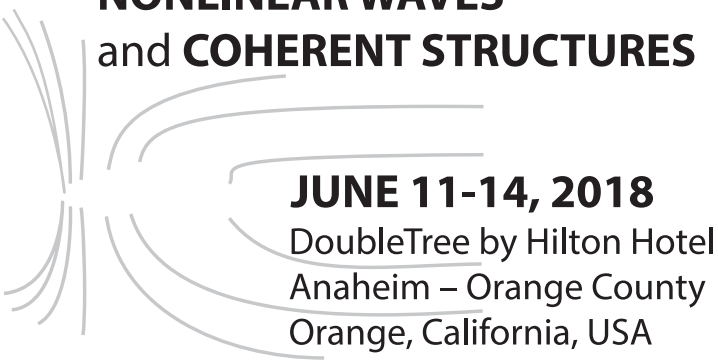
Final Program

SIAM Conference on NONLINEAR WAVES and COHERENT STRUCTURES



JUNE 11-14, 2018

DoubleTree by Hilton Hotel
Anaheim – Orange County
Orange, California, USA

Sponsored by the SIAM Activity Group on Nonlinear Waves & Coherent Structures (NWCS)

The Activity Group on Nonlinear Waves & Coherent Structures (NWCS) fosters collaborations among applied mathematicians, physicists, fluid dynamicists, engineers, and biologists in those areas of research related to the theory, development, and use of nonlinear waves and coherent structures. It promotes and facilitates nonlinear waves and coherent structures as an academic discipline; brokers partnerships between academia, industry, and government laboratories; and works with other professional societies to promote NWCS.

The activity group organizes the biennial SIAM Conference on Nonlinear Waves & Coherent Structures; awards The Martin Kruskal Lecture every two years to recognize a notable body of mathematics and contributions in the field of nonlinear waves and coherent structures; awards the T. Brooke Benjamin Prize in Nonlinear Waves every two years to a mid-career established researcher for recent outstanding work on a topic in nonlinear waves; and maintains a member directory and an electronic mailing list.

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Organizing Committee Co-Chairs

Mathew Johnson
University of Kansas, USA

Todd Kapitula
Calvin College, USA

Organizing Committee

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Southern Methodist University, USA

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Jason Metcalfe
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Benjamin Seibold
Temple University, USA

Thomas Trogdon
University of California, Irvine, USA

Vlad Vicol
Princeton University, USA

Rudy Horne
Morehouse College, USA
We are sad to report the recent passing of Organizing Committee Member Rudy Horne, Morehouse College, USA. An obituary is available at *http://www.morehouse.edu/newscenter/morehousecollegemournsthelossofdrrudyhorne.html*

Conference Themes

Nonlinear Waves and Coherent Structures in:
Fluids
Optics, Photonics & Bose Einstein Condensates
Biological Systems
Social Sciences
Climate and Geosciences
Traffic
Ocean Engineering
Astrophysics & Cosmology
Stochastic Systems

Emphasizing Methods of:
Stability Analysis, Spectral Theory, & Geometric Analysis
Scientific Computing
Integrable Systems
Harmonic Analysis
Asymptotic Analysis

SIAM Registration Desk

The SIAM registration desk is located in the Malibu room on the Main Floor. It is open during the following hours:

Sunday, June 10
5:00 PM - 7:00 PM

Monday, June 11
7:30 AM - 3:30 PM

Tuesday, June 12
8:15 AM - 3:30 PM

Wednesday, June 13
8:15 AM - 3:30 PM

Thursday, June 14
8:15 AM - 3:30 PM

Hotel Address

DoubleTree by Hilton Hotel Anaheim - Orange County
100 The City Drive
Orange, California, 92868-3204
USA
Phone Number: +1-714-634-4500
Hotel website: *http://doubletree3.hilton.com/en/hotels/california/doubletree-by-hilton-hotel-anaheim-orange-county-SNACCDT/index.html*

Hotel Telephone Number

To reach an attendee or leave a message, call +1-714-634-4500. If the attendee is a hotel guest, the hotel operator can connect you with the attendee's room.

Hotel Check-in and Check-out Times

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

Child Care

Visit *www.care.com* for information on child care services. Care.com provides a web-based resource to connect individuals with vetted babysitters and nannies. Attendees are responsible for making their own child care arrangements.

Corporate Members and Affiliates

SIAM corporate members provide their employees with knowledge about, access to, and contacts in the applied mathematics and computational sciences community through their membership benefits. Corporate membership is more than just a bundle of tangible products and services; it is an expression of support for SIAM and its programs. SIAM is pleased to acknowledge its corporate members 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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Bechtel Marine Propulsion Laboratory

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Department of National Defence (DND/ CSEC)

DSTO- Defence Science and Technology Organisation

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Huawei FRC French R&D Center

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IDA Center for Communications Research, La Jolla

IDA Center for Communications Research, Princeton

IFP Energies nouvelles

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Lawrence Livermore National Labs

Lockheed Martin

Los Alamos National Laboratory

Max-Planck-Institute for Dynamics of Complex Technical Systems

Mentor Graphics

National Institute of Standards and Technology (NIST)

National Security Agency (DIRNSA)

Naval PostGrad

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

Sandia National Laboratories

Schlumberger-Doll Research

United States Department of Energy

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

US Naval Research Labs

List current April 2018.

Funding Agency

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

Join SIAM and save!

Leading the applied mathematics community . . .

SIAM members save up to $140 on full registration for the SIAM Conference on Nonlinear Waves and Coherent Structures (NWCS18). Join your peers in supporting the premier professional society for applied mathematicians and computational scientists. SIAM members receive subscriptions to *SIAM Review, SIAM News* and *SIAM Unwrapped,* and enjoy substantial discounts on SIAM books, journal subscriptions, and conference registrations.

If you are not a SIAM member and paid the *Non-Member* or *Non-Member Mini Speaker/Organizer* rate to attend the conference, you can apply the difference between what you paid and what a member would have paid ($140 for a *Non-Member* and $70 for a *Non-Member Mini Speaker/Organizer*) towards a SIAM membership. Contact SIAM Customer Service for details or join at the conference registration desk.

If you are a SIAM member, it only costs $15 to join the SIAM Activity Group on Nonlinear Waves and Coherent Structures. As a SIAG/NWCS member, you are eligible for an additional $15 discount on this conference, so if you paid the SIAM member rate to attend the conference, you might be eligible for a free SIAG/NWCS 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.

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

Telephone: +1-215-382-9800 (worldwide); or 800-447-7426 (U.S. and Canada only)

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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' omputers.

A data (LCD) projector and screen will be provided in all technical session meeting rooms. The data projectors support both VGA and HDMI connections. Presenters requiring an alternate connection must provide their own adaptor.

Internet Access

Attendees booked within the SIAM room block will receive complimentary wireless Internet access in their guest rooms and the public areas of the hotel. All conference attendees will have complimentary wireless Internet access in the meeting space.

SIAM will also provide a limited number of email stations.

Job Postings

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

Registration Fee Includes

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

Poster Participant Information

The poster session is scheduled for Tuesday, June 12 from 5:15 PM – 7:15 PM. Poster presenters must set-up their poster material on the 4' x 8' poster boards in the Huntington/Manhattan Room on the Main Floor after 3:00 PM on Monday, June 11. All materials must be posted by Tuesday, June 12 at 5:15 PM, the official start time of the session. Posters will remain on display through 10:00 AM on Thursday, June 14. **Posters must be removed by 10:00 AM on Thursday, June 14.**

Table Top Display

SIAM

Name Badges

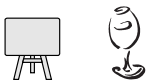
A space for emergency contact information is provided on the back of your name badge. Help us help you in the event of an emergency!

Comments?

Comments about SIAM meetings are encouraged! Please send to: Cynthia Phillips, SIAM Vice President for Programs (vpp@siam.org).

Get-togethers

Welcome Reception and Poster Session
Tuesday, June 12
5:15 PM - 7:15 PM



Business Meeting
(open to SIAG/NWCS members)
Wednesday, June 13
6:30 PM - 7:15 PM
Complimentary beer and wine will be served.

Statement on Inclusiveness

As a professional society, SIAM is committed to providing an inclusive climate that encourages the open expression and exchange of ideas, that is free from all forms of discrimination, harassment, and retaliation, and that is welcoming and comfortable to all members and to those who participate in its activities. In pursuit of that commitment, SIAM is dedicated to the philosophy of equality of opportunity and treatment for all participants regardless of gender, gender identity or expression, sexual orientation, race, color, national or ethnic origin, religion or religious belief, age, marital status, disabilities, veteran status, field of expertise, or any other reason not related to scientific merit. This philosophy extends from SIAM conferences, to its publications, and to its governing structures and bodies. We expect all members of SIAM and participants in SIAM activities to work towards this commitment.

Please Note

SIAM is not responsible for the safety and security of attendees' computers. Do not leave your personal electronic devices unattended. Please remember to turn off your cell phones and other devices 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 #SIAMNWCS18.

SIAM's Twitter handle is @TheSIAMNews.

Changes to the Printed Program

The printed program and abstracts were current at the time of printing, however, please review the online program schedule *(http://meetings.siam.org/program.cfm?CONFCODE=nw18)* for the most up-to-date information.

Minitutorial

The Minitutorial will take place in Redondo - Main Floor

Wednesday, June 13

3:00 PM - 5:00 PM

Organizer: Benjamin Seibold, *Temple University, USA*

MT1 Phantom Jams and Nonlinear Waves in Traffic Flow - Theory and Practice

Invited Plenary Speakers

All Invited Plenary Presentations will take place in Laguna/Newport - Main Floor

Monday, June 11

8:45 AM - 9:30 AM

IP1 Amphiphilic Morphology: Lipids, Proteins, and Entropy

Keith Promislow, *Michigan State University, USA*

1:45 PM - 2:30 PM

IP2 Pilot-wave Hydrodynamics: From Chaotic Dynamics to Quantum-like Statistics

John W. Bush, *Massachusetts Institute of Technology, USA*

Tuesday, June 12

8:45 AM - 9:30 AM

IP3 Partial Differential Equations as Models for Social Complex Systems

Nancy Rodriguez-Bunn, *University of North Carolina at Chapel Hill, USA*

1:45 PM - 2:30 PM

IP4 On the Way to the Limit:
Oscillatory Stiffness and Low Frequency Dynamics in Climate and Weather Prediction

Beth Wingate, *University of Exeter, United Kingdom*

Invited Plenary Speakers

All Invited Plenary Presentations will take place in Laguna/Newport - Main Floor

Wednesday, June 13

8:45 AM - 9:30 AM

IP5 Multi-scale Problems of Material Design in Sustainable Energies
Barbara Wagner, *Weierstrass Institute, Germany*

1:45 PM - 2:30 PM

IP6 Nonlinear Geometric Optics and Applications to Stable Singularity Formation
Jared Speck, *Massachusetts Institute of Technology, USA*

Thursday, June 14

8:45 AM - 9:30 AM

IP7 The Rainbow of Spatio-temporal Dynamics in Nonlinear Optics: The Story of Multi-color Light Filaments, Vortices and Other Patterns and the Mathematics Behind It
Alejandro Aceves, *Southern Methodist University, USA*

1:45 PM - 2:30 PM

IP8 Propagating Waves in Nonlocal Neural Media
G. Bard Ermentrout, *University of Pittsburgh, USA*

Prize and Special Lecture

Martin Kruskal Prize Recipient

Michael I. Weinstein, *Columbia University, USA*

T. Brooke Benjamin Prize in Nonlinear Waves Recipient

David M. Ambrose, *Drexel University, USA*

Monday, June 11

5:15 PM - 5:30 PM

Martin D. Kruskal Prize and T. Brooke Benjamin Prize
in Nonlinear Waves Award Presentations

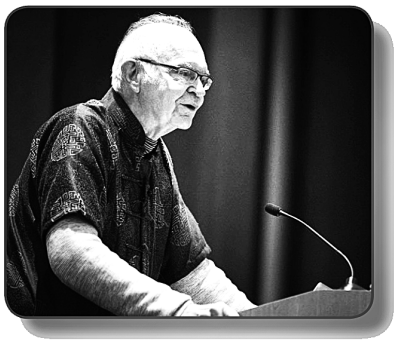
5:30 PM - 6:15 PM

SP1 Martin D. Kruskal Prize Lecture –
On the Mathematical Theory of Graphene and its Artificial Analogues

Michael I. Weinstein, *Columbia University, USA*

SIAM PRESENTS IS AN AUDIO-VISUAL ARCHIVE

COMPRISED OF MORE THAN 2,000 PRESENTATIONS POSTED IN OVER 40 SEARCHABLE TOPICS, INCLUDING:



- **algebraic geometry**
- **atmospheric and oceanographic science**
- **computational science**
- **data mining**
- **geophysical science**
- **optimization**
- **uncertainty quantification and more...**

The collection, *Featured Lectures from our Archives*, includes audio and slides from more than 30 conferences since 2008, including talks by invited and prize speakers, select minisymposia, and minitutorials. Presentations from SIAM meetings are being added throughout the year.

In addition you can view short video clips of speaker interviews from sessions at Annual Meetings starting in 2010.

Plans for adding more content are on the horizon. Keep an eye out!

The audio, slide, and video presentations are part of SIAM's outreach activities to increase the public's awareness of mathematics and computational science in the real world, and to bring attention to exciting and valuable work being done in the field. Funding from SIAM, the National Science Foundation, and the Department of Energy was used to partially support this project.

New presentations are posted every few months as the program expands with sessions from additional SIAM meetings. Users can search for presentations by category, speaker name, and/or key words.

www.siam.org/meetings/presents.php

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SIAM Activity Group on Nonlinear Waves & Coherent Structures (SIAG/NWCS)

www.siam.org/activity/nwcs

A GREAT WAY TO GET INVOLVED!

Collaborate and interact with mathematicians and applied scientists whose work involves Nonlinear Waves and Coherent Structures

ACTIVITIES INCLUDE:

- **Special Sessions at SIAM meetings**
- **Biennial conference**
- **The T. Brooke Benjamin Prize in Nonlinear Waves (awarded biennially)**

BENEFITS OF SIAG/NWCS MEMBERSHIP:

- **Listing in the SIAG's online membership directory**
- **Additional $15 discount on registration at the SIAM Conference on Nonlinear Waves and Coherent Structures**
- **Electronic communications about recent developments in your specialty**
- **Eligibility for candidacy for SIAG/NWCS office**
- **Participation in the selection of SIAG/NWCS officers**

ELIGIBILITY:

- **Be a current SIAM member.**

COST:

- **$15 per year**
- **Student members can join 2 activity groups for free!**

SIAM Conference on
NONLINEAR WAVES
and **COHERENT STRUCTURES**

JUNE 11-14, 2018
DoubleTree by Hilton Hotel
Anaheim – Orange County
Orange, California, USA

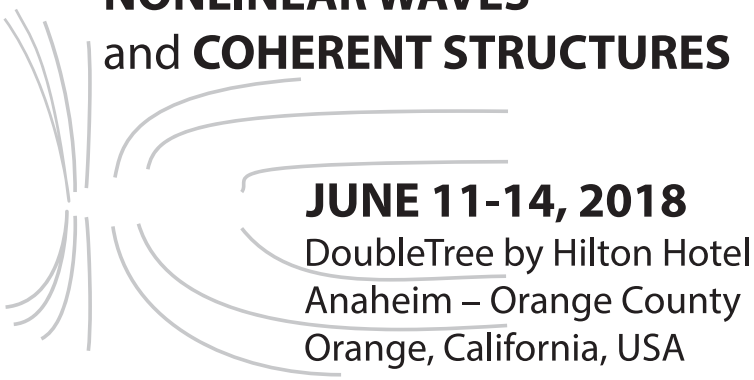
2017-18 SIAG/NWCS OFFICERS

Chair: :	Peter Miller, University of Michigan
Vice Chair:	Jay Wright, Drexel University
Program Director:	Todd Kapitula, Calvin College
Secretary:	Katie Oliveras, Seattle University

TO JOIN:

SIAG/NWCS: ***my.siam.org/forms/join_siag.htm***
SIAM: ***www.siam.org/joinsiam***

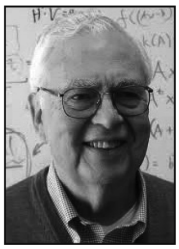
Program Schedule



Gene Golub g2s3 2019 SIAM Summer School

June 17-28, 2019
Aussois, France

HIGH PERFORMANCE DATA ANALYTICS



The tenth Gene Golub SIAM Summer School will take place in France, at the Paul Langevin conference center in Aussois, in the French Alps.

The focus of the school will be on large-scale data analytics, which lies at the intersections of data analytics algorithms and high performance computing. Students will be introduced to problems in data analytics arising from both the machine learning and the scientific computing communities. The school will include perspectives from industry, such as Amazon, Google, and IBM, as well as from academic instructors.

Students will be exposed to "end-to-end" multidisciplinary topics, which span several traditionally disparate areas. The series of lectures will develop background on methods and algorithms for data analytics, approximation algorithms to deal with large volumes of data, languages and tools for implementing those algorithms on large scale computers, and data-driven applications from scientific computing and machine learning.

The summer school is being organized by Laura Grigori (Inria and Sorbonne University), Matthew Knepley (University at Buffalo) Olaf Schenk (Università della Svizzera Italiana), and Rich Vuduc (Georgia Institute of Technology).

The intended audience is intermediate graduate students (students with a Master's degree, 2nd-3rd year Ph.D. students without an MS, or equivalent). Applicants selected to participate pay no registration fee. Funding for local accommodations and meal expenses will be available for all participants.

Application deadline: February 1, 2019

As information becomes available on how to apply, it will be posted at:

http://www.siam.org/students/g2s3/

Sponsored by SIAM through an endowment from the estate of Gene Golub.

For more information about prior summer schools and Professor Gene Golub go to ***http://www.siam.org/students/g2s3/***

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siam@siam.org • www.siam.org

Sunday, June 10

Registration

5:00 PM-7:00 PM

Room:Malibu - Main Floor

Monday, June 11

Registration

7:30 AM-3:30 PM

Room:Malibu - Main Floor

Opening Remarks

8:30 AM-8:45 AM

Room:Laguna/Newport - Main Floor

Monday, June 11

IP1

Amphiphilic Morphology: Lipids, Proteins, and Entropy

8:45 AM-9:30 AM

Room:Laguna/Newport - Main Floor

Chair: Todd Kapitula, Calvin College, USA

The self organization of phospholipids into membranes is fundamental to the origin of life, allowing for protection of internal structure while necessitating machinery to open pores. Evolutionary pressure has designed a myriad of controls in the guise of surface proteins that adjust the entropy of the lipid-solvent interactions, raising and lower energy barriers to membrane fusion, budding, endocytosis, and inducing curvature vectors that encode for fenestration and helical structures. All of these actors orchestrate the delicate dynamics of the endoplasmic reticulum (ER) and associated Golgi apparatus, biology's original coherent structures. We embed the ER and its dynamics within an energy minimization problem whose coherent dynamics play out on a huge center-stable stage. We given an overview of the bifurcation structure, including a mechanism for the onset of morphological complexity observed in synthetic amphiphilic polymers, and describe the template ER problem: the evolution and budding of lipid droplets.

Keith Promislow

Michigan State University, USA

Coffee Break

9:30 AM-10:00 AM

Room:Huntington/Manhattan - Main Floor

Monday, June 11

MS1

Defects in Structured Systems: Modeling, Analysis, and Simulation - Part I of II

10:00 AM-12:00 PM

Room:Laguna/Newport - Main Floor

For Part 2 see MS7

Structured systems support patterns comprised of broad ranges of spatial frequencies and meta-stable defects that have long-lifetimes. Defects are often associated with emergent behavior, such as high frequency spatial instabilities that induce additional structure on a background pattern or may arise when systems pass transiently through instability. Defects encumber the physical system with obstacles that frustrate the relaxation to equilibrium or may lead to permanent morphological change. Defects pose many problems to model development, to analysis of temporal behavior and stability, and to effective numerical resolution. This minisymposium will present a diverse collection of talks that address the modeling, analysis, and simulation of defects in physical contexts arising from material science and biological systems.

Organizer: Qiliang Wu

Ohio University, USA

Organizer: Keith Promislow

Michigan State University, USA

10:00-10:25 Defects in Two-fluid Models of Lipid Droplets

Keith Promislow, Michigan State University, USA

10:30-10:55 Dynamics and Competition of Block Copolymer Aggregates

Karl Glasner, University of Arizona, USA

11:00-11:25 A Phase Field Crystal Model for Active Binary Mixtures

Francesco Alaimo and Axel Voigt, Technische Universität Dresden, Germany

11:30-11:55 Modelling Defect Structures and Pattern Formation in 2 Dimensional Materials and Heterostructures

Ken Elder, Oakland University, USA

Monday, June 11

MS2

Minisymposium in Honor of Rudy L. Horne

10:00 AM-12:00 PM

Room:Hermosa - Main Floor

This Minisymposium is dedicated to Dr. Rudy Horne (Morehouse College) who passed away last December. Dr. Horne was not only active in the field of nonlinear waves but also known for his role as a consultant in the movie "Hidden Figures". This session brings people together who share his passion for mathematics and science.

Organizer: Tobias Schaefer

City University of New York, Staten Island, USA

Organizer: Richard O. Moore

New Jersey Institute of Technology, USA

10:00-10:25 Rudy Horne: The Mathematical Consultant of the Hidden Figures Movie

Talitha Washington, Howard University, USA

10:30-10:55 Nonlinear Waves in a Number of Discrete Dynamical Lattices

Nathaniel Whitaker, University of Massachusetts, Amherst, USA

11:00-11:25 Direct Numerical Simulation of Nonlinear Water Waves

David Trubatch, Montclair State University, USA

11:30-11:55 Tsunami

Harvey Segur, University of Colorado, USA

Monday, June 11

MS3

Challenges in Mathematical Modeling, Analysis and Computation of Quantum Systems - Part I of II

10:00 AM-12:00 PM

Room:Sunset - Main Floor

For Part 2 see MS9

The dynamics of quantum systems have been the subject of intensive studies in recent years. The modeling, analysis and computation of interacting particles, Fermions or Bosons, in the quantum regime have offered valuable insight into the dispersion, nonlinearity and other properties of novel atomic systems and materials. The underlying models include aspects of density functional theory, Schroedinger-type and Dirac equations, as well as various mean-field theories. This area of research is rich in mathematical questions. This minisymposium aims to bring together experts who work in theoretical aspects of quantum systems. An objective is to identify challenging issues and generate interactions among specialists.

Organizer: Dionisios Margetis

University of Maryland, College Park, USA

Organizer: Jeremy L. Marzuola

University of North Carolina, Chapel Hill, USA

10:00-10:25 Symmetry Breaking and Branching in Density Functional Theory Models

Jeremy L. Marzuola, University of North Carolina, Chapel Hill, USA; *Duo Song*, University of California, San Diego, USA

10:30-10:55 Mean Field Limits of Large Quantum Systems in Equilibrium

Mathieu Lewin, CNRS and University of Cergy-Pontoise, France

continued on next page

11:00-11:25 Band Degeneracies in 90-degree Rotationally Invariant, Periodic Schroedinger Operators

Rachael Keller, Columbia University, USA; Jeremy L. Marzuola, University of North Carolina, Chapel Hill, USA; Braxton Osting and Michael I. Weinstein, Columbia University, USA

11:30-11:55 Wave-packet Dynamics in Locally Periodic Media

Alexander Watson, Duke University, USA; Michael I. Weinstein, Columbia University, USA; Jianfeng Lu, Duke University, USA

Monday, June 11

MS4

Nonlinear Waves and Singularities in Hydrodynamics, Physics and Biology - Part I of III

10:00 AM-12:00 PM

Room:Redondo - Main Floor

For Part 2 see MS10

We encounter waves in all areas of our everyday lives, from ripples on the surface of a cup of coffee and sound waves to the plasma excitations on the sun. Waves of finite amplitude require solutions beyond linear approximation by taking into account nonlinear effects. Examples of the corresponding phenomena can be observed in self-focusing of laser beams in nonlinear media, wave breaking in hydrodynamics and aggregation of bacterial colonies. The minisymposium is devoted to new advances in the theory of nonlinear waves and singularities demonstrating vividly the similarity of approaches in a broad spectrum of applications.

Organizer: Alexander O. Korotkevich

University of New Mexico, USA and Russian Academy of Sciences, Russia

Organizer: Pavel M. Lushnikov

University of New Mexico, USA

10:00-10:25 Computing Quasi-periodic Water Waves

Jon Wilkening, University of California, Berkeley, USA

10:30-10:55 Loss of Phase and Universality of Stochastic Interactions Between Laser Beams

Gadi Fibich, Amir Sagiv, and Adi Ditkowski, Tel Aviv University, Israel

continued in next column

11:00-11:25 Computation of Singular Solutions using Hermite Methods with H-P Refinement

Daniel Appelo, University of Colorado Boulder, USA; Thomas M. Hagstrom, Southern Methodist University, USA

11:30-11:55 New Integrals of Motion and Singularities in 2D Fluid Dynamics with Free Surface

Sergey Dyachenko, University of Illinois at Urbana-Champaign, USA; Alexander Dyachenko, Landau Institute for Theoretical Physics, Russia; Pavel M. Lushnikov, University of New Mexico, USA; Vladimir Zakharov, University of Arizona, USA

Monday, June 11

MS5

Stability of Coherent Structures: A Geometric Approach - Part I of III

10:00 AM-12:00 PM

Room:Lassen - 2nd Floor

For Part 2 see MS11

The purpose of this special session is to bring together researchers working on various stability issues for special solutions of partial differential equations, such as periodic and solitary waves. Many aspects of stability/instability will be discussed, from spectral to nonlinear, with a special emphasis on geometric methods. It is expected that the speakers will spend some time addressing potential future directions in their respective fields in order to stimulate further discussion and research. The main theme of the special session will be applications of infinite dimensional symplectic geometry in spectral theory of operators obtained by linearizing a partial differential equation about a traveling wave or other special solution. Many of the talks will be concerned with the relation between the Maslov index, a topological invariant defined as the signed number of intersections of a path formed by Lagrangian subspaces with a train of a fixed subspace, and the Morse index, the number of unstable eigenvalues of the linearization.

Organizer: Robert Marangell
University of Sydney, Australia

Organizer: Yuri Latushkin
University of Missouri, Columbia, USA

Organizer: Graham Cox
Memorial University of Newfoundland, Canada

continued in next column

10:00-10:25 Nodal Deficiency, Quantum Graphs and the Maslov Index

Jeremy L. Marzuola, University of North Carolina, Chapel Hill, USA

10:30-10:55 Nonlinear Resonances: An Exploration of NLS on a Simple Open Metric Graph

Gregory Berkolaiko, Texas A&M University, USA

11:00-11:25 On Limits of Quantum Graph Operators with Shrinking Edges

Selim Sukhtaiev, Rice University, USA

11:30-11:55 Eigenvalues of the NLS Equation on Compact Graphs

Robert Marangell and Mitchell Curran, University of Sydney, Australia; Yuri Latushkin, University of Missouri, Columbia, USA; Selim Sukhtaiev, Rice University, USA

Monday, June 11

MS6

Recent Advances in Nonlinear Water Wave Modeling with Applications - Part I of II

10:00 AM-12:00 PM

Room:Sequoia - 2nd Floor

For Part 2 see MS12

This session focuses on recent advances in numerical/asymptotical/experimental approaches to nonlinear water waves, in particular, with new applications. Main topics to be discussed include computations of highly nonlinear waves possibly interacting with background flows or ocean environments, new asymptotic models for broadband wave fields, and nonlinear wave-wave interactions in a density-stratified fluid, the evolution and stability of traveling and standing waves.

Organizer: Wooyoung Choi
New Jersey Institute of Technology, USA

Organizer: Tore Magnus Taklo
New Jersey Institute of Technology, USA

10:00-10:25 A Uni-directional Model for Nonlinear Waves in Water of Finite Depth

Wooyoung Choi, New Jersey Institute of Technology, USA

10:30-10:55 A Lagrangian for Water Waves with Application to the Stability of Stokes Waves

Nick Pizzo and W. Kendall Melville, University of California, San Diego, USA

11:00-11:25 Two-dimensional Stability of Solitary Waves on a Linear Shear Current

Sunao Murashige, Ibaraki University, Japan

11:30-11:55 Computing Travelling Wave Solutions to Euler's Equations

Olga Trichtchenko, University of Washington, USA

Monday, June 11

CP1

Global Solutions for PDEs

10:00 AM-11:20 PM

Room:Redwood - 2nd Floor

Chair: Daniel E. Ruiz, Sandia National Laboratories, USA

10:00-10:15 Effects Time Fractional Order on Transient Rotating Magnetohydrodynamic Electroosmotic Micropumps in a Slowly Varying Periodically Micro-channel

Mohammed Abdulhameed, Federal Polytechnic Bauchi, Nigeria

10:20-10:35 Optical Solitons in Nematic Liquid Crystals: Model with Saturation Effects and Without Smallness Condition on the Deviation Angle

Juan Pablo Borgna, Universidad Nacional de General San Martin, Argentina; Panayotis Panayotaros, IIMAS-UNAM, Mexico; Diego Rial and Constanza Sanchez De La Vega, Universidad de Buenos Aires, Argentina

10:40-10:55 Global Lagrangian Solutions of the Camassa-Holm Equation

Jae Min Lee, City University of New York Graduate Center, USA

11:00-11:15 Steady Three-dimensional Ideal Flows with Nonvanishing Vorticity in Domains with Edges

Douglas Svensson Seth and Erik Wahlén, Lund University, Sweden

Lunch Break

12:00 PM-1:45 PM

Attendees on their own

Monday, June 11

IP2

Pilot-wave Hydrodynamics: From Chaotic Dynamics to Quantum-like Statistics

1:45 PM-2:30 PM

Room:Laguna/Newport - Main Floor

Chair: Dionisios Margetis, University of Maryland, College Park, USA

A decade ago, Yves Couder in Paris discovered that droplets walking on a vibrating fluid bath exhibit several features previously thought to be exclusive to the microscopic, quantum realm. These walking droplets propel themselves by virtue of a resonant interaction with their own wavefield, and so represent the first macroscopic realization of a pilot-wave system of the form proposed for microscopic quantum dynamics by Louis de Broglie in the 1920s. New experimental and theoretical results allow us to rationalize the emergence of quantum-like behavior in this hydrodynamic pilot-wave system in a number of settings, and explore its potential and limitations as a quantum analog.

John W. Bush

Massachusetts Institute of Technology, USA

Coffee Break

2:30 PM-3:00 PM

Room:Huntington/Manhattan - Main Floor

Monday, June 11

MS7

Defects in Structured Systems: Modeling, Analysis, and Simulation - Part II of II

3:00 PM-4:30 PM

Room:Laguna/Newport - Main Floor

For Part 1 see MS1

Structured systems support patterns comprised of broad ranges of spatial frequencies and meta-stable defects that have long-lifetimes. Defects are often associated with emergent behavior, such as high frequency spatial instabilities that induce additional structure on a background pattern or may arise when systems pass transiently through instability. Defects encumber the physical system with obstacles that frustrate the relaxation to equilibrium or may lead to permanent morphological change. Defects pose many problems to model development, to analysis of temporal behavior and stability, and to effective numerical resolution. This minisymposium will present a diverse collection of talks that address the modeling, analysis, and simulation of defects in physical contexts arising from material science and biological systems.

Organizer: Qiliang Wu

Ohio University, USA

Organizer: Keith Promislow

Michigan State University, USA

3:00-3:25 Phase Field Crystal Models of Graphene Formation on Crystalline Substrates

Steven M. Wise, University of Tennessee, USA

3:30-3:55 Degenerate FCH Functional and Defects in Amphiphilic Structures

Shibin Dai, University of Alabama, USA

4:00-4:25 Defects in Bilayer Interfaces in the Multi-component Functionalised Cahn-Hilliard Equation

Frits Veerman, University of Edinburgh, United Kingdom

Monday, June 11

MS8

Wave-ice Interactions: Nonlinearity, Paradigms, and Modelling Approaches - Part I of III

3:00 PM-5:00 PM

Room:Hermosa - Main Floor

For Part 2 see MS13

Wave-ice interactions in the marginal ice zones (MIZ) of the polar oceans comprise a complex but important set of processes influencing sea ice extent, ice pack albedo, and ice thickness. In both the Arctic and Antarctic, the ice floe size distribution (FSD) in the MIZ plays a central role in in controlling wave propagation through it. Ocean waves break up and shape the ice floes which, in turn, attenuate various wave characteristics, controlling which waves propagate further into the pack. The propagating waves are attenuated by a combination of scattering, floe collisions, and the viscoelastic nature of the ice water mix. Which mechanism is dominant depends on the relative scales of wave length, floe size, and ice thickness. Two main approaches have been taken to model wave-ice interaction, models focused primarily on wave scattering and models which treat the ice water mix as a continuum. In this minisymposium we will bring together mathematicians investigating both points of view and discuss the physical processes responsible for wave attenuation in the ice pack. We will also bring together those studying the interplay between waves and the FSD in both the Arctic and Antarctic. The goal of this minisymposium will be to further our understanding of the actual physical processes at play, discuss modeling paradigms, and consider the challenges associated with modeling the effect waves have on the ice packs.

continued in next column

Organizer: Christian Sampson
University of North Carolina, Chapel Hill, USA

Organizer: Vernon A. Squire
University of Otago, New Zealand

Organizer: Mike Meylan
University of Newcastle, Australia

3:00-3:25 An Overview of Waves in Sea Ice (Paradigms and Challenges)
Vernon A. Squire, University of Otago, New Zealand

3:30-3:55 Mathematical and Experimental Perspectives on Modelling Wave-induced Collisions and Rafting of Ice Floes
Lucas J. Yiew, Nanyang Technical University, Singapore

4:00-4:25 Mathematical Modelling of Wave Transmission by Overwashed Sea-ice Floes
David M. Skene, University of Adelaide, Australia

4:30-4:55 Scattering and Attenuation of Solitary Waves in a Fragmented Sea Ice
Emilian I. Parau, University of East Anglia, United Kingdom; Philippe Guyenne, University of Delaware, USA

Monday, June 11

MS9

Challenges in Mathematical Modeling, Analysis and Computation of Quantum Systems - Part II of II

3:00 PM-5:00 PM

Room:Sunset - Main Floor

For Part 1 see MS3

The dynamics of quantum systems have been the subject of intensive studies in recent years. The modeling, analysis and computation of interacting particles, Fermions or Bosons, in the quantum regime have offered valuable insight into the dispersion, nonlinearity and other properties of novel atomic systems and materials. The underlying models include aspects of density functional theory, Schroedinger-type and Dirac equations, as well as various mean-field theories. This area of research is rich in mathematical questions. This minisymposium aims to bring together experts who work in theoretical aspects of quantum systems. An objective is to identify challenging issues and generate interactions among specialists.

Organizer: Dionisios Margetis
University of Maryland, College Park, USA

Organizer: Jeremy L. Marzuola
University of North Carolina, Chapel Hill, USA

3:00-3:25 Long-range Schroedinger Dynamics
Kay Kirkpatrick, University of Illinois at Urbana-Champaign, USA

3:30-3:55 Dark Solitons: From 1D to 2D and 3D with Some Quantum Touches
Panayotis Kevrekidis, University of Massachusetts, USA

4:00-4:25 The Concept of a Phonon in Boson Dynamics in a Trap
Dionisios Margetis, University of Maryland, College Park, USA

4:30-4:55 Averaging of Nonlinear Schrödinger Equations with Strong Confinement and Rotation
Christof Sparber, University of Illinois, Chicago, USA

Monday, June 11

MS10

Nonlinear Waves and Singularities in Hydrodynamics, Physics and Biology - Part II of III

3:00 PM-5:00 PM

Room:Redondo - Main Floor

For Part 1 see MS4
For Part 3 see MS16

We encounter waves in all areas of our everyday lives, from ripples on the surface of a cup of coffee and sound waves to the plasma excitations on the sun. Waves of finite amplitude require solutions beyond linear approximation by taking into account nonlinear effects. Examples of the corresponding phenomena can be observed in self-focusing of laser beams in nonlinear media, wave breaking in hydrodynamics and aggregation of bacterial colonies. The minisymposium is devoted to new advances in the theory of nonlinear waves and singularities demonstrating vividly the similarity of approaches in a broad spectrum of applications.

Organizer: Alexander O. Korotkevich

University of New Mexico, USA and Russian Academy of Sciences, Russia

Organizer: Pavel M. Lushnikov

University of New Mexico, USA

3:00-3:25 Fast and High Order Computation of Axisymmetric MHD Equilibria via Conformal Mapping

Antoine Cerfon and Andras Pataki, Courant Institute of Mathematical Sciences, New York University, USA; Jeffrey Freidberg, Massachusetts Institute of Technology, USA; Leslie Greengard, Simons Foundation and Courant Institute of Mathematical Sciences, New York University, USA; Michael O'Neil, New York University, USA

3:30-3:55 Direct Computation of Singular Solutions of Evolutionary PDEs

Thomas M. Hagstrom, Southern Methodist University, USA

4:00-4:25 Critical Points in Strichartz Functionals

Vadim Zharnitsky, University of Illinois, USA; C. E. Wayne, Boston University, USA

4:30-4:55 Transverse Instability and Filamentation of Electron Plasma Waves via Direct 2+2D Vlasov Simulations

Denis Silantyev, New York University, USA; Pavel M. Lushnikov, University of New Mexico, USA; Harvey Rose, New Mexico Consortium Inc., USA

continued in next column

Monday, June 11

MS11

Stability of Coherent Structures: A Geometric Approach - Part II of III

3:00 PM-5:00 PM

Room:Lassen - 2nd Floor

For Part 1 see MS5
For Part 3 see MS17

The purpose of this special session is to bring together researchers working on various stability issues for special solutions of partial differential equations, such as periodic and solitary waves. Many aspects of stability/instability will be discussed, from spectral to nonlinear, with a special emphasis on geometric methods. It is expected that the speakers will spend some time addressing potential future directions in their respective fields in order to stimulate further discussion and research. The main theme of the special session will be applications of infinite dimensional symplectic geometry in spectral theory of operators obtained by linearizing a partial differential equation about a traveling wave or other special solution. Many of the talks will be concerned with the relation between the Maslov index, a topological invariant defined as the signed number of intersections of a path formed by Lagrangian subspaces with a train of a fixed subspace, and the Morse index, the number of unstable eigenvalues of the linearization.

Organizer: Robert Marangell

University of Sydney, Australia

Organizer: Yuri Latushkin

University of Missouri, Columbia, USA

Organizer: Graham Cox

Memorial University of Newfoundland, Canada

continued on next page

Monday, June 11

MS11

Stability of Coherent Structures: A Geometric Approach - Part II of III

3:00 PM-5:00 PM

continued

3:00-3:25 Abstract Boundary Value Problems, Maslov Index, and Applications

Yuri Latushkin, University of Missouri, Columbia, USA; Selim Sukhtaiev, Rice University, USA

3:30-3:55 The Maslov Index for Linear Hamiltonian Systems on (0,1) and Applications to Periodic Waves

Peter Howard, Texas A&M University, USA; Soyeun Jung, Kongju National University, South Korea; Bongsuk Kwon, Ulsan National Institute of Science and Technology, South Korea

4:00-4:25 Calculating the Maslov Index for Traveling Waves in a Singularly Perturbed System

Paul Cornwell and Chris Jones, University of North Carolina at Chapel Hill, USA

4:30-4:55 A Symplectic Perspective on Constrained Eigenvalue Problems

Graham Cox, Memorial University of Newfoundland, Canada

Monday, June 11

MS12

Recent Advances in Nonlinear Water Wave Modeling with Applications - Part II of II

3:00 PM-5:00 PM

Room:Sequoia - 2nd Floor

For Part 1 see MS6

This session focuses on recent advances in numerical/asymptotical/experimental approaches to nonlinear water waves, in particular, with new applications. Main topics to be discussed include computations of highly nonlinear waves possibly interacting with background flows or ocean environments, new asymptotic models for broadband wave fields, and nonlinear wave-wave interactions in a density-stratified fluid, the evolution and stability of traveling and standing waves.

Organizer: Wooyoung Choi
New Jersey Institute of Technology, USA

Organizer: Tore Magnus Taklo
New Jersey Institute of Technology, USA

3:00-3:25 Surface Waves over Highly Irregular Topographies

Andre Nachbin, Institute of Pure and Applied Mathematics, Brazil

3:30-3:55 On Resonant Wave Interactions of Gravity-capillary Waves

Malik Chabane, New Jersey Institute of Technology, USA; Wooyoung Choi, New Jersey Institute of Technology, USA

4:00-4:25 Experimental Investigation of Gas-liquid Interaction in Wavy Two-phase Pipe Flow

Vollestad Petter, *Atle Jensen*, and Ayati Anis, University of Oslo, Norway

4:30-4:55 Nonlinear Surface and Internal Wave Interactions

Tore Magnus Taklo, New Jersey Institute of Technology, USA; Wooyoung Choi, New Jersey Institute of Technology, USA

Monday, June 11

CP2

Modeling and Numerical Simulation of Wave Propagation

3:00 PM-5:20 PM

Room:Redwood - 2nd Floor

Chair: Daniel E. Ruiz, Sandia National Laboratories, USA

3:00-3:15 Coherent Vortex Detection from Particles Trajectories Analysis

Anass El Aouni, Khalid Daoudi, and Hussein Yahia, Inria Bordeaux Sud-Ouest, France; Khalid Minaoui, Mohammed V University, Morocco

3:20-3:35 Wave Propagation in Nonlinear Fluid Dielectrics

Wolfgang F. Ellermeier, Technische Universität Darmstadt, Germany

3:40-3:55 Modeling Ultrashort Electromagnetic Pulses with a Generalized Kadomtsev-Petviashvili Equation

Andrew M. Hofstrand and Jerry Moloney, University of Arizona, USA

4:00-4:15 Finding the Critical Synaptic Conductance in Active Dendrites

William Kath, Northwestern University, USA

4:20-4:35 Internal Waves in the Ocean in the Presence of Shear: Wave Turbulence Perspective

Yuri V. Lvov, Rensselaer Polytechnic Institute, USA

4:40-4:55 A Computational Characterization of Dipolar Bose-Einstein Condensate Ground States

Jessica Taylor and Boaz Ilan, University of California, Merced, USA

5:00-5:15 Wave Kinetic Equation in a Nonstationnary and Inhomogeneous Medium with a Weak Quadratic Nonlinearity

Daniel E. Ruiz, Sandia National Laboratories, USA

Intermission

5:00 PM-5:15 PM

Monday, June 11

Martin D. Kruskal and T. Brooke Benjamin Prize in Nonlinear Waves Award Presentations

5:15 PM-5:30 PM

Room:Laguna/Newport - Main Floor

SP1

Martin D. Kruskal Prize Lecture - On the Mathematical Theory of Graphene and its Artificial Analogues

5:30 PM-6:15 PM

Room:Laguna/Newport - Main Floor

Chair: To Be Determined

Graphene is a two-dimensional material made up of a single atomic layer of carbon atoms arranged in honeycomb pattern. Many of its remarkable electronic properties, e.g. quasi-particles (wave-packets) that propagate as massless relativistic particles and topologically protected edge states, are closely related to the spectral properties of the underlying single-electron Hamiltonian: -Laplacian + V(x), where V(x) is a potential defined on the plane with the symmetries of a hexagonal tiling of the plane. Taking inspiration from graphene, there has been a great deal of activity in the fundamental and applied physics communities related to the properties of waves (photonic, acoustic, elastic,…) in media whose material properties have honeycomb symmetry. In this talk l will review progress on the mathematical theory. In particular, I'll discuss propagation of wave-packets in bulk graphene (the infinite two-dimensional honeycomb structure) and of robust "edge states" along line defects (both sharp terminations of the bulk and domain walls) in graphene-like structures. Finally, I'll discuss ongoing work on metastable edge states which slowly radiate their energy from the edge into the bulk. The latter is a question in "beyond all orders asymptotics", a class of problems to which M.D. Kruskal made seminal contributions.

Michael I. Weinstein

Columbia University, USA

Tuesday, June 12

Registration

8:15 AM-3:30 PM

Room:Malibu - Main Floor

Remarks

8:40 AM-8:45 AM

Room:Laguna/Newport - Main Floor

Tuesday, June 12

IP3

Partial Differential Equations as Models for Social Complex Systems

8:45 AM-9:30 AM

Room:Laguna/Newport - Main Floor

Chair: Andrea Bertozzi, University of California, Los Angeles, USA

Gentrification, urban crime, and rioting activity are all important social issues that have become increasingly relevant as technological advances and a growing population have increased the flow of people and information. Much effort has gone into understanding these topics from a variety of scientific methodologies, including through mathematical modeling via partial differential equations (PDEs), which have the power to shed light on the dynamics of these complex social systems by identifying spatio-temporal patterns that these systems demonstrate. In this talk I will present various PDE systems that have been introduced to model urban crime, rioting activity, and gentrification, including new models that have been recently proposed that have allowed for a deeper intuition and understanding of these social phenomena. The analysis of the these systems has required advances in numerical and theoretical techniques, which are interesting in their own right as generic techniques that can be employed in the analysis other PDE systems. Finally, I will highlight how the mathematical analysis of these systems can be combined with data from real-world events to provide a comprehensive picture of the phenomena, and further validate the ability of mathematical results to successfully predict and shed understanding on observed data.

Nancy Rodriguez-Bunn

University of North Carolina at Chapel Hill, USA

Coffee Break

9:30 AM-10:00 AM

Room:Huntington/Manhattan - Main Floor

Tuesday, June 12

MS13

Wave-ice Interactions: Nonlinearity, Paradigms, and Modelling Approaches - Part II of III

10:00 AM-12:00 PM

Room:Laguna/Newport - Main Floor

For Part 1 see MS8
For Part 3 see MS19

Wave-ice interactions in the marginal ice zones (MIZ) of the polar oceans comprise a complex but important set of processes influencing sea ice extent, ice pack albedo, and ice thickness. In both the Arctic and Antarctic, the ice floe size distribution (FSD) in the MIZ plays a central role in in controlling wave propagation through it. Ocean waves break up and shape the ice floes which, in turn, attenuate various wave characteristics, controlling which waves propagate further into the pack. The propagating waves are attenuated by a combination of scattering, floe collisions, and the viscoelastic nature of the ice water mix. Which mechanism is dominant depends on the relative scales of wave length, floe size, and ice thickness. Two main approaches have been taken to model wave-ice interaction, models focused primarily on wave scattering and models which treat the ice water mix as a continuum. In this minisymposium we will bring together mathematicians investigating both points of view and discuss the physical processes responsible for wave attenuation in the ice pack. We will also bring together those studying the interplay between waves and the FSD in both the Arctic and Antarctic. The goal of this minisymposium will be to further our understanding of the actual physical processes at play, discuss modeling paradigms, and consider the challenges associated with modeling the effect waves have on the ice packs.

continued in next column

Organizer: Christian Sampson
University of North Carolina, Chapel Hill, USA

Organizer: Vernon A. Squire
University of Otago, New Zealand

Organizer: Mike Meylan
University of Newcastle, Australia

10:00-10:25 Attenuation Observations and Energy Loss Mechanisms of Waves in Sea Ice

Mike Meylan, University of Newcastle, Australia

10:30-10:55 Physics, Mathematics and Reality of some Viscoelastic Wave-in-ice Models

Hayley H. Shen and Sukun Cheng, Clarkson University, USA

11:00-11:25 Novel Field and Laboratory Observations of Wave-ice Interactions in Various Sea Ice Types

Jean Rabault, University of Oslo, Norway; Graig Sutherland, Norwegian Meteorological Institute, Norway; Atle Jensen, University of Oslo, Norway

11:30-11:55 Bounds on the Effective Viscoelasticity of an Ice Covered Ocean

Christian Sampson, University of North Carolina, Chapel Hill, USA; N. Benjamin Murphy, Elena Cherkaev, and Kenneth M. Golden, University of Utah, USA

Tuesday, June 12

MS14

Water Waves: Comparisons Between Experiments and Predictions - Part I of II

10:00 AM-12:00 PM

Room:Hermosa - Main Floor

For Part 2 see MS20

This minisymposium brings together mathematicians, experimentalists, and oceanographers. With a focus on surface water waves, the speakers will present comparisons of numerical and analytical results from mathematical models with data from experiments and the ocean.

Organizer: John Carter
Seattle University, USA

10:00-10:25 The Bidirectional Whitham Equations

John Carter, Seattle University, USA

10:30-10:55 Effect of Wind and Viscosity on Ocean Waves: Numerical and Analytic Approaches

Andrea Armaroli, Debbie Eeltink, Maura Brunetti, and Jérôme Kasparian, University of Geneva, Switzerland

11:00-11:25 Breather Evolution in Shawllow Water

Olivier Kimmoun, Aix-Marseille Université, France; Hung-Chu Hsu, National Cheng Kung University, Taiwan; Amin Chabchoub, University of Sydney, Australia

11:30-11:55 On the Orbital Stability of Elliptic Solutions to Focusing NLS

Jeremy Upsal and Bernard Deconinck, University of Washington, USA

Tuesday, June 12

MS15

Inverse Scattering and Dispersive Hydrodynamics - Part I of II

10:00 AM-12:00 PM

Room:Sunset - Main Floor

For Part 2 see MS21

Fifty years after Gardner, Greene, Kruskal and Miura first used the technique to solve the initial value problem for the Korteweg-deVries equation, the inverse scattering transform (IST) still continues to be the subject of considerable study by many research worldwide. Current research efforts include: (i) extending the class of initial conditions that one can effectively treated by IST, (ii) extending the class of nonlinear models for which the IST can be applied, (iii) developing efficient numerical methods for evaluating solutions via IST, (iv) using the IST to characterize the behavior of solutions, (v) studying singular asymptotics such as long-time behavior or semiclassical limits, (v) relating IST predictions to numerical or experimental results in various physical applications. This minisymposium aims at bringing together researchers working on these topics. A follow-up minisymposium will focus on applications.

Organizer: Gino Biondini

State University of New York at Buffalo, USA

10:00-10:25 Non-periodic Genus-one Solutions of KdV

Vladimir Zakharov, University of Arizona, USA

10:30-10:55 Inverse Scattering Transform and Soliton Solutions for Matrix Nonlinear Schrodinger Equations

Barbara Prinari, University of Colorado, Colorado Springs, USA

11:00-11:25 Interactions between Solitons and Radiation in Modulationally Unstable Media

Dionyssis Mantzavinos, University of Kansas, USA

11:30-11:55 Zakharov-Shabat Scattering Problems with Nonzero Background

Xudan Luo and Gino Biondini, State University of New York at Buffalo, USA

Tuesday, June 12

MS16

Nonlinear Waves and Singularities in Hydrodynamics, Physics and Biology - Part III of III

10:00 AM-12:00 PM

Room:Redondo - Main Floor

For Part 2 see MS10

We encounter waves in all areas of our everyday lives, from ripples on the surface of a cup of coffee and sound waves to the plasma excitations on the sun. Waves of finite amplitude require solutions beyond linear approximation by taking into account nonlinear effects. Examples of the corresponding phenomena can be observed in self-focusing of laser beams in nonlinear media, wave breaking in hydrodynamics and aggregation of bacterial colonies. The minisymposium is devoted to new advances in the theory of nonlinear waves and singularities demonstrating vividly the similarity of approaches in a broad spectrum of applications.

Organizer: Alexander O. Korotkevich

University of New Mexico, USA and Russian Academy of Sciences, Russia

Organizer: Pavel M. Lushnikov

University of New Mexico, USA

10:00-10:25 Slow Light Pulses in Two-level Media

Gregor Kovacic, Rensselaer Polytechnic Institute, USA; Katelyn J. Leisman, University of Illinois, USA; Gino Biondini, State University of New York at Buffalo, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA

continued in next column

10:30-10:55 Instability and Noise in Nonlinear Optical Resonators

Curtis R. Menyuk, Zhen Qi, and Shaokang Wang, University of Maryland, Baltimore County, USA

11:00-11:25 Stokes Waves over a Constant Vorticity Flow

Vera Mikyoung Hur and Sergey Dyachenko, University of Illinois at Urbana-Champaign, USA

11:30-11:55 Light Dynamics in Twisted Photonic Structures

Alejandro Aceves, Southern Methodist University, USA

Tuesday, June 12

MS17

Stability of Coherent Structures: A Geometric Approach - Part III of III

10:00 AM-12:00 PM

Room:Lassen - 2nd Floor

For Part 2 see MS11

The purpose of this special session is to bring together researchers working on various stability issues for special solutions of partial differential equations, such as periodic and solitary waves. Many aspects of stability/instability will be discussed, from spectral to nonlinear, with a special emphasis on geometric methods. It is expected that the speakers will spend some time addressing potential future directions in their respective fields in order to stimulate further discussion and research. The main theme of the special session will be applications of infinite dimensional symplectic geometry in spectral theory of operators obtained by linearizing a partial differential equation about a traveling wave or other special solution. Many of the talks will be concerned with the relation between the Maslov index, a topological invariant defined as the signed number of intersections of a path formed by Lagrangian subspaces with a train of a fixed subspace, and the Morse index, the number of unstable eigenvalues of the linearization.

Organizer: Robert Marangell
University of Sydney, Australia

Organizer: Yuri Latushkin
University of Missouri, Columbia, USA

Organizer: Graham Cox
Memorial University of Newfoundland, Canada

10:00-10:25 On Coalescing Characteristics in Whitham Modulation Theory: The Characteristic (Krein) Signs and their Nonlinear Implications

Tom J. Bridges, University of Surrey, United Kingdom; Daniel J. Ratliff, Loughborough University, United Kingdom

10:30-10:55 Homoclinic Snaking and its Structural Stability in Discrete Systems

Hadi Susanto, University of Essex, United Kingdom

11:00-11:25 Conservation Law Geometry and the Evolution of Nonlinear Waves

Daniel J. Ratliff, Loughborough University, United Kingdom; Tom J. Bridges, University of Surrey, United Kingdom

11:30-11:55 One-dimensional BGK Model

Alim Sukhtayev, Miami University, USA; Kevin Zumbrun, Indiana University, USA

continued in next column

Tuesday, June 12

MS18

Nonlinear Kinetic Waves and Coherent Structures in Vlasov Plasmas - Part I of II

10:00 AM-12:00 PM

Room:Sequoia - 2nd Floor

For Part 2 see MS24

The Kinetic Theory of Plasma Waves is an excellent test bed for self-organization phenomena far from equilibrium, e.g. through the action of intense lasers and magnetic fields. This conference is an ideal interdisciplinary forum to look for ways to reinvigorate this field by cross-fertilizing rigorous mathematical methods with physical intuition and simplified models, drawing inspiration from high fidelity computer simulations. We have assembled eight speakers -- physicist, numerical analysts and applied mathematicians from academia, industry, and the national labs -- whose expertise spans the spectrum just noted, including functional and harmonic analysis techniques, asymptotic methods, and rigorous numerical approaches to the long time evolution of nonlinear phase space structures in Vlasov plasmas. Focus areas for the session include distilling the relationships between Case-van Kampen modes, BGK modes, Zakharov-Karpman solutions, and driven nonlinear electron plasma waves and KEEN waves; and incorporating mild collisional models (such as Fokker-Planck and Lenard-Bernstein) in the presence and absence of ambient and self-generated magnetic fields.

Organizer: Jon Wilkening
University of California, Berkeley, USA

Organizer: Bedros Afeyan
Polymath Research Inc., USA

continued on next page

10:00-10:25 Nonlinear Kinetic Non-stationary Waves in Vlasov Plasmas: Past and Present

Bedros Afeyan, Polymath Research Inc., USA; B. A. Shadwick, University of Nebraska, USA; Richard Sydora, University of Alberta, Canada; David Larson and Jeffrey A. Hittinger, Lawrence Livermore National Laboratory, USA; Archis Joglekar, University of California, Los Angeles, USA; Jon Wilkening, Lawrence Berkeley National Laboratory and University of California Berkeley, USA

10:30-10:55 The Evolution of Non-Linear Steady-states in a 1D,1λ, Driven, Electron Plasma Wave in a Vlasov-Fokker-Planck-Poisson System

Archis Joglekar, Benjamin Winjum, and Warren Mori, University of California, Los Angeles, USA; Bedros Afeyan, Polymath Research Inc., USA

11:00-11:25 Landau Damping and Collisions in Stable and Unstable Initial Velocity Distribution

Rockford D. Foster, University of California, Berkeley, USA

11:30-11:55 Modern Algorithms for PIC Simulation of Laser-plasma Interactions (LPI)

Guangye Chen, Luis Chacon, Lin Yin, Brian Albright, David Stark, and Bob Bird, Los Alamos National Laboratory, USA

Tuesday, June 12

CP3

Dynamics and Finite-dimensional Approximations

10:00 AM-12:00 PM

Room:Redwood - 2nd Floor

Chair: M. J. Philipp Hack, Stanford University, USA

10:00-10:15 Application of Koopman Operator Theory to Highway Traffic Dynamics

Allan Avila and Igor Mezic, University of California, Santa Barbara, USA

10:20-10:35 Multi-scale Analysis of Coherent Structures in Wall Turbulence

M. J. Philipp Hack, Stanford University, USA

10:40-10:55 On the Optimum Layout of a Large Number of Interacting Piezoelectric Flags in Axial Flow

Mikael A. Langthjem, Yamagata University, Japan

11:00-11:15 Locating Exact Coherent Structures using Dynamic Mode Decomposition

Jacob Page, University of Bristol, United Kingdom; Rich Kerswell, University of Cambridge, United Kingdom

11:20-11:35 Data-driven Koopman Analysis of Tropical Climate Space-time Variability

Joanna Slawinska, University of Wisconsin, Milwaukee, USA; Dimitrios Giannakis, Courant Institute of Mathematical Sciences, New York University, USA

11:40-11:55 Mixing and Lagrangian Coherent Structures in Two-dimensional Rayleigh-Benard Convection with Periodic Perturbations

Masahito Watanabe, Tomohiro Miyamoto, and Hiroaki Yoshimura, Waseda University, Japan

Lunch Break

12:00 PM-1:45 PM

Attendees on their own

Tuesday, June 12

IP4

On the Way to the Limit: Oscillatory Stiffness and Low Frequency Dynamics in Climate and Weather Prediction

1:45 PM-2:30 PM

Room:Laguna/Newport - Main Floor

Chair: Gianne Derks, University of Surrey, United Kingdom

One of the most well-known breakthroughs in scientific computing came just after WWII when a group of mathematicians and scientists came together to create the world's first numerical weather prediction on one of the world's first computers - ENIAC. One of the most important lessons learned from that experience was that there is an intimate relationship between the mathematical structure of the governing equations, their numerical approximation, and understanding their dynamics. Building on that history, I will discuss one of the mathematical issues that leads to computational limitations for many different types of physical phenomenon including climate and weather prediction – oscillatory stiffness in the PDEs from time-scale separation that leads to low-frequency dynamics. I will discuss some of the first mathematical discoveries from geophysical fluid dynamics about how nonlinear phenomenon gives rise to low-frequency solutions and the relationship to fast singular limits studied in PDE's analysis and numerical analysis. I will discuss some of the key mathematical ideas behind new time-parallel numerical integrators, where we use frequency-averaging to approximate the low frequency dynamics.

Beth Wingate

University of Exeter, United Kingdom

Coffee Break

2:30 PM-3:00 PM

Room:Huntington/Manhattan - Main Floor

Tuesday, June 12

MS19

Wave-ice Interactions: Nonlinearity, Paradigms, and Modelling Approaches - Part III of III

3:00 PM-5:00 PM

Room:Laguna/Newport - Main Floor

For Part 2 see MS13

Wave-ice interactions in the marginal ice zones (MIZ) of the polar oceans comprise a complex but important set of processes influencing sea ice extent, ice pack albedo, and ice thickness. In both the Arctic and Antarctic, the ice floe size distribution (FSD) in the MIZ plays a central role in in controlling wave propagation through it. Ocean waves break up and shape the ice floes which, in turn, attenuate various wave characteristics, controlling which waves propagate further into the pack. The propagating waves are attenuated by a combination of scattering, floe collisions, and the viscoelastic nature of the ice water mix. Which mechanism is dominant depends on the relative scales of wave length, floe size, and ice thickness. Two main approaches have been taken to model wave-ice interaction, models focused primarily on wave scattering and models which treat the ice water mix as a continuum. In this minisymposium we will bring together mathematicians investigating both points of view and discuss the physical processes responsible for wave attenuation in the ice pack. We will also bring together those studying the interplay between waves and the FSD in both the Arctic and Antarctic. The goal of this minisymposium will be to further our understanding of the actual physical processes at play, discuss modeling paradigms, and consider the challenges associated with modeling the effect waves have on the ice packs.

Organizer: Christian Sampson

University of North Carolina, Chapel Hill, USA

Organizer: Vernon A. Squire

University of Otago, New Zealand

Organizer: Mike Meylan

University of Newcastle, Australia

continued in next column

3:00-3:25 The Evolution of Scaling Laws in the Sea Ice Floe Size Distribution

Christopher Horvat, Brown University, USA

3:30-3:55 Modelling Wave-induced Ice Breakup In the Marginal Ice Zone

Fabien Montiel and Vernon A. Squire, University of Otago, New Zealand

4:00-4:25 Wave-induced Stress and Breaking of Sea Ice in a Coupled Hydrodynamic Discrete-element Wave--ice Model

Agnieszka Herman, University of Gdansk, Poland

4:30-4:55 Seasonal and Interannual Variations of Floe Size Distribution in the Pan-Arctic Ice-Ocean Modeling and Assimilation System

Jinlun Zhang, University of Washington, USA

Tuesday, June 12

MS20

Water Waves: Comparisons Between Experiments and Predictions - Part II of II

3:00 PM-5:00 PM

Room:Hermosa - Main Floor

For Part 1 see MS14

This minisymposium brings together mathematicians, experimentalists, and oceanographers. With a focus on surface water waves, the speakers will present comparisons of numerical and analytical results from mathematical models with data from experiments and the ocean.

Organizer: John Carter

Seattle University, USA

3:00-3:25 Modelling Faraday Pilot Waves over Submerged Topography

Paul A. Milewski, University of Bath, United Kingdom

3:30-3:55 Bidirectional Fully Dispersive Models for Water Waves over an Uneven Bottom

Evgueni Dinvay and Henrik Kalisch, University of Bergen, Norway; Denys Dutykh, Universite de Savoie, France; John Carter, Seattle University, USA

4:00-4:25 Relationships between Pressure, Wave-height and Bathymetry

Katie Oliveras, Seattle University, USA

4:30-4:55 KdV Equations and Wave Breaking in Undular Bores

Henrik Kalisch, University of Bergen, Norway

Tuesday, June 12

MS21

Inverse Scattering and Dispersive Hydrodynamics - Part II of II

3:00 PM-5:00 PM

Room:Sunset - Main Floor

For Part 1 see MS15

Fifty years after Gardner, Greene, Kruskal and Miura first used the technique to solve the initial value problem for the Korteweg-deVries equation, the inverse scattering transform (IST) still continues to be the subject of considerable study by many research worldwide. Current research efforts include: (i) extending the class of initial conditions that one can effectively treated by IST, (ii) extending the class of nonlinear models for which the IST can be applied, (iii) developing efficient numerical methods for evaluating solutions via IST, (iv) using the IST to characterize the behavior of solutions, (v) studying singular asymptotics such as long-time behavior or semiclassical limits, (v) relating IST predictions to numerical or experimental results in various physical applications. This minisymposium aims at bringing together researchers working on these topics. A follow-up minisymposium will focus on applications.

Organizer: Gino Biondini

State University of New York at Buffalo, USA

3:00-3:25 The Semiclassical Defocusing Davey-Stewartson II Equation

Peter D. Miller, University of Michigan, Ann Arbor, USA

3:30-3:55 Numerical Inverse Scattering for Step-like Potentials

Thomas Trogdon, University of California, Irvine, USA

4:00-4:25 The Instabilities of Elliptic Solutions of Integrable PDEs

Bernard Deconinck, University of Washington, USA

4:30-4:55 Small-dispersion Limits for Focusing NLS with Periodic BC

Jeffrey Oregero and Gino Biondini, State University of New York at Buffalo, USA

Tuesday, June 12

MS22

Boundary-value Problems for Linear and Nonlinear Integrable Equations - Part I of II

3:00 PM-5:00 PM

Room:Redondo - Main Floor

For Part 2 see MS28

Boundary-value problems (BVPs) are ubiquitous in applications. Boundary conditions play an important role in the behavior of the solution and even in the linear case, this role is often still poorly understood. In the last decade, the use of a new method for solving BVPs due to Fokas has been expanded by him, his collaborators, and others. This method contains the classical solution methods as special cases and allows for the explicit solution of problems which could not previously be solved. This session will bring together those interested in BVPs as well as practitioners of the Fokas Method and expose interested parties to the many applications of this technique.

Organizer: Natalie E. Sheils

University of Minnesota, USA

3:00-3:25 Dispersive Quantization in Nonperiodic Domains

Natalie E. Sheils, University of Minnesota, USA

3:30-3:55 Nonlocal Problems for Linear Evolution Equations

David Smith, Yale-NUS College, Singapore

4:00-4:25 New Methods for Diffusive Wave Field Theory

Darren G. Crowdy, Imperial College London, United Kingdom

4:30-4:55 Title Not Available

Beatrice Pelloni, Heriot-Watt University, Edinburgh, United Kingdom

Tuesday, June 12

MS23

Patterns and Localized Structures - Part I of III

3:00 PM-5:00 PM

Room:Lassen - 2nd Floor

For Part 2 see MS29

Core mechanisms in the formation and dynamics of patterns can be elucidated by studying existence, stability, bifurcations and interactions of in particular fronts, pulses, wave trains, spots and stripes. This minisymposium features a collection of new advances in this field ranging from analytic results to numerical simulations and applications.

Organizer: Martina Chirilus-Bruckner

Leiden University, Netherlands

Organizer: Jens Rademacher

Universität Bremen, Germany

3:00-3:25 Localized Structures in Heterogeneous Media

Martina Chirilus-Bruckner, Leiden University, Netherlands

3:30-3:55 Run-and-Tumble Processes: Equidistribution, Ripples, Clusters, and Blowup

Arnd Scheel, University of Minnesota, Minneapolis, USA; Kyungkeun Kang, Yonsei University, South Korea; Angela Stevens, Max Planck Institute for Mathematics in the Sciences, Germany

4:00-4:25 Selection and Bifurcations of Depinning Fronts Outside the Homoclinic Snaking Region in the Planar Swift-Hohenberg Equation

David Lloyd, University of Surrey, United Kingdom

4:30-4:55 Bifurcation to Locked Fronts in a Two Component Reaction-diffusion System

Matt Holzer, George Mason University, USA

Tuesday, June 12

MS24

Nonlinear Kinetic Waves and Coherent Structures in Vlasov Plasmas - Part II of II

3:00 PM-5:00 PM

Room:Sequoia - 2nd Floor

For Part 1 see MS18

The Kinetic Theory of Plasma Waves is an excellent test bed for self-organization phenomena far from equilibrium, e.g. through the action of intense lasers and magnetic fields. This conference is an ideal interdisciplinary forum to look for ways to reinvigorate this field by cross-fertilizing rigorous mathematical methods with physical intuition and simplified models, drawing inspiration from high fidelity computer simulations. We have assembled eight speakers -- physicist, numerical analysts and applied mathematicians from academia, industry, and the national labs -- whose expertise spans the spectrum just noted, including functional and harmonic analysis techniques, asymptotic methods, and rigorous numerical approaches to the long time evolution of nonlinear phase space structures in Vlasov plasmas. Focus areas for the session include distilling the relationships between Case-van Kampen modes, BGK modes, Zakharov-Karpman solutions, and driven nonlinear electron plasma waves and KEEN waves; and incorporating mild collisional models (such as Fokker-Planck and Lenard-Bernstein) in the presence and absence of ambient and self-generated magnetic fields.

Organizer: Jon Wilkening
University of California, Berkeley, USA

Organizer: Bedros Afeyan
Polymath Research Inc., USA

continued in next column

3:00-3:25 LoKi and Valhalla Simulations of Nonlinear Kinetic Plasma Structures including Collisions

Jeffrey A. Hittinger, Lawrence Livermore National Laboratory, USA

3:30-3:55 Driven Kinetic Nonlinear Plasma Waves in Multiple Dimensions Controlled by Externally Generated Transient Magnetic Fields

Richard Sydora, University of Alberta, Canada; B. A. Shadwick, University of Nebraska, USA; Bedros Afeyan, Polymath Research Inc., USA

4:00-4:25 Vlasov and Particle Simulations of Nonlinear Plasma Waves in the Presence of Self-generated Magnetic Fields

B. A. Shadwick, University of Nebraska, USA; Bedros Afeyan, Polymath Research Inc., USA

4:30-4:55 Shape Function Kinetics (SFK) Simulations of Electron Plasma Waves and Keen Waves

David Larson, Lawrence Livermore National Laboratory, USA; Bedros Afeyan, Polymath Research Inc., USA

Tuesday, June 12

CP4

Existence of Waves and Fronts

3:00 PM-5:20 PM

Room:Redwood - 2nd Floor

Chair: Alyssa K. Ortiz, University of Colorado, Colorado Springs, USA

3:00-3:15 Lump Solutions to a (2+1)-Dimensional Fifth-order KdV-like Equation

Sumayah Batwa and Wen-Xiu Ma, University of South Florida, USA

3:20-3:35 Existence of Stationary Fronts in a System of Two Coupled Wave Equations with Spatial Inhomogeneity

Jacob Brooks, Gianne Derks, and David Lloyd, University of Surrey, United Kingdom

3:40-3:55 Multiscaled Solitary Waves

Oleg Derzho, Institute of Thermophysics, Russian Academy of Sciences, Russia

4:00-4:15 Soliton Solutions of Certain Reductions of the Matrix Nonlinear Schrodinger Equation

Alyssa K. Ortiz and Barbara Prinari, University of Colorado, Colorado Springs, USA

4:20-4:35 On the Existence of the Highest Traveling Solitary Wave Solution to Whitham's Equation

Tien T. Truong, Lund University, Sweden

4:40-4:55 Asymptotics for the Focusing Integrable Discrete Nonlinear Schrödinger Equation

Hideshi Yamane, Kwansei Gakuin University, Japan

5:00-5:15 The Semi-classical Sine-Gordon Equation with Pure Impulse Initial Data, Universality at the Gradient Catastrophe

Bingying Lu, University of Michigan, USA; Peter D. Miller, University of Michigan, Ann Arbor, USA

Intermission

5:00 PM-5:15 PM

Tuesday, June 12

PP1

Welcome Reception and Poster Session

5:15 PM-7:15 PM

Room:Huntington/Manhattan - Main Floor

Computational Simulation on the Dissipation of Water Waves over a Newtonian Fluid-mud Layer

Mohammed Abdulhameed, Federal Polytechnic Bauchi, Nigeria

Krein Signature for Instability of *PT*-Symmetric States

Alexandr Chernyavskiy and Dmitry Pelinovsky, McMaster University, Canada

Traveling Waves in Mass and Spring Dimer Fermi-Pasta-Ulam-Tsingou Lattices

Timothy E. Faver and Doug Wright, Drexel University, USA

Vortices in Rapidly Rotating Boussinesq Convection

Ryan Goh and C. Eugene Wayne, Boston University, USA

Stability of Double Pulse Solutions to the 5th Order KdV Equation, a Numerical Approach

Ross H. Parker and Bjorn Sandstede, Brown University, USA

Computational Mechanics of Coherent Structures in Spatiotemporal Systems

Adam Rupe, University of California, Davis, USA

Pulse Solutions for the Discrete FitzHugh-Nagumo Equation with Infinite Range Interactions.

Willem M. Schouten and Hermen Jan Hupkes, Leiden University, Netherlands

Spatiotemporal Pattern Extraction by Spectral Analysis of Vector-valued Observables

Dimitrios Giannakis, Courant Institute of Mathematical Sciences, New York University, USA; *Joanna Slawinska*, University of Wisconsin, Milwaukee, USA; Abbas Ourmazd, University of Wisconsin, USA

Reduction Approach to the Dynamics of Interacting Front Solutions in a Singular Perturbed Bistable System

Takashi Teramoto, Asahikawa Medical University, Japan

Noise-induced Tipping in a Periodically-Forced Bistable System

Alexandria Volkening, Ohio State University, USA; Yuxin Chen, Northwestern University, USA; John Gemmer, Wake Forest University, USA; Mary Silber, University of Chicago, USA

Rare Events in an Actively Mode-locked Laser Model with Multiple Paths

Nathan L. Sanford, Northwestern University, USA

continued in next column

Wednesday, June 13

Registration

8:15 AM-3:30 PM

Room:Malibu - Main Floor

Remarks

8:40 AM-8:45 AM

Room:Laguna/Newport - Main Floor

IP5

Multi-scale Problems of Material Design in Sustainable Energies

8:45 AM-9:30 AM

Room:Laguna/Newport - Main Floor

Chair: Andrea Bertozzi, University of California, Los Angeles, USA

The higher demand for sources of sustainable energies poses tremendous challenges in production and storage capabilities as well as the restructuring of existing and the creation of smart networks for transport of distributed energy. Mathematics plays a key role in understanding the complex problems that arise in exploiting underlying multi-scale structures and processes. In this talk I will focus on the material science aspect and discuss several research topics that illustrate the multi-scale nature of material design in photovoltaics and highlight the impact of thin-film nano-structures on light harvesting and charge transport at complex interfaces. Similar mathematical problems on the interplay of material design and battery function will also be considered.

Barbara Wagner

Weierstrass Institute, Germany

Coffee Break

9:30 AM-10:00 AM

Room:Huntington/Manhattan - Main Floor

Wednesday, June 13

MS25

Large-scale Effects of Local Structures in Complex Systems - Part I of II

10:00 AM-12:00 PM

Room:Laguna/Newport - Main Floor

For Part 2 see MS50

In this minisymposium we address the connection of large scale flow phenomena with the emergence of meso-scale coherent structures in applications ranging from granular media to polymeric liquids and active suspensions. We are particularly interested in such systems where local changes at the meso-scale can have dramatic effects on the behaviour at the macro-scale and the mathematical challenges that arise from their description.

Organizer: Barbara Wagner

Weierstrass Institute, Germany

Organizer: Andreas Muench

University of Oxford, United Kingdom

10:00-10:25 Signatures of Slip in Thin-film Flows

Barbara Wagner and Dirk Peschka, Weierstrass Institute, Germany; Andreas Münch, University of Oxford, United Kingdom

10:30-10:55 The Role of Slip and van der Waals Forces in Fiber Coating

Hangjie Ji, University of California, Los Angeles, USA

11:00-11:25 Transiently Networked Solutions

L. Pamela Cook, University of Delaware, USA; *Lin Zhou*, New York City College of Technology, USA

11:30-11:55 Dynamics and Structure of Active Fluids under Confinement

Tong Gao, Michigan State University, USA

Wednesday, June 13

MS26

Existence and Stability of Traveling Waves - Part I of III

10:00 AM-12:00 PM

Room:Hermosa - Main Floor

For Part 2 see MS32

This minisymposium will bring together researchers who study traveling or standing waves: fronts, pulses, wave trains, shock waves, and related structures. In mathematics, these objects are realized as solutions of nonlinear partial differential equations arising in physics, chemistry, and biology. Specifically, this minisymposium presents a selection of new developments concerning the problems of existence, stability, dynamic properties, and bifurcations of those solutions. The techniques reflect the multi-faceted nature of the subject, some analytical and some numerical, or combination of those.

Organizer: Stephane Lafortune

College of Charleston, USA

Organizer: Vahagn Manukian

Miami University Hamilton, USA

Organizer: Anna Ghazaryan

Miami University, USA

10:00-10:25 Center Manifolds for a Class of Degenerate Evolution Equations and Exponential Decay of Kinetic Shocks

Alin Pogan, Miami University, USA; Kevin Zumbrun, Indiana University, USA

10:30-10:55 On the Ground States for the Schroedinger Equation under Magnetic Trap Potential

Atanas Stefanov, University of Kansas, USA

11:00-11:25 Rigorous Numerical Verification of Properties of Traveling Waves

Blake Barker, Brigham Young University, USA

11:30-11:55 On the Stability of Fronts with Marginally Unstable Essential Spectrum

Anna Ghazaryan, Miami University, USA; Yuri Latushkin, University of Missouri, Columbia, USA; Yang Xinyao, Xi'an Jiaotong - Liverpool University, China

Wednesday, June 13

MS27

Dispersive Hydrodynamics and Applications - Part I of II

10:00 AM-12:00 PM

Room:Sunset - Main Floor

For Part 2 see MS33

This minisymposium is a follow-up to (and closely related to) the minisymposium "Inverse scattering and dispersive hydrodynamics", but the focus here is more towards applications.

Organizer: Gino Biondini

State University of New York at Buffalo, USA

10:00-10:25 Nonlinear Schrödinger Equation and the Universal Description of Dispersive Shock Waves

Gennady El, Loughborough University, United Kingdom; Congy Thibault, Université Paris Sud, France; Mark A. Hoefer, University of Colorado Boulder, USA

10:30-10:55 Solitary/Linear Wave-mean Flow Interaction

Mark A. Hoefer, University of Colorado Boulder, USA

11:00-11:25 The Dispersive Riemann Problem in Nonlinear Fiber Optics

Stefano Trillo, University of Ferrara, Italy; Gang Xu, Abdelkrim Bendhamane, Alexandre Kudlinski, Arno Mussot, and Matteo Conforti, University of Lille, France

11:30-11:55 Shock Dynamics of Phase Diagrams: Maxwell Relations, Collective Phenomena and Integrability

Antonio Moro, Northumbria University, United Kingdom

Wednesday, June 13

MS28

Boundary-value Problems for Linear and Nonlinear Integrable Equations - Part II of II

10:00 AM-12:00 PM

Room:Redondo - Main Floor

For Part 1 see MS22

Boundary-value problems (BVPs) are ubiquitous in applications. Boundary conditions play an important role in the behavior of the solution and even in the linear case, this role is often still poorly understood. In the last decade the use of a new method for solving BVPs due to Fokas has been expanded by him, his collaborators, and others. This method contains the classical solution methods as special cases and allows for the explicit solution of problems which could not previously be solved. This session will bring together those interested in BVPs as well as practitioners of the Fokas Method and expose interested parties to the many applications of this technique.

Organizer: Natalie E. Sheils

University of Minnesota, USA

10:00-10:25 Initial-boundary Value Problems for a Class of Nonlocal PDEs

Gino Biondini, State University of New York at Buffalo, USA

10:30-10:55 Initial and Boundary Value Problems for Nonlinear Evolution Equations

Alex Himonas, University of Notre Dame, USA

11:00-11:25 Stokes Flow in Polygonal Channels

Elena Louca and Stefan Llewellyn Smith, University of California, San Diego, USA

11:30-11:55 Numerical Inverse Scattering For the Sine-Gordon Equation

Xin Yang, University of Washington, USA

Wednesday, June 13

MS29

Patterns and Localized Structures - Part II of III

10:00 AM-12:00 PM

Room:Lassen - 2nd Floor

For Part 1 see MS23
For Part 3 see MS34

Core mechanisms in the formation and dynamics of patterns can be elucidated by studying existence, stability, bifurcations and interactions of in particular fronts, pulses, wave trains, spots and stripes. This minisymposium features a collection of new advances in this field ranging from analytic results to numerical simulations and applications.

Organizer: Martina Chirilus-Bruckner

Leiden University, Netherlands

Organizer: Jens Rademacher

Universität Bremen, Germany

10:00-10:25 The Stability of Hotspots for a Three-component Reaction-diffusion Model of Urban Crime with Focused Police Patrol

Michael Ward, University of British Columbia, Canada; Theodore Kolokolnikov, Dalhousie University, Canada; Wang Hung Tse, Trinity Western University, Canada; Juncheng Wei, University of British Columbia, Canada

10:30-10:55 An Action Functional Approach to Localized Patterns and its Application to the Spatial Heterogeneity

Takashi Teramoto, Asahikawa Medical University, Japan; Peter van Heijster, Queensland University of Technology, Australia; Yasumasu Nishiura, WPI Advanced Institute for Materials Research, Japan

11:00-11:25 Anomalous Scaling of Hopf Bifurcation Thresholds of Localized Spot Patterns in 2-D

Justin Tzou, Macquarie University, Sydney, Australia

11:30-11:55 Domain Walls in Landau-Lifschitz Equations with Spin Torque Term

Lars Siemer, Universität Bremen, Germany

Wednesday, June 13

MS30

Nonlinear Dispersive Waves

10:00 AM-12:00 PM

Room:Sequoia - 2nd Floor

Dispersion can co-exist with nonlinearity, can be created and altered by nonlinearity, can be altered by other effects such as discretization, and can undergo bifurcations. The presentations in this session will focus on the behavior of dispersion in integrable systems, fluid mechanics, electro-magnetism, and quantum mechanics.

Organizer: Katelyn J. Leisman

University of Illinois, USA

10:00-10:25 Seeking an Effective Dispersion Relation in Solutions to the NLS and Measuring Effective Nonlinearity

Katelyn J. Leisman, University of Illinois, USA; David Cai, Shanghai Jiao Tong University, China and Courant Institute of Mathematical Sciences, New York University, USA; Gregor Kovacic, Rensselaer Polytechnic Institute, USA

10:30-10:55 Different Dynamical Behaviors of Dispersive Waves from Weakly Nonlinear to Strongly Nonlinear Regimes

Shixiao W. Jiang, Pennsylvania State University, USA

11:00-11:25 On-site and Off-site Bound States of the Discrete Nonlinear Schroedinger Equation and the Peierls-Nabarro Barrier

Michael Jenkinson, Rensselaer Polytechnic Institute, USA; Michael I. Weinstein, Columbia University, USA

11:30-11:55 Bifurcations on Quantum Graphs

Roy Goodman, New Jersey Institute of Technology, USA

Wednesday, June 13

CP5

Persistence and Stability Waves

10:00 AM-11:40 AM

Room:Redwood - 2nd Floor

Chair: Kevin R. Anderson, California State Polytechnic University, Pomona, USA

10:00-10:15 Numerical Study of Psuedo Poiseuille Taylor Couette Flow Structures in a High Speed Motor Narrow Gap Region

Kevin R. Anderson, Alexander Wong, and Jun Lin, California State Polytechnic University, Pomona, USA

10:20-10:35 Necessary Conditions for Streaming Instability of 3D Internal Gravity Wave Beams

Felix Beckebanze, Utrecht University, The Netherlands; Keshav Raja, Université Grenoble Alpes, France; Leo Maas, Utrecht University, The Netherlands

10:40-10:55 Ray and Wave Chaos in Randomly Irregular Waveguides: Application to Ocean Acoustics

Denis V. Makarov, Pacific Oceanological Institute of the Russian Academy of Sciences, Russia

11:00-11:15 When Is the L^2 Energy of the 1D Damped Klein-Gordon Equation Decaying?

Satbir Malhi, University of Kansas, USA; Milena Stanislavova, University of Kansas, Lawrence, USA

11:20-11:35 Spectral Stability of Finite-Amplitude Gravity Waves in the Atmosphere

Mark Schlutow and Erik Wahlen, Lund University, Sweden

Lunch Break

12:00 PM-1:45 PM

Attendees on their own

Wednesday, June 13

IP6

Nonlinear Geometric Optics and Applications to Stable Singularity Formation

1:45 PM-2:30 PM

Room:Laguna/Newport - Main Floor

Chair: Jason Metcalfe, University of North Carolina, Chapel Hill, USA

Quasilinear hyperbolic systems are evolution-type PDEs that arise in many physical and geometric contexts. In this talk, I will describe some of my recent work on stable singularity formation in solutions to large classes of such systems. The methods have robust features and apply in particular to systems in multiple spatial dimensions with multiple speeds of propagation. The proofs rely on new geo-analytic constructions, notably the development of a theory of nonlinear geometric optics for transport operators that is dynamically adapted to the singularity. I will also highlight some important open problems and connect the results to the broader goal of obtaining a rigorous mathematical theory modeling the long-time behavior of solutions. Some of the works I will discuss are joint with G. Holzegel, J. Luk, and W. Wong.

Jared Speck
Massachusetts Institute of Technology, USA

Coffee Break

2:30 PM-3:00 PM

Room:Huntington/Manhattan - Main Floor

Wednesday, June 13

MT1

Phantom Jams and Nonlinear Waves in Traffic Flow - Theory and Practice

3:00 PM-5:00 PM

Room:Redondo - Main Floor

Chair: Benjamin Seibold, Temple University, USA

Vehicular traffic is an important real world application in which nonlinear waves phenomena exist and interact with the large-scale emergent phenomena that are observed on roadways. Our society now possesses the technical capabilities to acquire traffic flow data at fine temporal and spatial resolutions, which enables us to track flow features on the vehicle scale. This allows us to ask more ambitious questions: rather than estimating, predicting, and controlling for throughput maximization, we can now think about optimizing for fuel consumption, safety, and other more complex flow characteristics. In addition, we are about to insert disruptive technologies into the traffic stream (autonomous vehicles, synchronized e-taxi fleets, etc.) that will fundamentally change the way traffic flows, and will also provide us with completely new ways to affect and control traffic flow, from the vehicle-to-vehicle scale all the way to metropolitan corridor scales. Delivered by applied mathematics and civil engineering faculty, this mini-tutorial provides a mathematical introduction to traffic flow theory, an overview of models for traffic waves and simulation tools, and many perspectives on data collection, traffic flow control in reality, traffic experiments, legal constraints, and cultural considerations.

Speakers:

Benjamin Seibold
Temple University, USA

Daniel Work
Vanderbilt University, USA

Wednesday, June 13

MS31

Recent Development in High Performance Nonlinear Optical Systems - Part I of III

3:00 PM-5:00 PM

Room:Laguna/Newport - Main Floor

For Part 2 see MS37

This minisymposium focuses on recent developments in nonlinear waves with application to lasers, resonators, photonics and metamaterials. Topics include but are not limited to: first, novel and realistic models of optical systems that reflect the current state-of-the-art in optical experiments; second, the existence, stability and dynamics of traveling wave or periodic solutions; third, the balance of nonlinearity, dispersion, gain and loss; finally, optimization and control of optical pulses for high energy, low noise, and short duration. This minisymposium aims to bring together balanced perspectives including theory, computa- tion and experiment in the fields of nonlinear science and optical systems.

Organizer: Yannan Shen
California State University, Northridge, USA

Organizer: Richard O. Moore
New Jersey Institute of Technology, USA

Organizer: Curtis R. Menyuk
University of Maryland, Baltimore County, USA

Organizer: David Ambrose
Drexel University, USA

3:00-3:25 Nonlinear Dynamics in Honeycomb Optical Lattices
Christopher Curtis, San Diego State University, USA

3:30-3:55 Resonant vs Non-resonant Collapse Events of Optical Beams
Alexey Sukhinin, University of Vermont, USA

4:00-4:25 Dynamics and Noise Performance of Periodically-stationary Pulses in Fiber Lasers
Vrushaly K. Shinglot and John Zweck, University of Texas at Dallas, USA; Curtis R. Menyuk, University of Maryland, Baltimore County, USA; Yannan Shen, California State University, Northridge, USA

4:30-4:55 Non-linearity Induced Non-reciprocity and Topological Transitions in Optical Metamaterials
Dimitrios Sounas and Andrea Alu, University of Texas at Austin, USA

Wednesday, June 13

MS32

Existence and Stability of Traveling Waves - Part II of III

3:00 PM-5:00 PM

Room:Hermosa - Main Floor

For Part 1 see MS26
For Part 3 see MS38

This minisymposium will bring together researchers who study traveling or standing waves: fronts, pulses, wave trains, shock waves, and related structures. In mathematics, these objects are realized as solutions of nonlinear partial differential equations arising in physics, chemistry, and biology. Specifically, this minisymposium presents a selection of new developments concerning the problems of existence, stability, dynamic properties, and bifurcations of those solutions. The techniques reflect the multi-faceted nature of the subject, some analytical and some numerical, or combination of those.

Organizer: Anna Ghazaryan
Miami University, USA

Organizer: Stephane Lafortune
College of Charleston, USA

Organizer: Vahagn Manukian
Miami University Hamilton, USA

3:00-3:25 Stability of Standing Waves for a Nonlocal NLS Equation
Milena Stanislavova, University of Kansas, Lawrence, USA; Atanas Stefanov, University of Kansas, USA

3:30-3:55 Spectral Stability of Solutions to the Vortex Filament Hierarchy
Stephane Lafortune and Thomas Ivey, College of Charleston, USA

4:00-4:25 Spectral Stability of Inviscid Roll Waves
Mathew Johnson, University of Kansas, USA

4:30-4:55 Front Solutions of Modified Rosenzweig-MacArthur Model
Hong Cai and Anna Ghazaryan, Miami University, USA; *Vahagn Manukian*, Miami University Hamilton, USA

Wednesday, June 13

MS33

Dispersive Hydrodynamics and Applications - Part II of II

3:00 PM-5:00 PM

Room:Sunset - Main Floor

For Part 1 see MS27

This minisymposium is a follow-up to (and closely related to) the minisymposium "Inverse scattering and dispersive hydrodynamics", but the focus here is more towards applications.

Organizer: Gino Biondini
State University of New York at Buffalo, USA

3:00-3:25 Double Scaling in the Relaxation Time in the β-Fput Model
Miguel Onorato, University of Turin, Italy; Yuri V. Lvov, Rensselaer Polytechnic Institute, USA

3:30-3:55 Rogue Wave Formation Modeled by the Focusing Nonlinear Schroedinger Equation
Alexander Tovbis, University of Central Florida, USA

4:00-4:25 Interplay between the IST and the Unified Transform: Applications to PDEs on Graphs and Nonlocal Reductions
Vincent Caudrelier, Leeds University, United Kingdom

4:30-4:55 Universal Behavior of Modulationally Unstable Media with Non-zero Boundary Conditions
Sitai Li and Gino Biondini, State University of New York at Buffalo, USA; Dionyssis Mantzavinos, University of Kansas, USA; Stefano Trillo, University of Ferrara, Italy

Wednesday, June 13

MS34

Patterns and Localized Structures - Part III of III

3:00 PM-5:00 PM

Room:Lassen - 2nd Floor

For Part 2 see MS29

Core mechanisms in the formation and dynamics of patterns can be elucidated by studying existence, stability, bifurcations and interactions of in particular fronts, pulses, wave trains, spots and stripes. This minisymposium features a collection of new advances in this field ranging from analytic results to numerical simulations and applications.

Organizer: Martina Chirilus-Bruckner

Leiden University, Netherlands

Organizer: Jens Rademacher

Universität Bremen, Germany

3:00-3:25 Transitions from Localised Multiple-spike Waves to Bumps in Spatially-extended Networks of Integrate-and-Fire Neurons

Daniele Avitabile, University of Nottingham, United Kingdom

3:30-3:55 Moving Inhomogeneities in Oscillating Chemical Reactions

Gabriela Jaramillo, University of Arizona, USA

3:55-3:55 Stability of Hamiltonian Lattice Waves in the High-energy Limit

Michael Herrmann, Technische Universität Braunschweig, Germany

4:00-4:25 Traveling Waves in a Stochastic Nagumo Equation

Christian Hamster and Hermen Jan Hupkes, Leiden University, Netherlands

Wednesday, June 13

MS35

Boundaries, Fronts, and Interfaces in Biological and Physical Applications - Part I of III

3:00 PM-5:00 PM

Room:Redwood - 2nd Floor

For Part 2 see MS42

The natural world exhibits many nonlinear phenomena characterized by the separation of and interaction between regions with different behavior. The dynamics of these interfaces or boundaries characterizes, at least in part, the large-scale behavior of the overarching complex system. Examples occur in widely disparate fields, such as the growth of tumors, transonic shocks and vortex shedding in gas dynamics, the growth of bacteria colonies or even the rise of cooperation in evolutionary games on structured populations. This minisymposium will bring together researchers with expertise in conservation laws, singularly perturbed systems, and modeling to discuss their techniques, insights and understanding of boundaries and interfaces from a variety of viewpoints and disciplines.

Organizer: Eun Heui Kim

California State University, Long Beach, USA

Organizer: Chung-Min Lee

California State University, Long Beach, USA

Organizer: Hui Sun

California State University, Long Beach, USA

Organizer: James von Brecht

California State University, Long Beach, USA

3:00-3:25 On the Relative Entropy Method for Thermoviscoelasticity

Cleopatra Christoforou, University of Cyprus, Cyprus; Athanasios Tzavaras, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

3:30-3:55 Wave Model for Nematic Liquid Crystal

Geng Chen, University of Kansas, USA

4:00-4:25 Stokes Expansions and Asymptotic Models of Water Waves

Ching-hsiao A. Cheng, National Central University, Taiwan; Rafael Granero-Belinchón, Université Claude Bernard Lyon 1, France; Steve Shkoller, University of California, Davis, USA; Jon Wilkening, University of California, Berkeley, USA

4:30-4:55 On the Dynamics of Ferrofluids: A Relaxation Limit from the Rosensweig Model Towards Equilibrium

Konstantina Trivisa and Franziska Weber, University of Maryland, USA

continued in next column

Wednesday, June 13

MS36

Nonlinear Waves in Nature: Fluid, Plasma and Applied Physics - Part I of III

3:00 PM-5:00 PM

Room:Sequoia - 2nd Floor

For Part 2 see MS43

The spectacular phenomena that we observe in our everyday life is often a manifestation of a nonlinear model: a Kelvin-Helmholtz instability shapes the clouds in the sky, a water wave breaking on the shore, or a ray of charged particles interacting with plasma in magnetoshere producing aurora in the northern sky. Our section is devoted to the recent advances in the field of nonlinear waves in fluids, plasmas and optics.

Organizer: Sergey Dyachenko
University of Illinois at Urbana-Champaign, USA

Organizer: Denis Silantyev
New York University, USA

3:00-3:25 Variation of Iinverse Cascade Spectrum for Gravity Waves due to Condensate
Alexander O. Korotkevich, University of New Mexico, USA and Russian Academy of Sciences, Russia

3:30-3:55 Appearance of Traveling-standing Waves in Deep Water
Anastassiya Semenova, University of New Mexico, USA

4:00-4:25 Efficient Numerical Methods for Initial Value Problem with Randomness
Amir Sagiv, Adi Ditkowski, and Gadi Fibich, Tel Aviv University, Israel

4:30-4:55 Zonal Flows: A Quasilinear Foothold to Gaining Insight
Jeff Parker, Lawrence Livermore National Laboratory, USA

Intermission

5:00 PM-5:15 PM

Wednesday, June 13

PD1

Hot-topic Session: Future Directions for Research

5:15 PM-6:15 PM

Room:Laguna/Newport - Main Floor

Chair: J. Douglas Wright, Drexel University, USA

The panelists (each of who is either an invited speaker, or an organizer for a mini-tutorial) will first provide a short presentation (2-4 minutes) on what he/she thinks are the interesting research questions in his/her area. After the presentations, the floor will be opened for questions and discussion.

Panelists:

Alejandro Aceves
Southern Methodist University, USA

G. Bard Ermentrout
University of Pittsburgh, USA

Keith Promislow
Michigan State University, USA

Nancy Rodriguez-Bunn
University of North Carolina at Chapel Hill, USA

Benjamin Seibold
Temple University, USA

Barbara Wagner
Weierstrass Institute, Germany

Beth Wingate
University of Exeter, United Kingdom

Intermission

6:15 PM-6:30 PM

SIAG/NWCS Business Meeting

6:30 PM-7:15 PM

Room:Laguna/Newport - Main Floor

Complimentary beer and wine will be served.

Thursday, June 14

Registration

8:15 AM-3:30 PM

Room:Malibu - Main Floor

Closing Remarks

8:40 AM-8:45 AM

Room:Laguna/Newport - Main Floor

IP7

The Rainbow of Spatio-temporal Dynamics in Nonlinear Optics: The Story of Multi-color Light Filaments, Vortices and Other Patterns and the Mathematics Behind It

8:45 AM-9:30 AM

Room:Laguna/Newport - Main Floor

Chair: Chris Jones, University of North Carolina, USA

Since the first observation of a nonlinear process in light matter interaction in 1961, better lasers and designs of photonic structures have opened new ways to explore nonlinear phenomena with many important technological applications. In this talk we will focus our attention to spatio-temporal dynamics and coherent modes described by nonlinear Schrödinger-like equations. While the presentation will center on models and experiments of light filament propagation in air, we will also discuss recent optical experiments in quadratic media, multi-mode fibers and fiber arrays; most in need of a fresh theoretical formulation.

Alejandro Aceves
Southern Methodist University, USA

Coffee Break

9:30 AM-10:00 AM

Room:Huntington/Manhattan - Main Floor

Thursday, June 14

MS37

Recent Development in High Performance Nonlinear Optical Systems - Part II of III

10:00 AM-11:30 AM

Room:Laguna/Newport - Main Floor

For Part 1 see MS31
For Part 3 see MS44

This minisymposium focuses on recent developments in nonlinear waves with application to lasers, resonators, photonics and metamaterials. Topics include but are not limited to: first, novel and realistic models of optical systems that reflect the current state-of-the-art in optical experiments; second, the existence, stability and dynamics of traveling wave or periodic solutions; third, the balance of nonlinearity, dispersion, gain and loss; finally, opti- mization and control of optical pulses for high energy, low noise, and short duration. This minisymposium aims to bring together balanced perspectives including theory, computation and experiment in the fields of nonlinear science and optical systems.

Organizer: Yannan Shen
California State University, Northridge, USA

Organizer: Richard O. Moore
New Jersey Institute of Technology, USA

Organizer: Curtis R. Menyuk
University of Maryland, Baltimore County, USA

Organizer: David Ambrose
Drexel University, USA

10:00-10:25 Deterministic Triggering of Cavity Solitons in a Microresonator

Feng Li, Zhe Kang, Jinhui Yuan, and P. K. Alex Wai, Hong Kong Polytechnic University, China

10:30-10:55 Optical Mode Stability and Dynamics in Nonlinear Twisted Pt-symmetric Structures

Claudia Castro-Castro, University of Texas at Austin, USA; Alejandro Aceves, Southern Methodist University, USA; Yannan Shen, California State University, Northridge, USA

11:00-11:25 Integrable Models for Ultral-short Pulse Propagation

Bao-Feng Feng, University of Texas - Pan American, USA

Thursday, June 14

MS38

Existence and Stability of Traveling Waves - Part III of III

10:00 AM-12:00 PM

Room:Hermosa - Main Floor

For Part 2 see MS32

This session will bring together researchers who study fronts, pulses, wave trains and pat- terns of more complex structure which are realized as special solutions of nonlinear partial differential equations. Existence, stability, dynamic properties, and bifurcations of those solutions will be discussed, from both analytical and numerical point of views.

Organizer: Vahagn Manukian
Miami University Hamilton, USA

Organizer: Anna Ghazaryan
Miami University, USA

Organizer: Stephane Lafortune
College of Charleston, USA

10:00-10:25 Snaky Structures of Localized Patterns with Oscillatory Tails and Collision Dynamics in Heterogeneous Media

Yasumasa Nishiura, Tohoku University, Japan

10:30-10:55 Gelfand Type Problem for Turbulent Jets

Peter Gordon, Kent State University, USA

11:00-11:25 One-dimensional Periodic Solutions in a Three-component Reaction-diffusion System

Gianne Derks, University of Surrey, United Kingdom; Peter van Heijster, Queensland University of Technology, Australia; David Lloyd, University of Surrey, United Kingdom

11:30-11:55 Kink Dynamics in a Parametric Φ^8 Model

Aslihan Demirkaya, University of Hartford, USA

Thursday, June 14

MS39

Vegetation Patterns: Modeling, Analysis, and Data - Part I of II

10:00 AM-12:00 PM

Room:Sunset - Main Floor

For Part 2 see MS45

Regular spatial patterns in the vegetation growth of dryland ecosystems provide a striking example of self-organization on a community scale. These patterns most often appear on very gentle slopes as bands of vegetation separated by bare soil and can have characteristic length scales of 10-100 meters and evolve on 100-1000 year time scales. However, a diversity of patterns including regular spots of vegetation and circular gaps in uniform vegetation have also been observed on less graded terrain. This session focuses on the development and analysis of models that capture the various kinds of positive feedback between the individual plants and water availability that are thought to be responsible for the observed patterns. We also highlight the role that the increasing availability of spatial information from satellites and other sources can play in developing deeper insights into the mechanisms responsible for pattern formation and inferring the dynamics of the system.

Organizer: Jasper Weinburd
University of Minnesota, Twin Cities, USA

Organizer: Punit Gandhi
Ohio State University, USA

Organizer: Arnd Scheel
University of Minnesota, Minneapolis, USA

continued on next page

10:00-10:25 Water Transport in Dryland Ecosystems: Shaping Banded Vegetation Patterns
Punit Gandhi, Ohio State University, USA; Lucien Werner, California Institute of Technology, USA; Sarah Iams, Harvard University, USA; Karna V. Gowda, Northwestern University, USA; Mary Silber, University of Chicago, USA

10:30-10:55 Periodic Vegetation Patterns and Stability Boundaries
Jens Rademacher, Universität Bremen, Germany

11:00-11:25 Multistability and Effects of Grazing on Desertification
Eric Siero, University of Oldenburg, Germany

11:30-11:55 Strong Interaction Between Plants Induces Circular Barren Patches: Fairy Circles
Marcel Clerc, Universidad de Chile, Chile

Thursday, June 14

MS40

Localized Structures in Nonlinear Evolution and Lattice Equations - Part I of II

10:00 AM-12:00 PM

Room:Redondo - Main Floor

For Part 2 see MS46

The minisymposium will bring together specialists studying nonlinear waves in PDEs and their lattices. The particular emphasis will be given to recent results of single and multi-component nonlinear wave-type and nonlinear lattice equations with local and/or nonlocal terms as well as orbital and asymptotic stability of breathers and gap solitons, multi-solitons. This minisymposium touches, via a diverse cohort of experts, upon the current state-of-the-art in this field and the challenges that lie ahead. A balanced perspective encompassing theory, computation and experiment will be sought that should be of value to newcomers, as well as to seasoned researchers in the field.

Organizer: Vassilis M. Rothos
Aristotle University of Thessaloniki, Greece

Organizer: Efstathios Charalampidis
University of Massachusetts, Amherst, USA

10:00-10:25 Nonlinear Excitations in Magnetic Lattices with Long Range Interactions
Christopher Chong, Bowdoin College, USA

10:30-10:55 Spatial Localization in in Homogeneous FPU Lattices
Francisco Martinez-Farias, Universidad Autónoma del Estado de Hidalgo, Mexico; *Panayotis Panayotaros*, IIMAS-UNAM, Mexico

11:00-11:25 Quantifying the Rate of Noise-induced Transitions in Magnetic Droplet Solitons
Richard O. Moore, New Jersey Institute of Technology, USA

11:30-11:55 Waves and Obstacles in Square Lattices
Hermen Jan Hupkes, Leiden University, Netherlands; Erik Van Vleck, University of Kansas, USA; Aaron Hoffman, Franklin W. Olin College of Engineering, USA; Leonardo Morelli, Leiden University, Netherlands

Thursday, June 14

MS41

Spatial Dynamics: Local and Global Results - Part I of II

10:00 AM-12:00 PM

Room:Lassen - 2nd Floor

For Part 2 see MS47

We wish to showcase recent work which implements, extends, or draws inspiration from the spatial dynamics approach, which has proved very successful in the study of coherent structures in a variety of physical systems, such as cardiac electrophysiology, defect dynamics in crystallization, and mathematical neuroscience. Here one typically studies specific solutions of a PDE by posing it as an (infinite dimensional) dynamical system in a spatial variable. Coherent states can then be found by locating bounded solutions, such as periodic, homoclinic, and heteroclinic orbits. Stability and bifurcations of such solutions can be studied by using an associated linear spatial flow to locate eigenvalues, for example by constructing eigenfunctions using Lin's method, or by formulating an Evans function. We wish to exhibit recent advances in existence, stability, and bifurcations, which extend this framework to more complicated situations, such as higher dimensional spatial domains. We also hope to highlight recent work which draws upon this theory for inspiration and brings in new techniques from areas such as topology and functional analysis to study systems which are not readily posed as a spatial dynamical system, such as nonlocal equations. In all of this, we aim to showcase early-career researchers in an effort to provide exposure for their research and to work on developing a strong community among the coming generation of nonlinear waves and coherent structures researchers.

Organizer: Berry Bakker
VU University, Amsterdam, Netherlands

Organizer: Jason Bramburger
Brown University, USA

Organizer: Ryan Goh
Boston University, USA

continued on next page

Thursday, June 14

MS41

Spatial Dynamics: Local and Global Results - Part I of II

10:00 AM-12:00 PM

continued

10:00-10:25 Snaking in Dimensions 1+epsilon

Jason Bramburger, Brown University, USA

10:30-10:55 Stability of Spiral Waves in Cardiac Dynamics

Stephanie Dodson and Bjorn Sandstede, Brown University, USA

11:00-11:25 Diffusive Stability of Planar Wave Trains in Reaction-diffusion Systems Against Nonlocalized Perturbations

Björn De Rijk, Universität Stuttgart, Germany; Bjorn Sandstede, Brown University, USA

11:30-11:55 A Pattern Formation Mechanism for Control of Synapse Density During C. Elegans Growth

Heather Zinn Brooks, University of Utah, USA

Thursday, June 14

MS42

Boundaries, Fronts, and Interfaces in Biological and Physical Applications - Part II of III

10:00 AM-12:00 PM

Room:Redwood - 2nd Floor

For Part 1 see MS35
For Part 3 see MS48

The natural world exhibits many nonlinear phenomena characterized by the separation of and interaction between regions with different behavior. The dynamics of these interfaces or boundaries characterizes, at least in part, the large-scale behavior of the overarching complex system. Examples occur in widely disparate fields, such as the growth of tumors, transonic shocks and vortex shedding in gas dynamics, the growth of bacteria colonies or even the rise of cooperation in evolutionary games on structured populations. This minisymposium will bring together researchers with expertise in conservation laws, singularly perturbed systems, and modeling to discuss their techniques, insights and understanding of boundaries and interfaces from a variety of viewpoints and disciplines.

Organizer: Eun Heui Kim
California State University, Long Beach, USA

Organizer: Chung-Min Lee
California State University, Long Beach, USA

Organizer: Hui Sun
California State University, Long Beach, USA

Organizer: James von Brecht
California State University, Long Beach, USA

continued in next column

10:00-10:25 Dynamic Implicit Solvent Model: Understanding Solvent Stokes Flow and Interface Dynamics for Biomolecules

Paul Sun, California State University, Long Beach, USA; Shenggao Zhou, Soochow University, China; Li-Tien Cheng and Bo Li, University of California, San Diego, USA

10:30-10:55 Mean-field Models for Chemotaxis

Xu Yang, University of California, Santa Barbara, USA; Tong Li, University of Iowa, USA; Guangwei Si, Harvard University, USA; Min Tang, Shanghai Jiao Tong University, China

11:00-11:25 Nonlocal Interaction Models in Biological Systems

Scott McCalla, Montana State University, USA; James von Brecht, California State University, Long Beach, USA

11:30-11:55 Dynamics of Religious Group Growth and Survival

Tongzhou Chen, Georgia Institute of Technology, USA; Michael McBride, University of California, Irvine, USA; *Martin Short*, Georgia Institute of Technology, USA

Thursday, June 14

MS43

Nonlinear Waves in Nature: Fluid, Plasma and Applied Physics - Part II of III

10:00 AM-12:00 PM

Room:Sequoia - 2nd Floor

For Part 1 see MS36
For Part 3 see MS49

The spectacular phenomena that we observe in our everyday life is often a manifestation of a nonlinear model: a Kelvin-Helmholtz instability shapes the clouds in the sky, a water wave breaking on the shore, or a ray of charged particles interacting with plasma in magnetoshere producing aurora in the northern sky. Our section is devoted to the recent advances in the field of nonlinear waves in fluids, plasmas and optics.

Organizer: Sergey Dyachenko
University of Illinois at Urbana-Champaign, USA

Organizer: Denis Silantyev
New York University, USA

10:00-10:25 Exact Solutions and Integrability for Nonlinear Development of Kelvin-Helmholtz Instability for Counterflow of Superfluid and Normal Components of Helium II
Pavel M. Lushnikov, University of New Mexico, USA

10:30-10:55 Solitary Wave-hydrodynamic Flow Interaction in Bi-directional Systems
Patrick Sprenger and Mark A. Hoefer, University of Colorado Boulder, USA

11:00-11:25 Sparse Grid Techniques for Kinetic Plasma Simulation
Lee Ricketson, Milo Dorr, and Jeffrey A. Hittinger, Lawrence Livermore National Laboratory, USA

11:30-11:55 Discontinuous Galerkin Methods for the Nonlinear Shallow Water Equations with Horizontal Temperature Gradients
Jolene Britton, University of California, Riverside, USA; Yulong Xing, Ohio State University, USA

Lunch Break

12:00 PM-1:45 PM

Attendees on their own

Thursday, June 14

IP8

Propagating Waves in Nonlocal Neural Media

1:45 PM-2:30 PM

Room:Laguna/Newport - Main Floor

Chair: Jens Rademacher, Universität Bremen, Germany

Traveling waves are among the most commonly spatio-temporal dynamics observed in the recording of electrical activity in the brain. They range from stimulus evoked waves, propagation of pathological behavior such as epilepsy and migraine auras to more complex patterns such as spiral waves and other types of rotating waves. In this talk, I will first discuss the different classes of traveling waves, mainly divided between waves in excitable media and so-called phase waves. Interactions in a piece of neural tissue are not mediated by simple diffusion, but rather, nonlocal connections that are mediated by convolutions in space. I will discuss recent mathematical and computational work on the existence of wave fronts, wave pulses, and nonlocal phase models. I will relate the mathematical results to some experimental findings and discuss some open problems.

G. Bard Ermentrout
University of Pittsburgh, USA

Coffee Break

2:30 PM-3:00 PM

Room:Huntington/Manhattan - Main Floor

Thursday, June 14

MS44

Recent Development in High Performance Nonlinear Optical Systems - Part III of III

3:00 PM-4:30 PM

Room:Laguna/Newport - Main Floor

For Part 2 see MS37

This minisymposium focuses on recent developments in nonlinear waves with application to lasers, resonators, photonics and metamaterials. Topics include but are not limited to: first, novel and realistic models of optical systems that reflect the current state-of-the-art in optical experiments; second, the existence, stability and dynamics of traveling wave or periodic solutions; third, the balance of nonlinearity, dispersion, gain and loss; finally, optimization and control of optical pulses for high energy, low noise, and short duration. This minisymposium aims to bring together balanced perspectives including theory, computation and experiment in the fields of nonlinear science and optical systems.

Organizer: Yannan Shen
California State University, Northridge, USA

Organizer: David Ambrose
Drexel University, USA

Organizer: Richard O. Moore
New Jersey Institute of Technology, USA

Organizer: Curtis R. Menyuk
University of Maryland, Baltimore County, USA

3:00-3:25 Time Domain Modeling of Active and Optically Tunable Materials
Ludmila Prokopeva, Shaimaa Azzam, and Michael Povolotskyi, Purdue University, USA; Derek Olson, Michael Jenkinson, and Gregor Kovacic, Rensselaer Polytechnic Institute, USA; Alexander V. Kildishev, Purdue University, USA

3:30-3:55 Nonlinear Wave in Left-handed Transmission Lattices
Yannan Shen, California State University, Northridge, USA

4:00-4:25 On the Discrete Solitons and Vortices in Nonlinear Two-dimensional Lattices
Haitao Xu, Huazhong University of Science & Technology, China

Thursday, June 14

MS45

Vegetation Patterns: Modeling, Analysis, and Data - Part II of II

3:00 PM-5:00 PM

Room:Sunset - Main Floor

For Part 1 see MS39

Regular spatial patterns in the vegetation growth of dryland ecosystems provide a striking example of self-organization on a community scale. These patterns most often appear on very gentle slopes as bands of vegetation separated by bare soil and can have characteristic length scales of 10-100 meters and evolve on 100-1000 year time scales. However, a diversity of patterns including regular spots of vegetation and circular gaps in uniform vegetation have also been observed on less graded terrain. This session focuses on the development and analysis of models that capture the various kinds of positive feedback between the individual plants and water availability that are thought to be responsible for the observed patterns. We also highlight the role that the increasing availability of spatial information from satellites and other sources can play in developing deeper insights into the mechanisms responsible for pattern formation and inferring the dynamics of the system.

Organizer: Jasper Weinburd
University of Minnesota, Twin Cities, USA

Organizer: Punit Gandhi
Ohio State University, USA

Organizer: Arnd Scheel
University of Minnesota, Minneapolis, USA

continued in next column

3:00-3:25 Reaction-diffusion-advection Models of Vegetation Stripes on Sloped Terrain

Paul Carter, University of Arizona, USA; Arjen Doelman, Universiteit Utrecht, The Netherlands

3:30-3:55 A Numerical Bifurcation Analysis of a Dryland Vegetation Model

Cory Ward, University of Massachusetts, Amherst, USA; Panayotis Kevrekidis, University of Massachusetts, USA; Nathaniel Whitaker, University of Massachusetts, Amherst, USA

4:00-4:25 Assessing Controls on Hydrologic Connectivity, Plant Water Availability and Degradation Risk in Drylands with Lagrangian Modeling and Isotope Tracers

Octavia Crompton and Sally Thompson, University of California, Berkeley, USA

4:30-4:55 Advection and Autocatalysis in Banded Vegetation Patterns

Jasper Weinburd and Arnd Scheel, University of Minnesota, Twin Cities, USA; Richard Samuelson, Trinity College, USA; Zachary Singer, Carnegie Mellon University, USA

Thursday, June 14

MS46

Localized Structures in Nonlinear Evolution and Lattice Equations - Part II of II

3:00 PM-5:00 PM

Room:Redondo - Main Floor

For Part 1 see MS40

The minisymposium will bring together specialists studying nonlinear waves in PDEs and their lattices. The particular emphasis will be given to recent results of single and multi-component nonlinear wave-type and nonlinear lattice equations with local and/or nonlocal terms as well as orbital and asymptotic stability of breathers and gap solitons, multi-solitons. This minisymposium touches, via a diverse cohort of experts, upon the current state-of-the-art in this field and the challenges that lie ahead. A balanced perspective encompassing theory, computation and experiment will be sought that should be of value to newcomers, as well as to seasoned researchers in the field.

Organizer: Vassilis M. Rothos
Aristotle University of Thessaloniki, Greece

Organizer: Efstathios Charalampidis
University of Massachusetts, Amherst, USA

3:00-3:25 Maximum Amplitudes of Hyperelliptic Solutions of the Cubic Nonlinear Schrödinger Equation

Otis Wright, Cedarville University, USA

3:30-3:55 Title Not Available

Vassilis M. Rothos, Aristotle University of Thessaloniki, Greece

4:00-4:25 Properties of Some Breather Solutions of a Nonlocal Discrete NLS Equation

Roberto I. Ben, Universidad Nacional de General Sarmiento, Argentina; Juan Pablo Borgna, Universidad Nacional de General San Martin, Argentina; Panayotis Panayotaros, IIMAS-UNAM, Mexico

4:30-4:55 Interactions between Solitons and Dispersive Shocks in Focusing Media

Jonathan Lottes and Gino Biondini, State University of New York at Buffalo, USA

Thursday, June 14

MS47

Spatial Dynamics: Local and Global Results - Part II of II

3:00 PM-5:00 PM

Room:Lassen - 2nd Floor

For Part 1 see MS41

We wish to showcase recent work which implements, extends, or draws inspiration from the spatial dynamics approach, which has proved very successful in the study of coherent structures in a variety of physical systems, such as cardiac electrophysiology, defect dynamics in crystallization, and mathematical neuroscience. Here one typically studies specific solutions of a PDE by posing it as an (infinite dimensional) dynamical system in a spatial variable. Coherent states can then be found by locating bounded solutions, such as periodic, homoclinic, and heteroclinic orbits. Stability and bifurcations of such solutions can be studied by using an associated linear spatial flow to locate eigenvalues, for example by constructing eigenfunctions using Lin's method, or by formulating an Evans function. We wish to exhibit recent advances in existence, stability, and bifurcations, which extend this framework to more complicated situations, such as higher dimensional spatial domains. We also hope to highlight recent work which draws upon this theory for inspiration and brings in new techniques from areas such as topology and functional analysis to study systems which are not readily posed as a spatial dynamical system, such as nonlocal equations. In all of this, we aim to showcase early-career researchers in an effort to provide exposure for their research and to work on developing a strong community among the coming generation of nonlinear waves and coherent structures researchers.

Organizer: Berry Bakker
VU University, Amsterdam, Netherlands

Organizer: Jason Bramburger
Brown University, USA

Organizer: Ryan Goh
Boston University, USA

continued in next column

3:00-3:25 Large Fronts in Nonlocal Equations using Conley--Floer Theory
Berry Bakker, VU University, Amsterdam, Netherlands

3:30-3:55 Spatial Dynamics in Global Bifurcation Arguments
Miles Wheeler, University of Vienna, Austria

4:00-4:25 Bifurcation of Spikes From the Essential Spectrum in Nonlocally Coupled Systems
Tianyu Tao, University of Minnesota, USA

4:30-4:55 The Stability of Grain Boundaries in Swift-Hohenberg Equation
Qiliang Wu, Ohio University, USA

Thursday, June 14

MS48

Boundaries, Fronts, and Interfaces in Biological and Physical Applications - Part III of III

3:00 PM-5:00 PM

Room:Redwood - 2nd Floor

For Part 2 see MS42

The natural world exhibits many nonlinear phenomena characterized by the separation of and interaction between regions with different behavior. The dynamics of these interfaces or boundaries characterizes, at least in part, the large-scale behavior of the overarching complex system. Examples occur in widely disparate fields, such as the growth of tumors, transonic shocks and vortex shedding in gas dynamics, the growth of bacteria colonies or even the rise of cooperation in evolutionary games on structured populations. This minisymposium will bring together researchers with expertise in conservation laws, singularly perturbed systems, and modeling to discuss their techniques, insights and understanding of boundaries and interfaces from a variety of viewpoints and disciplines.

Organizer: Eun Heui Kim
California State University, Long Beach, USA

Organizer: Chung-Min Lee
California State University, Long Beach, USA

Organizer: Hui Sun
California State University, Long Beach, USA

Organizer: James von Brecht
California State University, Long Beach, USA

continued on next page

Thursday, June 14

MS48

Boundaries, Fronts, and Interfaces in Biological and Physical Applications - Part III of III

3:00 PM-5:00 PM

continued

3:00-3:25 From Slow Diffusion to a Hard Height Constraint: A Singular Limit of Keller-Segel

Katy Craig, University of California, Santa Barbara, USA; Inwon Kim, University of California, Los Angeles, USA; Ihsan Topaloglu, Virginia Commonwealth University, USA; Yao Yao, Georgia Institute of Technology, USA

3:30-3:55 Bubble Assemblies in Ternary Systems with Long Range Interaction

Yanxiang Zhao, Chong Wang, and Xiaofeng Ren, George Washington University, USA

4:00-4:25 Geometric Control of Active Collective Motion

Maxime Theillard, University of California, Merced, USA; Roberto Alonso-Matilla and David Saintillan, University of California, San Diego, USA

4:30-4:55 Expansion Dynamics of Bacterial Populations

Jonas Cremer, University of California, San Diego, USA

Thursday, June 14

MS49

Nonlinear Waves in Nature: Fluid, Plasma and Applied Physics - Part III of III

3:00 PM-5:00 PM

Room:Sequoia - 2nd Floor

For Part 2 see MS43

The spectacular phenomena that we observe in our everyday life is often a manifestation of a nonlinear model: a Kelvin-Helmholtz instability shapes the clouds in the sky, a water wave breaking on the shore, or a ray of charged particles interacting with plasma in magnetoshere producing aurora in the northern sky. Our section is devoted to the recent advances in the field of nonlinear waves in fluids, plasmas and optics.

Organizer: Sergey Dyachenko
University of Illinois at Urbana-Champaign, USA

Organizer: Denis Silantyev
New York University, USA

3:00-3:25 Inhomogeneous Wave Turbulence as an Effective Quantum Plasma: A Study of Zonal Flows

Ilya Dodin, Princeton Plasma Physics Laboratory, USA; Daniel E. Ruiz, Sandia National Laboratories, USA; Hongxuan Zhu, Princeton University, USA; Yao Zhou, Princeton Plasma Physics Laboratory, USA

3:30-3:55 Stochastic Dynamics in Spatially Extended Magentic Systems

Yuan Gao, University of North Carolina at Chapel Hill, USA; Katherine Newhall, Rensselaer Polytechnic Institute, USA; Jeremy L. Marzuola, University of North Carolina, Chapel Hill, USA

4:00-4:25 High-order Accurate Conservative Finite Difference Methods for Vlasov Equation

Jeffrey W. Banks, Rensselaer Polytechnic Institute, USA

4:30-4:55 Numerical Study of the Second-order Correct Hamiltonian Model for Unidirectional Water Waves

Youngjoon Hong, University of Illinois, Chicago, USA

Thursday, June 14

MS50

Large-scale Effects of Local Structures in Complex Systems - Part II of II

3:00 PM-4:30 PM

Room:Hermosa - Main Floor

For Part 1 see MS25

In this minisymposium we address the connection of large scale flow phenomena with the emergence of meso-scale coherent structures in applications ranging from granular media to polymeric liquids and active suspensions. We are particularly interested in such systems where local changes at the meso-scale can have dramatic effects on the behaviour at the macro-scale and the mathematical challenges that arise from their description.

Organizer: Barbara Wagner
Weierstrass Institute, Germany

Organizer: Andreas Muench
University of Oxford, United Kingdom

3:00-3:25 Hydrodynamic Models of Two-dimensional Active Liquid Crystals

Ananyo Maitra, Université Paris Sud, France

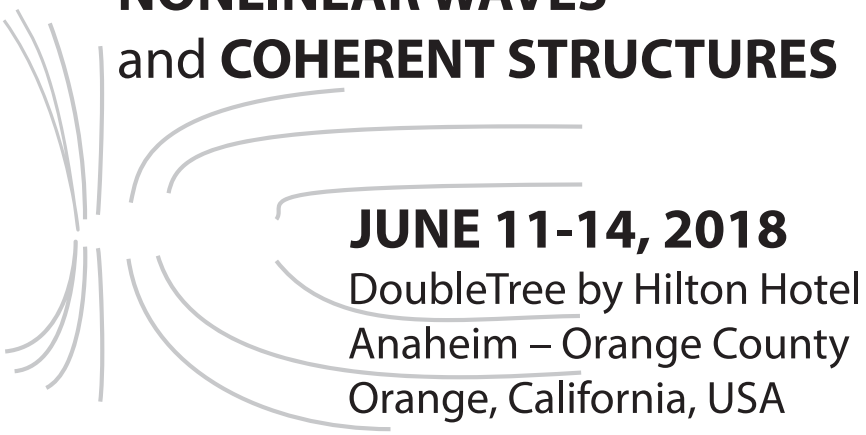
3:30-3:55 Well-posed Dynamics of Dense Granular Materials

Michael Shearer, North Carolina State University, USA

4:00-4:25 On Yield Stress of Concentrated Suspensions

Andreas Muench, University of Oxford, United Kingdom; Barbara Wagner, Weierstrass Institute, Germany

Organizer and Speaker Index



A

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Afeyan, Bedros, MS18, 10:00 Tue

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Wagner, Barbara, MS25, 10:00 Wed
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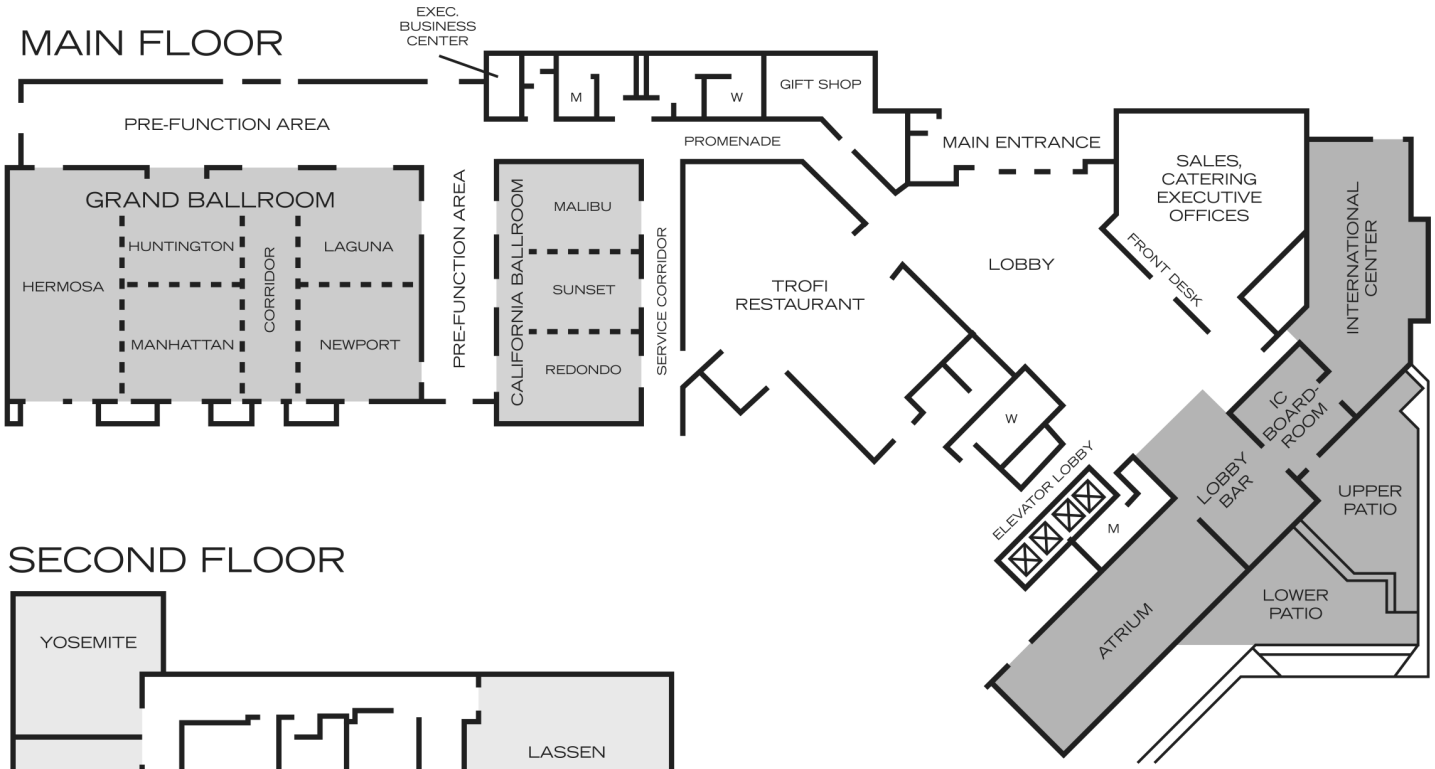
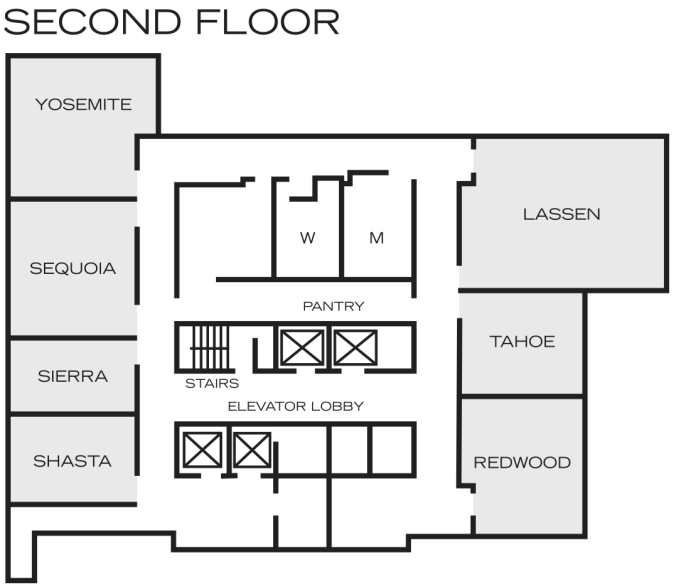
Notes

NWCS18 Budget

Conference Budget
SIAM Conference on Nonlinear Waves and Coherent Structures
June 11-14, 2018
Orange (Anaheim), CA

Expected Paid Attendance	250	
Revenue		
Registration Income		$86,288
	Total	$86,288
Expenses		
Printing		$1,500
Organizing Committee		$2,300
Invited Speakers		$8,400
Food and Beverage		$16,000
AV Equipment and Telecommunication		$19,000
Advertising		$2,500
Professional Services		$0
Conference Labor (including benefits)		$35,280
Other (supplies, staff travel, freight, misc.)		$4,125
Administrative		$8,356
Accounting/Distribution & Shipping		$5,465
Information Systems		$9,245
Customer Service		$3,566
Marketing		$5,835
Office Space (Building)		$3,791
Other SIAM Services		$4,664
	Total	$130,027
Net Conference Expense		-$43,739
Support Provided by SIAM		$43,739
		$0
Estimated Support for Travel Awards not included above:		
Early Career / Students	21	$16,800

DoubleTree by Hilton Hotel Anaheim – Orange County, Orange, California, USA

Floor Plan