence and Blow-Up for a Class of Nonlocal Wave Equations

Saadet Erbay, Ozyegin University, Turkey; Albert Erkip, Sabanci University, Turkey; Husnu A. Erbay, Ozyegin University, Turkey

#### 11:20-11:35 Stability and Instability of Solitary Waves for a Class of Nonlocal Nonlinear Equations

Husnu A. Erbay, Ozyegin University, Turkey; *Albert Erkip*, Sabanci University, Turkey; Saadet Erbay, Ozyegin University, Turkey

## 11:40-11:55 On the Generalized KdV Equation

*Luiz G. Farah*, Universidade Federal de Minas Gerais, Brazil

#### 12:00-12:15 Eulerian Computation Of Complex Short Wave Forms Propagating Over Long Distances

Subhashini Chitta and John Steinhoff, University of Tennessee Space Institute, USA

Lunch Break 12:00 PM-2:00 PM

Attendees on their own

## **MS37**

### Modeling, Analysis and Control of Fluid / Flow-Structure Interactions -Part IV of V

2:00 PM-4:00 PM

Room: Palm Ballroom I - Lobby Level

#### For Part 3 see MS25 For Part 5 see MS49

This is the fourth part of the minisymposium on PDE systems describing fluids/flows interacting with other types of dynamics, e.g. plates or elasticity (with fixed or moving interfaces). Questions on modeling, wellposedness, control, stability, optimization and numerical simulations of such coupled systems will be of primary interest. The session participants will have research interests and expertise in the Navier-Stokes and wave equations. mathematical control and numerical analysis of PDE dynamics (particularly those of hyperbolic or "composite" characteristics), and in modeling of complex physical processes.

Organizer: Daniel Toundykov University of Nebraska-Lincoln, USA

Organizer: Lorena Bociu North Carolina State University, USA

Organizer: Irena M. Lasiecka University of Virginia, USA

Organizer: Justin Webster Oregon State University, USA

2:00-2:25 On the Two-phase Navier-Stokes Equations in Cylindrical Domains

Mathias Wilke, University of Halle, Germany

#### 2:30-2:55 Min-Max Game Problem for Elastic and Visco-Elastic Fluid Structure Interactions

Jing Zhang, Virginia State University, USA; Irena M. Lasiecka and Roberto Triggiani, University of Virginia, USA

continued in next column

#### 3:00-3:25 Exact Controllability of a Membrane Immersed in a Potential Fluid

Scott Hansen, Iowa State University, USA

#### 3:30-3:55 On Incompressible Two-Phase Fluid Flows with Phase Transitions

*Gieri Simonett*, Vanderbilt University, USA

## Sunday, December 8

## MS38

## Recent Progress on the Incompressible Euler Equations - Part II of III

2:00 PM-4:00 PM

Room: Palm Ballroom III - Lobby Level

#### For Part 1 see MS26 For Part 3 see MS50

The incompressible Euler equations are a model for nearly inviscid fluid flow in the incompressible regime. There are many challenging open problems regarding these equations, including but not limited to: existence of weak solutions, uniqueness and non-uniqueness of weak solutions, the vanishing viscosity problem, qualitative properties of solutions to these equations, stability of stationary or steady states, solutions with rough initial data, interaction with boundaries, passage to turbulence. In recent years there has been substantial progress in several of these directions. In this minisymposium we will address some of the new results in the field.

Organizer: Helena J. Nussenzveig Lopes

Universidade Federal do Rio De Janeiro, Brazil

Organizer: James P. Kelliher University of California, Riverside, USA

2:00-2:25 On the Behavior of Bounded Vorticity, Bounded Velocity Solutions to the 2D Euler Equations James P. Kelliher, University of

California, Riverside, USA

#### 2:30-2:55 Planar Limits of 3D Helical Flows

Anna Mazzucato, Pennsylvania State University, USA; Milton C. Lopes Filho, Universidade Federal de Rio de Janeiro, Brazil; Dongjuan Niu, Capital Normal University, China; Helena J. Nussenzveig Lopes, Universidade Federal do Rio De Janeiro, Brazil; Edriss S. Titi, University of California, Irvine, USA and Weizmann Institute of Science, Israel

## **MS38**

Recent Progress on the Incompressible Euler Equations - Part II of III continued

#### 3:00-3:25 On Vorticity Formulation for the Navier-Stokes Equations in the Half Plane and Its Applications to the Inviscid Limit Problem

Yasunori Maekawa, Tohoku University, Japan

#### 3:30-3:55 Remarks on the Question of Dissipation Anomaly for the Navier-Stokes and Euler Equations

*Edriss S. Titi*, University of California, Irvine, USA and Weizmann Institute of Science, Israel; Claude Bardos, Université Pierre et Marie Curie, France

### Sunday, December 8

## MS39 Linear Boltzmann Transport in Random Media

2:00 PM-4:00 PM

#### Room:Palm Ballroom IV - Lobby Level

Linear Boltzmann transport in random media is an emerging interdisciplinary area in applied mathematics with its relation to hyperbolic partial differential equations, probability theory, asymptotic analysis, and numerical analysis. A particular importance of the linear Boltzmann equation or the radiative transport equation is its application to medical imaging as inverse problems. This minisymposium will present some of the recent developments in this field including the fundamental solution, asymptotic analysis, numerical algorithms, and related inverse problems.

Organizer: Manabu Machida University of Michigan, USA

## 2:00-2:25 Title Not Available at Time of Publication

Simon Arridge, University College London, United Kingdom

#### 2:30-2:55 Deriving the Kubelka-Munk Equations from Radiative Transport Arnold D. Kim and Chris Sandoval,

University of California, Merced, USA

#### 3:00-3:25 Filtered Spherical Harmonics Expansions of the Radiative Transfer Equation

*Ryan G McClarren*, Texas A&M University, USA

## 3:30-3:55 Case's Method in Three Dimensions

Manabu Machida, University of Michigan, USA

## Sunday, December 8

## MS40 Water Waves - Part II of II 2:00 PM-4:00 PM

Room: Palm Ballroom V - Lobby Level

#### For Part 1 see MS28

This minisymposium is concerned with classical water waves acted upon by gravity. Although it has a venerable history, there has been a great deal of very recent activity. One recent exciting discovery is that in both two and three dimensions, small enough initial data lead to solutions that exist for all time. Another discovery is the proof of existence of solitary water waves of large amplitude. There are new discoveries on the relationship between the pressure and the surface wave. Both analytical and numerical studies are included in this minisymposium.

Organizer: Vera Mikyoung Hur University of Illinois at Urbana-Champaign, USA

Organizer: Walter Strauss Brown University, USA

#### 2:00-2:25 Pressure Beneath a Traveling Wave with Constant Vorticity

*Vishal Vasan*, Pennsylvania State University, USA; Katie Oliveras, Seattle University, USA

#### 2:30-2:55 Mathematical Theory of Wind-generated Water Waves

Samuel Walsh, University of Missouri, USA; Oliver Buhler and Jalal Shatah, Courant Institute of Mathematical Sciences, New York University, USA; Chongchun Zeng, Georgia Institute of Technology, USA

#### 3:00-3:25 Large-Amplitude Solitary Waves Generated by Surface Pressure

Miles Wheeler, Brown University, USA

#### 3:30-3:55 On the Benjamin-Feir Instability

Vera Mikyoung Hur and Jared Bronski, University of Illinois at Urbana-Champaign, USA; Mathew Johnson, University of Kansas, USA

## **MS41**

### High Order Numerical Methods for Hyperbolic and Kinetic Equations -Part IV of IV

2:00 PM-4:00 PM

Room:Camelia/Dogwood - Mezzanine Level

#### For Part 3 see MS29

This minisymposium is to address the recent advances in algorithm design, analysis, application and implementations of high order numerical methods (e.g. discontinuous Galerkin method, finite difference/volume weighted essentially non-oscillatory method, high order time integrators) for solving hyperbolic and kinetic equations.

Organizer: Yingda Cheng Michigan State University, USA

Organizer: Jingmei Qiu University of Houston, USA

#### 2:00-2:25 On the Parametrized Maximum Principle Flux Limiters for Hyperbolic Conservation Laws: Accuracy and Application

*Zhengfu Xu*, Michigan Technological University, USA

#### 2:30-2:55 Stability Analysis and Error Estimates of an Exactly Divergence-Free Method for the Magnetic Induction Equations

Fengyan Li and *He Yang*, Rensselaer Polytechnic Institute, USA

#### 3:00-3:25 High-order Multiderivative Time Integrators for Hyperbolic Conservation Laws

*David C. Seal*, Yamen Guclu, and Andrew J. Chrislieb, Michigan State University, USA

#### 3:30-3:55 Energy-conserving Discontinuous Galerkin Methods for the Vlasov-Ampère System

Yingda Cheng, Andrew J. Christlieb, and *Xinghui Zhong*, Michigan State University, USA Sunday, December 8

## MS42 Nonlocal Models in PDEs

and Applications -Part III of III

2:00 PM-3:30 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

#### For Part 2 see MS30

Nonlocal models based on integrodifferential equations behave in fundamentally different ways than their local PDE-based counterparts, requiring new and novel analytical and numerical techniques to analyze and utilize them. In this minisymposium we focus on recent advances in nonlocal theories, including theoretical results (wellposedness, regularity and asymptotic behavior of solutions) numerical methods and analysis (such as convergence and conditioning), and practical application (modeling, simulation, engineering analysis) related to nonlocal theories that have appeared in fracture modeling (peridynamics), nonlocal diffusion, biology, image processing, and more.

Organizer: Petronela Radu University of Nebraska, Lincoln, USA

Organizer: Michael L. Parks Sandia National Laboratories, USA

#### 2:00-2:25 The Fractional Laplacian Operator as a Special Case of the Nonlocal Diffusion Operator

Marta D'Elia and Max Gunzburger, Florida State University, USA

2:30-2:55 Homogenization of the Nonlocal Navier System of Equations Tadele Mengesha, Pennsylvania State University, USA

3:00-3:25 Improved One-point Quadrature Algorithms for Two-Dimensionsal Peridynamic Models Based on Analytic Calculations *Pablo Seleson*, University of Texas at Austin, USA

## Sunday, December 8

## **MS43**

### Homogenization and Multiscale Modeling of Heterogeneous Media -Part II of II

2:00 PM-4:00 PM

Room:Fuschia/Gardenia - Mezzanine Level

#### For Part 1 see MS31

This minisymposium is aimed to present recent developments in multiscale modeling of composites and other heterogeneous media. In particular, the minisymposium will bring together experts focusing on multiscale modeling of flow in porous media, upscaling, inverse problems, homogenization, and computational tools for modeling complex inhomogeneous media.

Organizer: Ana Vasilic United Arab Emirates University, United Arab Emirates

Organizer: Silvia Jimenez Bolanos Colgate University, USA

#### 2:00-2:25 Modeling Effective Acoustic Behavior of Porous Media with Microstructure

Ana Vasilic, United Arab Emirates University, United Arab Emirates; Robert P. Gilbert, University of Delaware, USA; Alexander Panchenko, Washington State University, USA

2:30-2:55 Error Estimates for Mesoscale Continuum Models of Particle Systems

Alexander Panchenko, Washington State University, USA

#### 3:00-3:25 Effect of Slip Boundary Conditions on the Effective Behavior of Suspensions and Membranes

Bogdan M. Vernescu, Worcester Polytechnic Institute, USA

#### 3:30-3:55 Homogenization of High-Contrast Brinkman Flows

Donald Brown, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; Guanglian Li and Yalchin Efendiev, Texas A&M University, USA; Viktoria Savatorova, National Research Nuclear University MEPhI, Russia

## **MS44**

## Qualitative Analysis of Nonlinear Waves -Part I of III

2:00 PM-4:00 PM

## Room:Kahili/Lily - Mezzanine Level

#### For Part 2 see MS55

Wave phenomena occur in most scientific and engineering disciplines: fluid mechanics, optics, acoustics, electromagnetism, quantum mechanics to name just a few. This minisymposium will provide an opportunity for active researchers to discuss various problems that arise in nonlinear PDE's describing wave propagation. It focuses on (but is not restricted to) water waves, nonlinear Schrodinger equation, and related hyperbolic and hyperbolic-like systems. Of primary interest are qualitative properties of solutions: local and global wellposedness, regularity, largetime behavior, control and stability, scattering, dispersive estimates, etc.

Organizer: Yanqiu Guo Weizmann Institute of Science, Israel

#### 2:00-2:25 Persistency of the Spatial Analyticity for Nonlinear Wave Equations and the Cubic Szego Equation

*Yanqiu Guo*, Weizmann Institute of Science, Israel

#### 2:30-2:55 Sensitivity Analysis with Respect to Principal Parameters of Long Time Dynamics in Hyperbolic Systems with Critical Exponents

Irena M. Lasiecka, University of Virginia, USA

## 3:00-3:25 On Incompressible Flows with Singular Velocities

Francisco Gancedo, University of Seville, Spain

#### 3:30-3:55 Big Box Limit for NLS

Pierre Germain, New York University, USA; Zaher Hani, Courant Institute of Mathematical Sciences, New York University, USA; Erwan Faou, INRIA, France Sunday, December 8

## MS45 Finite Element Methods for

Wave Equations - Part II of II

2:00 PM-4:00 PM

Room: Hibiscus - Mezzanine Level

#### For Part 1 see MS33

Computational wave propagation constitutes a perennial challenge owing to the very wide range of applications, multiple scales behaviour and geometry. Even amongst the finite element community, there is still no firm consensus on which of the many alternative formulations should be preferred. Recent years has seen considerable progress on the understanding of traditional FEM formulations including mixed, lumped, consistent and discontinuous finite element schemes for first- and second- order formulations, but also the emergence of new schemes including hybridised DG, discontinuous Petrov-Galerkin methods in addition to formulations based on plane waves. The symposium will bring together leading researchers from many of these areas.

Organizer: Robert C. Kirby Baylor University, USA

Organizer: Mark Ainsworth Brown University, USA

#### 2:00-2:25 Numerical Approximation of Boussinesq-Green-Naghdi Models for Near-Shore Wave Physics

*Clint Dawson* and Nishant Panda, University of Texas at Austin, USA

#### 2:30-2:55 Discontinuous Petrov Galerkin Methods for Wave Propagation

Jay Gopalakrishnan, Portland State University, USA

#### 3:00-3:25 Finite Element Exterior Calculus Methods for Geophysical Fluid Dynamics

*Colin Cotter*, Imperial College London, United Kingdom

#### 3:30-3:55 DGSEM-ALE Approximation of Reflection and Transmission at Moving Interfaces

Andrew Winters and David A. Kopriva, Florida State University, USA

### Sunday, December 8

## MS46 Nonlocal Interaction Models - Part I of III

2:00 PM-4:00 PM

Room: Iris - Mezzanine Level

#### For Part 2 see MS57

Models that involve nonlocal interactions are prevalent in the scientific literature. Some examples include anomalous diffusion of nutrients inside a cell; interactions within a biological swarm; ecological dispersal and transport in porous media, and n-body or n-vortex dynamics problem in the limit of large n. These models pose tough challenging mathematical questions that push the boundaries of established mathematical theories. This minisymposium will bring together practitioners who study nonlocal models either from mathematical or modelling perspective.

Organizer: Yanghong Huang Imperial College London, United Kingdom

Organizer: Theodore Kolokolnikov Dalhousie University, Canada

#### 2:00-2:25 Two Short Stories on Existence and Stability of N-Vortex Equilibria in Fluids

Anna M. Barry, University of Minnesota, USA

#### 2:30-2:55 Stability Analysis of Flock Rings for 2nd Order Models in Swarming

Daniel Balague, Universitat Autònoma de Barcelona, Spain; Giacomo Albi, Universita' di Ferrara, Italy; Jose Carrillo, Imperial College London, United Kingdom; James von Brecht, University of California, Los Angeles, USA

#### 3:00-3:25 Bifurcation Dynamics in a Nonlocal Hyperbolic Model for Selforganised Biological Aggregations *Raluca Eftimie*, University of Alberta,

Canada

#### 3:30-3:55 Vortex Crystals, Animal Skin Patterns and Ice Fishing

*Theodore Kolokolnikov*, Dalhousie University, Canada

## MS47 Mathematical Analysis of

### Liquid Crystals - Part I of III 2:00 PM-3:30 PM

Room:Magnolia - Mezzanine Level

#### For Part 2 see MS58

Liquid crystals represent a broad class of anisotropic soft matter materials. A wide spectrum of mathematical problems will be considered on this topic providing analyses of models for these materials with varying detail and at different length scales. Research on both dynamic and stationary problems will be presented. Topics included are dynamics for the Ericksen Leslie equations, molecular dynamics, analysis of defect structure and stability of defects in smectic and nematic models. chevron structure in solutions for smectics, simulations for electrostatic effects, and analysis of models for models with biological applications.

Organizer: Patricia Bauman Purdue University, USA

Organizer: Tiziana Giorgi New Mexico State University, USA

Organizer: Daniel Phillips Purdue University, USA

#### 2:00-2:25 Regularity Properties for Nematic Liquid Crystals

Patricia Bauman and *Daniel Phillips*, Purdue University, USA

### 2:30-2:55 Electric-Field-Induced Instabilities in Liquid-Crystal Films

*Eugene C. Gartland*, Kent State University, USA

#### 3:00-3:25 Analysis of Point Defects in a Ferroelectric Liquid Crystal Using a Generalized Ginzburg-Landau Model

Sean A. Colbert-Kelly and Daniel Phillips, Purdue University, USA; Geoffrey McFadden, National Institute of Standards and Technology, USA Sunday, December 8

### MS48 Free Boundary and Obstacle Problems

## Obstacle Problems for Nonlinear and Nonlocal Operators

### 2:00 PM-4:00 PM

Room:Begonia - Mezzanine Level

We discuss our recent work on regularity of free boundary regularities and eexistence, uniqueness, and regularity of solutions to obstacle problems for nonlinear and nonlocal operators.

Organizer: Paul Feehan Rutgers University, USA

Organizer: Arshak Petrosyan Purdue University, USA

Organizer: Panagiota Daskalopoulos Columbia University, USA

Organizer: Camelia A. Pop University of Pennsylvania, USA

2:00-2:25 Free-boundary Problems in Surface Evolution by Curvature Flows Panagiota Daskalopoulos, Columbia University, USA

2:30-2:55 A Classical Perron Method for Existence of Smooth Solutions to Boundary Value and Obstacle Problems for Degenerate-elliptic Operators via Holomorphic Maps Paul Feehan, Rutgers University, USA

#### 3:00-3:25 Optimal Regularity and the Free Boundary in the Parabolic Signorini Problem

Donatella Danielli, Purdue University, USA; Nicola Garofalo, Universita di Padova, Italy; *Arshak Petrosyan* and Tung To, Purdue University, USA

#### 3:30-3:55 Regularity of Solutions and of the Free Boundary of the Obstacle Problem for the Fractional Laplacian with Drift

*Camelia A. Pop*, University of Pennsylvania, USA; Arshak Petrosyan, Purdue University, USA; Charles Epstein, University of Pennsylvania, USA

## Sunday, December 8

### MS76 Partial Differential Equations for Biophysical Systems: Direct and Inverse Problems. 2:00 PM-4:00 PM

#### Room: Poinsettia - Mezzanine Level

Biophysical systems provide large classes of examples of challenging problems in PDEs. Among those we can cite growth models, structured population equations, and neuroscience models. However, it is crucial to be able to calibrate the models. under consideration so as to develop realistic simulations and predictions. Thus, it is natural to consider the application of the mathematical theory of inverse problems to this area. In this minisymposium we gather a broad group working on different aspects of PDEs for biophysical systems and ranging from structured population equations to neuronal networks.

Organizer: Jorge P. Zubelli IMPA, Brazil

#### 2:00-2:25 Long Time Behavior in Population Models: the Example of Neuronal Networks

*Benoit Perthame*, Université Pierre et Marie Curie - Paris VI, France

#### 2:30-2:55 A Population Model with Small Density Cut-off

*Alexander Lorz*, Laboratoire Jacques-Louis Lions and Université Pierre et Marie Curie - Paris 6, France

#### 3:00-3:25 Inverse Problems for Structured Population Equations Jorge P. Zubelli, IMPA, Brazil

**3:30-3:55 Coherent Structures of a Nonlocal FitzHugh-Nagumo Equation** *Gregory Faye* and Arnd Scheel, University of Minnesota, USA

## CP4 **Navier-Stokes Equations** and Turbulence - Part I

2:00 PM-4:20 PM

Room: Azalea - Mezzanine Level

Chair: Hatice Ozcan. University of Edinburgh, United Kingdom

#### 2:00-2:15 Compressible Viscous Navier-Stokes Flows Grazing a Non-Convex Corner

Jae Ryong Kweon, Pohang University of Science and Technology, Korea

### 2:20-2:35 Rethinking Computation of Incompressible Fluid Flow - More Than a Mathematical Trick

Jonas T. Holdeman, Retired

#### 2:40-2:55 Entropy-Stable Schemes for the Initial Boundary Value Euler **Equations**

Hatice Ozcan, University of Edinburgh, United Kingdom; Magnus Svärd, University of Bergen, Norway

#### 3:00-3:15 Primitive Equations with **Continuous Initial Data**

Walter Rusin, Oklahoma State University, USA; Igor Kukavica, Yuan Pei, and Mohammed Ziane, University of Southern California, USA

#### 3:20-3:35 Existence of Classical Sonic-Supersonic Solutions for the **Steady Euler Equations**

Tianyou Zhang and Yuxi Zheng, Pennsylvania State University, USA

#### 3:40-3:55 A Unilateral Open Boundary Condition for the Navier-Stokes **Equations**

Norikazu Saito, Guanyu Zhou, and Yoshiki Sugitani, University of Tokyo, Japan

#### 4:00-4:15 On Inviscid Limits for the **Stochastic Navier-Stokes Equations** and Related Systems.

Nathan Glatt-Holtz, Virginia Tech, USA

## **Coffee Break**

4:00 PM-4:30 PM



Room: Palm Ballroom II - Lobby Level

## Sunday, December 8

## **SIAG/APDE** Business Meeting

4:30 PM-5:00 PM

Room:Palm Ballroom I -Lobby Level

Complimentary wine and beer will be served.

**Dinner Break** 5:00 PM-7:30 PM Attendees on their own

## MT1 **Game Theoretical Methods** in PDEs

7:30 PM-9:30 AM

Room: Palm Ballroom I - Lobby Level Chair: Keith Promislow, Michigan State University, USA

Organizer and Speaker Marta Lewicka, University of Pittsburgh, USA

## Monday, **December 9**

Registration 7:30 AM-4:00 PM Room: Palm Foyer - Lobby Level

**Announcements** 

7:55 AM-8:00 AM Room: Palm Ballroom I - Lobby Level

## IP5

## Tug-of-war and Infinity Laplacian with Neumann **Boundary Conditions**

8:00 AM-8:45 AM

Room: Palm Ballroom I - Lobby Level

Chair: Helena J. Nussenzveig Lopes, Universidade Federal do Rio De Janeiro, Brazil

We study a version of the stochastic "tug-of-war" game, played on graphs and smooth domains, with an empty set of terminal states. We prove that, when the running payoff function is shifted by an appropriate constant, the values of the game after n steps converge. Using this we prove the existence of solutions to the infinity Laplace equation with vanishing Neumann boundary condition. In earlier work with Schramm, Sheffield and Wilson (http://arxiv.org/abs/math/0605002, JAMS 2009), we related a tug of war game to the infinity Laplacian equation with Dirichlet boundary conditions- I will survey that work as well as the version for the p-Laplacian in http://arxiv.org/abs/ math/0607761 - Duke 2009. (Talk based on joint work with Tonci Antunovic, Scott Sheffield, Stephanie Somersille http:// arxiv.org/abs/1109.4918, Comm. PDE 2012)

Yuval Peres Microsoft Research, USA Monday, December 9

## IP6

### Models for Neural Networks; Analysis, Simulations and Qualitative Behavior

8:45 AM-9:30 AM

#### Room:Palm Ballroom I - Lobby Level Chair: Suncica Canic, University of Houston, USA

Neurons exchange information via discharges propagated by membrane potential which trigger firing of the many connected neurons. How to describe large networks of such neurons? How can such a network generate a collective activity? Such questions can be tackled using nonlinear partial-integro-differential equations which are classically used to describe neuronal networks. Among them, the Wilson-Cowan equations are the best known and describe globally brain spiking rates. Another classical model is the integrate-and-fire equation based on Fokker-Planck equations. The spike times distribution, which encodes more directly the neuronal information, can also be described directly thanks to structured population. We will compare and analyze these models. A striking observation is that solutions to the I&F can blow-up in finite time, a form of synchronization that can be regularized with a refractory stage. We can also show that for small or large connectivities the 'elapsed time model' leads to desynchronization. For intermediate regimes, sustained periodic activity occurs compatible with observations. A common tool is the use of the relative entropy method.

Benoit Perthame Université Pierre et Marie Curie -Paris VI, France

## Coffee Break

9:30 AM-10:00 AM



Room:Palm Ballroom II - Lobby Level

Monday, December 9

## **MS49**

Modeling, Analysis and Control of Fluid / Flow-Structure Interactions -Part V of V

### 10:00 AM-12:00 PM

Room:Palm Ballroom I - Lobby Level

#### For Part 2 see MS37 This is the fifth part of the minisymposium on PDE systems describing fluids/flows interacting with other types of dynamics, e.g. plates or elasticity (with fixed or moving inter- faces). Questions on modeling, well-posedness, control, stability, optimization and numerical simulations of such coupled systems will be of primary interest. The session participants will have research interests and expertise in the Navier-Stokes and wave equations, mathematical control and numerical analysis of PDE dynamics (particularly those of hyperbolic or "composite" characteristics), and in modeling of complex physical processes.

Organizer: Daniel Toundykov University of Nebraska-Lincoln, USA

Organizer: Lorena Bociu North Carolina State University, USA

Organizer: Irena M. Lasiecka University of Virginia, USA

Organizer: Justin Webster Oregon State University, USA

#### 10:00-10:25 Model Development and Uncertainty Quantification for Systems with Nonlinear and Hysteretic Actuators

Ralph C. Smith, North Carolina State University, USA

#### 10:30-10:55 Fluid-Structure Interaction Problems in Ocular Blood Flow

*Giovanna Guidoboni*, Indiana University - Purdue University Indianapolis, USA

continued in next column

#### 11:00-11:25 New Advances and Open Problems in Nonlinear Flow-Plate Interactions

Justin Webster, Oregon State University, USA; Irena M. Lasiecka, University of Virginia, USA

#### 11:30-11:55 Intrinsic Decay Rates for the Energy of Second Order Nonlinear Evolutions with Viscoelasticity

Irena M. Lasiecka, University of Virginia, USA

Monday, December 9

## MS50

## Recent Progress on the Incompressible Euler Equations - Part III of III

10:00 AM-11:30 AM

Room:Palm Ballroom III - Lobby Level For Part 2 see MS38

The incompressible Euler equations are a model for nearly inviscid fluid flow in the incompressible regime. There are many challenging open problems regarding these equations, including but not limited to: existence of weak solutions, uniqueness and non-uniqueness of weak solutions, the vanishing viscosity problem, qualitative properties of solutions to these equations, stability of stationary or steady states, solutions with rough initial data, interaction with boundaries, passage to turbulence. In recent years there has been substantial progress in several of these directions. In this minisymposium we will address some of the new results in the field.

Organizer: Helena J. Nussenzveig Lopes

Universidade Federal do Rio De Janeiro, Brazil

Organizer: James P. Kelliher University of California, Riverside, USA

## 10:00-10:25 Nonlinear Stability of Vortex Pairs

Geoffrey Burton, University of Bath, United Kingdom; *Milton Lopes Filho* and Helena J. Nussenzveig Lopes, Universidade Federal do Rio De Janeiro, Brazil

10:30-10:55 Hölder Continuous Euler Flows

Phil Isett, Princeton University, USA

#### 11:00-11:25 Regularity of Solutions to the Axisymmetric Euler Equations

Elaine Cozzi, Oregon State University, USA

Monday, December 9

## **MS51**

### Multidimensional Hyperbolic Problems in Mechanics and Related Applications - Part I of IV

10:00 AM-12:00 PM

Room:Palm Ballroom V - Lobby Level

#### For Part 2 see MS63

Multi-dimensional conservation laws are a core subject of nonlinear partial differential equations whose theory has traditionally developed in connection to the subject of mechanics construed in a broad sense. This minisymposium aims to present recent developments in gas dynamics, elasticity, magnetohydrodynamics placing emphasis on multi-dimensional issues.

Organizer: Athanasios Tzavaras University of Crete, Greece

Organizer: Dehua Wang University of Pittsburgh, USA

Organizer: Charis Tsikkou West Virginia University, USA

#### 10:00-10:25 The Onset of Cavitation for the Equations of Polyconvex Elasticity

Athanasios Tzavaras, University of Crete, Greece

#### 10:30-10:55 Hyperbolic Techniques for Multidimensional Interface Dynamics

*Christian Rohde*, University of Stuttgart, Germany

11:00-11:25 Algebraic Vortex Spirals Volker W. Elling, University of Michigan, USA

#### 11:30-11:55 Linear and Nonlinear Reflection Patterns in Gas Dynamics

Barbara Keyfitz, Ohio State University, USA; Katarina Jegdic, University of Houston-Downtown, USA; Suncica Canic, University of Houston, USA; Hao Ying, The Ohio State University, USA

## Monday, December 9

## **MS52**

### Asymptotic Methods for Heterogeneous Media -Part I of II

10:00 AM-12:00 PM

Room:Camelia/Dogwood - Mezzanine Level

#### For Part 2 see MS64

The minisymposium will assess the use of asymptotic methods in analysis of models arising in composite and other heterogeneous media. In particular, issues that will be addressed but not limited to are asymptotic analysis for singular fields, geometric aspects of averaging, inverse problems, waves and transport in random heterogeneous media, and computational tools for complex inhomogeneous media. The purpose of this section is to enable contact between researchers working on asymptotic analysis for partial differential equations with an update on recent progress in this field.

Organizer: Yuliya Gorb University of Houston, USA

Organizer: Alexei Novikov Pennsylvania State University, USA

10:00-10:25 Title Not Available at Time of Publication

Lenya Ryzhik, Stanford University, USA

10:30-10:55 Asymptotic Approximation of the Dirichlet to Neumann Map of High Contrast Conductive Media

Liliana Borcea, Rice University, USA

11:00-11:25 Anomalous Diffusion of a Tracer Particle in Fast Cellular Flow Gautam Iyer, Carnegie Mellon

University, USA

#### 11:30-11:55 Asymptotic Expansion for Wave Propagation in a Media with a Small Hole

Hoai Minh Nguyen, University of Minnesota, USA

## MS53

### Mathematics of Novel Microstructures and Wave Propagation - Part I of II

10:00 AM-12:00 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

### For Part 2 see MS65

There has been a great deal of activity centering on novel micro-structured media for the purpose of controlling linear and nonlinear waves. Examples of such media include periodic structures, which operate by the classical bandgap (interference) effect and "metamaterials', in which the individual microfeatures have their own internal degrees resonances. Examples of applications in E&M, QM, Elasticity, are: high Q - factor cavities electromagnetic and quantum applications, novel dynamics of wave-packets in honeycomb structures, one-way topologically stable edge states in quantum or electromagnetic media, and cloaking by transformational optics or by anomalous localized resonance.

This minisymposium will explore recent modeling, analytical and computational developments.

Organizer: Michael I. Weinstein Columbia University, USA

Organizer: Andrew Norris Rutgers University, USA

### 10:00-10:25 Mathematics of Novel Microstructures and Wave Propagation

Andre Diatta, Shane Cooper and Sebastien Guenneau, Institut Fresnel, CNRS, Aix-Marseille Université, Ecole Centrale Marseille, France 10:30-10:55 Pathological Scattering in the Resonant Slow-Light Regime

Stephen P. Shipman, Louisiana State University, USA

### 11:00-11:25 Engineering Anisotropy to Amplify a Long Wavelength Field Without a Limit

Liping Liu, Rutgers University, USA

### 11:30-11:55 Tight-Binding Approximations and Edge States in Honeycomb Optical Lattices

Chris Curtis, University of Colorado Boulder, USA

### Monday, December 9

## MS54

## Global Attractors, Dissipative Dynamical Systems, and Turbulence - Part I of II

10:00 AM-12:00 PM

Room:Fuschia/Gardenia - Mezzanine Level

### For Part 2 see MS66

Many dissipative dynamical systems of scientific and practical interest exhibit an extremely rich variety of long-time behaviors. Recently, much progress has been made in this study, leading to discoveries of new phenomena, as well as a sharper, more cohesive understanding of the underlying mechanisms. This symposium aims to increase the interdisciplinary synthesis of methods currently being developed in the theory and application of dissipative dynamical systems. Results about global attractors, global regularity of hydrodynamic systems, generalizations of attractors to semi-dissipative systems, and analysis of properties of attractors for regularized dynamical systems will be among the major topics of interest.

Organizer: Adam Larios Texas A&M University, USA

Organizer: Animikh Biswas University of North Carolina, Charlotte, USA

10:00-10:25 An Appropriate Notion of Attractor for Semi-Dissipative Equations Animikh Biswas, University of North

Carolina, Charlotte, USA; Ciprian Foias and *Adam Larios*, Texas A&M University, USA

## 10:30-10:55 On Forced Turbulence in Physical Scales of 3D NSE

*Radu Dascaliuc*, Oregon State University, USA; Zoran Grujic, University of Virginia, USA

### 11:00-11:25 Existence and Uniqueness of Solutions for the Inviscid Shallow Water Equations

Roger M. Temam and Aimin Huang, Indiana University, USA

### 11:30-11:55 The Well-posedness Linear Hyperbolic Partial Differential Equations in a Rectangle

Aimin Huang and Roger M. Temam, Indiana University, USA

## Monday, December 9

## MS55

## Qualitative Analysis of Nonlinear Waves -Part II of III

10:00 AM-12:00 PM

Room:Kahili/Lily - Mezzanine Level

### For Part 1 see MS44 For Part 3 see MS67

Wave phenomena occur in most scientific and engineering disciplines: fluid mechanics, optics, acoustics, electromagnetism, quantum mechanics to name just a few. This minisymposium will provide an opportunity for active researchers to discuss various problems that arise in nonlinear PDE's describing wave propagation. It focuses on (but is not restricted to) water waves, nonlinear Schrodinger equation, and related hyperbolic and hyperbolic-like systems. Of primary interest are qualitative properties of solutions: local and global wellposedness, regularity, large-time behavior, control and stability, scattering, dispersive estimates, etc.

Organizer: Yanqiu Guo Weizmann Institute of Science, Israel

10:00-10:25 Justifying the Modulation Approximation of the Full Water Wave Problem

Nathan Totz, Duke University, USA

### 10:30-10:55 Scattering for Small Solutions of NLS with Subcritical Nonlinearity

Atanas Stefanov, University of Kansas, USA

### 11:00-11:25 Finite Time Blow-Up Versus Global Existence of Solutions for a 1D Fluid Model

*Slim Ibrahim*, University of Victoria, Canada

### 11:30-11:55 Nonstandard Dispersive Estimates and Long Time Existence for the 2d Water Wave Problem

Jennifer Beichman, University of Michigan, USA; Sijue Wu, University of Michigan, Ann Arbor, USA

## **MS56**

## Elliptic and Parabolic Equations with Nonstandard Nonlinearity - Part I of III

10:00 AM-12:00 PM

Room: Hibiscus - Mezzanine Level

### For Part 2 see MS68

Many important problems in modern sciences and technology require more and more sophisticated non-linear models, which usually deal with the non-linearity deviating from the standard ones. These demand developments of new methods in mathematics to explore them. This minisymposium aims to report advances in this field, particularly for elliptic and parabolic equations. Special attention will be given to topics such as regularity, qualitative properties, stability, asymptotic analysis and dynamics of the solutions of those nonlinear partial differential equations.

Organizer: Akif Ibragimov Texas Tech University, USA

Organizer: Luan Hoang Texas Tech University, USA

Organizer: Mikhail D. Surnachev Russian Academy of Sciences, Russia

Organizer: Vasily Zhikov Vladimir State University, Russia

### 10:00-10:25 Parabolic Equations Degenerating on a Part of the Domain

Mikhail D. Surnachev, Russian Academy of Sciences, Russia

#### 10:30-10:55 On a Chemotaxis Model with Saturated Chemotactic Flux *Alina Chertock*, North Carolina State

University, USA

### 11:00-11:25 Some Recent Progress on the Study of Behavior of Solutions of Degenerate Viscous Hamilton-Jacobi Equations

Hung Tran, University of Chicago, USA

#### 11:30-11:55 G-Convergence of Elliptic Operators with Nonstandard Growth

Alexander Pankov, Morgan State University, USA Monday, December 9

# MS57

### Nonlocal Interaction Models - Part II of III

10:00 AM-12:00 PM

Room: Iris - Mezzanine Level

### For Part 1 see MS46 For Part 3 see MS69

Models that involve nonlocal interactions are prevalent in the scientific literature. Some examples include anomalous diffusion of nutrients inside a cell; interactions within a biological swarm; ecological dispersal and transport in porous media, and n-body or n-vortex dynamics problem in the limit of large n. These models pose tough challenging mathematical questions that push the boundaries of established mathematical theories. This minisymposium will bring together practitioners who study nonlocal models either from mathematical or modelling perspective.

Organizer: Yanghong Huang Imperial College London, United Kingdom

Organizer: Theodore Kolokolnikov Dalhousie University, Canada

### 10:00-10:25 Stationary States and Asymptotic Behaviour of Aggregation Models with Nonlinear Local Repulsion

Martin Burger, University of Muenster, Germany; Razvan Fetecau, Simon Fraser University, Canada; *Yanghong Huang*, Imperial College London, United Kingdom

### 10:30-10:55 Modeling Selective Local Interactions with Memory

Doron Levy, University of Maryland, USA

### 11:00-11:25 Minimization of an Energy Defined via an Attractive-Repulsive Interaction Potential Related to Nonlocal Aggregation Models

*Ihsan A. Topaloglu*, McGill University, Canada

## 11:30-11:55 Title Not Available at Time of Publication

James von Brecht, University of California, Los Angeles, USA

### Monday, December 9

## MS58

## Mathematical analysis of Liquid Crystals - Part II of III

10:00 AM-12:00 PM

Room: Magnolia - Mezzanine Level

### For Part 1 see MS47 For Part 3 see MS70

Liquid crystals represent a broad class of anisotropic soft matter materials. A wide spectrum of mathematical problems will be considered on this topic providing analyses of models for these materials with varying detail and at different length scales. Research on both dynamic and stationary problems will be presented. Topics included are dynamics for the Ericksen Leslie equations, molecular dynamics, analysis of defect structure and stability of defects in smectic and nematic models, chevron structure in solutions for smectics, simulations for electrostatic effects, and analysis of models for models with biological applications.

Organizer: Patricia Bauman Purdue University, USA

Organizer: Tiziana Giorgi New Mexico State University, USA

Organizer: Daniel Phillips Purdue University, USA

### 10:00-10:25 Higher-Order Gradient Theories for Nematic Liquid Crystals

Amit Acharya, Carnegie Mellon University, USA; *Dmitry Golovaty*, University of Akron, USA

### 10:30-10:55 Chevron Structures in Liquid Crystal Films

Lei Zhang Cheng, Indiana University Kokomo, USA

### 11:00-11:25 Stability of Radially Symmetric Solution in Landau-De Gennes Theory of Liquid Crystals

Valeriy Slastikov, University of Bristol, United Kingdom

## 11:30-11:55 Mathematical Models for a Soap Opera

Raffaella De Vita, Virginia Tech, USA; Iain W. Stewart, University of Strathclyde, United Kingdom

## **MS59**

### Recent Advances in Methods for System with Dynamical Boundaries -Part I of III

10:00 AM-12:00 PM

Room:Begonia - Mezzanine Level

### For Part 2 see MS71

Many physical problems involve moving boundaries whose dynamics are determined as part of the solution. The existence of the dynamical boundaries poses significant mathematical challenges for the underlying PDE system. This minisymposium will highlight some recent advances in analytical and computational studies for such systems, including fluid systems with free and physical boundaries, optimal control of free boundary problems, interactions of floating objects, regularity in the parabolic thin obstacle problem, Stefan problem with variable surface, Wiener test for the classification of singularities for the elliptic and parabolic PDEs and obstacle problems.

Organizer: Ugur G. Abdulla Florida Institute of Technology, USA

Organizer: Jian Du Florida Institute of Technology, USA

#### 10:00-10:25 An Interface Capturing Method for Simulating Dynamic Gel-Fluid Interaction

Jian Du, Florida Institute of Technology, USA; Robert D. Guy, University of California, Davis, USA; Aaron L. Fogelson, University of Utah, USA; Grady B. Wright, Boise State University, USA; James P. Keener, University of Utah, USA

#### 10:30-10:55 Compressible Navier-Stokes System with Temperature Dependent Viscosity and Heat Conductivity

Weizhe Zhang and Ronghua Pan, Georgia Institute of Technology, USA

continued in next column

### 11:00-11:25 Coupling Between Fluid Equations and Fabric Surface Model *Xiaolin Li*, State University of New

York, Stony Brook, USA

### 11:30-11:55 Toward a Theory of Mutual Attractions and Repulsions of Floating Objects

Robert Finn, Stanford University, USA

### Monday, December 9

## CP5

Reaction-Diffusion Systems, Nonlocal Equations, and Pattern Formation - Part I

10:00 AM-12:00 PM

Room:Palm Ballroom IV - Lobby Level

Chair: To Be Determined

### 10:00-10:15 Multiple Steady State Solutions of Some Reaction-Diffusion Systems

*Cyril Joel Batkam*, University of Sherbrooke, Canada

### 10:20-10:35 Stability and Convergence Analysis for Nonlocal Diffusion and Nonlocal Wave Equations

*Qingguang Guan* and Max Gunzburger, Florida State University, USA

#### 10:40-10:55 Global Attractors of the Hyperbolic Relaxation of Reaction-Diffusion Equations with Dynamic Boundary Conditions

Joseph L. Shomberg, Providence College, USA; Ciprian Gal, Florida International University, USA

### 11:00-11:15 Phase Transitions with Mid-Range Interactions: a Non-Local Stefan Model

*Cristina Brandle*, Universidad Carlos III de Madrid, Spain; Emmanuel Chasseigne, Universite François Rabelais, France; Fernando Quirós, Universidad Autonoma de Madrid, Spain

#### 11:20-11:35 Localized Perturbations of the Complex Ginzburg-Landau Equation: Rcovering Fredholm Poperties Via Kondratiev Spaces *Gabriela Jaramillo*, University of

Minnesota, USA

# 11:40-11:55 On $\lambda\text{-Symmetry}$ Classification and Conservations Laws of Differential Equations

*Teoman Özer*, Özlem Orhan, and Gülden Gün, Istanbul Technical University, Turkey

## CP6 Continuum Mechanics -Part I

### 10:00 AM-12:00 PM

Room:Azalea - Mezzanine Level

Chair: To Be Determined

### 10:00-10:15 Mathematical Analysis on Chevron Structures in Liquid Crystal Films

*Lei Z. Cheng*, Olivet Nazarene University, USA

10:20-10:35 A Longwave Model for Strongly Anisotropic Growth of a Crystal Step

Mikhail V. Khenner, Western Kentucky University, USA

### 10:40-10:55 Finite-Volume Numerical Approximations of Conservation Law with Fading Memory

Paramjeet Singh, Thapar University, India

11:00-11:15 On the Existence of Absolute Weak Minimizers of Energy Functionals Associated with the Boundary Value Problem of Nonlinear Elasticity

Salim M. Haidar, Grand Valley State University, USA

### 11:20-11:35 Acoustic Resonance of a Vapor Bounded by Its Own Liquid Phase

Takeru Yano, Osaka University, Japan

### 11:40-11:55 Multicomponent Polymer Flooding in Two Dimensional Oil Reservoir Simulation

Sudarshan Kumar Kenettinkara, Praveen c, and G.D. Veerappa Gowda, TIFR Centre, Bangalore, India

### Lunch Break

12:00 PM-2:00 PM

Attendees on their own

### Monday, December 9

### SP1

The SIAG/Analysis of Partial Differential Equations Prize Lecture: Weak Solutions of the Euler Equations: Nonuniqueness and Dissipation

2:00 PM-2:45 PM

### Room:Palm Ballroom I - Lobby Level

There are two aspects of weak solutions of the incompressible Euler equations which are strikingly different to the behaviour of classical solutions. Weak solutions are not unique in general and do not have to conserve the energy. Although the relationship between these two aspects is not clear, both seem to be in vague analogy with Gromov's h-principle. In the talk I will explore this analogy in light of recent results concerning both the non-uniqueness, the search for selection criteria, as well as the dissipation anomaly and the conjecture of Onsager.

### Speaker:

. László Székelyhidi, Jr. Universität Leipzig, Germany

Co-author: Camillo De Lellis University of Zurich, Switzerland

### Coffee Break

2:45 PM-3:15 PM



Room:Palm Ballroom II - Lobby Level

### Monday, December 9

## **MS60**

### The Fluid-Structure Interaction: Analysis, Numerics and Applications-Part I of II

3:15 PM-5:15 PM

Room: Palm Ballroom I - Lobby Level

### For Part 2 see MS72

Fluid-structure interaction (FSI) problems arise in many applications, including aeroelasticity and biofluids. This has been a very active research area for the past 20 years. However, a comprehensive study of these problems remains to be a challenge due to their strong nonlinearity and multiphysics nature. This minisymposium will focus on nonlinear, moving-boundary FSI problems, where the Navier-Stokes equations are coupled with elastic structures. The main topics addressed in the minisymposium will be: wellposedness, numerical schemes, computer simulations, and applications to real-life problems.

Organizer: Boris Muha University of Zagreb, Croatia

Organizer: Martina Bukac University of Pittsburgh, USA

### 3:15-3:40 Global Existence and Nonlinear Stability for Fluid-structure Problems

Steve Shkoller, University of California, Davis, USA

#### 3:45-4:10 A Constructive Existence Proof for a Moving Boundary Fluid-Multi-Layered Structure Interaction Problem

*Boris Muha*, University of Zagreb, Croatia; Suncica Canic, University of Houston, USA

### 4:15-4:40 Weak Solutions for an Incompressible, Generalized Newtonian Fluid Interacting with a Linearly Elastic Koiter Shell

Daniel Lengeler, University of Regensburg, Germany

### 4:45-5:10 The Motion of the Rigid Body with Collisions in a Bounded Domain. Global Solvability Result

Sarka Necasova, Mathematical Institute of Academy of Sciences, Czech Republic

## MS61 Mathflows - Part I of II

3:15 PM-5:15 PM

Room:Palm Ballroom III - Lobby Level

### For Part 2 see MS73

The objective of the session is to discuss various problems appearing in the area of fluid mechanics such as structure interactions and non-standard behavior. The topics concentrate on the Navier-Stokes system and its generalizations including coupling with elasticity equations, non-standard rheologies described by very general constitutive relations, Navier-Stokes-Fourier equations capturing compressible viscous and heat conducting flows, the problems of chemically reacting fluids and ocean dynamics. The interest shall also be directed to applications in the fields of natural sciences and engineering.

Organizer: Agnieszka Swierczewska-Gwiazda University of Warsaw, Poland

Organizer: Piotr Mucha Warsaw University, Poland

### 3:15-3:40 Generalized Stokes System and Implicit Constitutive Relations

Agnieszka Swierczewska-Gwiazda, University of Warsaw, Poland

### 3:45-4:10 Global Existence of Solutions to Fluid Structure Model with Moving Interface and Boundary Dissipation

Irena M. Lasiecka, University of Virginia, USA

### 4:15-4:40 Steady Compressible Navier-Stokes-Fourier System with Temperature Dependent Viscosities

Milan Pokorny, Charles University, Czech Republic

### 4:45-5:10 Non-Newtonian Fluids -Applications of Orlicz Spaces in Theory of PDE

Aneta Wroblewska-Kaminska, Polish Academy of Sciences, Poland Monday, December 9

## MS62

### Analysis of Nonlinear Differential Equations Arising in Fluid Dynamics -Part I of III

3:15 PM-5:15 PM

Room:Palm Ballroom IV - Lobby Level

### For Part 2 see MS74

In this minisymposium, we collect research work devoted to the analysis on nonlinear differential equations in fluid dynamics. The modern theory of mathematical fluid models began with Jean Leray in 1930's. Since then, a lot of mathematicians and physicists have made effort to develop the theory of fluid dynamics. But the area is still widely open. We are going to focus on certain types of nonlinear differential equations modeling some important phenomena in fluid dynamics. For such a subclass of fluids, we shall investigate the progress which have been recently made on studying the properties of solutions, existence, regularity, stability and asymptotic behaviors.

Organizer: Mimi Dai University of Colorado Boulder, USA

Organizer: Alexey Cheskidov University of Illinois, Chicago, USA

### 3:15-3:40 The Atmospheric Equations of Water Vapor with Saturation

Roger M. Temam, Indiana University, USA; Michele Coti Zelati, Indiana University Bloomington, USA

### 3:45-4:10 The Regularity Criteria for 3D Magneto-hydrodynamic System

Alexey Cheskidov, University of Illinois, Chicago, USA; *Mimi Dai*, University of Colorado Boulder, USA

### 4:15-4:40 Coupled Systems of Nonlinear Dispersive Wave Equations

Jerry Bona, University of Illinois, Chicago, USA

#### 4:45-5:10 Averaging and Spectral Properties of the 2D Advection-diffusion Equation in the Semi-classical Limit for Vanishing Diffusivity

Jesenko Vukadinovic, City University of New York, College of Staten Island, USA

## Monday, December 9

## **MS63**

### Multidimensional Hyperbolic Problems in Mechanics and Related Applications - Part II of IV

3:15 PM-5:15 PM

Room: Palm Ballroom V - Lobby Level

### For Part 1 see MS51 For Part 3 see MS75

Multi-dimensional conservation laws are a core subject of nonlinear partial differential equations whose theory has traditionally developed in connection to the subject of mechanics construed in a broad sense. This minisymposium aims to present recent developments in gas dynamics, elasticity, magnetohydrodynamics placing emphasis on multi-dimensional issues.

Organizer: Athanasios Tzavaras University of Crete, Greece

Organizer: Dehua Wang University of Pittsburgh, USA

Organizer: Charis Tsikkou West Virginia University, USA

3:15-3:40 On Multiphase Flow Models: Global Existence of Weak Solutions *Konstantina Trivisa*, University of Maryland, USA

**3:45-4:10 Shock-free Transonic Solutions to the Steady Euler System** *Yuxi Zheng* and Tianyou Zhang,

Pennsylvania State University, USA

### 4:15-4:40 Relative Entropy in Hyperbolic Relaxation of Balance Laws

Alexey Miroshnikov, University of Massachusetts, Amherst, USA; Konstantina Trivisa, University of Maryland, USA

### 4:45-5:10 Global Weak Solutions to the Inhomogeneous Navier-Stokes-Vlasov Equations

*Cheng Yu*, University of Texas, USA; Dehua Wang, University of Pittsburgh, USA

## **MS64**

### Asymptotic Methods for Heterogeneous Media - Part II of II

3:15 PM-5:45 PM

Room:Camelia/Dogwood - Mezzanine Level

### For Part 1 see MS52

The minisymposium will assess the use of asymptotic methods in analysis of models arising in composite and other heterogeneous media. In particular, issues that will be addressed but not limited to are asymptotic analysis for singular fields, geometric aspects of averaging, inverse problems, waves and transport in random heterogeneous media, and computational tools for complex inhomogeneous media. The purpose of this section is to enable contact between researchers working on asymptotic analysis for partial differential equations with an update on recent progress in this field.

Organizer: Yuliya Gorb University of Houston, USA

Organizer: Alexei Novikov Pennsylvania State University, USA

### 3:15-3:40 Long Time Influence of Small Perturbations

Mark I. Freidlin, University of Maryland, USA

#### 3:45-4:10 Classical Limit for a System of Random Non-Linear Schrödinger Equations

*Olivier Pinaud*, Colorado State University, USA

### 4:15-4:40 Linear Relaxation to Planar Travelling Waves in Inertial Confinement Fusion

Lèonard Monsaingeon, Carnegie Mellon University, USA

### 4:45-5:10 Asymptotic Behaviors for the Random Schrödinger Equation with Long-Range Correlations

*Christophe Gomez*, Aix-Marseille Université, France

### 5:15-5:40 Title Not Available at Time of Publication

*Gung-Min Gie* and Chang-yeol Jung, Indiana University, USA; Ahmed Bchatnia, University of Dammam, Saudi Arabia; YoungJoon Hong, Indiana University, USA Monday, December 9

## MS65

## Mathematics of Novel Microstructures and Wave Propagation - Part II of II

3:15 PM-5:15 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

### For Part 1 see MS53

There has been a great deal of activity centering on novel micro-structured media for the purpose of controlling linear and nonlinear waves. Examples of such media include periodic structures, which operate by the classical band-gap (interference) effect and "meta-materials," in which the individual micro-features have their own internal degrees resonances. Examples of applications in E&M, QM, Elasticity are: high Q - factor cavities electromagnetic and quantum applications, novel dynamics of wavepackets in honeycomb structures, oneway topologically stable edge states in quantum or electromagnetic media, and cloaking by transformational optics or by anomalous localized resonance. This minisymposium will explore recent modeling, analytical and computational developments.

Organizer: Michael I. Weinstein *Columbia University, USA* 

Organizer: Andrew Norris Rutgers University, USA

3:15-3:40 Exponential Asymptotics for Line Solitons in Two-Dimensional Periodic Potentials

Jianke Yang, University of Vermont, USA

#### 3:45-4:10 Quantum Graph Spectral Analysis of Graphyne Structures

Peter Kuchment, Texas A&M University, USA

### 4:15-4:40 High Frequency Homogenization: Connecting the Microstructure to the Macroscale

*Richard Craster*, Imperial College London, United Kingdom

4:45-5:10 Geometric Optimization of Laplace-Beltrami Eigenvalues Braxton Osting, University of California, Los Angeles, USA

## Monday, December 9

## **MS66**

### Global Attractors, Dissipative Dynamical Systems, and Turbulence -Part II of II

3:15 PM-5:15 PM

Room:Fuschia/Gardenia - Mezzanine Level

### For Part 1 see MS54

Many dissipative dynamical systems of scientific and practical interest exhibit an extremely rich variety of long-time behaviors. Recently, much progress has been made in this study, leading to discoveries of new phenomena, as well as a sharper, more cohesive understanding of the underlying mechanisms. This symposium aims to increase the interdisciplinary synthesis of methods currently being developed in the theory and application of dissipative dynamical systems. Results about global attractors, global regularity of hydrodynamic systems, generalizations of attractors to semi-dissipative systems, and analysis of properties of attractors for regularized dynamical systems will be among the major topics of interest.

Organizer: Adam Larios Texas A&M University, USA

Organizer: Animikh Biswas University of North Carolina, Charlotte, USA

### 3:15-3:40 Rate of Vertical Heat Transport in Rayleigh-Benard Convection

Xiaoming Wang, Florida State University, USA

### 3:45-4:10 On the Temperature Variance Cascade in Surface Quasigeostrophic Turbulence

Zachary Bradshaw and Zoran Grujic, University of Virginia, USA

#### 4:15-4:40 On Dynamics of Fluid Flows in Porous Media

Luan Hoang, Texas Tech University, USA

### 4:45-5:10 On the Existence of Pullback Attractors for the 3D Navier-Stokes Equations

Landon Kavlie, University of Illinois, Chicago, USA

### MS67 Qualitative Analysis of Nonlinear Waves -Part III of III

3:15 PM-4:45 PM

Room: Kahili/Lily - Mezzanine Level

### For Part 2 see MS55

Wave phenomena occur in most scientific and engineering disciplines: fluid mechanics, optics, acoustics, electromagnetism, quantum mechanics to name just a few. This minisymposium will provide an opportunity for active researchers to discuss various problems that arise in nonlinear PDE's describing wave propagation. It focuses on (but is not restricted to) water waves, nonlinear Schrodinger equation, and related hyperbolic and hyperbolic-like systems. Of primary interest are qualitative properties of solutions: local and global wellposedness, regularity, largetime behavior, control and stability, scattering, dispersive estimates, etc.

Organizer: Yanqiu Guo Weizmann Institute of Science, Israel

### 3:15-3:40 On the Spectral Stability of Kinks in Some PT-symmetric Nonlinear Equations

Milena Stanislavova, University of Kansas, Lawrence, USA

### 3:45-4:10 Global Exact Controllability of Semilinear Plate Equations

Matthias Eller, Georgetown University, USA; *Daniel Toundykov*, University of Nebraska-Lincoln, USA

### 4:15-4:40 Two Dimensional Water Waves In Holomorphic Coordinates

Mihaela Ifrim, McMaster University, Canada; Daniel Tataru, University of California, Berkeley, USA; John Hunter, University of California, Davis, USA Monday, December 9

## MS68

## Elliptic and Parabolic Equations with Nonstandard Nonlinearity - Part II of III

3:15 PM-5:15 PM

Room: Hibiscus - Mezzanine Level

### For Part 1 see MS56 For Part 3 see MS79

Many important problems in modern sciences and technology require more and more sophisticated non-linear models, which usually deal with the non-linearity deviating from the standard ones. These demand developments of new methods in mathematics to explore them. This minisymposium aims to report advances in this field, particularly for elliptic and parabolic equations. Special attention will be given to topics such as regularity, qualitative properties, stability, asymptotic analysis and dynamics of the solutions of those non-linear partial differential equations.

Organizer: Akif Ibragimov Texas Tech University, USA

Organizer: Luan Hoang Texas Tech University, USA

Organizer: Mikhail D. Surnachev Russian Academy of Sciences, Russia

Organizer: Vasily Zhikov Vladimir State University, Russia

#### 3:15-3:40 On Passage to the Limit in Nonlinear Elliptic and Parabolic Equations

Vasily Zhikov, Vladimir State University, Russia

### 3:45-4:10 Two-phase Generalized Forchheimer Flows

*Thinh Kieu*, Luan Hoang, and Akif Ibragimov, Texas Tech University, USA

### 4:15-4:40 Upscaling of Forchheimer Flows

Lidia Bloshanskaya, State University of New York, New Paltz, USA; Eugenio Aulisa and Akif Ibragimov, Texas Tech University, USA; Yalchin Efendiev, Texas A&M University, USA

## 4:45-5:10 Complementary Media in Metamaterials

Hoai-Minh Nguyen, University of Minnesota, USA

### Monday, December 9

## MS69 Nonlocal Interaction Models - Part III of III

3:15 PM-5:15 PM

Room: Iris - Mezzanine Level

### For Part 2 see MS57

Models that involve nonlocal interactions are prevalent in the scientific literature. Some examples include anomalous diffusion of nutrients inside a cell; interactions within a biological swarm; ecological dispersal and transport in porous media, and n-body or n-vortex dynamics problem in the limit of large n. These models pose tough challenging mathematical questions that push the boundaries of established mathematical theories. This minisymposium will bring together practitioners who study nonlocal models either from mathematical or modelling perspective.

Organizer: Yanghong Huang Imperial College London, United Kingdom

Organizer: Theodore Kolokolnikov Dalhousie University, Canada

### 3:15-3:40 Nonlinear Stability of Steady States of Nonlocal-interaction Equations

Dejan Slepcev and Robert Simione, Carnegie Mellon University, USA

## 3:45-4:10 Title Not Available at Time of Publication

David T. Uminsky, University of San Francisco, USA

### 4:15-4:40 Nonlocal Interaction Equations in Environments with Heterogeneities and Boundaries

*Lijiang Wu* and Dejan Slepcev, Carnegie Mellon University, USA

#### 4:45-5:10 A Blob Method for the Aggregation Equation *Katy Craig*, Rutgers University, USA

## MS70 Mathematical Analysis of

Liquid Crystals - Part III of III 3:15 PM-5:15 PM

Room:Magnolia - Mezzanine Level

### For Part 2 see MS58

Liquid crystals represent a broad class of anisotropic soft matter materials. A wide spectrum of mathematical problems will be considered on this topic providing analyses of models for these materials with varying detail and at different length scales. Research on both dynamic and stationary problems will be presented. Topics included are dynamics for the Ericksen Leslie equations, molecular dynamics, analysis of defect structure and stability of defects in smectic and nematic models, chevron structure in solutions for smectics, simulations for electrostatic effects. and analysis of models for models with biological applications.

Organizer: Patricia Bauman Purdue University, USA

Organizer: Tiziana Giorgi New Mexico State University, USA

Organizer: Daniel Phillips Purdue University, USA

### 3:15-3:40 Models for Active Liquid Crystals and Their Applications to Complex Biological Systems

*Qi Wang*, University of South Carolina, USA

### 3:45-4:10 Field Responses of Smectic A Liquid Crystals in 2D and 3D

Sookyung Joo, Old Dominion University, USA; Carlos Garcia-Cervera, University of California, Santa Barbara, USA

### 4:15-4:40 Liquid Crystals: from Molecular Dynamics to Pdes

Ibrahim Fatkullin, University of Arizona, USA

### 4:45-5:10 The Existence of Global Solutions to the Ericksen-Leslie System in R<sup>2</sup>

Changyou Wang, University of Kentucky, USA

## Monday, December 9

## **MS71**

### Recent Advances in Methods for System with Dynamical Boundaries -Part II of III

3:15 PM-5:15 PM

### Room:Begonia - Mezzanine Level

#### For Part 1 see MS59 For Part 3 see MS81

Many physical problems involve moving boundaries whose dynamics are determined as part of the solution. The existence of the dynamical boundaries poses significant mathematical challenges for the underlying PDE system. This minisymposium will highlight some recent advances in analytical and computational studies for such systems, including fluid systems with free and physical boundaries, optimal control of free boundary problems, interactions of floating objects, regularity in the parabolic thin obstacle problem, Stefan problem with variable surface, Wiener test for the classification of singularities for the elliptic and parabolic PDEs and obstacle problems.

Organizer: Ugur G. Abdulla Florida Institute of Technology, USA

Organizer: Jian Du Florida Institute of Technology, USA

3:15-3:40 The Wiener Test for the Removability of the Logarithmic Singularity for the Elliptic PDEs with Measurable Coefficients, and Its Measure-Theoretical, Topological, and Probabilistic Consequences

*Ugur G. Abdulla*, Florida Institute of Technology, USA

### 3:45-4:10 The Elliptic Obstacle Problem When the Coefficients Are Only in Vmo

*Ivan Blank* and Zheng Hao, Kansas State University, USA; Kubrom Teka, SUNY Oswego, USA

### 4:15-4:40 On a Thermodynamically Consistent Stefan Problem with Variable Surface

*Gieri Simonett*, Vanderbilt University, USA

### 4:45-5:10 Monotonicity Formulas in the Signorini Problem

Nicola Garofalo, Universita di Padova, Italy

### Monday, December 9

## CP7 Elliptic PDE - Part I

3:15 PM-4:55 PM

Room: Azalea - Mezzanine Level

Chair: To Be Determined

### 3:15-3:30 A Unique Solution to a Quasi-Linear Elliptic Equation

Diane Denny, Texas A&M University, Corpus Christi, USA

### 3:35-3:50 Eigenvalues and Eigenfunctions of the Laplacian Via Inverse Iteration with Shift

*Eder M. Martins*, Universidade Federal de Ouro Preto, Brazil; Grey Ercole, Rodney Biezuner, and Breno Giacchini, Universidade Federal de Minas Gerais, Brazil

### 3:55-4:10 Global Regularity for a Class of Quasi-Linear Nonlocal Elliptic Equations

Alejandro Velez-Santiago, University of California, Riverside, USA

## 4:15-4:30 The Robin Eigenvalue Problem for the p(x)-Laplacian As $p \rightarrow \infty$

Marian Bocea, Loyola University of Chicago, USA

### 4:35-4:50 Well-Posedness of a Mathematical Model for Trace Gas Sensors

Brian W. Brennan and Robert C. Kirby, Baylor University, USA

## Dinner Break

5:15 PM-7:30 PM

Attendees on their own

## MT2

### Kinetic Descriptions of Multiscale Phenomena in Collective Dynamics

7:30 PM-9:30 PM

Room:Palm Ballroom I - Lobby Level Chair: Doron Levy, University of Maryland, USA Organizer and Speaker Eitan Tadmor, University of Maryland, USA

## Tuesday, December 10

Registration 7:30 AM-3:30 PM Room:Palm Foyer - Lobby Level

Closing Remarks 8:10 AM-8:15 AM Room:Palm Ballroom I - Lobby Level

## IP7

### A PDE Approach to Computing Viscosity Solutions of the Monge-Kantorovich Problem

8:15 AM-9:00 AM

Room:Palm Ballroom I - Lobby Level

Chair: Jean-Frederic Gerbeau, INRIA Paris-Rocquencourt, France

After a quick overview of the optimal transport for the Euclidean distance problem and available numerical methods, I will present a new technique to deal with the state constraint that binds the transport when source and target have compact support. It takes the form of non-linear boundary conditions which can be combined to a Monge-Ampère equation to solve the optimal transport problem. The wide-stencil discretization technique and fast Newton solver proposed by Oberman and Froese is extended to this framework and allows to compute weak viscosity solution of the optimal transport problem. Numerical solutions will be presented to illustrate strengths and weaknesses of the method.

Jean-David Benamou INRIA Rocquencourt, France

Coffee Break

9:00 AM-9:30 AM



Tuesday, December 10

The Fluid-Structure Interaction: Analysis, Numerics and Applications -Part II of II

9:30 AM-11:30 AM

Room:Palm Ballroom I - Lobby Level

### For Part 1 see MS60

Fluid-structure interaction (FSI) problems arise in many applications, including aeroelasticity and biofluids. This has been a very active research area for the past 20 years. However, a comprehensive study of these problems remains to be a challenge due to their strong nonlinearity and multi-physics nature. This minisymposium will focus on nonlinear, moving-boundary FSI problems, where the Navier-Stokes equations are coupled with elastic structures. The main topics addressed in the minisymposium will be: wellposedness, numerical schemes, computer simulations, and applications to real-life problems.

Organizer: Boris Muha University of Zagreb, Croatia

Organizer: Martina Bukac University of Pittsburgh, USA

### 9:30-9:55 Reduced Models for Solving Inverse Fluid-Structure Interaction Problems

Luca Bertagna, Emory University, USA; *Alessandro Veneziani*, Emory University, USA

10:00-10:25 Enforcing Interface Conditions for Fsi Problems Using Nitsche's Method. Derivation of Explicit Coupling Strategies for Multilayered Poroelastic Arteries.

Martina Bukac, Ivan Yotov, Rana Zakerzadeh, and *Paolo Zunino*, University of Pittsburgh, USA

continued on next page

Room:Palm Ballroom II - Lobby Level

## **MS72**

### The Fluid-Structure Interaction: Analysis, Numerics and Applications -Part II of II

9:30 AM-11:30 AM

continued

### 10:30-10:55 Validation of An Open Source Framework for the Simulation of Blood Flow in Deformable Vessels

Tiziano Passerini, Emory University, USA; Annalisa Quaini, University of Houston, USA; Umberto E. Villa, Lawrence Livermore National Laboratory, USA; Alessandro Veneziani, Emory University, USA; Suncica Canic, University of Houston, USA

### 11:00-11:25 Modeling Arterial Walls As a Multi-Layered Structure, and Their Interaction with Pulsatile Blood Flow

Martina Bukac, University of Pittsburgh, USA; Boris Muha, University of Zagreb, Croatia; Suncica Canic, University of Houston, USA Tuesday, December 10

## MS73 Mathflows - Part II of II

9:30 AM-11:30 AM

Room:Palm Ballroom III - Lobby Level For Part 1 see MS61

The objective of the session is to discuss various problems appearing in the area of fluid mechanics such as structure interactions and non-standard behavior. The topics concentrate on the Navier-Stokes system and its generalizations including coupling with elasticity equations, non-standard rheologies described by very general constitutive relations, Navier-Stokes-Fourier equations capturing compressible viscous and heat conducting flows, the problems of chemically reacting fluids and ocean dynamics. The interest shall also be directed to applications in the fields of natural sciences and engineering.

Organizer: Agnieszka Swierczewska-Gwiazda University of Warsaw, Poland

Organizer: Piotr Mucha Warsaw University, Poland

9:30-9:55 Compressible Navier-Stokes System with Inflow Condition *Piotr Mucha*, Warsaw University, Poland

10:00-10:25 Singular Limits of Compressible Fluids

*Eduard Feireisl*, Mathematical Institute ASCR, Prague, Czech Republic

#### 10:30-10:55 Existence Analysis of the Navier-Stokes System for Multicomponent Mixtures

*Ewelina Zatorska*, Warsaw University of Technology, Poland

### 11:00-11:25 Well-Posedness of the Primitive Equations of the Ocean with Continuous Initial Data

Walter Rusin, Oklahoma State University, USA; Igor Kukavica, Yuan Pei, and Mohammed Ziane, University of Southern California, USA Tuesday, December 10

## **MS74**

### Analysis of Nonlinear Differential Equations Arising in Fluid Dynamics -Part II of III

9:30 AM-11:30 AM

Room:Palm Ballroom IV - Lobby Level

### For Part 1 see MS62 For Part 3 see MS84

In this minisymposium, we collect research work devoted to the analysis on nonlinear differential equations in fluid dynamics. The modern theory of mathematical fluid models began with Jean Leray in 1930's. Since then, a lot of mathematicians and physicists have made effort to develop the theory of fluid dynamics. But the area is still widely open. We are going to focus on certain types of nonlinear differential equations modeling some important phenomena in fluid dynamics. For such a subclass of fluids, we shall investigate the progress which have been recently made on studying the properties of solutions, existence, regularity, stability and asymptotic behaviors.

Organizer: Mimi Dai University of Colorado Boulder, USA

Organizer: Alexey Cheskidov University of Illinois, Chicago, USA

#### 9:30-9:55 Pde Model of Gbm: Insights Into The Shortcomings of Anti-Angiogeneic Therapy

Hassan M. Fathallah-Shaykh, University of Alabama at Birmingham, USA; Olivier Saut and Thierry Colin, Institut de Mathématiques de Bordeaux, France

### 10:00-10:25 On the Euler-Poincare Equation with Non-Zero Dispersion

Dong Li, University of British Columbia, Canada; Xinwei Yu and Zhichun Zhai, University of Alberta, Canada

## 10:30-10:55 Laminar Boundary Layers in Rayleigh-Benard Convection

Christian Seis, University of Toronto, Canada

## **MS75**

### Multidimensional Hyperbolic Problems in Mechanics and Related Applications - Part III of IV

9:30 AM-11:30 AM

Room: Palm Ballroom V - Lobby Level

### For Part 2 see MS63 For Part 2 see MS85

Multi-dimensional conservation laws are a core subject of nonlinear partial differential equations whose theory has traditionally developed in connection to the subject of mechanics construed in a broad sense. This minisymposium aims to present recent developments in gas dynamics, elasticity, magnetohydrodynamics placing emphasis on multi-dimensional issues.

Organizer: Athanasios Tzavaras University of Crete, Greece

Organizer: Dehua Wang University of Pittsburgh, USA

Organizer: Charis Tsikkou West Virginia University, USA

#### 9:30-9:55 Incompressible Limits for Magnetohydrodynamics

Dehua Wang, University of Pittsburgh, USA

#### 10:00-10:25 Weak Solutions for Pressureless Gas Dynamics and Other Hyperbolic Systems Through Energy Minimization

*Pierre-Emmanuel Jabin*, University of Maryland, USA; Jean-Francois Jabir, University of Santiago, Spain; Alexis F. Vasseur, University of Texas, Austin, USA; Amina Amassad, University of Nice, France

### 10:30-10:55 Title Not Available at Time of Publication

Alexis F. Vasseur, University of Texas, Austin, USA

11:00-11:25 Convex Entropy, Hopf Bifurcation, and Viscous and Inviscid Shock Stability

Kevin Zumbrun, Indiana University, USA

Tuesday, December 10

## **MS76**

See Sunday schedule on page 33.

Tuesday, December 10

## **MS77**

### Charge Transport with Applications to Solar Cells -Part I of II

9:30 AM-11:30 AM

Room:Narcissus/Orange Blossom -Mezzanine Level

### For Part 2 see MS86

Solar cells have attracted great attention in the past several decades. The efficiency of a solar cell depends on many physical processes, such as generation, transport, recombination, and collection of charge carriers. Energy transfer between carriers and carrierphonon interaction can also play an important role. In this minisymposium we propose to bring together specialists in the field from different backgrounds, and exchange recent developments and ideas on modeling these processes, enhancing predictability, and guiding material designs. Experiment, theory and simulations will be discussed.

Organizer: Carlos Garcia-Cervera University of California, Santa Barbara, USA

Organizer: Jingrun Chen University of California, Santa Barbara, USA

Organizer: Xu Yang University of California, Santa Barbara, USA

9:30-9:55 Charge Transport in Bulk-Heterojunction Organic Solar Cells: Adaptivity, High-Throughput Computing and Optimal Morphologies *Baskar Ganapathysubramanian*, Iowa

State University, USA

10:00-10:25 Multiscale Modeling and Computation of Nano Optical Responses

Di Liu, Michigan State University, USA

10:30-10:55 First-Principles Prediction of Charge and Energy Transport in Disordered Semiconductors for Photovoltaic Applications

*Gang Lu*, California State University, Northridge, USA

11:00-11:25 Deterministic Solvers to Describe DG-MOSFET Devices

Maria Caceres, Universidad de Granada, Spain

## **MS78**

### Front Propagation and Interface Motion in Nonlinear PDE Models -Part I of II

9:30 AM-11:30 AM

Room:Fuschia/Gardenia - Mezzanine Level

### For Part 2 see MS87

Interfaces and fronts arise in many physical and biological systems modeled by PDEs. This minisymposium will focus on analysis of fronts and interfaces goverened by reactiondiffusion equations, by geometric motion laws, and by other nonlinear PDEs. In particular, speakers will address questions about different models for interface motion, about the asymptotic behaviour of fronts, and about how a front interacts with a heterogeneous medium.

Organizer: James Nolen Duke University, USA

Organizer: Antoine Mellet University of Maryland, USA

#### 9:30-9:55 The Logarithmic Delay of Kpp Fronts in a Heterogeneous Medium

Francois Hamel, Université d'Aix-Marseille III, France; *James Nolen*, Duke University, USA; Jean-Michel Roquejoffre, Universite Paul Sabatier, France; Lenya Ryzhik, Stanford University, USA

#### 10:00-10:25 Anomalous Spreading in a System of Coupled Fisher-Kpp Equations

Matt Holzer, University of Minnesota, USA

#### 10:30-10:55 Sharp Asymptotic Growth Laws of Turbulent Flame Speeds in Cellular Flows by Inviscid Hamilton-Jacobi Models

*Yifeng Yu* and Jack Xin, University of California, Irvine, USA

#### 11:00-11:25 Homogenization for Problems with Oscillatory Boundary Conditions

*Nestor Guillen*, University of California, Los Angeles, USA Tuesday, December 10

## **MS79**

## Elliptic and Parabolic Equations with Nonstandard Nonlinearity - Part III of III

9:30 AM-11:30 AM

Room: Hibiscus - Mezzanine Level

### For Part 2 see MS68

Many important problems in modern sciences and technology require more and more sophisticated non-linear models, which usually deal with the non-linearity deviating from the standard ones. These demand developments of new methods in mathematics to explore them. This minisymposium aims to report advances in this field, particularly for elliptic and parabolic equations. Special attention will be given to topics such as regularity, qualitative properties, stability, asymptotic analysis and dynamics of the solutions of those non-linear partial differential equations.

Organizer: Akif Ibragimov Texas Tech University, USA

Organizer: Luan Hoang Texas Tech University, USA

Organizer: Mikhail D. Surnachev Russian Academy of Sciences, Russia

Organizer: Vasily Zhikov Vladimir State University, Russia

### 9:30-9:55 An Ersatz Existence Theorem for Fully Nonlinear Parabolic Equations without Convexity Assumptions

Nicolai Krylov, University of Minnesota, USA

### 10:00-10:25 A New Curvaturedependent Surface Tension Model in Fracture Mechanics

Anna Zemlyanova, Texas A&M University, USA

### 10:30-10:55 Ultrasound-modulated Optical Tomography: A Nonlinear Model

*Loc Nguyen*, Ecole Normale Superieure de Paris, France

#### 11:00-11:25 Landis-type Lemma of Growth in the Layered Cylinders for Solution of the Parabolic Degenerate Equation and Applications

Akif Ibragimov, Luan Hoang, and Thinh Kieu, Texas Tech University, USA

## Tuesday, December 10

### MS80 Fluid Dynamia

### Fluid Dynamic Equations : Existence and Asymptotic Between Theory and Numerics - Part I of II

9:30 AM-11:30 AM

Room: Magnolia - Mezzanine Level

### For Part 2 see MS88

Global regularity for Navier-Stokes and Euler equations continues to stand among the most challenging problems in mathematics. Also, zero viscosity limit of the NS solutions in bounded domains remains as one of the most important unanswered questions. However, few progresses have been made in both directions, either in proving the global regularity or the finite-time blow-up for other fluid models. Similarly, some important advances are made for the convergence of several reduced modeled to these equations. In this direction, the Primitive Equations constitute one of the most famous models for which many interesting results have been already proved.

Organizer: Makram Hamouda Indiana University, USA

Organizer: Slim Ibrahim University of Victoria, Canada

9:30-9:55 Title Not Available at Time of Publication

*Slim Ibrahim*, University of Victoria, Canada

## 10:00-10:25 Title Not Available at Time of Publication

*Taoufik Hmidi*, University of Rennes 1 and INRIA Rennes, France

### 10:30-10:55 Global Regularity for Some Oldroyd-B Type Models of Viscoelasticity

*Tarek Elghindi*, Courant Institute of Mathematical Sciences, New York University, USA

11:00-11:25 The Numerical Approach of the Singularly Perturbed Problems YoungJoon Hong, Indiana University, USA

## **MS81**

### Recent Advances in Methods for System with Dynamical Boundaries -Part III of III

9:30 AM-11:30 AM

Room:Begonia - Mezzanine Level

### For Part 2 see MS71

Many physical problems involve moving boundaries whose dynamics are determined as part of the solution. The existence of the dynamical boundaries poses significant mathematical challenges for the underlying PDE system. This minisymposium will highlight some recent advances in analytical and computational studies for such systems, including fluid systems with free and physical boundaries, optimal control of free boundary problems, interactions of floating objects, regularity in the parabolic thin obstacle problem, Stefan problem with variable surface, Wiener test for the classification of singularities for the elliptic and parabolic PDEs and obstacle problems.

Organizer: Ugur G. Abdulla Florida Institute of Technology, USA

Organizer: Jian Du Florida Institute of Technology, USA

### 9:30-9:55 Title Not Available at Time of Publication

Jean-Paul Zolesio, CNRS and INRIA Sophia-Antipolis, France

### 10:00-10:25 On the Optimal Control of Free Boundary Boundary Problems for the Second Order Parabolic PDEs

Ugur G. Abdulla and *Jonathan Goldfarb*, Florida Institute of Technology, USA

### 10:30-10:55 Recent Progress on Local Behavior of the Logarithmic Diffusion Equation

*Naian Liao* and Emmanuele DiBenedetto, Vanderbilt University, USA; Ugo P. Gianazza, University of Pavia, Italy

#### 11:00-11:25 Magic Toplitz Matrix for Mixed Boundary Laplace Equation and Its Application to Breast Cancer Detection

Eugene Demidenko, Dartmouth College, USA

Tuesday, December 10

## **CP8** Fractional and Nonlocal Operators

9:30 AM-11:10 AM

Room:Kahili/Lily - Mezzanine Level

Chair: William H. Sulis, McMaster University, Canada

### 9:30-9:45 Fractional Differential Equations with Impulses

Syed Abbas, Indian Institute of Technology, India

### 9:50-10:05 Exact Solutions of Nonlinear Fractional Partial Differential Equation

Adem Cevikel, Yildiz Technical University, Turkey; Ozkan Guner, Dumlupinar University, Turkey; Ahmet Bekir, Eskisehir Osmangazi University, Turkey; Mutlu Akar, Yildiz Technical University, Turkey

## 10:10-10:25 Multiscaling Modelling in Evolutionary Dynamics

Max O. Souza, Universidade Federal Fluminense, Brazil; Fabio Chalub, Universidade Nova de Lisboa, Portugal

### 10:30-10:45 Stability of Solutions of Parabolic and Hyperbolic Systems of Partial Differential Equations

*Ilya V. Boykov* and Vladimir Ryazantsev, Penza State University, Russia

### 10:50-11:05 A Game Theoretic Approach to Non-Relativistic Quantum Mechanics

William H. Sulis, McMaster University, Canada

### Tuesday, December 10

## CP9

### Computational Analysis of Physical Systems

9:30 AM-11:30 AM

Room: Iris - Mezzanine Level

Chair: To Be Determined

### 9:30-9:45 Finite Element Analysis of the Stationary Power-Law Stokes Equations Driven by Friction Boundary Conditions

*Mbehou Mohamed* and Djoko Kamdem Jules, University of Pretoria, South Africa

### 9:50-10:05 Non-Linear Controller of Combined Radiative Conduction Systems

*Ghattassi Mohamed*, Université de Lorraine, France

### 10:10-10:25 A Second-Order Time Discretization Scheme for a System of Nonlinear Schrödinger Equations

Takiko Sasaki and Norikazu Saito,

University of Tokyo, Japan

#### 10:30-10:45 Fictitious Domain Method with the L<sup>2</sup>-Penalty and Application to the Finite Element and Finite Volume Methods

*Guanyu Zhou* and Norikazu Saito, University of Tokyo, Japan

### 10:50-11:05 On the Method of Numerical Integration for Friction Boundary Conditions

Takahito Kashiwabara, University of Tokyo, Japan

### 11:10-11:25 Numerical Methods and Multi-Scale Analysis for the Dirac Equation in Nonrelativistic Limit Regime

*Xiaowei Jia*, National University of Singapore, Singapore

2013 SIAM Conference on Analysis of Partial Differential Equations

Tuesday, December 10

## CP10 Dispersive and Wave

Equations - Part II

9:30 AM-11:50 AM

### Room: Azalea - Mezzanine Level

Chair: Robert Pego, Carnegie Mellon University, USA

### 9:30-9:45 Traveling Waves of Moderate Amplitude in Shallow Water

Anna Geyer, University of Vienna, Austria

### 9:50-10:05 On a Nonlinear Dispersive Wave of Third Order

Jeng-Eng Lin, George Mason University, USA

#### 10:10-10:25 Shock-Wave Analysis of Condensate Development in a Model of Photon Scattering

Robert Pego, Carnegie Mellon University, USA

#### 10:30-10:45 Relating Collision-Induced Dynamics of Soliton Sequences of Coupled-NIs Equations and Dynamics in Lotka-Volterra Models

Avner Peleg, State University of New York, Buffalo, USA; Debananda Chakraborty, Virginia Intermonte College, USA; Quan M. Nguyen, Vietnam National University at Ho Chi Minh City, Vietnam; Yeojin Chung, Southern Methodist University, USA; Jae-Hun Jung, State University of New York, Buffalo, USA

#### 10:50-11:05 On Models of Short Pulse Type in Continuous Media

Yannan Shen, University of Minnesota, USA

#### 11:10-11:25 Higher Order Energy Preserving Schemes for a Nonlinear Variational Wave Equation

Peder Aursand, Norwegian University of Science and Technology, Norway; Siddhartha Mishra, ETH Zürich, Switzerland; Ujjwal Koley, University of Würzburg, Germany

#### 11:30-11:45 On-Site and Off-Site Solitary Waves of the Discrete Nonlinear Schrödinger Equation

Michael Jenkinson and Michael I. Weinstein, Columbia University, USA

### Lunch Break

11:30 AM-1:30 PM Attendees on their own

### Tuesday, December 10

## IP8

## Modelling Collective Cell Motion in Biology

1:30 PM-2:15 PM

Room: Palm Ballroom I - Lobby Level

Chair: Carlos Garcia-Cervera, University of California, Santa Barbara, USA

We will consider three different examples of collective cell movement which require different modelling approaches: movement of cells in epithelial sheets, with application to rosette formation in the mouse epidermis and monoclonal conversion in intestinal crypts; cranial neural crest cell migration which requires a hybrid discrete cell-based chemotaxis model; acid-mediated cancer cell invasion, modelled via a coupled system of non-linear partial differential equations. We show that in many cases, all these models can be expressed in the framework of nonlinear diffusion equations. We show how these models can be used to understand a range of biological phenomena.

Philip K. Maini University of Oxford, United Kingdom

### **Coffee Break**

2:15 PM-2:45 PM Room:Palm Ballroom II - Lobby Level

### Tuesday, December 10

## MS82 Regularizing Effects for Quasi-linear PDEs

2:45 PM-4:45 PM

Room: Palm Ballroom I - Lobby Level

This session will focus on regularity of solutions to quasi-linear PDEs which generally include the conservation laws, degenerate diffusion equations, and convection-diffusion equations. A common feature of these equations is that solution operators admit a regularizing effect, which is dictated by the nonlinearity of the governing equations. The aim of this session is to demonstrate such regularizing effects by employing various methods; such as kinetic formulations, velocity averaging lemmas, the De Giorgi method, the energy method.

Organizer: Hantaek Bae University of California, Davis, USA

### 2:45-3:10 Dissipation Vs. Quadratic Nonlinearity: from Energy Bound to High-Order Regularizing Effect

*Eitan Tadmor*, University of Maryland, USA; Animikh Biswas, University of North Carolina, Charlotte, USA

### 3:15-3:40 Critical Regularity Estimates for Transport Problems

*Pierre-Emmanuel Jabin*, University of Maryland, USA

### 3:45-4:10 Regularizing Effects on 1D Nonlinear Scalar Conservation Laws in Fractional Bv Spaces

Stephane Junca, Université de Nice, Sophia Antipolis, France; Christian Bourdarias, Universite de Savoie, France; Pierre Castelli, Université de Nice, France; Marguerite Gisclon, Universite de Savoie, France

### 4:15-4:40 Kinetic Formulation and Regularizing Effects for Degenerate Parabolic Equations

Hantaek Bae, University of California, Davis, USA; Eitan Tadmor, University of Maryland, USA

## MS83 Application of Partial Differential Equations in

### Differential Equations Biology

2:45 PM-4:45 PM

### Room: Palm Ballroom III - Lobby Level

This minisymposium will illustrate how PDE models have been used to make important discoveries in biology and, how biology has led to new mathematical challenges. We now realise that biological entities move stochastically in spatially heterogeneous environments so a key question is how to derive population-level descriptions and analyse the resulting novel PDE equations, which may be fully nonlinear with spatially varying parameters. In particular, how do certain behaviours, such as robust generation of gradients or production of scale-invariant patterns emerge from these systems? These issues will be addressed in the context of bacterial dynamics, developmental biology, disease, and ecology.

### Organizer: Philip K. Maini University of Oxford, United Kingdom

### 2:45-3:10 Scale Invariance in Mathematical Models of Biological Pattern Formation

Hans G. Othmer, University of Minnesota, Minneapolis, USA

### 3:15-3:40 Nonlinear Diffusion Equation Model of Bacterial Dynamics

Mark S. Alber, University of Notre Dame, USA

### 3:45-4:10 Fully Anisotropic Diffusion Equations and Applications to Glioma Growth and Wolf Movement

*Thomas J. Hillen*, University of Alberta, Canada

### 4:15-4:40 Local Kinetics of Morphogen Gradients

Stanislav Shvartsman, Princeton University, USA

### Tuesday, December 10

## **MS84**

### Analysis of Nonlinear Differential Equations Arising in Fluid Dynamics -Part III of III

2:45 PM-4:45 PM

### Room:Palm Ballroom IV - Lobby Level

### For Part 2 see MS74

In this minisymposium, we collect research work devoted to the analysis on nonlinear differential equations in fluid dynamics. The modern theory of mathematical fluid models began with Jean Leray in 1930's. Since then, a lot of mathematicians and physicists have made effort to develop the theory of fluid dynamics. But the area is still widely open. We are going to focus on certain types of nonlinear differential equations modeling some important phenomena in fluid dynamics. For such a subclass of fluids, we shall investigate the progress which have been recently made on studying the properties of solutions, existence, regularity, stability and asymptotic behaviors.

### Organizer: Mimi Dai University of Colorado Boulder, USA

Organizer: Alexey Cheskidov University of Illinois, Chicago, USA

#### 2:45-3:10 Dynamical Aspects of the Cubic Instability in a Landau-De Gennes Energy for Nematic Liquid Crystals

Xiang Xu and Gautam Iyer, Carnegie Mellon University, USA; Arghir Zarnescu, University of Sussex, United Kingdom

### 3:15-3:40 Regularity and Uniqueness for a Class of Weak Solutions to the Hydrodynamic Flow of Nematic Liquid Crystals

*Tao Huang* and Changyou Wang, University of Kentucky, USA

continued in next column

### 3:45-4:10 Existence and Decay of Solutions of the 2dqg Equation in the Presence of An Obstacle

*Leonardo F. Kosloff*, University of California, Riverside, USA; Tomas Schonbek, Florida Atlantic University, USA

### 4:15-4:40 Regularizing Effect of the Forward Energy Cascade in the Inviscid Dyadic Model

Karen Zaya and Alexey Cheskidov, University of Illinois, Chicago, USA 2013 SIAM Conference on Analysis of Partial Differential Equations

Tuesday, December 10

## **MS85**

### Multidimensional Hyperbolic Problems in Mechanics and Related Applications - Part IV of IV

2:45 PM-4:45 PM

Room: Palm Ballroom V - Lobby Level

### For Part 3 see MS75

Multi-dimensional conservation laws are a core subject of nonlinear partial differential equations whose theory has traditionally developed in connection to the subject of mechanics construed in a broad sense. This minisymposium aims to present recent developments in gas dynamics, elasticity, magnetohydrodynamics placing emphasis on multi-dimensional issues.

Organizer: Athanasios Tzavaras University of Crete, Greece

Organizer: Dehua Wang University of Pittsburgh, USA

Organizer: Charis Tsikkou West Virginia University, USA

### 2:45-3:10 Conservation Laws with no Classical Riemann Solutions: Existence of Singular Shocks

*Charis Tsikkou*, West Virginia University, USA; Barbara Lee Keyfitz, The Ohio State University, USA

#### 3:15-3:40 Boussinesq System with Nonlinear Heat Diffusion on a Bounded Domain

Ronghua Pan, Georgia Institute of Technology, USA

## 3:45-4:10 Title Not Available at Time of Publication

Mikhail Perepelitsa, University of Houston, USA

#### 4:15-4:40 Well-Posedness for Variational Wave Equations

Geng Chen, Georgia Institute of Technology, USA Tuesday, December 10

## **MS86**

### Charge Transport with Applications to Solar Cells -Part II of II

2:45 PM-4:15 PM

Room:Narcissus/Orange Blossom -Mezzanine Level

### For Part 1 see MS77

Solar cells have attracted great attention in the past several decades. The efficiency of a solar cell depends on many physical processes, such as generation, transport, recombination, and collection of charge carriers. Energy transfer between carriers and carrierphonon interaction can also play an important role. In this minisymposium we propose to bring together specialists in the field from different backgrounds, and exchange recent developments and ideas on modeling these processes, enhancing predictability, and guiding material designs. Experiment, theory and simulations will be discussed.

Organizer: Carlos Garcia-Cervera University of California, Santa Barbara, USA

Organizer: Jingrun Chen University of California, Santa Barbara, USA

Organizer: Xu Yang University of California, Santa Barbara, USA

### 2:45-3:10 Master Equation Model for Charge Transport in Disordered Semiconductors

José Freire, Universidade Federal do Parana, Brazil

#### 3:15-3:40 Hall-Mhd and Related Plasma Problem

Jian-Guo Liu, Duke University, USA

### 3:45-4:10 Competitive Geometric Evolution of Complex Structures in Fuel Cell Membranes

Shibin Dai, New Mexico State University, USA

### Tuesday, December 10

## **MS87**

### Front Propagation and Interface Motion in Nonlinear PDE Models -Part II of II

2:45 PM-4:45 PM

Room:Fuschia/Gardenia - Mezzanine Level

### For Part 1 see MS78

Interfaces and fronts arise in many physical and biological systems modeled by PDEs. This minisymposium will focus on analysis of fronts and interfaces goverened by reaction-diffusion equations, by geometric motion laws, and by other nonlinear PDEs. In particular, speakers will address questions about different models for interface motion, about the asymptotic behaviour of fronts, and about how a front interacts with a heterogeneous medium.

Organizer: James Nolen Duke University, USA

Organizer: Antoine Mellet University of Maryland, USA

### 2:45-3:10 Front Propagation in Sharp and Diffuse Interface Models of Stratified Media

Annalisa Cesaroni, University of Padova, Italy; *Cyrill B. Muratov*, New Jersey Institute of Technology, USA; Matteo Novaga, University of Padova, Italy

### 3:15-3:40 Quasi-Static Evolution and Congested Crowd Motion

Damon Alexander and Inwon Kim, University of California, Los Angeles, USA; *Yao Yao*, University of Wisconsin, USA

## 3:45-4:10 Discrete Motion by Mean Curvature

Aaron Yip, Purdue University, USA

### 4:15-4:40 Eventual Self-Similarity of Solutions for Diffusion-Absorption Equation with a Singular Source

*Peter Gordon*, University of Akron, USA; Cyrill B. Muratov, New Jersey Institute of Technology, USA

## **MS88**

### Fluid Dynamic Equations : Existence and Asymptotic Between Theory and Numerics - Part II of II

2:45 PM-4:45 PM

### Room: Magnolia - Mezzanine Level

### For Part 1 see MS80

Global regularity for Navier-Stokes and Euler equations continues to stand among the most challenging problems in mathematics. Also, zero viscosity limit of the NS solutions in bounded domains remains as one of the most important unanswered questions. However, few progresses have been made in both directions, either in proving the global regularity or the finite-time blow-up for other fluid models. Similarly, some important advances are made for the convergence of several reduced modeled to these equations. In this direction, the Primitive Equations constitute one of the most famous models for which many interesting results have been already proved.

Organizer: Makram Hamouda Indiana University, USA

Organizer: Slim Ibrahim University of Victoria, Canada

#### 2:45-3:10 How Do Flows in Conduit and Porous Media Interact?

Xiaoming Wang, Florida State University, USA

3:15-3:40 Singular Perturbation Analysis for Convection-diffusion Equations with Corners

*Chang-Yeol Jung*, Ulsan National Institute of Science and Technology, South Korea

### 3:45-4:10 Vanishing Viscosity Limit of Some Symmetric Flows

Gung-Min Gie, Indiana University, USA

4:15-4:40 Well-Posedness and Asymptotic Stability for the Lame System with Infinite Memories in Bounded Domain

Ahmed Bchatnia, University of Dammam, Saudi Arabia

## Tuesday, December 10

## CP11

### Reaction-Diffusion Systems, Nonlocal Equations, and Pattern Formation - Part II

2:45 PM-4:25 PM

Room:Kahili/Lily - Mezzanine Level

Chair: Jeff Eisenbeis, Carnegie Mellon University, USA

### 2:45-3:00 Nonlocal Weighted Biological Aggregation

*Jeff Eisenbeis*, Robert Pego, and Dejan Slepcev, Carnegie Mellon University, USA

### 3:05-3:20 Multi-Agent Control of the Generalized Viscous Burgers Equation

*Dimitrios Papadimitriou*, University of Ghent, Belgium

### 3:25-3:40 Bi-Stable Mean-Field Model

*Chao Tian* and Qiang Du, Pennsylvania State University, USA

### 3:45-4:00 Different Wave Solutions Associated with Singular Lines on Phase Plane

Yu V. Wang, City College of New York, USA

4:05-4:20 Front-Dynamics and Pattern Selection in Semi-Bounded Domains: Pulled Vs Pushed Fronts in Cahn-Hilliard, CGL, and FHN

Ryan Goh, University of Minnesota, USA

### Tuesday, December 10

## CP12 Elliptic PDE - Part II

2:45 PM-4:45 PM

Room: Hibiscus - Mezzanine Level

Chair: To Be Determined

2:45-3:00 A Free Boundary Problem for Higher Order Elliptic Operators Henok Mawi, Howard University, USA

3:05-3:20 Steklov Representations of Harmonic Functions on Exterior Regions *Giles Auchmuty*, University of Houston, USA

## 3:25-3:40 Differentiability of the Function Best Sobolev Constant

*Grey Ercole*, Universidade Federal de Minas Gerais, Brazil

### 3:45-4:00 Bubbling Solutions for the Chern-Simons Gauged O(3) Sigma Model

Jongmin Han, KyungHee University, South Korea; Kwangseok Choe, Inha University, Korea; Chang-Shou Lin, National Taiwan University, Taiwan

### 4:05-4:20 A Semismooth Newton Multigrid Method for Constrained Elliptic Optimal Control Problems

Jun Liu, Southern Illinois University, USA; Mingqing Xiao, Southern Illinois University, Carbondale, USA

### 4:25-4:40 Numerical Solution of Nonlinear Elliptic Equation Using Finite Element Method

*Garima Mishra* and Manoj Kumar, Motilal Nehru National Institute of Technology, India

## **CP13** Hamilton-Jacobi Equations

## and First-order Systems

2:45 PM-4:05 PM

Room:Begonia - Mezzanine Level Chair: Jeff Calder, University of

Michigan, USA

### 2:45-3:00 A Hamilton-Jacobi Equation for the Continuum Limit of Non-Dominated Sorting

*Jeff Calder*, Selim Esedoglu, and Alfred O. Hero, University of Michigan, USA

### 3:05-3:20 General Solution to Unidimensional Hamilton-Jacobi Equation

Maria Lewtchuk Espindola, Universidade Federal da Paraiba, Brazil

#### 3:25-3:40 Semicontinuous Viscosity Solutions for Quasiconvex Hamiltonians

*Emmanuel Barron*, Loyola University of Chicago, USA

## 3:45-4:00 The Pullback Equation: An Overview

*Olivier Kneuss*, University of California, Berkeley, USA

Tuesday, December 10

## Continuum Mechanics -Part II

2:45 PM-4:05 PM

Room:Azalea - Mezzanine Level

Chair: Alejandro Sarria, University of Colorado Boulder, USA

### 2:45-3:00 Boundary Value Problems of the System of Pdes of Steady Vibrations in the Theory of Thermoelasticity for Solids with Double Porosity

Merab Svanadze, Ilia State University, Georgia

### 3:05-3:20 Damping by Heat Conduction in the Timoshenko System: Fourier and Cattaneo Are the Same

Aslan R. Kasimov and *Belkacem Saidhouari*, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

### 3:25-3:40 Long-time Behavior of Solutions to the Generalized Two-Component Hunter-Saxton System

*Alejandro Sarria*, University of Colorado Boulder, USA

#### 3:45-4:00 From Micropolar Navier-Stokes Equations to Ferrofluids: Analysis and Numerics

Ignacio Tomas, University of Maryland, College Park, USA

## PD13 Abstracts

SIAM Conference on Analysis of **Partial Differential Equations** 

December 7-10, 2013 Hilton Orlando Lake Buena Vista Lake Buena Vista, Florida USA

Abstracts are printed as submitted by the authors.

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SIAM Conference on Analysis of **Partial Differential Equations** 

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Bae, Hantaek, MS82, 2:45 Tue Bae, Hantaek, MS82, 4:15 Tue Balague, Daniel, MS46, 2:30 Sun Balakrishnan, A.V., MS1, 10:30 Sat Barron, Emmanuel, CP13, 3:25 Tue Barry, Anna M., MS46, 2:00 Sun Batkam, Cyril Joel, CP5, 10:00 Mon Bauman, Patricia, MS47, 2:00 Sun Bauman, Patricia, MS58, 10:00 Mon Bauman, Patricia, MS70, 3:15 Mon Bchatnia, Ahmed, MS88, 4:15 Tue Beichman, Jennifer, MS55, 11:30 Mon Benamou, Jd, MS36, 10:00 Sun Benamou, Jean-David, IP7, 8:15 Tue Bessaih, Hakima, MS2, 10:00 Sat Bessaih, Hakima, MS14, 2:00 Sat Bessaih, Hakima, MS20, 2:00 Sat Birnir, Bjorn, MS2, 10:30 Sat Biswas, Animikh, MS14, 2:30 Sat Biswas, Animikh, MS54, 10:00 Mon Biswas, Animikh, MS66, 3:15 Mon Blank, Ivan, MS71, 3:45 Mon Bloshanskaya, Lidia, MS68, 4:15 Mon Bocea, Marian, CP7, 4:15 Mon Bociu, Lorena, MS1, 10:00 Sat Bociu, Lorena, MS1, 11:30 Sat Bociu, Lorena, MS13, 2:00 Sat Bociu, Lorena, MS25, 10:00 Sun Bociu, Lorena, MS37, 2:00 Sun Bociu, Lorena, MS49, 10:00 Mon Bona, Jerry, MS62, 4:15 Mon Borcea, Liliana, MS52, 10:30 Mon Borggaard, Jeff, MS17, 2:30 Sat Boykov, Ilya V., CP8, 10:30 Tue Bradshaw, Zachary, MS66, 3:45 Mon Brandle, Cristina, CP5, 11:00 Mon Brennan, Brian W., CP7, 4:35 Mon Brown, Donald, MS43, 3:30 Sun Bukac, Martina, MS60, 3:15 Mon Bukac, Martina, MS72, 9:30 Tue Bukac, Martina, MS72, 11:00 Tue

## С

Caceres, Maria, MS77, 11:00 Tue Calder, Jeff, CP13, 2:45 Tue Canic, Suncica, MS1, 11:00 Sat Cao, Chongsheng, MS8, 10:00 Sat Causley, Matthew F., MS4, 10:30 Sat Cevikel, Adem, CP8, 9:50 Tue Chaudhari, Nikhila, CP3, 10:00 Sun Chen, Geng, MS85, 4:15 Tue *Chen, Jingrun, MS77, 9:30 Tue Chen, Jingrun, MS86, 2:45 Tue*  Chen, Ming, MS19, 3:00 Sat Chen, Ming, CP3, 10:20 Sun Chen, Thomas, MS35, 11:30 Sun Chen, Xuwen, MS23, 2:30 Sat Cheng, Lei Z., CP6, 10:00 Mon Cheng, Yingda, MS4, 10:00 Sat Cheng, Yingda, MS4, 10:00 Sat Cheng, Yingda, MS16, 2:00 Sat Cheng, Yingda, MS29, 10:00 Sun Cheng, Yingda, MS41, 2:00 Sun Chertock, Alina, MS9, 10:00 Sat Chertock, Alina, MS21, 2:00 Sat Chertock, Alina, MS56, 10:30 Mon Cheskidov, Alexey, MS32, 10:00 Sun Cheskidov, Alexey, MS62, 3:15 Mon Cheskidov, Alexey, MS74, 9:30 Tue Cheskidov, Alexev, MS84, 2:45 Tue Chou, Ching-Shan, MS4, 11:00 Sat Christlieb, Andrew J., MS4, 11:30 Sat Ciomaga, Adina, MS12, 10:00 Sat Ciomaga, Adina, MS12, 10:00 Sat Ciomaga, Adina, MS24, 2:00 Sat Colbert-Kelly, Sean A., MS47, 3:00 Sun Coti Zelati, Michele, MS8, 11:30 Sat Cotter, Colin, MS45, 3:00 Sun Cozzi, Elaine, MS50, 11:00 Mon Craig, Katy, MS69, 4:45 Mon Craster, Richard, MS65, 4:15 Mon Curtis, Chris, MS53, 11:30 Mon Czubak, Magda, MS7, 10:30 Sat

## D

Dabkowski, Michael, MS20, 2:30 Sat Dai, Mimi, MS62, 3:15 Mon Dai, Mimi, MS62, 3:45 Mon Dai, Mimi, MS74, 9:30 Tue Dai, Mimi, MS84, 2:45 Tue Dai, Shibin, MS86, 3:45 Tue Daraio, Chiara, IP4, 8:45 Sun Dascaliuc, Radu, MS54, 10:30 Mon Daskalopoulos, Panagiota, MS48, 2:00 Sun Daskalopoulos, Panagiota, MS48, 2:00 Sun Dawson, Clint, MS45, 2:00 Sun De Silva, Daniela, MS12, 10:30 Sat De Vita, Raffaella, MS58, 11:30 Mon De Vuyst, Florian, MS17, 3:00 Sat D'Elia, Marta, MS42, 2:00 Sun Demidenko, Eugene, MS81, 11:00 Tue Demirbas, Seckin, MS35, 10:00 Sun Denny, Diane, CP7, 3:15 Mon Diatta, Andre, MS53, 10:00 Mon Di Plinio, Francesco, MS20, 3:30 Sat Doelman, Arjen, MS27, 11:30 Sun Doering, Charles R., MS2, 10:00 Sat Du, Jian, MS59, 10:00 Mon Du, Jian, MS59, 10:00 Mon Du, Jian, MS71, 3:15 Mon Du, Jian, MS81, 9:30 Tue Du, Qiang, MS30, 10:00 Sun

## E

Eftimie, Raluca, MS46, 3:00 Sun Eisenbeis, Jeff, CP11, 2:45 Tue Elghindi, Tarek, MS80, 10:30 Tue Elgindi, Tarek M., MS20, 3:00 Sat Elling, Volker W., MS51, 11:00 Mon Ellis, Truman E., MS33, 11:30 Sun Erbay, Saadet, CP3, 11:00 Sun Ercole, Grey, CP12, 3:25 Tue Erdogan, Burak, MS11, 11:30 Sat Erkip, Albert, CP3, 11:20 Sun Espindola, Maria Lewtchuk, CP13, 3:05 Tue

## F

Farah, Luiz G., CP3, 11:40 Sun

Farhat, Aseel, MS8, 10:00 Sat Farhat, Aseel, MS20, 2:00 Sat Farhat, Aseel, MS14, 3:00 Sat Farhat, Aseel, MS32, 10:00 Sun Faria, Luiz, CP2, 2:20 Sat Fathallah-Shavkh, Hassan M., MS74, 9:30 Tue Fatkullin, Ibrahim, MS70, 4:15 Mon Faye, Gregory, MS76, 3:30 Sun Feehan, Paul, MS48, 2:00 Sun Feehan, Paul, MS48, 2:30 Sun Feireisl, Eduard, MS73, 10:00 Tue Figalli, Alessio, IP2, 8:45 Sat Finn, Robert, MS59, 11:30 Mon Foss, Mikil, MS30, 10:30 Sun Freidlin, Mark I., MS64, 3:15 Mon Freire, José, MS86, 2:45 Tue

### G

Ganapathysubramanian, Baskar, MS77, 9:30 Tue Gancedo, Francisco, MS44, 3:00 Sun Garcia-Cervera, Carlos, MS77, 9:30 Tue Garcia-Cervera, Carlos, MS86, 2:45 Tue Garofalo, Nicola, MS71, 4:45 Mon Gartland, Eugene C., MS47, 2:30 Sun Gerbeau, Jean-Frederic, MS17, 2:00 Sat Gerbeau, Jean-Frederic, MS17, 3:30 Sat Germain, Pierre, MS28, 10:00 Sun Germain, Pierre, MS44, 3:30 Sun Geyer, Anna, CP3, 10:40 Sun Geyer, Anna, CP10, 9:30 Tue Ghazaryan, Anna, MS10, 11:30 Sat Gie, Gung-Min, MS64, 5:15 Mon Gie, Gung-Min, MS88, 3:45 Tue Gilbert, Robert P., MS31, 10:00 Sun Giorgi, Tiziana, MS47, 2:00 Sun

Giorgi, Tiziana, MS58, 10:00 Mon Giorgi, Tiziana, MS70, 3:15 Mon Glasner, Karl, MS15, 2:00 Sat Glatt-Holtz, Nathan, MS14, 2:00 Sat Glatt-Holtz, Nathan, CP4, 4:00 Sun Goh, Ryan, CP11, 4:05 Tue Goldberg, Michael, MS7, 11:30 Sat Goldfarb, Jonathan, MS81, 10:00 Tue Golovaty, Dmitry, MS58, 10:00 Mon Gomez, Christophe, MS64, 4:45 Mon Gopalakrishnan, Jay, MS45, 2:30 Sun Gorb, Yuliya, MS31, 11:00 Sun Gorb, Yuliya, MS52, 10:00 Mon Gorb, Yuliya, MS64, 3:15 Mon Gordon, Peter, MS10, 10:00 Sat Gordon, Peter, MS22, 2:00 Sat Gordon, Peter, MS87, 4:15 Tue Goudiaby, Mouhamadou S, CP2, 2:40 Sat Graber, Jameson, MS13, 2:00 Sat Grujic, Zoran, MS8, 10:30 Sat Guan, Qingguang, CP5, 10:20 Mon Guclu, Yaman, MS16, 2:00 Sat Guidoboni, Giovanna, MS49, 10:30 Mon Guidotti, Patrick, MS6, 10:00 Sat Guidotti, Patrick, MS34, 10:30 Sun Guillen, Nestor, MS78, 11:00 Tue Gunzburg, Max, MS18, 3:30 Sat Guo, Wei, MS16, 2:30 Sat Guo, Yanqiu, MS44, 2:00 Sun Guo, Yanqiu, MS44, 2:00 Sun Guo, Yanqiu, MS55, 10:00 Mon Guo, Yanqiu, MS67, 3:15 Mon

## Η

Hagstrom, Thomas M., MS33, 10:30 Sun Haidar, Salim M., CP6, 11:00 Mon

Italicized names indicate session organizers.

Hamouda, Makram, MS80, 9:30 Tue Hamouda, Makram, MS88, 2:45 Tue Han, Daozhi, MS32, 10:30 Sun Han, Jongmin, CP12, 3:45 Tue Hani, Zaher, MS19, 2:30 Sat Hansen, Scott, MS37, 3:00 Sun Hayrapetyan, Gurgen, MS15, 3:30 Sat Hieber, Matthias, MS13, 2:30 Sat Hillen, Thomas J., MS83, 3:45 Tue Hmidi, Taoufik, MS80, 10:00 Tue Hoang, Luan, MS56, 10:00 Mon Hoang, Luan, MS68, 3:15 Mon Hoang, Luan, MS66, 4:15 Mon Hoang, Luan, MS79, 9:30 Tue Holdeman, Jonas T., CP4, 2:20 Sun Holmer, Justin, MS11, 10:00 Sat Holmer, Justin, MS23, 2:00 Sat Holmer, Justin, MS23, 2:00 Sat Holmer, Justin, MS35, 10:00 Sun Holzer, Matt, MS78, 10:00 Tue Hong, Younghun, MS23, 3:30 Sat Hong, YoungJoon, MS80, 11:00 Tue Howard, Peter, MS3, 11:00 Sat Hu, Jingwei, MS21, 3:00 Sat Hu, Weiwei, MS13, 3:00 Sat Huang, Aimin, MS54, 11:30 Mon Huang, Tao, MS84, 3:15 Tue Huang, Yanghong, MS46, 2:00 Sun Huang, Yanghong, MS57, 10:00 Mon Huang, Yanghong, MS57, 10:00 Mon Huang, Yanghong, MS69, 3:15 Mon Hur, Vera Mikyoung, MS28, 10:00 Sun Hur, Vera Mikyoung, MS40, 2:00 Sun Hur, Vera Mikyoung, MS40, 3:30 Sun

Ibragimov, Akif, MS56, 10:00 Mon Ibragimov, Akif, MS68, 3:15 Mon *Ibragimov, Akif, MS79, 9:30 Tue* Ibragimov, Akif, MS79, 11:00 Tue Ibrahim, Slim, MS55, 11:00 Mon *Ibrahim, Slim, MS80, 9:30 Tue* Ibrahim, Slim, MS80, 9:30 Tue *Ibrahim, Slim, MS88, 2:45 Tue* Ifrim, Mihaela, MS67, 4:15 Mon Ignatova, Mihaela, MS13, 3:30 Sat Isett, Phil, MS50, 10:30 Mon Iyer, Gautam, MS52, 11:00 Mon Iyiola, Olaniyi S., CP1, 11:00 Sat

J

Jabin, Pierre-Emmanuel, MS75, 10:00 Tue Jabin, Pierre-Emmanuel, MS82, 3:15 Tue Jachalski, Sebastian, CP1, 10:00 Sat Jang, Juhi, MS14, 3:30 Sat Jaramillo, Gabriela, CP5, 11:20 Mon Jenkinson, Michael, CP10, 11:30 Tue Jia, Xiaowei, CP9, 11:10 Tue Jimenez Bolanos, Silvia, MS31, 10:00 Sun Jimenez Bolanos, Silvia, MS31, 11:30 Sun Jimenez Bolanos, Silvia, MS43, 2:00 Sun Jolly, Michael S., MS8, 10:00 Sat Jolly, Michael S., MS2, 11:30 Sat Jolly, Michael S., MS20, 2:00 Sat Jolly, Michael S., MS32, 10:00 Sun Joo, Sookyung, MS70, 3:45 Mon Junca, Stephane, MS82, 3:45 Tue Jung, Chang-Yeol, MS88, 3:15 Tue

**K** Kapitula, Todd, MS15, 3:00 Sat Kashiwabara, Takahito, CP9, 10:50 Tue Kavlie, Landon, MS66, 4:45 Mon

Kelliher, James P., MS26, 10:00 Sun Kelliher, James P., MS38, 2:00 Sun Kelliher, James P., MS38, 2:00 Sun Kelliher, James P., MS50, 10:00 Mon Kenettinkara, Sudarshan Kumar, CP6. 11:40 Mon Keyfitz, Barbara, MS51, 11:30 Mon Khenner, Mikhail V., CP6, 10:20 Mon Kieu, Thinh, MS68, 3:45 Mon Kim, Arnold D., MS39, 2:30 Sun Kim, Inwon, MS12, 11:30 Sat Kirby, Robert C., MS33, 10:00 Sun Kirby, Robert C., MS33, 10:00 Sun Kirby, Robert C., MS45, 2:00 Sun Kneuss, Olivier, CP13, 3:45 Tue Kolokolnikov, Theodore, MS46, 2:00 Sun Kolokolnikov, Theodore, MS46, 3:30 Sun Kolokolnikov, Theodore, MS57, 10:00 Mon Kolokolnikov, Theodore, MS69, 3:15 Mon Kosloff, Leonardo F., MS84, 3:45 Tue Krylov, Nicolai, MS79, 9:30 Tue Kuchment, Peter, MS65, 3:45 Mon Kurganov, Alexander, MS9, 10:00 Sat Kurganov, Alexander, MS21, 2:00 Sat Kurganov, Alexander, MS21, 3:30 Sat Kweon, Jae Ryong, CP4, 2:00 Sun

L Lambers, James V., MS6, 11:00 Sat Larios, Adam, MS54, 10:00 Mon Larios, Adam, MS54, 10:00 Mon Larios, Adam, MS66, 3:15 Mon Lasiecka, Irena M., MS1, 10:00 Sat Lasiecka, Irena M., MS13, 2:00 Sat Lasiecka, Irena M., MS25, 10:00 Sun Lasiecka, Irena M., MS37, 2:00 Sun Lasiecka, Irena M., MS44, 2:30 Sun Lasiecka, Irena M., MS49, 10:00 Mon Lasiecka, Irena M., MS49, 11:30 Mon Lasiecka, Irena M., MS61, 3:45 Mon Lawrie, Andrew, MS11, 11:00 Sat Lengeler, Daniel, MS60, 4:15 Mon Levine, Stacey, MS6, 10:30 Sat Levy, Doron, MS57, 10:30 Mon Levy, Doron, MT2, 7:30 Mon Li, Dong, MS74, 10:00 Tue Li, Fengyan, MS29, 11:30 Sun Li, Xiaolin, MS59, 11:00 Mon Li, Yi, MS5, 10:00 Sat Liao, Naian, MS81, 10:30 Tue Lin, Jeng-Eng, CP10, 9:50 Tue Lipton, Robert P., MS31, 10:30 Sun Liu, Di, MS77, 10:00 Tue Liu, Jian-guo, MS9, 10:00 Sat Liu, Jian-guo, MS9, 10:00 Sat Liu, Jian-guo, MS21, 2:00 Sat Liu, Jian-Guo, MS86, 3:15 Tue Liu, Jun, CP12, 4:05 Tue Liu, Liping, MS53, 11:00 Mon Liu, Yuan, MS16, 3:00 Sat Lopes Filho, Milton, MS50, 10:00 Mon Lorz, Alexander, MS76, 2:30 Sun Lu, Gang, MS77, 10:30 Tue Lu, Yongjin, MS25, 10:30 Sun Lukacova, Maria, MS21, 2:30 Sat Lunasin, Evelyn, MS2, 10:00 Sat Lunasin, Evelyn, MS8, 11:00 Sat Lunasin, Evelyn, MS14, 2:00 Sat Lyng, Gregory, CP2, 3:00 Sat

## Μ

Machida, Manabu, MS39, 2:00 Sun Machida, Manabu, MS39, 3:30 Sun Maday, Yvon, MS17, 2:00 Sat Maekawa, Yasunori, MS38, 3:00 Sun Maini, Philip K., IP8, 1:30 Tue Maini, Philip K., MS83, 2:45 Tue Manukian, Vahagn, MS10, 10:30 Sat Margetis, Dionisios, MS34, 10:00 Sun Marion, Dziwnik, CP1, 10:20 Sat Martinez, Vincent, MS32, 11:00 Sun Martins, Eder M., CP7, 3:35 Mon Mawi, Henok, CP12, 2:45 Tue Mazzucato, Anna L., MS2, 10:00 Sat Mazzucato, Anna L., MS14, 2:00 Sat Mazzucato, Anna, MS38, 2:30 Sun McCalla, Scott, MS27, 10:30 Sun McClarren, Ryan G, MS39, 3:00 Sun Mellet, Antoine, MS78, 9:30 Tue Mellet, Antoine, MS87, 2:45 Tue Mengesha, Tadele, MS42, 2:30 Sun Mieussens, Luc, MS9, 11:00 Sat Miroshnikov, Alexey, MS63, 4:15 Mon Mishra, Garima, CP12, 4:25 Tue Mitchell, John A., MS30, 11:00 Sun Mizumachi, Tetsu, MS15, 2:30 Sat Mohamed, Ghattassi, CP9, 9:50 Tue Mohamed, Mbehou, CP9, 9:30 Tue Monsaingeon, Lèonard, MS64, 4:15 Mon

Moroz, Vitaly, MS22, 2:30 Sat Mucha, Piotr, MS34, 10:00 Sun Mucha, Piotr, MS61, 3:15 Mon Mucha, Piotr, MS73, 9:30 Tue Mucha, Piotr, MS73, 9:30 Tue Muha, Boris, MS60, 3:15 Mon Muha, Boris, MS60, 3:45 Mon Muha, Boris, MS72, 9:30 Tue Muratov, Cyrill B., MS10, 11:00 Sat Muratov, Cyrill B., MS87, 2:45 Tue

### Ν

Nakamura, Ken-Ichi, MS22, 3:30 Sat

Necasova, Sarka, MS60, 4:45 Mon Nguyen, Hoai Minh, MS52, 11:30 Mon Nguyen, Hoai-Minh, MS68, 4:45 Mon Nguyen, Loc, MS79, 10:30 Tue Nicholls, David P., MS28, 11:00 Sun Noelle, Sebastian, MS21, 2:00 Sat Nolen, James, MS78, 9:30 Tue Nolen, James, MS78, 9:30 Tue Nolen, James, MS87, 2:45 Tue Norris, Andrew, MS53, 10:00 Mon Norris, Andrew, MS65, 3:15 Mon Novikov, Alexei, MS52, 10:00 Mon Novikov, Alexei, MS64, 3:15 Mon Nussenzveig Lopes, Helena J., MS26, 10:00 Sun Nussenzveig Lopes, Helena J., MS26, 10:00 Sun Nussenzveig Lopes, Helena J., MS38, 2:00 Sun Nussenzveig Lopes, Helena J., MS50, 10:00 Mon

O Oberman, Adam, MS12, 11:00 Sat Oberman, Adam, MS36, 11:00 Sun Orcan-Ekmekci, Betul, MS12, 10:00 Sat Orcan-Ekmekci, Betul, MS24, 2:00 Sat Orcan-Ekmekci, Betul, MS24, 2:00 Sat Osting, Braxton, MS65, 4:45 Mon Othmer, Hans G., MS83, 2:45 Tue Ozcan, Hatice, CP4, 2:40 Sun

Ö Özer, Teoman, CP5, 11:40 Mon

**P** Palaniappan, Kannappan, MS6, 10:00 Sat Pan, Ronghua, MS85, 3:15 Tue

Panchenko, Alexander, MS43, 2:30 Sun

Pankov, Alexander, MS56, 11:30 Mon Papadakis, Nicolas, MS36, 11:30 Sun Papadimitriou, Dimitrios, CP11, 3:05 Tue

Parks, Michael L., MS18, 2:00 Sat Parks, Michael L., MS18, 2:00 Sat Parks, Michael L., MS30, 10:00 Sun Parks, Michael L., MS42, 2:00 Sun Pass, brendan, MS36, 10:00 Sun Patrizi, Stefania, MS24, 2:30 Sat Pavlovic, Natasa, MS35, 11:00 Sun Pego, Robert, CP10, 10:10 Tue Peleg, Avner, CP10, 10:30 Tue Perepelitsa, Mikhail, MS85, 3:45 Tue Peres, Yuval, IP5, 8:00 Mon Perthame, Benoit, IP6, 8:45 Mon Perthame, Benoit, MS76, 2:00 Sun Petrosyan, Arshak, MS48, 2:00 Sun Petrosyan, Arshak, MS48, 3:00 Sun Phillips, Daniel, MS47, 2:00 Sun Phillips, Daniel, MS47, 2:00 Sun Phillips, Daniel, MS58, 10:00 Mon Phillips, Daniel, MS70, 3:15 Mon Pinaud, Olivier, MS64, 3:45 Mon Pokorny, Milan, MS61, 4:15 Mon Pop, Camelia A., MS48, 2:00 Sun Pop, Camelia A., MS48, 3:30 Sun Prasath, Surya, MS6, 10:00 Sat Prasath, Surya, MS6, 11:30 Sat Prins, Corien, MS36, 10:30 Sun Promislow, Keith, MS3, 10:00 Sat Promislow, Keith, MS3, 11:30 Sat Promislow, Keith, MS15, 2:00 Sat Promislow, Keith, MS27, 10:00 Sun Promislow, Keith, MT1, 7:30 Sun Pusateri, Fabio, MS28, 10:30 Sun

## Q

*Qi, Yuanwei, MS5, 10:00 Sat* Qi, Yuanwei, MS5, 11:00 Sat *Qiu, Jingmei, MS4, 10:00 Sat Qiu, Jingmei, MS16, 2:00 Sat Qiu, Jingmei, MS29, 10:00 Sun Qiu, Jingmei, MS41, 2:00 Sun* Quaini, Annalisa, MS72, 10:30 Tue

## R

Radu, Petronela, MS18, 2:00 Sat Radu, Petronela, MS18, 2:30 Sat Radu, Petronela, MS30, 10:00 Sun Radu, Petronela, MS42, 2:00 Sun Raynor, Sarah, MS11, 10:30 Sat Rohde, Christian, MS51, 10:30 Mon Roudenko, Svetlana, MS35, 10:30 Sun Rusin, Walter, CP4, 3:00 Sun Rusin, Walter, MS73, 11:00 Tue Russo, Giovanni, MS9, 10:30 Sat Rybka, Piotr, MS34, 10:00 Sun Rybka, Piotr, MS34, 11:00 Sun Ryzhik, Lenya, MS52, 10:00 Mon

## S

said-houari, belkacem, CP14, 3:05 Tue Saito, Norikazu, CP4, 3:40 Sun Sarria, Alejandro, CP14, 3:25 Tue Sasaki, Takiko, CP9, 10:10 Tue Savin, Ovidiu, MS24, 3:30 Sat Scheel, Arnd, MS27, 10:00 Sun Schütz, Jochen, MS9, 11:30 Sat Seal, David C., MS41, 3:00 Sun Seis, Christian, MS74, 10:30 Tue Seleson, Pablo, MS42, 3:00 Sun Shen, Yannan, CP10, 10:50 Tue Shipman, Stephen P., MS53, 10:30 Mon Shkoller, Steve, MS25, 10:00 Sun Shkoller, Steve, MS28, 11:30 Sun Shkoller, Steve, MS60, 3:15 Mon Shomberg, Joseph L., CP5, 10:40 Mon Shuai, Zhisheng, MS5, 10:30 Sat Shvartsman, Stanislav, MS83, 4:15 Tue

Shvydkoy, Roman, MS26, 10:30 Sun Silling, Stewart, MS18, 3:00 Sat Simonett, Gieri, MS37, 3:30 Sun Simonett, Gieri, MS71, 4:15 Mon Simpson, Gideon, MS7, 10:00 Sat Simpson, Gideon, MS7, 10:00 Sat Simpson, Gideon, MS19, 2:00 Sat Singh, Paramjeet, CP6, 10:40 Mon Slastikov, Valeriy, MS58, 11:00 Mon Slepcev, Dejan, MS69, 3:15 Mon Smith, Ralph C., MS49, 10:00 Mon Sohinger, Vedran, MS23, 3:00 Sat Sokolowski, Jan, MS25, 11:00 Sun Solem, Susanne, CP2, 3:20 Sat Souza, Max O., CP8, 10:10 Tue Stanislavova, Milena, MS67, 3:15 Mon Stefanov, Atanas, MS55, 10:30 Mon Steinhoff, John, CP3, 12:00 Sun Strauss, Walter, MS28, 10:00 Sun Strauss, Walter, MS40, 2:00 Sun Sulem, Catherine, IP1, 8:00 Sat Sulem, Catherine, MS7, 10:00 Sat Sulem, Catherine, MS19, 2:00 Sat Sulis, William H., CP8, 10:50 Tue Sundar, P., MS2, 11:00 Sat Surnachev, Mikhail D., MS56, 10:00 Mon Surnachev, Mikhail D., MS56, 10:00 Mon Surnachev, Mikhail D., MS68, 3:15 Mon Surnachev, Mikhail D., MS79, 9:30 Tue Svanadze, Merab, CP14, 2:45 Tue Swierczewska-Gwiazda, Agnieszka, MS61, 3:15 Mon Swierczewska-Gwiazda, Agnieszka, MS61, 3:15 Mon Swierczewska-Gwiazda, Agnieszka, MS73, 9:30 Tue

Székelyhidi, Jr., László, IPO, 2:00 Mon

## T

Tadmor, Eitan, MS82, 2:45 Tue Temam, Roger M., MS54, 11:00 Mon Temam, Roger M., MS62, 3:15 Mon Tesdall, Allen, CP2, 3:40 Sat Tian, Chao, CP11, 3:25 Tue Titi, Edriss S., MS38, 3:30 Sun Tomas, Ignacio, CP14, 3:45 Tue Tonegawa, Yoshihiro, MS22, 2:00 Sat Tonegawa, Yoshihiro, MS34, 11:30 Sun Topaloglu, Ihsan A., MS57, 11:00 Mon Totz, Nathan, MS55, 10:00 Mon Toundykov, Daniel, MS1, 10:00 Sat Toundykov, Daniel, MS13, 2:00 Sat Toundykov, Daniel, MS25, 10:00 Sun Toundykov, Daniel, MS37, 2:00 Sun Toundykov, Daniel, MS49, 10:00 Mon Toundykov, Daniel, MS67, 3:45 Mon Tran, Hung, MS24, 3:00 Sat Tran, Hung, MS56, 11:00 Mon Triggiani, Roberto, MS25, 11:30 Sun Trivisa, Konstantina, MS63, 3:15 Mon Tsikkou, Charis, MS51, 10:00 Mon Tsikkou, Charis, MS63, 3:15 Mon Tsikkou, Charis, MS75, 9:30 Tue Tsikkou, Charis, MS85, 2:45 Tue Tsikkou, Charis, MS85, 2:45 Tue Tzavaras, Athanasios, MS51, 10:00 Mon Tzavaras, Athanasios, MS51, 10:00 Mon Tzavaras, Athanasios, MS63, 3:15 Mon Tzavaras, Athanasios, MS75, 9:30 Tue Tzavaras, Athanasios, MS85, 2:45 Tue Tzirakis, Nikolaos, MS11, 10:00 Sat Tzirakis, Nikolaos, MS11, 10:00 Sat Tzirakis, Nikolaos, MS23, 2:00 Sat Tzirakis, Nikolaos, MS35, 10:00 Sun

## U

Uminsky, David T., MS69, 3:45 Mon

### V

Van Den Berg, Jan Bouwe, MS3, 10:30 Sat

Vasan, Vishal, MS40, 2:00 Sun Vasilic, Ana, MS31, 10:00 Sun Vasilic, Ana, MS43, 2:00 Sun Vasilic, Ana, MS43, 2:00 Sun Vasseur, Alexis F., MS75, 10:30 Tue Velez-Santiago, Alejandro, CP7, 3:55 Mon Veneziani, Alessandro, MS72, 9:30 Tue Vernescu, Bogdan M., MS43, 3:00 Sun Vicol, Vlad C., MS26, 11:00 Sun von Brecht, James, MS57, 11:30 Mon Varotnikov, Dmitry A, MS6, 10:00 Sat

Vorotnikov, Dmitry A., MS6, 10:00 Sat Vukadinovic, Jesenko, MS62, 4:45 Mon

### W

Walker, Shawn, CP1, 10:40 Sat Walsh, Samuel, MS40, 2:30 Sun Wang, Changyou, MS70, 4:45 Mon Wang, Dehua, MS51, 10:00 Mon Wang, Dehua, MS63, 3:15 Mon Wang, Dehua, MS75, 9:30 Tue Wang, Dehua, MS75, 9:30 Tue Wang, Dehua, MS85, 2:45 Tue Wang, Qi, MS70, 3:15 Mon Wang, Wei, MS29, 10:30 Sun Wang, Xiaoming, MS66, 3:15 Mon Wang, Xiaoming, MS88, 2:45 Tue Wang, Yu V., CP11, 3:45 Tue Ward, Michael, MS3, 10:00 Sat Webster, Justin, MS1, 10:00 Sat Webster, Justin, MS13, 2:00 Sat Webster, Justin, MS25, 10:00 Sun Webster, Justin, MS37, 2:00 Sun Webster, Justin, MS49, 10:00 Mon Webster, Justin, MS49, 11:00 Mon Weinstein, Michael I., IP3, 8:00 Sun Weinstein, Michael I., MS53, 10:00 Mon Weinstein, Michael I., MS65, 3:15 Mon Weiss, Georg, MS22, 3:00 Sat Wheeler, Miles, MS40, 3:00 Sun Wiedemann, Emil, MS26, 11:30 Sun Wilke, Mathias, MS37, 2:00 Sun Winters, Andrew, MS45, 3:30 Sun Wright, J. Douglas, MS19, 3:30 Sat Wroblewska-Kaminska, Aneta, MS61, 4:45 Mon Wu, Lijiang, MS69, 4:15 Mon Wu, Qiliang, MS27, 11:00 Sun Wylie, Jonathan J., MS10, 10:00 Sat

X Xie, weiqing, MS5, 11:30 Sat Xing, Yulong, MS29, 11:00 Sun Xu, Xiang, MS84, 2:45 Tue Xu, Zhengfu, MS41, 2:00 Sun

## Yang, He, MS41, 2:30 Sun Yang, Jianke, MS65, 3:15 Mon Yang, Xu, MS77, 9:30 Tue Yang, Xu, MS86, 2:45 Tue Yang, Yang, MS16, 3:30 Sat Yano, Takeru, CP6, 11:20 Mon Yao, Yao, MS87, 3:15 Tue Yip, Aaron, MS87, 3:45 Tue Yu, Cheng, MS63, 4:45 Mon Yu, Yifeng, MS78, 10:30 Tue

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Zatorska, Ewelina, MS73, 10:30 Tue Zaya, Karen, MS84, 4:15 Tue Zemlyanova, Anna, MS79, 10:00 Tue Zhang, Jing, MS37, 2:30 Sun Zhang, Tianyou, CP4, 3:20 Sun Zhang, Weizhe, MS59, 10:30 Mon Zhang, Yongtao, MS29, 10:00 Sun Zhang Cheng, Lei, MS58, 10:30 Mon Zheng, Yuxi, MS63, 3:45 Mon Zhikov, Vasily, MS56, 10:00 Mon Zhikov, Vasily, MS68, 3:15 Mon Zhikov, Vasily, MS68, 3:15 Mon Zhikov, Vasily, MS79, 9:30 Tue Zhong, Xinghui, MS41, 3:30 Sun Zhou, Guanyu, CP9, 10:30 Tue Zolesio, Jean-Paul, MS81, 9:30 Tue Zubelli, Jorge P., MS76, 2:00 Sun Zubelli, Jorge P., MS76, 3:00 Sun Zumbrun, Kevin, MS75, 11:00 Tue Zunino, Paolo, MS72, 10:00 Tue

## PD13 Budget

Conference Budget SIAM Conference on Analysis of Partial Differential Equations December 7-10, 2013 Lake Buena Vista, FL

Expected Paid Attendance 360

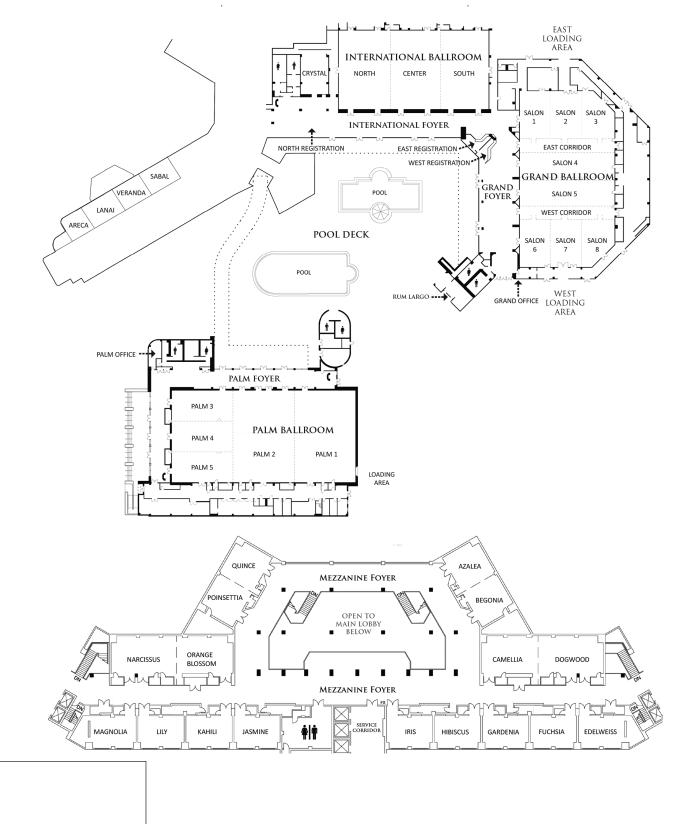
Revenue	
Registration	Incom

Registration Income		<u>\$119,075</u>
	Total	\$119,075
Expenses		
Printing		\$3,500
Organizing Committee		\$2,800
Invited Speakers		\$11,250
Food and Beverage		\$17,800
AV Equipment and Telecommunication		\$19,500
Advertising		\$6,600
Professional Services		\$12,000
Conference Labor (including benefits)		\$39,514
Other (supplies, staff travel, freight, misc.)		\$6,900
Administrative		\$11,684
Accounting/Distribution & Shipping		\$8,199
Information Systems		\$11,168
Customer Service		\$4,206
Marketing		\$6,835
Office Space (Building)		\$4,587
Other SIAM Services		\$5,115
	Total	\$171,658
Net Conference Expense		(\$52,583)
-		
Support Provided by SIAM		<u>\$52,583</u>
		\$0

Estimated Support for Travel Awards not included above:

Post Docs and Students	10	\$7,500
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## Hilton Orlando Lake Buena Vista Floor Plans



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