U.S. Association for
Computational Mechanics

12th U.S. National Congress on Computational Mechanics

USNCCM12

July 22-25, 2013

Raleigh, North Carolina

12th U.S. National Congress on Computational Mechanics

General Program at a Glance

	Sunday July 21	Monday July 22	Tuesday July 23	Wednesday July 24	Thursday July 25
7:30	Registration (2:00 pm - 9:00 pm)	Registration (7:30 am - 5:00 pm)	Registration (7:30 am - 5:00 pm)	Registration (7:30 am - 5:00 pm)	Registration (7:30 am - 12:00 pm)
8:30		Welcome			
9:00	Pre-congress shortcourses	Plenary Speaker	Plenary Speaker	Careers in Computational Mechanics Panel Discussion	Plenary Speaker
9:45		Break	Break	Break	Break
10:00		Technical Session 1	Technical Session 4	Technical Session 7	Technical Session 10
11:00					
12:00		Lunch Break	Lunch Break	Lunch Break	Closing Reception
1:00		Semi-Plenary Speakers	Semi-Plenary Speakers	Semi-Plenary Speakers	
2:00		Technical Session 2	Technical Session 5	Technical Session 8	
3:00					
4:00		Break	Break	Break	
4:30		Technical Session 3 Student (Poster Session)	Technical Session 6	Technical Session 9	
5:30					
6:30	Opening Reception			Awards Ceremony	
7:00				Banquet Reception	
7:30				Congress Banquet	
9:30					

The 12th U.S. National Congress on Computational Mechanics

Raleigh Convention Center/Marriott Raleigh

Raleigh, NC

July 22-25, 2013

Conference Co-Chairmen
Professor John Dolbow, Duke University
Professor Murthy Guddati, North Carolina State University

Local Organizing Committee

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Guglielmo Scovazzi, David Stepp, Xuanhe Zhao
North Carolina State University Murthy Guddati, Don Brenner, Pierre Gremaud
Marc Hoit, Kumar Mahinthakumar, Mohammed Zikry
Khalifa University of Science, Technology, and Research (KUSTAR) Tod Laursen

Congress Program Staff
Ruth Hengst, Vanessa Yu, Cynthia Steiner

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www.usacm.org

FOREWORD

Welcome to Raleigh, North Carolina, and USNCCM12 – the 12th US National Congress on Computational Mechanics! Thank you for participating in what we hope will be another fantastic meeting of the computational mechanics community. Under the umbrella of the United States Association for Computational Mechanics (USACM), USNCCM12 is locally hosted by Duke University and North Carolina State University.

We would like to thank everyone who put so much work into ensuring the success of the Congress. Thank you to the scientific committee and the local organizing committee for steering this event. Thank you to the minisymposia organizers for doing the hard work of soliciting speakers and assembling the technical sessions. Special thanks go to USACM President Tarek Zohdi and USACM Coordinator Ruth Hengst. We would also like to acknowledge the many sponsors of USNCCM12, including the National Science Foundation and the Army High Performance Computing Research Center (AHPCRC) at Stanford. Finally, we would like to thank all of the speakers for their technical contributions and exciting talks!

We would like to draw your attention to a few features in this Congress that are distinct from past events. Honorary minisymposia have been assembled for Tom Hughes and Leszek Demkowicz (MS 1.1 and MS 1.2). There is also a special minisymposium (MS 1.3) on the Predictive Science Academic Alliance Program (PSAAP) centers that will begin with the first technical session on Monday morning. Be sure to attend the AHPCRC student poster session and cocktail hour on Monday afternoon during Technical Session 3. Finally, on Wednesday morning we will hold a special plenary panel on careers in computational mechanics.

We hope that you enjoy the week in Raleigh and have the chance to attend all of the talks you really want to hear. There are several ways to navigate the Congress. First of all, there is this printed program. Talks are listed by days, by room numbers, and then by technical session. At the peak of the Congress, there will be twenty-nine concurrent minisymposia, with twenty in the Raleigh Convention Center and the remainder in the Marriott Hotel.

You can also navigate the program with the use of the mobile app that has been developed for the Congress. The app is available for download onto iOS devices, Android devices and Blackberry, and will provide an up-to-date schedule on a daily basis. Detailed instructions on how to download and use the app will be provided at the registration desk. The app is sponsored in part through generous donations from CEI, DS Simulia, and Khalifa. We thank them for their contributions!

We hope that you also have the opportunity to enjoy the city of Raleigh during your stay here. There are many fine restaurants within walking distance of the Raleigh Convention Center. You can also catch a ride on the free R-Line that circles the area.

Please do not hesitate to contact us if you have any questions or concerns during the event. Once again, thank you and enjoy USNCCM12!

John Dolbow and Murthy Guddati
Congress Co-Chairs

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Registration Hours

The registration desk is located on the 3rd floor Lobby of the Raleigh Convention Center. The registration hours are:

Sunday, July 21: 2:00 pm - 9:00 pm
Monday, July 22: 7:30 am - 5:00 pm
Tuesday, July 23: 7:30 am - 5:00 pm.
Wednesday, July 24: 7:30 am - 5:00 pm
Thursday, July 25: 7:30 am – 12:00 pm (noon)

Exhibition Hours

Exhibitors will be available on the 3rd floor of the Raleigh Convention Center during the following hours:

Sunday, July 21, 2:00 pm – 5:00 pm
Monday, July 22: 8:00 am – 5:00 pm
Tuesday, July 23: 8:00 am – 5:00 pm
Wednesday, July 24: 8:00 am – 5:00 pm
Thursday, July 25: 8:00 am – 12:00 pm (noon)

We encourage you to visit our exhibitor booths throughout the Congress.

AHPCRC Student Poster Competition

The student poster competition will be held on Monday afternoon beginning at 4:00 pm in the 3rd Floor Lobby of the Raleigh Convention Center. Drinks will be served during the session. Announcement of the winners of the competition will be made during the Awards Ceremony on Wednesday, July 24, beginning at 6:30 pm in Room 402 of the Raleigh Convention Center. A list of the student posters to be presented can be found in the technical program under Technical Session 3. Our thanks are due to AHPCRC for their generous travel support of this session and to Elsevier Scientific for their sponsorship of the poster awards.

Panel on Careers in Computational Mechanics

Panelists J. Tinsley Oden (University of Texas at Austin), James Stewart (Sandia National Laboratories), and Tod Laursen, (Khalifa University) will lead a discussion on careers in computational mechanics. The panel discussion will take place in Ballroom B of the Raleigh Convention Center from 9:00 am – 9:45 am, on Wednesday, July 24. Short presentations will be followed by a Q&A session. All those interested in pursuing a career in computational mechanics are encouraged to attend this informative session.

Conference Information

Venues:
The Raleigh Convention Center (RCC) and Marriott Hotel (MAR)

Emergency
The medical emergencies dial 911 (this is the national emergency number for the United States).

Parking
Parking is available in various self-parking garages surrounding the Raleigh Convention Center.

Internet
Internet service will be provided to all participants of USNCCM12 in the Raleigh Convention Center. Check with the registration desk for the password. It is available to participants in the Marriott meeting rooms who will be staying at the Marriott as guests.

Author's Compatibility Testing
Presenting authors are encouraged to test their laptop's compatibility with the provided audiovisual equipment by going to the room where your presentation will be held sometime before your session starts. Each session is preceded by a break; we strongly advise the presenters to use the time to make their final check on presentation equipment.

Lunch and Dinner
Participants are on their own for lunch and dinner. A sandwich concession stand will be open in the Raleigh Convention Center. Check with the registration desk or the mobile app for information on its location. Information sheets on nearby restaurants will also be available at the registration desk. All registrants are invited to the Congress Banquet on Wednesday evening, July 24.

Accompanying Guest Tours
USNCCM12 is excited to announce that we are providing accompanying persons tours during the Congress. We have teamed up with the reputable Tobacco Road Tours to bring you the history that fills the streets of Raleigh, NC and the surrounding areas. You can check at the registration desk for more information or go to http://12.usnccm.org/guesttours for more information.

Technical Sessions
The technical program consists of three Plenary, six Semi-Plenary lectures and 70 mini-symposia, with approximately 950 presentations divided into technical sessions. The program begins each day with a plenary lecture (RCC Ballroom B) followed by parallel technical sessions. The afternoon program begins with two parallel Semi-Plenary Lectures (Ballrooms A and C), followed by two sets of parallel technical sessions with a break in between. In the schedule included in the program book, each presenting author is indicated with an asterisk (*) by their name.

Abstracts are available for viewing online at http://submissions.usnccm.org/schedule/.

Conference Special Events

Sunday, July 21
9:00 am - 5:00 pm, RCC 3rd Floor, Raleigh Convention Center
Pre-Congress Short Courses
Pre-Congress short courses will be offered to paid participants only. Registration fees are $250.

Sunday, July 21
6:00 pm - 9:00 pm, RCC 4th Floor Ballroom Pre-Function Area
Welcome Reception
The USNCCM12 welcoming reception will take place on the 4th floor of the Raleigh Convention Center. All registered attendees are welcome.

Monday, July 22
4:00 pm – 6:30 pm, RCC 3rd Floor Lobby
AHPCRC Student Poster Competition

Wednesday, July 24
9:00 am – 9:45 am
Careers in Computational Mechanics Panel Discussion

Wednesday, July 24
6:30 pm – 7:00 pm
Awards Session
The 2013 USACM Honors and Awards will be presented in room 402 of the Raleigh Convention Center. The Student Poster Awards will also be made at that time.

Wednesday, July 27
7:00 pm - 7:30 pm, 3rd Floor Lobby
Congress Banquet Reception
The conference banquet reception will take place in the pre-function area of Ballroom B. All paid registrants are welcome to attend.

Wednesday, July 27
7:30 pm - 9:30 pm, Ballroom B/C
Congress Banquet
The conference banquet will take place from 7:30p.m.-9:30p.m. in Ballroom B of the Raleigh Convention Center. All registered participants are welcome to attend. Additional banquet tickets for guests can be purchased for $75 at the registration desk until noon on Wednesday, July 24.

Thursday, July 28
12:00 pm – 2:00 pm
Closing Reception
Closing reception will be held on the 4th floor lobby to conclude the congress. Light refreshments served.

Exhibitors/Sponsors

Army High Performance Computing Research Center (AHPCRC)
The Army High Performance Computing Research Center (AHPCRC), a collaboration between the U.S. Army and a consortium of university and industry partners, addresses the Army's most difficult scientific and engineering challenges using high performance computing (HPC). AHPCRC seeks to develop the potential of HPC as a means of addressing the real-world needs of today's warfighter. In addition, AHPCRC also fosters the education of the next generation of scientists and engineers—including those from racially and economically disadvantaged backgrounds—in the fundamental theories and best practices of simulation-based engineering sciences and high performance computing. AHPCRC consortium members are: Stanford University, High Performance Technologies, Inc., Morgan State University, New Mexico State University at Las Cruces, the University of Texas at El Paso, and the NASA Ames Research Center.

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Technical Sessions at a Glance

TS1	Technical Session 1	Monday, July 22, 10:00 am – 12:00 pm
TS2	Technical Session 2	Monday, July 22, 2:00 pm – 4:00 pm
TS3	Technical Session 3	Monday, July 22, 4:30 pm – 6:30 pm
TS4	Technical Session 4	Tuesday, July 23, 10:00 am – 12:00 pm
TS5	Technical Session 5	Tuesday, July 23, 2:00 pm – 4:00 pm
TS6	Technical Session 6	Tuesday, July 23, 4:30 pm – 6:30 pm
TS7	Technical Session 7	Wednesday, July 24, 10:00 am – 12:00 pm
TS8	Technical Session 8	Wednesday, July 24, 2:00 pm – 4:00 pm
TS9	Technical Session 9	Wednesday, July 24, 4:30 pm – 6:30 pm
TS10	Technical Session 10	Thursday, July 25, 10:00 am – 12:00 pm

USNCCM12 Session Times for Minisymposia		
MS #	**Minisymposium Title**	**Technical Sessions**
1.1	Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes	TS5 - TS10
1.2	Algorithms for Wave Propagation: A Symposium in Honor of the 60th Birthday of Professor Leszek Demkowicz	TS1-TS2, TS4
1.3	PSAAP Center: Predictive Science in Computational Mechanics	TS1, TS2
2.1	Biomechanics of Living Matter	TS8 – TS9
2.2	Computational Mechanics and Biology of Tissues	TS2, TS4
2.3	Cartilage Mechanics: Characterization and Computational Modeling	TS1
2.4	Computational modeling of native and engineered cardiovascular tissue	TS7
2.5	Computational Biomechanics of Trauma	TS1-TS2, TS4
2.6	Cardiovascular Biomechanics and Biomedical Engineering	TS5-TS6
2.7	Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics	TS5-TS9
3.1	High-Order Methods for Computational Fluid Dynamics	TS5-TS10
3.2	Flow and Transport in Heterogeneous Porous Media	TS1-TS2
3.3	Recent Developments of Computational Fluid Mechanics for Free and Moving Boundaries [*Merged with MS 3.4*]	
3.4	Computational Fluid Mechanics for Free and Moving Boundaries	TS4-TS8
3.5	Advances in nonlinear unsteady aerodynamic flows	TS1-TS2, TS4
3.6	Higher-Order Computational Methods for Modeling Transport in Porous Media	TS10
3.7	Finite Element Methods and High-Performance Computing for Environmental Fluid Mechanics	TS5-TS8
4.1	Continuum, Micro-scale and Nano-scale Material Modeling and Characterization	TS1-TS2; TS4-TS8
4.2	Advances in Constitutive Modelling of Metal Forming Processes across Different Lengthscales	TS1
4.3	Multiscale Mechanics Modeling of Phase Transitions	TS1-TS2
4.4	Multiscale Modeling and Simulations of Materials Phenomena	TS7-TS10
4.5	Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials	TS4-TS8
4.6	Multi-scale methods for heterogeneous materials	TS1-TS2, TS4
4.7	Computational Methods for Materials with Intrinsic Microstructure	TS7-TS10
4.8	Multi-scale and Multi-physics Computations in Fluids and Solids	TS9-TS10
4.9	Concurrent multi-length scale modeling: from finite elements to atoms and electrons	TS7-TS10

4.10	Multi-scale Modeling of Dynamic Behavior of Materials	TS8-TS9
4.11	Multiscale Methods and Nonlocal Theories for Complex Material Behavior	TS1TS2, TS4-TS6
4.12	Multiscale Thermo-Mechanical Response of Molecular Solids: Theory, Simulation, Modeling, and Experiments	TS1-TS2
4.13	Recent Developments in Nanoscale Modeling of Materials	TS1-TS2, TS4-TS5
4.14	Multiscale Modeling of Materials Behavior in Extreme Environments	TS4-TS6
5.1	Mathematical and numerical modeling of degradation of materials and structures	TS8-TS10
5.2	Computational Methods for Blast and Impact in Mechanics of Materials	TS9-TS10
5.3	Numerical Modeling and Engineering Design for Impact and Blast Problems	TS4-TS8
5.4	Recent Advances in Computational Fracture Mechanics	TS7-TS9
5.5	New challenges for the computational modeling of solids at failure	TS1-TS2, TS4-TS5
5.6	Advances in modeling and simulation of damage evolution, strain localization, and failure	TS4-TS9
5.9	Pavement Mechanics and Simulation	TS4-TS7
5.10	Cohesive Zone Models - Fundamentals and Multiscale Applications	TS1-TS2
5.11	Computational Stability Analysis	TS1-TS2
6.1	Computational Methods in Image Analysis	TS1
6.2	Multi-objective Evolutionary Computation Applied to Structural Engineering and Architecture	TS1-TS2
6.3	Inverse Problems: Theory, Algorithms, and Applications	TS4-TS9
6.4	New Trends in Topology Optimization	TS2, TS4-TS7
7.1	Enabling Technologies and their Application for Advancing Computational Mechanics	TS5-TS6
8.1	Emerging methods for large-scale quantum-mechanical materials calculations	TS1-TS2, TS4
8.2	Continuum Theories for Modeling Atomic Scale Physics: Novel Models and Methods	TS8-TS10
8.3	The atomistic basis of non-equilibrium thermal processes in materials	TS6
8.4	Computational Nanotribology and Interfacial Dynamics	TS1-TS2, TS4
9.1	Advances in Finite Element Methods for Tetrahedral Mesh Computations	TS8-TS10
9.2	Phase-field modeling and simulation in fluid mechanics, solid mechanics and life-sciences	TS7-TS10
9.3	General Polyhedral Discretizations: Meshing, Formulations, and Applications	TS7
9.4	Mini-Symposium on the Material Point Method and Other Similar Particle Methods	TS4-TS6
9.5	Meshfree Particle and Isogeometric Technologies	TS5-TS10
9.6	Advances and Applications of the Generalized/Extended Finite Element Method	TS1-TS2, TS4-TS7
9.7	Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX	TS1-TS2, TS4-TS6
9.8	Geometric Methods in Computational Mechanics	TS1-TS2, TS4-TS6
9.9	Advances in BEM for Advanced Materials	TS5-TS7
9.10	Advances in Numerical Methods for Linear and Non-Linear Dynamics	TS7-TS9
9.11	Qualitative and quantitative comparison of numerical methods for solving partial differential equations	TS8-TS10
10.1	Fluid-Structure Interaction Algorithms & Applications	TS4-TS6
10.2	Recent Advances on Modeling Methods for Fluid-Structure Interaction Systems	TS8-TS10
10.3	Computational Modeling of Embedded and Contact Interfaces	TS4-TS9

10.4	Methods for cut and composite meshes: Theory, Algorithms, and Applications	TS1
11.1	Multiphysics Computations for Nuclear Energy Simulations	TS4
11.2	Computational Methods for Wind Engineering with Emphasis on Wind Energy	TS1
12.1	Randomness, Fractals, and Computational Mechanics	TS1
12.2	UQ Challenge Benchmarks	TS4-TS5
12.3	Methods and Applications for Experimental Design with Uncertainties	TS7-TS8
12.4	Goal-oriented Error Estimation and Adaptivity	TS9-TS10
12.5	Computational Mechanics in the Big Data and Big Compute World	TS2
13.1	Predictive Modeling of the Co-evolution of Microstructure and Properties	TS1-TS2, TS4-TS8
13.2	Innovative Forming Processes and Advanced Material Behavior	TS2
13.3	Mathematical Modeling, Constitutive Theories, and Computations	TS8
13.4	Computational Soft Active Materials	TS9-TS10

Plenary/Semi-Plenary Lectures

Plenary Lecture Monday, July 22 9:00 am – 9:45 am (RCC Ballroom B)
Professor Omar Ghattas, University of Texas at Austin
Solution of Large-Scale Bayesian Inverse Problems Governed by Wave Propagation

Semi-Plenary Monday, July 22 1:00 pm – 1:45 pm (RCC Ballroom A)
Professor Barbara Wohlmuth, Technische Univerisität München
Dimension Reduced Models in Applications and Analysis

Semi-Plenary Monday, July 22 1:00 pm – 1:45 pm (RCC Ballroom C)
Professor George Karniadakis, Brown University
Stochastic Modeling in High Dimensions

Plenary Tuesday, July 23 9:00 am – 9:45 am (RCC Ballroom B)
Professor Jacob Fish, Columbia University
Practical Multiscaling

Semi-Plenary Tuesday, July 23 1:00 pm – 1:45 pm (RCC Ballroom A)
Professor Markus Buehler, Massachusetts Institute of Technology
Computational Biomaterials Science

Semi-Plenary Tuesday, July 23 1:00 pm – 1:45 pm (RCC Ballroom C)
Associate Professor Yuri Bazilevs, University of California, San Diego
Computational Fluid-Structure Interaction: From Blood Pumps to Wind Turbines

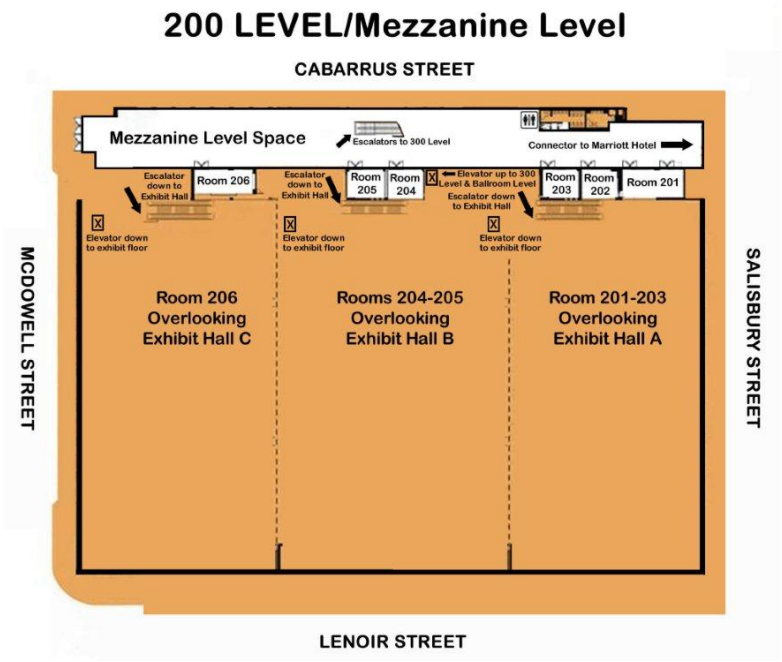
Semi-Plenary Wednesday, July 24 1:00 pm – 1:45 pm (RCC Ballroom A)
Dr. David Keyes, KAUST
Algorithmic Adaptations to Extreme Scale

Semi-Plenary Wednesday, July 24 1:00 pm – 1:45 pm (RCC Ballroom C)
Professor Bernardo Cockburn, University of Minnesota
The Hybridizable Discontinuous Galerkin Methods

Plenary Thursday, July 25 9:00 am – 9:45 am (RCC Ballroom B)
Professor Gebrand Ceder, Massachusetts Institute of Technolgy
The "Materials Genome" Project: Accelerated and Large-Scale Materials Discovery through Computation

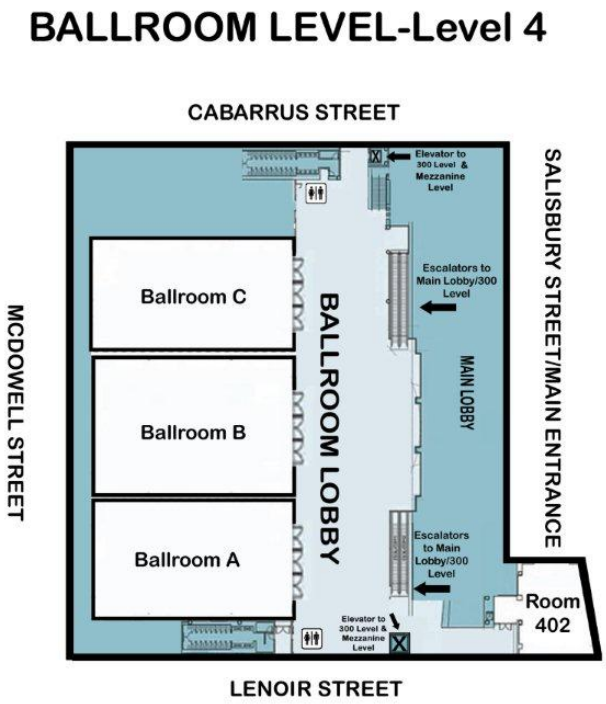
Maps of Raleigh Convention Center

Second Floor, Mezzanine Level
Walkway to Marriott Hotel to the right on the map.

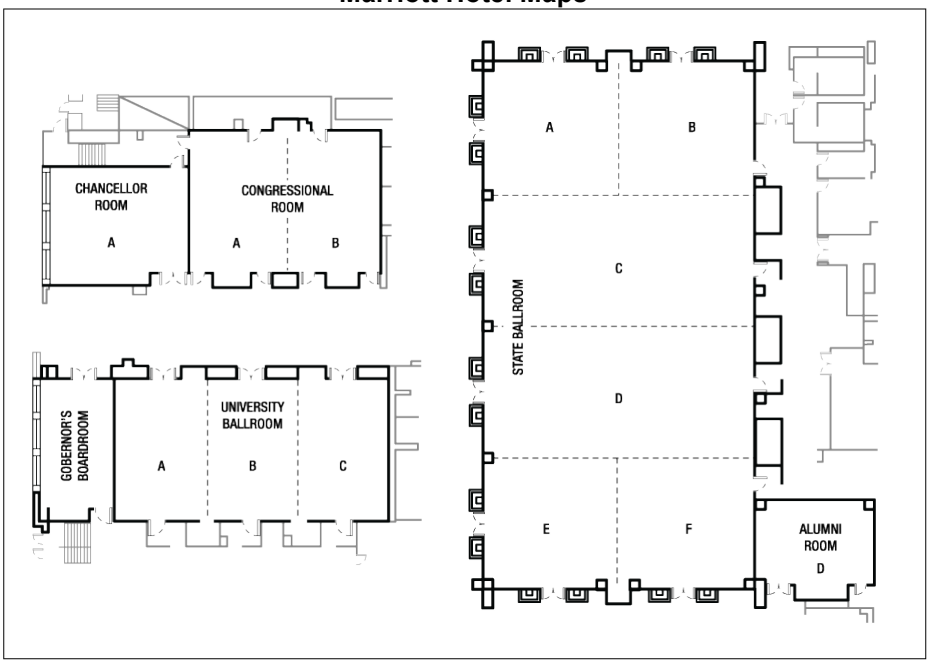


Third Floor

Fourth Floor Ballrooms



Marriott Hotel Maps



Room Key:

RCC – Raleigh Convention Center
MAR-CA – Marriott Congressional A
MAR-CB – Marriott Congressional B
MAR-CH – Marriott Chancellor Room
MAR-STA – Marriott State A
MAR-STB – Marriott State B
MAR-STE – Marriott State C
MAR-UA – Marriott University A
MAR-UB – Marriott University B
MAR-UC – Marriott University C

12th U.S. National Congress on Computational Mechanics Technical Program

Monday
July 22, 2013

Plenary Speaker, Monday, July 22, 2013
9:00 – 9:45 am, RCC Ballroom B

Solution of Large-Scale Bayesian Inverse Problems Governed by Wave Propagation

Omar Ghattas, Professor, University of Texas at Austin

Abstract: Inverse problems governed by acoustic, elastic, or electromagnetic wave propagation--in which we seek to reconstruct the unknown shape of a scatterer, or the unknown properties of a medium, from observations of waves that are scattered by the shape or medium--play an important role in a number of engineered or natural systems. Our goal is to address the quantification of uncertainty in the solution of the inverse problem by casting the inverse problem as one in Bayesian inference. This provides a systematic and coherent treatment of uncertainties in all components of the inverse problem, from observations to prior knowledge to the wave propagation model, yielding the uncertainty in the inferred medium/shape in a systematic and consistent manner. Unfortunately, state-of-the-art MCMC methods for characterizing the solution of Bayesian inverse problems are prohibitive when the forward problem is expensive (as in our 100—1000 wavelength target problems) and a high-dimensional parametrization is employed to describe the unknown medium (as in our target problems involving infinite-dimensional medium/shape fields, which result in millions of parameters when discretized). We report on recent research aimed at overcoming the mathematical and computational barriers for large-scale Bayesian inverse wave propagation problems. These include

* a high order, parallel, adaptive hp-non-conforming discontinuous Galerkin (DG) method for wave propagation
* parallel adaptive mesh refinement/coarsening algorithms based on forests of octrees to tailor mesh to the local wave speed, dynamically track wave fronts, and adapt to the inversion parameter field and its uncertainty;
* parallel scalable hybrid geometric-algebraic multigrid methods based on forest of octree meshes for the treatment of regularizing prior operators that are posed as inverses of elliptic operators;
* infinite-dimensional formulations of Bayesian inverse problems and their consistent finite-dimensional discretizations;
* a stochastic Newton MCMC method for solution of the statistical inverse problem that reduces the number of samples needed by several orders of magnitude, relative to conventional MCMC;
* fast low rank randomized SVD approximation of the Hessian based on compactness properties; and
* applications to solutions of Bayesian inverse wave propagation in whole Earth seismology with up to one million earth model parameters, 630 million state variables, on up to 100,000 processors.

This work is joint with George Biros, Tan Bui-Thanh, Carsten Burstedde, Ben Crestel, Jesse Kelly, James Martin, Georg Stadler, Hari Sundar, and Lucas Wilcox.

Biography: Dr. Omar Ghattas is the John A. and Katherine G. Jackson Chair in Computational Geosciences, Professor of Geological Sciences and Mechanical Engineering, and Director of the Center for Computational Geosciences in the Institute for Computational Engineering and Sciences (ICES) at The University of Texas at Austin. He also serves as Director of the KAUST-UT Austin Academic Excellence Alliance and holds courtesy appointments in Computer Sciences, Biomedical Engineering, the Institute for Geophysics, and the Texas Advanced Computing Center. He earned BS, MS, and PhD degrees from Duke University in 1984, 1986, and 1988. He has general research interests in simulation and modeling of complex geophysical, mechanical, and biological systems on supercomputers, with specific interest in inverse problems and associated uncertainty quantification for large-scale systems. His center's current research is aimed at large-scale forward and inverse modeling of whole-earth, plate-boundary-resolving mantle convection; global seismic wave propagation; dynamics of polar ice sheets and their land, atmosphere, and ocean interactions; and subsurface flows, as well as the underlying computational, mathematical, and statistical techniques for making tractable the solution and uncertainty quantification of such complex forward and inverse problems on parallel supercomputers. He received the 1998 Allen Newell Medal for Research Excellence, the 2004/2005 CMU College of Engineering Outstanding Research Prize, the SC2002 Best Technical Paper Award, the 2003 IEEE/ACM Gordon Bell Prize for Special Accomplishment in Supercomputing, the SC2006 HPC Analytics Challenge Award, and the 2008 TeraGrid Capability Computing Challenge award, and was a finalist for the 2008, 2010, and 2012 Bell Prizes. He has served on the editorial boards or as associate editor of 12 journals, has been co-organizer of 12 conferences and workshops and served on the scientific or program committees of 40 others, has delivered plenary lectures at 23 international conferences, and has been a member or chair of 20 national or international professional committees. More information on Dr. Ghattas can be found at http://www.ices.utexas.edu/people/143/.

Semi-Plenary Speaker, Monday, July 22, 2013
1:00 – 1:45 pm, RCC Ballroom A
Dimension Reduced Models in Applications and Analysis

Barbara Wohlmuth, Technische Univerisität München (TUM)

Abstract: Dimension reduced partial differential equation (pde) systems play an important role in the mathematical modelling of physical effects on different scales, e.g., fractures of co-dimension one in porous media systems, networks of co-dimension two or point sources. Although these simplified models seem to be very attractive from the computational point of view, for coupled problems they result in a solution of reduced regularity. From the mathematical point of view, transmission problems with piecewise smooth solutions or pdes in a distributional sense with singular solutions arise. Standard remedies to handle these type of problems are XFEM approaches or graded meshes, both techniques result in extra implementational work and computational cost. Here we show that simple energy correction schemes remove the pollution effect in case of corner singularities and heterogeneous coefficients. Moreover the accuracy of coupled systems of different dimensions is not influenced by a poor local resolution of the solution.

Biography: Barbara Wohlmuth works on the numerical simulation of partial differential equations. Her special focus is on advanced discretization techniques, a posteriori error analysis and mesh adaptivity, multi-scale iterative solvers, variational inequalities in analysis and applications and the mathematical modeling of coupled multi-field problems. Interdisciplinary cooperations with engineers from hydrodynamics and structural mechanics play an important role for her group.She studied mathematics at the Technische Univerisität München (TUM) and the University of Grenoble. She completed her PhD in 1995 at TUM and her Habilitation in 2000 at the University of Augsburg. As a PostDoc she stayed at the Courant Institute of Mathematical Sciences at New York University, and as a visiting professor in France and Hong Kong. In 2001 she accepted a full professor position for Numerical Mathematics at the Universität Stuttgart and in 2010 after declining several offers, e.g., from Berlin, Munich and Darmstadt, her current position at TUM. She served as a member of the Executive Board of the Association of Applied Mathematics and Mechanics (GAMM), of the General Council of the IACM, of the Editorial Board of SIAM Journal on Scientific Computing, of the Executive Board of Directors of the Excellence Cluster SimTech at the Universität Stuttgart. Actually she serves as Chair of the Advisory Board of the Weierstrass Institute for Applied Analysis and Stochastics, is a member of the Scientific Advisory Board of the Central Institute for Scientific Computing of the Friedrich-Alexander University Erlangen-Nuremberg, of the Editorial Boards of Computational Mechanics, Zeitschrift of Angewandte Mathematik und Mechanik, Numerische Mathematik, Mathematical Modelling and Numerical Analysis, IMA Journal of Numerical Analysis and SIAM Journal on Numerical Analysis. She acts as a reviewer for several national research foundations, such as, e.g., the French Research Agency, the German Research Foundation, the Swiss National Science Foundation, the Vienna Science and Technology Fund and the European Research Council.In 2012 she was awarded the prestigious Gottfried Wilhelm Leibniz Price of the German Research Foundation (DFG). She is elected member of the DFG Review Board 312 for Mathematics and is elected member of the Bavarian Academy of Sciences.

Semi-Plenary Speaker, Monday, July 22, 2013
1:00 – 1:45 pm, RCC Ballroom C
Stochastic Modeling in High Dimensions

George Karniadakis, Brown University

Abstract: A review of recent advances to stochastic modeling will be presented with application to fluid mechanics, ocean modeling, and biological systems. The main framework is based on Wiener chaos expansions and other extensions that allow us to deal efficiently with multi-dimensional systems at a fraction of computational cost compared to Monte-Carlo simulations. The same stochastic modeling approach allows us to examine the effect of random noise and arbitrary perturbations on the stability of flows and other systems. New approaches to address high dimensionality will be presented including the Wick-Malliavin approximation and the joint response-excitation PDF theory.

Biography: Professor Karniadakis received his B.Sc. from NTU, Athens, Greece in 1982, M.S. from MIT in 1984, and his Ph.D. from MIT in 1987. He was a postdoc at Stanford University (1987-1988) and Assistant Professor at Princeton from 1988-1993; a Visiting Professor at Caltech in the Spring quarter of 1993, an Associate Professor at Brown University from 1994 to 1996 and became a full Professor at Brown University in 1996. He has been a Research Scientist/Senior Lecturer of Mechanical Engineering at the Massachusetts Institute of Technology since 2000. Professor Karniadakis's main interest is the development of new numerical methods for multiscale modeling of physical and biological systems. He has authored three books and more than 200 research papers. He is a SIAM Fellow, a Fellow of the American Society of Mechanical Engineers, a Fellow of the American Physical Society, and an AIAA Associate Fellow. In 2007 Professor Karniadakis was awarded the 2007 Computational Fluid Dynamics Award presented by the US Association of Computational Mechanics. He is currently a professor of Applied Mathematics at Brown University and a research scientist of Mechanical Engineering at MIT. More information about Dr. Karniadakis can be found at http://www.cfm.brown.edu/people/gk/ and http://seagrant.mit.edu/people_desc.php?ID=265.

Monday, July 22, Technical Session 1

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 5.11 Computational Stability Analysis, Chair(s): Herbert A. Mang						
RCC201	New Buckling Theory of Pretwisted Curved Beams by State Space Equations		Stability Analysis of Rings and Arches on an Elastic Foundation	Mathematical Conditions for and Physical Meaning of a Maximum of the Determinant of the Tangent Stiffness Matrix in the Prebuckling Regime		
	Y. B. Yang*, S. R. Kuo		Christianne Nogueira*, Ricardo Silveira, Paulo Goncalves	Herbert A. Mang*, Xin Jia		
TS1: 8.4 Computational Nanotribology and Interfacial Dynamics, Chair(s): Yongsheng Leng						
RCC203	Modeling Friction Phenomena in Multicontact Systems		Aging of Silica in Aqueous Environments	Friction and Wear Mechanisms in Silicon and Silicon-Carbide Based Tips for Nanoprobe Applications Investigated Using Molecular Simulation	Consequences of Atomic-Scale Geometry in Rough Contacts	The Crossover from Random Close to Random Loose Packings of Frictional Disks
	Michael Urbakh*		Izabela Szlufarska*, Yun Liu	J. David Schall*, Kiran Vummaneni, Kathleen Ryan, Judith Harrison	Tristan Sharp*, Lars Pastewka, Mark Robbins	Stefanos Papanikolaou*
TS1: 2.3 Cartilage Mechanics: Characterization and Computational Modeling, Chair(s): David M. Pierce						
RCC204	A New Poroelastic Model for Cartilage and Cartilage Constructs	A Microstructurally -Based Continuum Model of Cartilage Elasticity and Permeability	Mathematical and Computational Mixture Models for Cartilage Regeneration in Cell-Seeded Scaffolds	Examining Relaxation Properties of Cartilage Matrix Water Through Nuclear Magnetic Resonance: Improved Characterization Through Two-Dimensional Stabilization of the Inverse Laplace Transform		
	David Smith*, Bruce Gardiner, John Davidson, Grodzinsky Alan	David M. Pierce*, Michael J. Unterberger, Tim Ricken, Gerhard A. Holzapfel	Mansoor Haider*, Andreas Aristotelous, Ahlam Elashegh	Hasan Celik*		
TS1: 2.5 Computational Biomechanics of Trauma, Chair(s): Daniel Balzani						
RCC205	Multiphysics Modeling of Blast Trauma	Predicting Traumatic Brain Injury in a Pre-Adolescent Porcine Model of Traumatic Brain Injury via Finite Element Modeling		On the Accuracy of Mechanical Variable Measures in Computational Prediction of Brain Injury		
	Brian Bigler*, Matthew Panzer, Barry Myers, Cameron Bass	Matthew Maltese*, Sarah Sullivan, Susan Margulies		Peter Matic*, Siddiq Qidwai, Nithyanand Kota, Amit Bagchi, Alan Leung		

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): Michael Tonks and Giovanni Pastore						
RCC206	On Modeling the Oxidation of High-Temperature Alloys		Multiphysics Modeling and Validation of CRUD-Induced Localized Corrosion (CILC) in PWRs	Hyrax: Phase Field Modeling of Zirconium Hydride Precipitation and Growth in Zirconium		
	Lallit Anand*		Michael Short*, Andrew Dykhuis	Andrea Jokisaari*, Katsuyo Thornton		
TS1: 3.2 Flow and Transport in Heterogeneous Porous Media, Chair(s): Mario Martinez						
RCC301A	Importance of Non-negative Solutions in Degradation Modeling, Groundwater Modeling, and Reactive Transport	A New Framework for Coupling Flow and Deformation of the Porous Solid	Numerical Investigation of the Effect of Fiber Properties on the Through-Plane Permeability of 3D Fibrous Media			
	Kalyana Babu Nakshatrala*	Mario Martinez*, Dan Turner, Kalyana Nakshatrala	Nikhil Kumar Palakurthi*, Urmila Ghia, Santosh Roopak Dungi, Thomas Baer, Ken Comer			
TS1: 3.5 Advances in Nonlinear Unsteady Aerodynamic Flows, Chair(s): Daniella E. Raveh						
RCC301B	An Introduction to and Overview of Nonlinear Unsteady Aerodynamic Flows		Computational Modeling of Unsteady Separated Incompressible Flows for an Airfoil at High Angle-of-Attack	Fluid-Thermal-Structural Modeling and Analysis of Shock-Panel Interactions	Recent Progress in Volterra Series Based System Identification of Nonlinear Aerodynamics	Overview and lessons learned from the Aeroelastic Prediction Workshop
	Earl Dowell*		Robert E. Kielb*, Jeffrey Thomas, Fanny Besem, Deman Tang, Earl H. Dowell, Kenneth C. Hall	Jack McNamara*, Andrew Crowell, Brent Miller	Maciej Balajewicz*, Earl Dowell	Jennifer Heeg*, P. Chwalowski, D. Schuster, M. Dalenbring, A. Jirasek, P.Taylor, D. Mavriplis, A. Boucke, D. Ballmann, M. Smith
TS1: 11.2 Computational Methods for Wind Engineering with Emphasis on Wind Energy, Chair(s): Baskar Ganapathysubramanian						
RCC302A	Analysis and Design of 100-m Tall Concrete Wind Turbine Towers	FSI Analysis of Wind Turbines at Full Scale	Analysis of Full Scale Large Wind Turbines Including 3D Fluid-Structure Interaction	Investigating Ply Material Uncertainty on Wind Turbine Blade Performance: A Stochastic-Isogeometric Approach	Constructing Low-Dimensional Stochastic Wind Models through Temporal and Spatial Decomposition	Investigation of Wind Turbine Wake Aerodynamics from Surface Measurements During the 2010 and 2011 Crop Wind-Energy Experiments (CWEX-10/11)
	Sri Sritharan*	Artem Korobenko*, Ming-Chen Hsu, Ido Akkerman, Yuri Bazilevs	Xiaowei Deng*, Artem Korobenko, Ming-Chen Hsu, Yuri Bazilevs	Qiang Guo*, Ming-Chen Hsu, Yuri Bazilevs, Baskar Ganapathysubramanian	Gene Takle*, Baskar Ganapathysubramanian, Quing Guo, Dan Rajewski	Daniel Rajewski*, Eugene Takle, John Prueger, Steven Oncley, Thomas Horst, Richard Pfeiffer, Jerry Hatfield, Kristopher Spoth, Russell Doorenbos

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 10.4 Methods for Cut and Composite Meshes: Theory, Algorithms, and Applications, Chair(s): Andre Massing						
RCC302B	Analysis of Backward Euler / XFEM Discretization of Parabolic Problems with Moving Interfaces	Immersed Finite Element Methods for Interface Problems	A High Order DG Cut Finite Element Method for Elliptic Problems	Algebraically-Constrained Tied Heaviside Methods for Computational Electromagnetics	Nitsche-Based Overlapping and Fictitious Domain Methods with Applications to Domain Bridging and FSI-Problems	Accurate, Efficient and Robust Numerical Integration of Weak Forms Over Polyhedral Shaped Cut Elements in Embedded Interface Methods
	Paolo Zunino*, Laura Cattaneo, Guido Iori	Tao Lin*	August Johansson*, Mats Larson	Christopher Siefert*, Pavel Bochev, Richard Kramer, Thomas Voth	Andre Massing*, Mats G. Larson, Anders Logg, Marie E. Rognes	Sudhakar Yogaraj*, J. P. Moitinho de Almeida, Wolfgang A. Wall
TS1: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Armando Duarte and Sundarajan Natarajan						
RCC302C	An Interface-Enriched Generalized Finite Element Method for the Computational Analysis and Design of Microvascular Composites		A Spline Based Enrichment Function for Arbitrary Inclusions in XFEM with Applications to Finite Deformations	Micromechanical Modeling of Long-Fiber Reinforced Polymer Matrix Composites	3D Modeling of Fiber Reinforced Polyurea Composite Materials Under Impact Loading	
	Philippe Geubelle*, Soheil Soghrati, Ahmad Najafi		Brett Benowitz*, Haim Waisman	Miguel Bessa*, Ted Belytschko, Wing Liu	Jifeng Zhao*, Jay Oswald, Rajiv Malhotra, Ted Belytschko	
TS1: 1.2 Algorithms for Wave Propagation: A Symposium in Honor of the 60th Birthday of Professor Leszek Demkowicz, Chair(s): Timothy Walsh						
RCC303	Finite-Element Modeling of 3-D Acoustic Scattering from Objects Lying on or in the Sedimentary Ocean Bottom		Physics-Based Model Reduction for Low-Frequency Electromagnetic Borehole Measurements	Inverse Structural Acoustic Source Identification in a Large-Scale Finite Element Framework	Numerical Investigation of Aeroacoustic Effects for the Prediction of Noise Distribution in Airplane Passenger Cabins	
	David Burnett*		David Pardo*, Ignacio Muga, Carlos Torres-Verdin	Timothy Walsh*, Wilkins Aquino	Frank Ihlenburg*, Joern Biedermann, Martin Wandel	
TS1: 9.8 Geometric Methods in Computational Mechanics, Chair(s): John A. Evans						
RCC304	Analysis-Suitable Isogeometric Discretizations		Analysis-Suitable T-splines: Characterization, Refineability, and Approximation	Spline Forests: Construction, Adaptivity, and Isogeometric Analysis	Modified T-Splines	
	Michael Scott*, Derek Thomas, Emily Evans		Xin Li*, Michael Scott	Derek C. Thomas*, Michael Scott, Emily J. Evans	Hongmei Kang*, Falai Chen, Jiansong Deng	
TS1: 8.1 Emerging Methods for Large-Scale Quantum-Mechanical Materials Calculations, Chair(s): N. Sukumar						
RCC305A	Finite Elements for Electronic Structure: From Classical to Enriched to Discontinuous		Spectral Finite-Element Based Methodology for Large-Scale Electronic Structure Calculations Using Kohn-Sham Density Functional Theory	An Adaptive Finite Element Method for Kohn-Sham Equation	All-Electron Electronic Structure Calculations on Hierarchic Finite Element Spaces	B-Splines and NURBS Based Finite Element Methods for Electronic Structure Calculations
	John Pask*		Phani Motamarri*, Vikram Gavini	Guanghui Hu*, Gang Bao, Di Liu	Volker Schauer*, Christian Linder	Arif Masud*

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 6.2 Multi-Objective Evolutionary Computation Applied to Structural Engineering and Architecture, Chair(s): Leonardo Moreno De Luca & Oscar J. Begambre Carrillo						
RCC305B	Digital Brainstorming: An Interactive Evolutionary Framework for Creativity, Diversity, and Performance in Conceptual Structural Design		Evolutionary Multi-Objective Computation Applied to the Structural, Acoustical and Aesthetical Design of a Grid Roof Structure			
	Caitlin Mueller*, John Ochsendorf		Leonardo Moreno-De Luca*, Oscar J. Begambre Carrillo			
TS1: 9.7 Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX, Chair(s): Steven Owen						
RCC306A	Anisotropic Mesh Generation Using Octree-Based Dual Contouring		Parallel Boundary Layer Mesh Adaptation at Large-scale	Adaptive Analysis of Fluid Flows with Shocks	On Metric Tensor Intersection and Union for Anisotropic Mesh Adaptation	
	Jin Qian*, Yongjie Zhang		Kedar Chitale*, Kenneth Jansen, Aleksandr Ovcharenko, Onkar Sahni, Mark Shephard, Saurabh Tendulkar, Rocco Nastasia, Mark Beall	Onkar Sahni*, Ashwin Menon, Ryan Molecke, Mark Shephard, Saurabh Tendulkar, Mark Beall	Guibault Francois*, Julien Dompierre, Shawn McKenzie, Yvan Mokwinski	
TS1: 12.1 Randomness, Fractals, and Computational Mechanics, Chair(s): Dr. Paul N. Demmie						
RCC306B	Fractional Spectral Methods for Computational Mechanics	Nonlinear Stochastic Dynamics of a Vibro-Impact Eletromechanical System	Advances in Stochastic Peridynamic Theory			
	Mohsen Zayernouri*, George Em Karniadakis	Roberta de Queiroz Lima*, Rubens Sampaio, Christian Soize	Paul Demmie*, Martin Ostoja-Starzewski			
TS1: 4.12 Multiscale Thermo-Mechanical Response of Molecular Solids: Theory, Simulation, Modeling and Experiments, Chair(s): Thomas Sewell						
RCC306C	Thermo-mechanical failure of amorphous solids		Size Effects on the Impact Responses of Copper Nanobars and Nanobeams	Molecular Dynamics Simulations of Shock Waves in Amorphous Cis-1,4-Polybutadiene Using All-Atom and United-Atom Model Force Fields	Application of the ReaxFF Reactive Force Field to Study Mechanical Properties of Lithiated Sulfur	
	Yunfeng Shi*, Jian Luo		Shan Jiang*, Zhen Chen, Yong Gan, Suleiman Oloriegbe, Thomas Sewell, Donald Thompson	Thomas D. Sewell*, Markus G. Frhlich, Lan He, Donald L. Thompson	MD Mahbubul Islam*, Alireza Ostadhossein, Adri C. T. van Duin	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 6.1 Computational Methods in Image Analysis, Chair(s): Joao Manuel R. S. Tavares						
RCC307	Spatio-Temporal Registration of Plantar Pressure Image Sequences	A Surface Evolution Scheme to Identify Nanoscale Intrinsic Geometry from ADM Experimental Data	Analysis of the Effect of Activation of Pelvic Floor During Vaginal Delivery	Selection of Image Features Based on a Wrapper Model for the Classification of Skin Lesions		
	Joao Tavares*, Francisco Oliveira, Carolina Tbuas, Pedro Gomes	Hyun-Seok Kim*, Hong-Lae Jang, Youmie Park, Seonho Cho, Jae Hyun Kim	Renato Natal Jorge*, Marco Parente, Elisabete Silva, Teresa Mascarenhas	Roberta Barbosa Oliveira*, Joo Manuel R. S. Tavares, Aledir Silveira Pereira		
TS1: 1.3 PSAAP Centers: Predictive Science in Computational Mechanics, Chair(s): Robert Voigt						
RCC402	Introduction	Predictive Simulation of Atmospheric Re-entry Vehicles		Device Predictions with Quantified Uncertainties in the Center for the Prediction of Reliability, Integrity and Survivability of Microsystems		
	Robert Voigt*	Robert Moser*		Lin Sun*, Sankaran Mahadevan, Jayathi Murthy, Alejandro Strachan		
TS1: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. Xianqiao Wang						
MAR-CA	Constitutive Modeling of Polymer Nanocomposites to Predict Frequency Dependent Damping in the Small Strain Regime	Modeling Bio-Filaments in Continuum Limit From their Atomistic Structures to Constitutive Laws	Quantifying Mechanical Cooperativity of Coupled Macromolecules	Hydrodynamic Modeling of Charge Carrier Flow in PN Junction Solar Cells	Design of Graphene Origami via Chemical Functionalization	
	Trisha Sain*, Anthony Waas, Ellen Arruda	Sachin Goyal*	Steve Cranford*	Williams Calderon-Muoz*, Juan Osses-Marquez	Liuyang Zhang*, Xianqiao Wang	
TS1: 4.2 Advances in Constitutive Modelling of Metal Forming Processes Across Different Lengthscales, Chair(s): Ivaylo Vladimirov and Robertt Valente						
MAR-CB	Constitutive Modelling and Numerical Aspects of Simulating Springback in Sheet Metal Forming	Advanced Micromorphic Elatoplastic Constitutive Equations with Various Lengthscales for Metal Forming Simulation	Evaluation of Cold Formability of DP Steel Using Combined Approaches on Different Length Scales	On the Assessment of Distinct Algorithmic Strategies in the Implementation of Advanced Anisotropic Models with Mixed Hardening	Simulation of Plasticity in Nickel-based Superalloy (ME3) Single and Polycrystals Using an Efficient Multiscale Crystal Plasticity Model	
	Ivaylo Vladimirov*, Michael Pietryga, Stefanie Reese	Saanouni Khemais*, Hamed Mohamed	Sebastian Muenstermann*, Junhe Lian, Napat Vajragupta	Tiago Grilo*, Robertt Valente, Ricardo Sousa	Masoud Ghorbani Moghaddam*, Ajit Achuthan, Brett A. Bednarcyk, Steven M. Arnold	
TS1: 4.11 Multiscale Methods and Nonlocal Theories for Complex Material Behavior, Chair(s): Pablo Seleson						
MAR-CH	The Peridigm Framework for Peridynamic Simulations		Quadrature for Nonlocal Mechanics and Peridynamics	A Fast Method with Efficient Matrix Assembly and Storage for a Two Dimensional Peridynamic Mode	Estimation of the Critical Time Step for Peridynamic Models	
	David Littlewood*, Michael Parks, John Mitchell, Stewart Silling		Stephen Bond*	Hong Wang*	Jesse Thomas*, David Littlewood, Timothy Shelton	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS1: 4.6 Multi-scale Methods for Heterogenous Materials, Chair(s): Regis Cottereau						
MAR-STA	A Fourier-free Approach to Solve Linear and Nonlinear Microstructural Problems Defined over Large Grids of Voxels		The Effect of the Scale of Variation of Load in Applying a Hierarchy of Bounds on Effective Material Behavior	Micro-Inertia Effects In Nonlinear Heterogeneous Continua	Strategy of Modeling the Behavior of Randomly Reinforced Materials by Stochastic Homogenization	
	Julien Yvonnet*, Thanh Tung Nguyen, Vincent Monchiet, Qizhi Zhu		Katherine Acton*	Sergey Kuznetsov*, Jacob Fish, Vasilina Filonova	Nait-ali Azdine*, Michaille Grard, Pagano Stphane	
TS1: 4.13 Recent Developments in Nanoscale Modeling of Materials of Materials, Chair(s): Albert C. To						
MAR-STB	Using Fractal Dimensions to Calculate Ab-Initio Modeling Based Tensile Strength of Irradiated Tungsten Nanostructures		Analysis of Multiresoultion Molecular Mechanics: Accuracy, Efficiency, Stability, and Convergence			
	Vikas Tomar*		Albert To*			
TS1: 4.3 Multiscale Mechanics Modeling of Phase Transitions, Chair(s): William S. Klug						
MAR-STE	Phase Field Modeling of Deformation Twinning		Relative Entropy Based Surrogate Energy Models for Modeling Phase Transitions	Phase Field Approach to Multiple Twinning and Variant-Variant Transformations in Martensite		
	Jaroslaw Knap*, John D. Clayton		Jesper Kristensen*, Ilias Bilionis, Nicholas Zabaras	Arunabha Roy*, Valery Levitas		
TS1: 5.10 Cohesive Zone Models - Fundamentals and Multiscale Applications , Chair(s): Glaucio Paulino						
MAR-UA	Innovative Fatigue Life Assessment of Complicated Composite Structures	Simulation of Mixed-mode I/III Stable Tearing Crack Growth Events Using the Cohesive Zone Model Approach	Validation of Cohesive-Zone Based Mixed-Mode Delamination Formulations in Abaqus	Interface Investigation though a Multiscale Hydro-Thermo-Mechanical Cohesive Zone Model in Concrete		
	Marcus P. Rutner*, Glaucio H. Paulino, Jeffrey Cipolla	Xin Chen*, Xiaomin Deng, Michael Sutton, Pablo Zavattieri	Kingshuk Bose*, Juan Hurtado, Shree Krishna, Lin Xia	Tao Wu*, Ilker Temizer, Peter Wriggers, Marco Paggi		
TS1: 5.5 New Challenges for the Computational Modeling of Solids at Failure, Chair(s): Ekkehard Ramm						
MAR-UC	Ductile vs Brittle Fracture Behaviors and Related Deformation Mechanisms in Nanostructured Materials		A Marching-Cubes Based Crack Propagation Concept to Model Failure in 3D Solids	Parametric Dislocation Representation of Semi-Elliptical Surface Cracks in Finite Volumes	A Variational Approach to the Fracture of Brittle Thin Films Under Out-of-Plane Loading	
	Huajian Gao*		Xiaoxuan Zhang*, Christian Linder	Akiyuki Takahashi*, Kazunori Kitsutaka	Ataollah Mesgarnejad*, Blaise Bourdin, Michael M. Khonsari	

Monday, July 22, Technical Session 2

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 5.11 Computational Stability Analysis, Chair(s): Y. B. Yang						
RCC201	Characterizing Dynamic Transitions Associated with Snap-Through of Clamped Shallow Arches		Dynamic Instability and Post-Buckling Behavior of Shell Structures	The Reduced Basis Method for an Elastic Buckling Problem	A Good and Stable Strategy for Solving Nonlinear FE Equations: The Combination of Orthogonal Residual Method and Flow Normal Technique	
	Ilinca Stanciulescu*, Yenny Chandra		Yang Zhou*, Ilinca Stanciulescu	Lorenzo Zanon*, Karen Veroy-Grepl	Ricardo Silveira*, Dalilah Maximiano, Andra Silva	
TS2: 8.4 Computational Nanotribology and Interfacial Dynamics, Chair(s): Izabela Szlufarska						
RCC203	Tip Wear of Single-Asperity		Comparative Study by the Grand Canonical Monte Carlo and Liquid-Vapor Molecular Dynamics Simulations on the Phase Transition of Simple Nonpolar Fluid Under Confinement	Theory of Hydrogel Lubrication	Green-Kubo Relation for Friction at Solid/Liquid Interface	
	Yunfeng Shi*		Yongsheng Leng*, Yuan Xiang, Yajie Lei, Qi Rao	Jeffrey Sokoloff*	Kai Huang*, Izabela Szlufarska	
TS2: 2.2 Computational Mechanics and Biology of Tissues, Chair(s): Elisa Budyn						
RCC204	Effects of Non-Linearity and Mechanical and Thickness Inhomogeneities on in Silico Models of Knee Biomechanics	Three-Dimensional Numerical Simulation of Chemotaxis of Living Cells in a Microchannel	Patterning via Strain-Cued Motility	In Vivo Mechanical Characterization and Modeling of Human Skin	Thermal Identification During the Cauterization Process in Porcine Skin	
	Jessica Deneweth*, Scott McLean, Ellen Arruda	Hongzhi Lan*, Damir B. Khismatullin	Brian Cox*	Kumar Vemaganti*, Daniel O'Brien	Elisa Budyn*, Sagar Bhogle, Steve Lacey, James Radosevich, Michael Colvard	
TS2: 2.5 Computational Biomechanics of Trauma, Chair(s): Nithyanand Kota						
RCC205	Finite Element Modeling of Lower Extremity Fractures in Occupants Subject to Under-Vehicle Blasts	Damage in Arterial Tissues - Constitutive Modeling and Related Experiments	Influence of Brain Topography on Wave Propagation	Model Based Prediction of Injury in Shaken Baby Syndrome		
	Matthew Panzer*, Robert Salzar, Jeff Crandall	Daniel Balzani*, Thomas Schmidt, Andreas Schriefl, Gerhard A. Holzapfel	Alan Leung*, Nithyanand Kota, Amit Bagchi, Siddiq Qidwai	Nikini Puhulwelle Gamage*, Poul Nielsen, Martyn Nash, Andrew Taberner, Thomas Lintern		

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): Michael Tonks and Paul Millett						
RCC206	3-D Multi-Physics Simulation of Microstructural Effects on Heat and Mass Transport in Uranium Oxide	Microstructure Reconstruction for Phase Field Modeling of Reactor Materials	Mesoscale Computer Simulation of the Effect of Intergranular Gas Bubbles on Thermal Conductivity in Nuclear Fuels	Mesoscale Modeling of Fuel Swelling and Restructuring: Coupling Microstructure Evolution and Mechanical Localization	Modeling of Fission Gas Behavior in Nuclear Fuel Applied to Engineering Scale Analysis	
	Harn Chyi Lim*, Pedro Peralta	Bradley Fromm*, Michael Tonks, Melissa Teague, David Field	Paul Millett*, Michael Tonks, Yongfeng Zhang, Bulent Biner	Remi Dingreville*, Timothy J. Bartel, Joshua Robbins	Giovanni Pastore*, Jason D. Hales, Stephen R. Novascone, Danielle M. Perez, Benjamin W. Spencer, Richard Williamson	
TS2: 3.2 Flow and Transport in Heterogeneous Porous Media, Chair(s): Kalyana Babu Nakshatrala						
RCC301A	Pore-Scale Analysis of Mixing Efficiency in Porous Media with Chemical Reaction Dependent Viscosity	Modeling of Problems in Poro-elasticity via a Mixed Least Squares Method Using Linear Tetrahedral Elements	On the Multiscale Continuum Modeling of Non-Isothermal Flow and Reactive Transport in Fractured Porous Media	On Modifications to Darcy Model and Associated Mixed Formulations		
	Hongkyu Yoon*, Mario Martinez, Scott Davison	Maria Tchonkova*, Stein Sture, John Peters	Satish Karra*, Peter Lichtner	Justin Chang*, K.B. Nakshatrala		
TS2: 3.5 Advances in Nonlinear Unsteady Aerodynamic Flows, Chair(s): Walter A. Silva						
RCC301B	Modeling and Prediction of Transonic-Buffet Phenomena	Transonic Shock-Buffet Instability of 3D Wings	Reduced Order Modelling for Gust Load and Buffet Predictions	Unsteady Reynolds-Averaged NavierStokes Simulation of Shock-Buffet Instability on the NACA 64A204 Using Unstructured Meshes		
	Jeffrey Crouch*	Michael Iovnovich*, Daniella Raveh	Kenneth Badcock*, Andrea Da Ronch, Sebastian Timme	Keerti Bhamidipati*, Daniel Reasor, Crystal Pasiliao, Jason Lechniak		
TS2: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Armando Duarte and Philipe Geubelle						
RCC302C	Nondestructive Identification of Multiple Flaws in Structures Using XFEM and Enhanced ABC Algorithm		Combining Locking-Free Continuum-Based Shell Element and the Phantom Node Method with Improved Integration for Modeling Fracture in Thin Shell Structures	Scaled boundary Finite Element Method for Three-Dimensional Crack ModellinB	Enrichment Functions for Generalized Finite Elements via Discontinuous Approximation of Particle Methods	
	Haim Waisman*, Hao Sun, Raimondo Betti		Sheng Peng*, Ted Belytschko	Sundararajan Natarajan*, Ean Tat Ooi, Chongmin Song	Sa Wu*, Marc Alexander Schweitzer	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 1.2 Algorithms for Wave Propagation: A Symposium in Honor of the 60th Birthday of Professor Leszek Demkowicz, Chair(s): David Pardo						
RCC303	DPG Method for Wave Propagation Problems. A Better Understanding	The Discontinuous Enrichment Method for Variable Wavenumber Medium-Frequency Helmholtz Problems	Adaptive Spacetime Discontinuous Galerkin Model for Wave Propagation in Layered Composite Plates with Defects	Optimal and Customized Mass-Stiffness Pairs Using Templates		
	Leszek Demkowicz*, Jay Gopalakrishnan, Markus Melenk, Ignacio Muga, David Pardo	Radek Tezaur*, Irina Kalashnikova, Charbel Farhat	Robert Haber*, Reza Abedi	Carlos Felippa*		
TS2: 9.8 Geometric Methods in Computational Mechanics, Chair(s): Rafael Vazquez						
RCC304	Injecting the Isogeometric Paradigm into Industrial Applications: The TERRIFIC Project	Arbitrary Genus Volumetric T-Spine Construction Using Frame Field	A Pure Membrane Formulation Based on Curvilinear Coordinates and Isogeometric Finite Elements	Isogeometric Boundary Element Methods	The Extended Isogeometric Boundary Element Method (XIBEM) for Helmholtz Problems	
	Carlo Lovadina*	Lei Liu*, Yongjie Zhang	Roger Sauer*, Thang Duong, Callum Corbett	Matthias Taus*, Michael A. Scott, Gregory J. Rodin, Thomas J. R. Hughes	Michael Peake*, Jon Trevelyan, Graham Coates	
TS2: 8.1 Emerging Methods for Large-Scale Quantum-Mechanical Materials Calculations, Chair(s): John Pask						
RCC305A	Adaptive Finite Element Method for Ab Initio Molecular Dynamics Simulations		Short-Range O(N) Algorithm for Scalable Molecular Dynamics Simulations from First-Principles	Coarse-Graining Kohn-Sham Density Functional Theory	Applications of a Linear Scaling Real-Space Kohn-Sham Density Functional Theory Implementation on Magnesium	
	Eiji Tsuchida*		Jean-Luc Fattebert*, Daniel Osei-Kuffuor	Phanish Suryanarayana*	Xin Wang*	
TS2: 6.2 Multi-Objective Evolutionary Computation Applied to Structural Engineering and Architecture, Chair(s): Leonardo Moreno De Luca & Oscar J. Begambre Carrillo						
RCC305B	Modified Finite Element Plate Theory to Predict Shell Shapes	The Interaction between Objectives and Constraints in Evolutionary Structural Engineering Optimisation	A Hybrid Evolutionary Optimization Strategy for Improved Efficiency and Robustness in Structural Optimization			
	Mitchell Gohnert*	Michael Fenton*, Ciaran McNally, Michael O'Neill	Oleg Golovidov*, David Kokan			

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 9.7 Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX, Chair(s): Matthew Staten						
RCC306A	Using Combinatorial Maps to Handle 2D and 3D Meshes in the Distributed Memory Context	CHM: Concise Topological Data Structures for 3D Hybrid Mesh Representations	MeshKit: An Open-Source Library for Mesh Generation and Meshing Algorithm Research	Optimal 1- and 2-Dimensional Mesh Generation Using Representation Deficit	Intelligent Mesh Defect Detection and Fixing Algorithm with Undo/Redo Capability	
	Franck Ledoux*	Luiz Fernando Martha*, Jose Paulo Moitinho de Almeida, Marcos Lage, Helio Lopes	Rajeev Jain*, Timothy J. Tautges, Iulian Grindeanu, Chaman S. Verma, Shengyong Cai, Scott A. Mitchell	David McLaurin*, Suzanne Shontz	B Kean Karamete*	
TS2: 12.5 Computational Mechanics in the Big Data and Big Compute World, Chair(s): Abani Patra						
RCC306B	Multidimensional Adaptive Relevance Vector Machines for Uncertainty Quantification		Adaptive Parallel Simulation of Large Finite Element Problems	Simultaneous Stochastic Characterization of Mesoscale Material Heterogeneities and Macro-scale Structural Complexities	Large Data and Large Computing in a Hazard Analysis Workflow	
	Nicholas Zabaras*, Ilias Bilionis		Babak Kamrani*, Boris Jeremic	Sonjoy Das*	Abani Patra*, Rohit Shivaswamy	
TS2: 4.12 Multiscale Thermo-Mechanical Response of Molecular Solids: Theory, Simulation, Modeling and Experiments, Chair(s): Thomas Sewell						
RCC306C	Surface-Accelerated Thermal Decomposition of Delta-HMX: Mechanisms and Reaction Kinetics	Optical Characterization of Shock-Induced Chemistry in the Explosive Nitromethane Using DFT and Time-Dependent DFT	Large-Scale Reactive Atomistic Simulation of Shock-Induced Initiation Processes in Energetic Materials	Direct Numerical Simulation of Hot Spot Ignition in Crystalline HMX		
	Roman Tsyshevskiy*, Onise Sharia, Maija Kuklja	Lenson Pellouchoud*, Evan Reed	Tzu-Ray Shan*, Aidan Thompson	Ryan Austin*, Nathan R. Barton, W. Michael Howard, Laurence E. Fried		
TS2: 6.4 New Trends in Topology Optimization, Chair(s): Glaucio Paulino						
RCC307	Recent Advances in Projection-Based Topology Optimization		Imposing Maximum Length Scale in Topology Optimization by Filtering Techniques	Topology Optimization for Solids and Fluids Using Polygonal Finite Elements in Arbitrary Domains	A New Framework for Topology Optimization Using Polytopes	
	James Guest*		Boyan Lazarov*	Ivan Menezes*, Anderson Pereira, Cameron Talischi, Glaucio Paulino	Arun Gain*, Glaucio Paulino, Leonardo Duarte, Ivan F.M. Menezes	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 1.3 PSAAP Centers: Predictive Science in Computational Mechanics, Chair(s): Robert Voigt						
RCC402	Modeling and Simulation of Hypervelocity Impact with Optimally Quantified Uncertainties		Assessment of Predictive Capability of the CRASH Code for Radiative Shock Experiments		Predictive Simulations of Multi-Physics Flow Phenomena with Application to Integrated Hypersonic Systems	
	Michael Ortiz*		R.P. Drake*, K.G. Powell, J.P. Holloway, Q.F. Stout, M.L. Adams		Ivan Bermejo-Moreno*, Parviz Moin, Gianluca Iaccarino	
TS2: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. James Chen						
MAR-CA	Delamination Failure in Sandwich Hulls Due to Water Slamming		Fracture Toughness Modelling of Particle Filled Polymer Composites	Modified G-Criterion Model: A Multiscale Approach	Selection, Calibration, and Validation of Coarse-Grained and Macro Models of Atomic Systems	
	Romesh Batra*, Jian Xiao		Bernd Lauke*	James Chen*, Steven Niemkiewicz	Kathryn Farrell*, J. Tinsley Oden, Peter Rossky, Eric Wright	
TS2: 13.2 Innovative Forming Processes and Advanced Material Behavior, Chair(s): Reza Kebriaei and Robertt Valente						
MAR-CB	Part-Level Finite Element Simulation of Selective Laser Melting	Simulation of Ploughing and Cutting in Soils by Incremental Limit Analysis	Predicting Residual Stresses Due to Forging and Machining Processes	Inverse Shape Optimization of a Forging Process		
	Neil Hodge*	James Hambleton*, Elaheh Kashizadeh	Arthur A. Brown*, Timothy D. Kostak, Bonnie R. Antoun, Stephanie A. Pitts, Thomas B. Reynolds	Robertt Valente*, Raquel de-Carvalho, Antnio Andrade-Campos		
TS2: 4.11 Multiscale Methods and Nonlocal Theories for Complex Material Behavior, Chair(s): Florin Bobaru						
MAR-CH	Peridynamics for Anti-Plane Shear and Torsional Deformations		Peridynamics for Beam and Shell Type Structures	A Non-Local Formulation for Fluid Flow and Mass Transport in Porous Media Based on Peridynamic Theory	A Complex-Step Method for Tangent-Stiffness Calculation in a Massively Parallel Computational Peridynamics Code	
	Erdogan Madenci*, Selda Oterkus		Erkan Oterkus*, Caglar Diyaroglu, Selda Oterkus, Erdogan Madenci	John Foster*, Amit Katiyar, Mukul Sharma	Michael Brothers*, John Foster, Harry Millwater	
TS2: 4.6 Multi-scale Methods for Heterogenous Materials, Chair(s): Frederic Legoll						
MAR-STA	A Crouzeix-Raviart Multiscale FEM for Problems on Perforated Domains		A Coupling Method for Stochastic Continuum Models at Different Scales	Localized Bases for Numerical Homogenization with Arbitrary Coefficients	Rigorous Computational Homogenization of Elliptic Problems with Heterogeneous Coefficients	
	Alexei Lozinski*, Claude Le Bris, Frederic Legoll		Regis Cottereau*, Yves Le Guennec, Didier Clouteau, Christian Soize	Lei Zhang*, Houman Owhadi, Leonid Berlyand	Daniel Peterseim*	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 4.13 Recent Developments in Nanoscale Modeling of Materials of Materials, Chair(s): Jay Oswald & Xiaowei Zeng						
MAR-STB	Shrinking Dimer Dynamics for Reliable Saddle Point Search	A Multi-Scale Method to Model Intrinsic Damping in Solids	A Coarse-Grained Representation of Polyurea for Modeling Wave Dissipation Due to Blast Loading	A Statistical Framework for Calibration and Uncertainty Quantification of Coarse-Grained Models of Atomic Systems	Reproducibility and Transferability of Si Many-Body Potentials	
	Qiang Du*	Kunal Kumar*, Narayana Aluru	Vipin Agrawal*, Greg Hattemer, Gaurav Arya, Jay Oswald	Eric Wright*, Peter Rossky, J. Tinsley Oden, Serge Prudhomme	Byeongchan Lee*, Moonseop Kim	
ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS2: 4.3 Multiscale Mechanics Modeling of Phase Transitions, Chair(s): Sergei Turteltaub						
MAR-STE	Grain Cluster Method for Multiscale Simulations of Multiphase Steels	Analyzing the Pseudoelastic Response of NiTi Shape Memory Alloys at Different Length Scales	Structural Phase Transitions in Virus Assembly and Maturation	A Phase-Transition Based Continuum Model, with Discrete Filamentous Networks of VACNTs		
	Sergio Turteltaub*, Sourena Yadegari, Akke Suiker	Reza Mirzaeifar*, Reginald DesRoches, Arash Yavari, Ken Gall	William Klug*	Nisha Mohan*, Prashant Purohit, Shailendra P. Joshi, Julia R. Greer		
TS2: 5.10 Cohesive Zone Models - Fundamentals and Multiscale Applications, Chair(s): Glaucio Paulino						
MAR-UA	A Physically-Based Constitutive Law for Granular Materials in Shear for Multiscale Dynamic Fracture Simulations		Fatigue Crack Growth Investigation Using Cohesive Zone Modeling	Inverse Extraction of Cohesive Zone Laws by Field Projection Method Using Numerical Auxiliary Fields		
	Ahmed Elbanna*		Kyoungsoo Park*, Glaucio H. Paulino, Robert H. Dodds, Jr.	Hyun-Gyu Kim*		
TS2: 5.5 New Challenges for the Computational Modeling of Solids at Failure, Chair(s): Ekkehard Ramm						
MAR-UC	Methods for Improving Convergence and Accuracy of Phase-Field Models for Dynamic Fracture in Brittle and Ductile Materials	Modeling Dynamic Fracture of Quasi-brittle Materials: Rate Sensitivity and Impact	A Local Phantom Node Approach to Dynamic Crack Propagation	A Local Finite Element Formulation for Transient Analysis of Strain-Softening Solids	Microstructural Modeling of Dynamic Intergranular and Transgranular Fracture Modes in Crystalline Alloys	
	Michael Borden*, Thomas Hughes, Chad Landis	Josko Ozbolt*, Baris Irhan	Jessica Sanders*, Mike Puso	Dhrubajyoti Mukherjee*, Lori Graham-Brady	Qifeng Wu*, Shoayb Ziaei, Prasenjit Khanikar, Mohammed Zikry	

Monday, July 22, Technical Session 3
Student Poster Session, RCC Third Floor Lobby

Title	Presenting Author	Board Number	Poster Number
Development and Validation of DG WAVE: A Discontinuous Galerkin-based numerical WAVe prediction model	Angela Nappi	1	1
Efficient time stepping for discontinuous Galerkin methods	Benjamin Yeager	1	2
A Spline Based Enrichment Function for Arbitrary Inclusions in XFEM with Applications to Finite Deformations	Brett Benowitz	1	3
Reduced meshfree approximation of static singular problems	Camille Marodon	1	4
Comparative study of different orders of the standard, spectral and isogeometric finite elements as well as the linear elements with reduced dispersion used for the solution of elastodynamics problems	Duc Pham	2	5
Universal Meshes for computing with nonconforming tetrahedralization	Hardik Kabaria	2	6
A GFEM Approach for Thermomechanical Effects due to Highly Localized Thermal Gradients	Julia Plews	2	7
The Reduced Basis Method for Finite Deformation in Elasticity	Lorenzo Zanon	2	8
An Oscillation-Limited Meshfree Formulation for Shock Modeling	Michael Roth	3	9
A Simple Fast Multipole BEM Implementation for Multi-Domain Problems	Shuo Huang	3	10
Automatic Mesh Generation of Watersheds using High-Resolution Digital Elevation Maps	Dustin West	3	11
A Novel Framework for Particle Systems based entirely on Morton Codes	Jeff Amelang	3	12
Reduced-Order Modeling for Numerical Representation of Fluid Flow Toward Efficient Simulation of High Temperature Reactor Components	Mohammad Ahmadpoor	4	13
Using Tools and Techniques from Software Engineering in Computational Mechanics	Patrick Diehl	4	14
On multi-time-step coupling for linear first and second-order transient systems	Saeid Karimi	4	15
O(N) fast direct linear solvers	Sivaram Ambikasaran	4	16
Modeling of Nearly Incompressible Composite Materials Using a New Stabilized Mixed Method for Tetrahedral Elements	Timothy Truster	5	17
A robust general Locking-Free shell element with Thickness Strech for large deformation analysis of FGM and Composite Structures	Venkat Vallala	5	18
Analysis of Singularity Field near Interface Edge of Bonded Structures Based on FEM Using Akin Singular Element	Yutaro Watanabe	5	19
Multiple Length/Time Scale Modeling of Multi-physics for Nano/Micro Material System	Jiaoyan Li	5	20
Multiscale Modeling of Particulate Composites: Concrete Aggregate Packing	Mir Shams	6	21

Simulations of Diffusion Driven Phase Transformations in Stressed Multiphase Multicomponent Solids	Subramanya Sadasiva	6	22
A Dispersive/Dissipative Multiscale Computational Model for Viscoelastic Composites	Tong Hui	6	23
A predictive multiscale computational framework for viscoelastic properties of polymeric materials	Ying Li	6	24
A Molecular Dynamics (MD) based investigation on the dislocation dynamics under nanoindentation	Ajith UKwattta	7	25
Charged-dislocation induced fields in piezoelectric AlGaN-GaN heterostructures	Ali Sangghaleh	7	26
Multiresolution Molecular Mechanics: Dynamics	Emre Biyikli	7	27
The Molecular Simulations of Gold–Sulfur Interface in Solvent	Huachuan Wang	7	28
Fully Non Local Multiscale Atomistic Simulation of Electromechanical Materials	Jason Marshall	8	29
Molecular Dynamics Based Study and Deformation Mechanisms Evolution Near Crack Tip in Crystalline Material	Jiaxi Zhang	8	30
Convergence of Multiresolution Molecular Mechanics	Qingcheng Yang	8	31
Atomistic Tensile Loading Simulations of Metallic Glass and Nanoglass Nanofilms	Sara Adibi	8	32
A linear-scaling Density Funcitonal Theory formulation for systems of unprecedented size	Swarnava Ghosh	9	33
a numerical algorithm for biophysically-constrained parameter estimation for tumor modeling and data assimilation with medical images	Amir Gholaminejad	9	34
Predicting Ovine Arterial Flow and Pressure Dynamics using a 1-D Fluid Dynamics Model with Viscoelastic Walls and Varying Arterial Stiffness	Christina Battista	9	35
Three-Dimensional Numerical Simulation of Chemotaxis of Living Cells in a Microchannel	Hongzhi Lan	9	36
Viscoelastic characterization and modeling of agar samples with different concentrations	Jiayue Shen	10	37
Symmetry in Viral Capsids and Conformational Changes during Maturation	Luigi Perotti	10	38
Model based Prediction of Injury in Shaken Baby Syndrome	Nikini Puhulwelle Gamage	10	39
Numerical Quadrature and Operator Splitting for Cardiac Electromechanics	Shankarjee Krishnamoorthi	10	40
Towards a mechanical model of human heart valves	Stefanie Heyden	11	41
Numerical Modeling of the Mechanical Behavior of Anisotropic Patterned Hydrogel	Tao Jin	11	42
On the Modeling of Red Blood Cells using NURBS based Isogeometric Analysis	Venkat Keshav Chivukula	11	43
Concurrent spatial mapping of the viscoelasticity of heterogeneous soft materials via a polymer-based microfluidic device: a preliminary study	Wenting Gu	11	44

Design Optimization Under Uncertainty for Rotor Blades Of Horizontal Axis Wind Turbines	Vahid Keshavarzzadeh	12	45
Structural Topology Optimization Using Polyhedral Elements	Arun Gain	12	46
Rapid Topology Optimization using Path-Dependent Reduced-Order Models	Matthew Zahr	12	47
A Model Reduction Approach for Partitioned Treatment of Uncertainty in Coupled Domain Problems	Mohammad Hadigol	12	48
Computationally Efficient Optimal Design of Localized Activation and Actuation for Morphing SMP Structures	Shuang Wang	13	49
Novel Preconditioners for PDE-constrained Optimization	Youngsoo Choi	13	50
Higher Order Anisotropic Bounds of Thermo-Mechanical Properties for Tomographically Characterized Polydisperse Granular Systems	Andrew Gillman	13	51
FSI Analysis of Wind Turbines at Full Scale	Artem Korobenko	13	52
Active Process Control System of Atmospheric Plasma Spray Process Using Support Vector Machines	Balachandar Guduri	14	53
hp discontinuous Galerkin methods for the vertical extent of the water column	Colton Conroy	14	54
Residual-based large eddy simulation models for magnetohydrodynamics	David Sondak	14	55
Developing a Reduced-Order Model of Vortex-Induced Vibrations for an Oscillating Cylinder using Proper Orthogonal Decomposition Methods	Fanny Besem	14	56
Fluid-structure interaction of non-Newtonian fluids and elastic solids: applications to bio-fluid dynamics	JaeHyuk Kwack	15	57
A Thermodynamically Consistent Algorithm for Liquid-Vapor Phase Transitions	Ju Liu	15	58
On modifications to Darcy model and associated mixed formulations	Justin Chang	15	59
Dissipative particle dynamics simulation of particle sedimentation toward functionally graded material fabrication	Lingqi Yang	15	60
On mesh restrictions for advective-diffusive-reactive systems to achieve non-negative solutions	Maruti Mudunuru	16	61
Pore-scale simulation and upscaling of flow, transport and wetting in porous media	Matteo Icardi	16	62
Parametric study of kinetic limitations in cloud particle activation using asynchronous collocation	Mehdi Saghafi	16	63
Performance Characterization of a Polymer-based Microfluidic Device for Detecting Continuous Distributed Loads	Peng Cheng	16	64
Cloud Dispersion in Shocked Particle-Laden Flow	Sean Davis	17	65
A Novel Fluid-Structure-Thermal Interaction Algorithm for Modelling of Lubricating Gaps in External Gear Machines	Sujan Dhar	17	66

Boundary Element Analysis of Three-dimensional Cracks in Transversely Isotropic Layered Media	Amirhossein Molavi Tabrizi	18	67
Homogenization-Based Multiscale Modeling of Crystal Plasticity and Ductile Failure at High Strain Rates	Coleman Alleman	18	68
Capturing Fracture Modes in Soil-Based Materials using Enhanced Finite Elements	David Weed	18	69
Dynamic Analysis of Saturated Porous Media with Applications to Penetration Problems	Hassan Sabetamal	18	70
Small Scale Yielding Models of Crack Divider Delamination in Al-Li with Gradient Crystal Plasticity	Mark Messner	19	71
Simulation of Interactions between Hydraulic Induced and Natural Fractures	Piyush Gupta	19	72
Dynamic Fracture Mechanics with the Partition of Unity Method and Embedded Peridynamics	Sa Wu	19	73
Effect of Reinforcement in the Sandwich Foam Core on the Flexural Response and Damage Behavior: Study by Finite Element Analysis	Sandip Haldar	19	74
On modeling fatigue failure using a Variational Multiscale Method	Shardul Panwar	20	75
Higher Order Stabilized Conforming Nodal Integration for Fracture Mechanics	Shih-Po Lin	20	76
Interface Investigation though a Multiscale Hydro-Thermo-Mechanical Cohesive Zone Model in Concrete	Tao Wu	20	77
A Stable and Optimally Convergent Generalized FEM (SGFEM) for Linear Elastic Fracture Mechanics	Varun Gupta	20	78
Simulation of mixed-mode I/III stable tearing crack growth events using the cohesive zone model approach	Xin Chen	21	79
A multi-scale material design space for predicting fracture toughness of polycrystalline metals	Yan Li	21	80
Numerical simulation and modeling of fracture pattern evolution in asphalt overlay/substrate systems at low temperatures	Yingjie Liu	21	81
MRF Texture synthesis approach for generation of metallic microstructures	Abhishek Kumar	21	82
Frank-Read Source Operation within a Stress-Gradient	Benjamin Szajewski	22	83
Development of Shallow Foundation Streetscape Vehicular Anti-ram (SVAR) Systems through Modeling and Testing	Edward O'Hare	22	84
Modeling and Analysis of Composite Materials Based on Tomographic Images	Elena Caraba	22	85
A Spectral method for circumferential waves in cylindrically curved micro-structural plates	Keerti Prakash	22	86
A Technique-Synergy for the 3-D, Spatial, Characterization and Quantification of Metal Alloys	Kiran Narayanan	23	87
Analysis of braking in interaction vehicle -	Mario Vasquez	23	88

structure			
ESSI Simulator: Program for Modeling and Simulating of Earthquake-Soil-Structure Interaction Systems	Nima Tafazzoli	23	89
Influence of surface stresses on harmonic vibrations of cylindrically curved plates – a numerical approach	Sushant Sachan	23	90
Dynamic Instability and Post-buckling Behavior of Shell Structures	Yang Zhou	24	91

12th U.S. National Congress on Computational Mechanics Technical Program

Tuesday July 23, 2013

Plenary Speaker, Tuesday, July 23, 2013
9:00 – 9:45 am, RCC Ballroom B
Practical Multiscaling
Jacob Fish, Columbia University

Abstract: The talk presents a practical multiscale-multiphysics design system, which integrates reduced order multiphysics-multiscale analysis; capabilities for life prediction and durability of composite structural components within a nonintrusive stochastic multiscale framework for uncertainty quantification and propagation at multiple scales. The stochastic multiscale-multiphysics design system has been successfully deployed in aerospace industry (Lockheed-Martin, Northrop-Grumman, Boeing, Rolls-Royce, General Electric) for fatigue life prediction and environmental degradation of high temperature CMC and PMC components as well as in automotive industry (General Motors, Automotive Composites Consortium) for crash prediction of composite cars. The talk includes theory, applications and software demonstrations. The case is made for a widespread adoption of multiscale methods in practice. We show that it is feasible to reliably predict the behavior of large-scale heterogeneous structural systems well into post-failure regime by accounting for fine-scale material details at a computational cost comparable to the phenomenological modeling of heterogeneous materials.

Biography: Over the past 30 years (in both industry and academia) Dr. Fish (55) has been in the forefront of multiscale computational science and engineering. He has an accomplished track record of technology transfer to industry. His multiscale methodologies have been employed by industry for manufacturing processes of GE90 fan blades; design of turbo-engines for General Electric and Rolls-Royce; simulation of aerospace structural components for Lockheed-Martin, Northrop-Grumman and Sikorski; optimization of energy absorption mechanism for lightweight composite cars manufactured by Ford, GM and Chrysler; predicting environmental degradation of polyimide-based composites in collaboration with Boeing, GE Aviation and Renegade Materials; analysis of concrete targets subjected to impact loading by high speed projectiles; design of piezoelectric and ferroelectric materials; and numerous nanotechnology applications including nanodevices and nanocomposites sponsored by Northrop-Grumman, Sandia National Laboratory, Army Research Laboratory and Department of Energy.

Dr. Fish, the Carleton Professor of Engineering at Columbia University, is a recipient of the 2010 Computational Mechanics award from the International Association for Computational Mechanics (IACM) and the 2005 Computational Structural Mechanics award from the US Association for Computational Mechanics (USACM). He is Past President of the United States Association for Computational Mechanics (USACM). Dr. Fish is a Founder and Editor-in-Chief of the International Journal of Multiscale Computational Engineering and Associate Editor of the International Journal for Numerical Methods in Engineering. He received his PhD from Northwestern University in 1989 after spending five years in aerospace industry and structural design. More information about Dr. Fish can be found at http://civil.columbia.edu/jacob-fish.

Semi-Plenary Lecture, Tuesday, July 23, 2013
1:00 – 1:45 pm, RCC Ballroom A
Computational Biomaterials Science
Markus Buehler, Massachusetts Institiute of Technology

Abstract: Biological materials are intriguing examples of advanced materials, which are synthesized, controlled and used for an astonishing variety of purposes—structural support, force generation, mass transport, catalysis, or energy conversion. By incorporating concepts from biology and engineering, computational modeling has led the way in identifying the core principles that link the molecular structure of biomaterials at scales of nanometers to macroscopic scales through hierarchical structures. Here we review a case study of an integrated analysis of synthetic silk proteins, where computation plays an important role in the design of experiments, validation, and understanding of underlying mechanisms. Combined with experimental studies, such "*in silico*" models allow us to simulate disease, understand catastrophic failure of tissues, and enable us to translate concepts from the living world into material designs that blur the distinction between the living and non-living systems.

Biography Markus J. Buehler is an Associate Professor in the Department of Civil and Environmental Engineering at the Massachusetts Institute of Technology (MIT), where he directs the Laboratory for Atomistic and Molecular Mechanics (LAMM). He is the Co-Director of the MIT Computation for Design and Optimization Program, Director of the MIT-Germany Program, and leads the Mechanics and Materials Group in the Department of Civil and Environmental Engineering. Buehler has published more than 200 articles on computational materials science, nanotechnology and nanoscience, authored two monographs, and given several hundred invited, keynote and plenary talks. Buehler received the National Science Foundation CAREER award, the United States Air Force Young Investigator Award, the Navy Young Investigator Award, and the DARPA Young Faculty Award, as well as the Presidential Early Career Award for Scientists and Engineers (PECASE). He was an invitee and plenary speaker at the National Academy of Engineering-Frontiers in Engineering Symposium, and he received the Harold E. Edgerton Faculty Achievement Award for exceptional distinction in teaching and in research or scholarship, the highest honor bestowed on young MIT faculty. Other major awards include the TMS Hardy Award, the IEEE Holm Conference Mort Antler Lecture Award, the Materials Research Society Outstanding Young Investigator Award, the Society of Engineering Science Young Investigator Medal, the Thomas J.R. Hughes Young Investigator Award, the Sia Nemat-Nasser Medal, the Rossiter W. Raymond Memorial Award, the Stephen Brunauer Award, the Alfred Noble Prize, and the Leonardo da Vinci Award. Buehler serves as a member of the editorial board of several international publications including: Roy. Soc. Interface, PLoS ONE, Int. J. Appl. Mech., Acta Mech. Sinica, J. Mech. Beh. Biomed. Mat., J. of Engrg. Mech., J. Nanomech. Micromech, J. Comp. and Theor. Nanosci. and BioNanoScience (as Editor-in-Chief). He is the founding chair of the Biomechanics Committee at the Engineering Mechanics Institute of ASCE, a member of the U.S. National Committee on Biomechanics, and Co-Chair of the Nanoengineering in Biology in Medicine Steering Committee of ASME.

Semi-Plenary Lecture, Tuesday, July 23, 2013
1:00 – 1:45 pm, RCC Ballroom C
Computational Fluid-Structure Interaction: From Blood Pumps to Wind Turbines
Yuri Bazilevs, University of California, San Diego

Abstract: A framework for computational fluid—structure interaction based on the Arbitrary Lagrangian—Eulerian formulation is presented. The fluid—structure interface discretization is assumed to be nonmatching allowing for the coupling of standard finite-element and isogeometric discretizations for the fluid and structural mechanics parts, respectively. FSI coupling strategies and their implementation in the high-performance parallel computing environment are discussed. Simulations of engineering systems at vastly different spatial scales, including cardiovascular medical devices, surface ships, and wind turbines are presented, and the corresponding computational challenges are addressed.

Biography: Dr. Bazilevs received his PhD from the University of Texas at Austin in 2006, and he is currently an Associate Professor in Department of Structural Engineering at University of California, San Diego. He has been conducting computational mechanics research since 2000, teaching classes on that subject since 2008, and has been conducting computational fluid–structure interaction research since 2005. He has published over 70 archival journal papers on computational fluid and structural mechanics, and fluid–structure interaction. He coauthored a book on isogeometric analysis, a technique that is now widely used in computational mechanics. He also coauthored a book on computational fluid–structure interaction. He is an Assistant Editor of Springer journal Computational Mechanics for the manuscripts on computational fluid mechanics and fluid–structure interaction. More information on Dr. Bazilevs can be found at http://ristretto.ucsd.edu/~bazily/.

Tuesday, July 23, Technical Session 4

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 11.1 Multiphysics Computations for Nuclear Energy Simulations, Chair(s): Jason Hales						
RCC201	Frictional Contact in Nuclear Fuel Simulations	Computational Challenges in Modeling Loss of Coolant Accidents	Advanced Modeling of Constituent Redistribution in Metallic Nuclear Fuels	Simulation of Soil/Structure Interaction Using Nonlinear Coupling to the Free Field and Gap Opening/Closing with Application to Seismic Analysis of Small Modular Reactors		
	Benjamin Spencer*, Jason Hales, Stephen Novascone, Danielle Perez, Richard Williamson	Jason Hales*, Richard Williamson, Stephen Novascone, Benjamin Spencer, Danielle Perez	Jack Galloway*, Cetin Unal, Neil Carlson	Jerome Solberg*		
TS4: 5.9 Pavement Mechanics and Simulation, Chair(s): William G. Buttlar						
RCC202	Mechanistic Modeling of Anisotropic Crack Growth of Asphalt Mixtures in Compression		Constitutive Modeling of Anisotropic Viscoplasticity of Asphalt Concrete	Numerical Simulation and Modeling of Fracture Pattern Evolution in Asphalt Overlay/Substrate Systems at Low Temperatures	Approaches to Face Material Variability in Asphalt Pavements	
	Robert Lytton*, Yuqing Zhang, Rong Luo		Yuqing Zhang*, Rong Luo, Robert Lytton	Yingjie Liu*, Lingqi Yang, Huiming Yin	Sivia Caro*, Daniel Castillo	
TS4: 8.4 Computational Nanotribology and Interfacial Dynamics, Chair(s): J. David Schall						
RCC203	Mechanical and Tribological Responses of Nanostructured MoS2		Microscopic Physical Picture of Nanoconfined Liquid from Molecular Dynamics Simulation	Solvation Force Simulations in Atomic Force Microscopy (AFM)	Effects of Doped Atoms on Graphene Folding	
	Susan Sinnott*		Hiroki Matsubara*, Fabio Pichierri, Kazue Kurihara	Rong-Guang Xu*, Yongsheng Leng	Matthew Becton*, Xianqiao Wang	
TS4: 2.2 Computational Mechanics and Biology of Tissues, Chair(s): Elisa Budyn						
RCC204	Anisotropic Finite Element Modeling Of The Mouse Cornea To Investigate Spiral Patterns In The Mouse Corneas	In Vivo 3D Analysis of Lumbar Endplate Subchondral Bone Density Distribution				
	Craig Foster*, Talisa Mohammad Nejad, Jerry Rhee, Philip Iannaccone, Steven Iannaccone	Shin Fujikawa*, Naoki Matsuo, Tomonori Yamaguchi, Alejandro Espinoza Oras, Nozomu Inoue				

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 2.5 Computational Biomechanics of Trauma, Chair(s): Matthew Panzer						
RCC205	Investigation of Cavitation as a Brain Injury Mechanism in Blast Exposure	Human Body Biomechanical Models for Investigation of Blast Wave TBI	Validation and Sensitivity Analysis of Human Head Model	Stiffness of Infant and Toddler Age Porcine Brain Tissue Subjected to High Rotational Velocities		
	Paul Taylor*, Aaron Brundage	X.G. Tan*, Andrzej Przekwas, Kyle Ott, Andrew Merkle	Nithyanand Kota*, Alan Leung, Amit Bagchi, Siddiq Qidwai	Connor Bradfield*		
TS4: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): Yu Wang and Bradley Fromm						
RCC206	Phase-Field Modeling of Phase Transformations, Microstructure Evolution, and Properties		Inverse Materials and Process Path Design and Homogenization Using Correlation Functions	Hybrid Potts-Phase Field Model for Coupled Microstructural-Compositional Evolution	Order Parameter Re-Mapping Algorithm for 3D Phase Field Modeling of Grain Growth Coupled to Mechanics Using FEM	
	Long-Qing Chen*		Hamid Garmestani*	Eric Homer*, Jordan Cox, Veena Tikare	Cody Permann*, Michael Tonks, Derek Gaston	
TS4: 3.4 Computational Fluid Mechanics for Free and Moving Boundaries, Chair(s): Rekha Rao						
RCC301A	Numerical Simulation of Three-Dimensional Viscoelastic Moving Free Surface Flows		Numberical Analysis of Non-Newtonian Fluid with Free Surface	A Comparison of the Conformal Decomposition Finite Element Method to the Level Set Method for Microfluidic Flows	A Narrow Band Gradient-Augmented Level Set Method for Incompressible Two-Phase Flow	
	Murilo Tome*		Jun Saito*	Rekha Rao*, David Noble, Christine Roberts, Scott Roberts, Christopher Brotherton, Martin Nemer	Curtis Lee*, John Dolbow, Peter Mucha	
TS4: 3.5 Advances in Nonlinear Unsteady Aerodynamic Flows, Chair(s): Earl H. Dowell						
RCC301B	Flutter of a Goland Beam in Axial Air Flow - The Continuum Theory	Unsteady Transonic Flows Supporting Non-unique Solutions	Developing a Reduced-Order Model of Vortex-Induced Vibrations for an Oscillating Cylinder Using Proper Orthogonal Decomposition Methods			
	A. V. Balakrishnan*	Kui Ou*, Jameson Antony, Jeffery Thomas, Earl Dowell, Kenneth Hall, John Vassberg	Fanny Besem*, Stephen Clark, Jeffrey Thomas, Robert Kielb			
TS4: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Michael Puso						
RCC302A	Nonlinear Reduction of Embedded Boundary Models for Fluid-Structure Interaction	Sliding Friction Across the Scales: Thermomechanical Interactions and Dissipation Partitioning	A Hybridized Least-Squares Ghost Fluid Method with Reduced Pressure Oscillations	A Space-Time Multiscale Solver Imbedding Model Reduction for Non-Linear Frictional Contact Problems	A Nonlinearly Stable Higher-Order Computational Framework for Multi-Material Flow Problems	
	Charbel Farhat*, Maciej Balajewicz	Ilker Temizer*	John Mousel*	Anthony Giacoma*, Anthony Gravouil, David Dureisseix, Michel Rochette	Alex Main*, Xianyi Zeng, Charbel Farhat	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 10.1 Fluid-Structure Interaction Algorithms & Applications, Chair(s): Jonathan Pitt						
RCC302B	An Eulerian-ALE Embedded Boundary Method for Turbulent Fluid-Structure Interaction Problems	Vibration of Submerged Structures Using an Efficient Calculation of Added Mass	A Full-Eulerian Solid Level Set Method for FluidStructure Interactions	Reduced Order Modelling Applied to a Transient Coupled Fluid/Structure Problem	Multiscale Hybrid RANS/LES Method for FSI Simulations	
	Vinod Lakshminarayan *, Alex Main, Kevin Wang, Charbel Farhat	Luis Monterrubio*, Petr Krysl	Ping He*, Rui Qiao	Pascal Schumacher*, Alain Combescure, Anthony Gravouil	Rooh Khurram*	
TS4: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Haim Waisman and Patrick O'Hara						
RCC302C	Simulation of Non-Planar Three-Dimensional Hydraulic Fracture Propagation	Simulation of Interactions between Hydraulic Induced and Natural Fractures	Simulating Fully Coupled Fracture Network - Porous Rock Matrix Flow on Non-Matching Grids with the XFEM	Higher Order Immersed Methods	Stability Analysis of a Displaced Mass of Slope for Xigu Hydropower Station by Numerical Manifold Method	
	Armando Duarte*, Piyush Gupta, Jorge Garzon	Piyush Gupta*, Carlos Armando Duarte	Nicolas Schwenck*, Bernd Flemisch, Rainer Helmig, Barbara Wohlmuth	Slimane Adjerid*, Mohamed Ben Romdhane, Tao Lin	Zhenzhong Shen*, Jing Wang, Lei Zheng	
TS4: 1.2 Algorithms for Wave Propagation: A Symposium in Honor of the 60th Birthday of Professor Leszek Demkowicz, Chair(s): Timothy Walsh						
RCC303	Efficient Time-Domain Perfectly Matched Layers for Elastodynamics	High Order Numerical Solution of the Variable Coefficient Helmholtz Equation with Non-Conforming Boundaries Using the Method of Difference Potentials	Improving Absorbtion Using Reflections: Absorbing Boundary Conditions for Elliptic Anisotropic Media			
	Koki Sagiyama*, Sanjay Govindjee, Per-Olof Persson	Semyon Tsynkov*, Steven Britt, Michael Medvinsky, Eli Turkel	Siddharth Savadatti*, Murthy Guddati			
TS4: 9.8 Geometric Methods in Computational Mechanics, Chair(s): Xin Li						
RCC304	Differential Forms in Isogeometric Analysis Based on T-Splines		Isogeometric Divergence-Conforming Collocation Methods for Incompressible Fluid Flow	IsoGeometric Hodge Decomposition with Applications in Fluid Mechanics	Discrete Ideal Flow Considered as Lie Algebra of Diverengence-Free Vector Fields	
	Rafael Vazquez*, Annalisa Buffa, Giancarlo Sangalli		John A. Evans*, Ren Hiemstra, Thomas J.R. Hughes, Dominik Schillinger	Rene Hiemstra*	Marc Gerritsma*	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 8.1 Emerging Methods for Large-Scale Quantum-Mechanical Materials Calculations, Chair(s): Phanish Suryanarayana						
RCC305A	Reduced Scaling in Electronic Structure Theory via Tensor Hypercontraction	A Symmetry-based Decomposition Approach to DFT Eigenvalue Problems with Applications to Electronic Structure Calculations	A Novel Spectral Scheme for Abinitio Simulations of Objective Structures	Dirac Spectral Finite Element Solver		
	Edward Hohenstein*, Robert Parrish, Todd Martinez	Xingyu Gao*, Jun Fang, Aihui Zhou	Amartya Banerjee*, Ryan Elliott, Richard James	Ondrej Certik*, John Pask		
TS4: 9.4 Mini-Symposium on the Material Point Method and Other Similar Particle Methods, Chair(s): Zhen Chen/Duan Z. Zhang						
RCC305B	A Particle-Discrete-Finite Element Method for Analysis of Particulate Flows and Their Interaction Structures		Material Point Method for Fluid-Solid Interactions with Chemical Reactions	Application of SPH Method in Prediction of Landmine Blast Effects	Numerical Fracture in the Material Point Method with Convective Particle Domain Interpolation	
	Eugenio Oate*, Miguel Angel Celigueta, Sergio R. Idelsohn, Alessandro Francis, Jos M Carbonell		Duan Zhang*, Xia Ma	Xudong Xin*, Bud Zaouk, Basant Parida, Norm Dana	James Colovos*, Michael Homel, Rebecca Brannon	
TS4: 9.7 Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX, Chair(s): Mark Shephard						
RCC306A	Low Order or High Order; This is the Question!		Anisotropic Mesh Adaptation: An Effective Strategy in CFD	Efficient GPU-Based Optimization of Volume Meshes	Parallel Unstructured Mesh Generation and Image-to-Mesh Conversion: Lesson Learned the Last 20 Years	
	Oubay Hassan*, Ruben Sevilla, Ken Morgan		Simona Perotto*, Stefano Micheletti	Raine Yeh*, Eric Shaffer, Zuofu Cheng , George Zagaris, Luke Olson	Nikos Chrisochoides*	
TS4: 12.2 UQ Challenge Benchmarks, Chair(s): Jim Stewart						
RCC306B	UQ Challenge Benchmark Problem on Materials		UQ Challenge Benchmark Problem for Nonlinear Fluid-Structure Interaction	UQ Benchmark Problems for Multiphysics Modeling	Benchmark Problems for UQ in CFD	
	Roger Ghanem*		Charbel Farhat*	Maarten Arnst*	Habib Najm*	
TS4: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Assad Oberai						
RCC306C	Inferring Tissue Microstructure Using Elasticity Imaging	Novel Exploitations of Sparsity in Inverse Elasticity Problems	Early Detection of Breast Cancer through an Inverse Problem Approach to Stiffness Mapping: 3D Results and Variations in Properties	Patient-Specific Computational Analysis of the Cervical Spine Towards Inverse Soft Tissue Characterization	A Numerical Algorithm for Biophysically-Constrained Parameter Estimation for Tumor Modeling and Data Assimilation with Medical Images	
	Assad Oberai*, Tengxiao Liu, Elizabete Ferreira, Paul Barbone	Paul Barbone*, Olalekan Babaniyi, D. Thomas Seidl, Bryan Chu, Assad A. Oberai	Lorraine Olson*, Robert Throne	Oliver Green*, John Brigham, William Anderst	Amir Gholaminejad*, George Biros	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 6.4 New Trends in Topology Optimization, Chair(s): Glaucio Paulino						
RCC307	An Operator Splitting Algorithm for Regularized Topology Optimization		A Level-Set Method for Topology Optimization of Natural Convection Problems	Optimal Design of Microstructural Composite Topologies for High Stiffness and High Damping Applications Including Strain Constraints and Nonlinear Polymer Response	Rapid Topology Optimization Using Path-Dependent Reduced-Order Models	
	Cameron Talischi*, Glaucio Paulino		Kurt Maute*, Peter Coffin	Greg Hulbert*, Julien Meaud, Zheng-Dong Ma, Tony Waas	Matthew Zahr*, Charbel Farhat	
TS4: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. James D. Lee						
MAR-CA	Towards Bridging Atomistic System and the Electrostatics of Deformable Continuum	A Two-Dimensional Ordinary, State-Based Peridynamics Model for Linearly Elastic Solids	Multiscale Molecular Simulation of Non-Crystalline but Highly-Symmetric Structures	Multiple Length/Time Scale Modeling of Multi-physics for Nano/Micro Material System		
	Denis Davydov*, Duc Khoi Vu, Paul Steinmann	Quang Le*, Wan Kan Chan, Justin Schwartz	Amin Aghaei*, Kaushik Dayal	Jiaoyan Li*, James Lee		
TS4: 4.5 Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials, Chair(s): J. Yvonnet						
MAR-CB	Multi-scale Simulation of Protein-Induced DNA Loop Formation		Hybrid Compatible-Incompatible Eigenstrain Based Homogenization	A Multiscale Partitionned Reduced Order Model Applied to Damage Simulation	On Improved Upper and Lower Bounds in Virtual Testing of Random Media with High Contrast Constituents	
	C.H. Lee*, J.S. Chen		Vasilina Filonova*, Jacob Fish, Zheng Yuan	Olivier Goury*, Pierre Kerfriden, Stephane Bordas	Fredrik Larsson*	
TS4: 4.11 Multiscale Methods and Nonlocal Theories for Complex Material Behavior, Chair(s): John Foster						
MAR-CH	Variable Horizon in a Peridynamic Body		Concurrent Coupling of Bond-Based Peridynamics and Navier Equation of Classical Elasticity by Blending	Predictive Computational Modeling of Elastic Properties of Carbon Nanotube/Polymer Composites by Classical Continuum and Nonlocal Elastic Models	Consistent Interface Between Local and Nonlocal Models: Application to Transient Dynamics	
	Stewart Silling*, Pablo Seleson		Pablo Seleson*, Youn Doh Ha, Samir Beneddine	Fei Han*, Yan Azdoud, Gilles Lubineau	Jrmy Marchais*, Christian Rey, Ludovic Chamoin	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 4.6 Multi-scale Methods for Heterogenous Materials, Chair(s): Lori Graham-Brady						
MAR-STA	Identification of a Prior Probabilistic Mesoscale Model with Experimental Multiscale Observations of One Specimen Under External Loads	A Micromechanics Based Crack Coalescence Damage Model to Predict Dynamic Failure of Brittle Materials under Compression	Multiscale Modeling of Particulate Composites: Concrete Aggregate Packing	Dissipative Particle Dynamics Simulation of Particle Sedimentation Toward Functionally Graded Material Fabrication	Multiscale Model for the Transformation from Micro Defects to Macro Cracks of Heterogeneous Rock	
	Christophe Desceliers*, Manh-Tu Nguyen, Christian Soize	Farah Huq*, Junwei Liu, Lori Graham-Brady	Mir Shams*, Ilya Avdeev, Konstantin Sobolev, Adil Amirjanov, Andrew Hastert	Lingqi Yang*, Yingjie Liu, Po-Hua Lee, Huiming Yin	Haiqing Yang*	
TS4: 4.13 Recent Developments in Nanoscale Modeling of Materials of Materials, Chair(s): Shaofan Li & Albert C. To						
MAR-STB	Heat Bath for Multiscale Simulations of Crystalline Solids	Multiresolution Molecular Mechanics: Dynamics	Convergence of Multiresolution Molecular Mechanics	A Multiscale Crystal Defect Dynamics and Simulations of Dislocation and Fracture		
	Baiyili Liu*, Shaoqiang Tang	Emre Biyikli*, Qingcheng Yang, Albert C. To	Qingcheng Yang*, Emre Biyikli, Albert To	Shaofan Li*		
TS4: 4.14 Multiscale Modeling of Materials Behavior in Extreme Environments, Chair(s): Avinash M. Dongare, Danny Perez						
MAR-STE	Atomic Modeling and Theoretical Analysis of Cutting+Looping Dynamics for Dislocation-Precipitate Interactions in an Al2139 Alloy.	Cooling Rates and Mechanisms of Resolidification in Short Pulse Laser Processing of Metal Targets	Multi-Scale Simulation of Asperity Evolution Under Electrical and Mechanical Load	Towards Development of Hydrogen Embrittlement Resistant Steel Alloys	Molecular Dynamics Based Modeling of Short Laser Pulse Nanostructuring of Materials on the Experimental Scale	
	Donald Brenner*, Lipeng Sun, Mohammed Zikry	Leonid Zhigilei*, Chengping Wu, Eaman Abdul Karim	Douglas L. Irving*, Benjamin E. Gaddy, Christopher R. Freeze, Xiaoyin Ji, Angus I. Kingon	Malik Wagih*, Tarek Hatem	Dmitry Ivanov*, Vladimir Lipp, Baerbel Rethfeld, Martin Garcia	
TS4: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Somnath Ghosh						
MAR-UA	Constitutive Framework Development to Study Incipient Spall Damage Using Microstructurally Explicit 3D Finite Element Models		Computational Interrogation of Dynamic Pore Nucleation in Polycrystalline Metallic Materials	Homogenization-Based Multiscale Modeling of Cystal Plasticity and Ductile Failure at High Strain Rates	Modeling Single Crystal Microstructure Evolution Under Shock Loading Using a Steady Plastic Wave Formulation	
	Pedro Peralta*, Kapil Krishnan, Andrew Brown, Leda Wayne		Curt Bronkhorst*, Darby Luscher, Veronica Livescu, Ellen Cerreta, George Gray	Coleman Alleman*, Somnath Ghosh	Jeffrey Lloyd*, John D. Clayton, David McDowell	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS4: 5.3 Numerical Modeling and Engineering Design for Impact and Blast Problems, Chair(s): Howie Fang						
MAR-UB	Crashworthiness Optimization for Strong Post W-Beam Guardrail Barrier System		Numerical Simulations of Vehicular Impacts on 29-Inch & 31-Inch W-Beam Guardrails	Crashworthiness Design for Functionally Graded Foam-filled Tapered Tube Based on Adaptive Ensemble Surrogate Model		
	Qing Li*, Chao Xue, Paul Briozzo, Guangyong Sun		Matthew Gutowski*, Ning Li, Matthew DiSogra, Hongbing Fang	Hanfeng Yin*, Guilin Wen, Howie Fang		
TS4: 5.5 New Challenges for the Computational Modeling of Solids at Failure, Chair(s): Christian Linder						
MAR-UC	A Multiscale Process Zone Model and Simulations of Fracture and Fragmentation		Material Point Method for Large Deformation Plasticity and Failure	The Role of Nonlocality in Crack Branching in Brittle Materials	Variational Nonlocal Regularization in Finite-Deformation Inelasticity	
	Bo Ren*, Shaofan Li		Ozgur Aslan*, Duan Zhang	Florin Bobaru*	James Foulk III*	

Tuesday, July 23, Technical Session 5

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Per-Olof Persson						
RCC201	A Scalable Algebraic p-Multigrid Preconditioner for High-Order Discontinuous Galerkin Discretizations of Convection-Dominated Flows		A Hybrid Discontinuous in Space and Time Galerkin Method for Wave Propagation	A High-Order Implicit-Explicit Discontinuous Galerkin Scheme for Fluid-Structure Interaction	Massively Parallel 3D Spectral Difference Solver for Simulating Vortex-Induced Vibrations of Circular Cylinders	
	Krzysztof Fidkowski*		Dalei Wang*, Radek Tezaur, Charbel Farhat	Bradley Froehle*, Per-Olof Persson	Andrew DeLong*, Chunlei Liang	
TS5: 5.9 Pavement Mechanics and Simulation, Chair(s): Ernian Pan						
RCC202	Fatigue Performance Assessment of Pervious Concrete Pavements		Development and Verification of Layered Viscoelastic Continuum Damage (LVECD) Program for Performance Analysis of Asphalt Pavement	Stress Dependent Viscoelastic Functionally Graded (SDVFG) Finite Element Framework for Pavement Simulation	Modeling of Mixed-Mode Fracture at Pavement Interfaces	
	John Bolander*, Abdulaziz Alsaif, Kunhwi Kim		Yeong-Tae Choi*, Mehran Eslaminia , Richard Kim	Eshan Dave*, Kyoungsoo Park, Glaucio Paulino, William Buttlar	Salman Hakimzadeh*, Brian Hill, William Buttlar, Glaucio Paulino	
TS5: 9.9 Advances in BEM for Advanced Materials, Chair(s): J.R. Berger						
RCC203	New Three-dimensional Boundary Element Formulation of a Viscoelastic Layer of Finite Thickness Applied to the Rolling Resistance of a Rigid Sphere	Fast Methodology for a Convolution Quadrature based BEM in Elastodynamics	Numerical Crack Simulation of Layered Magnetoelectroelastic Solids Under Impact Loading by a Time-Domain BEM	A Study on TD-BIEM with Lubich CQM Accelerated with ACA		
	Henri P. Gavin*, Gerard-Philippe Zehil	Martin Schanz*, Thomas Traub	Michael Wuensche*, Chuanzeng Zhang, Jan Sladek, Vladimir Sladek	Hitoshi Yoshikawa*, Ryosuke Matsuura, Naoshi Nishimura		
TS5: 2.6 Cardiovascular Biomechanics and Biomedical Engineering, Chair(s): John Brigham						
RCC204	GPU-Accelerated Multi-Scale Modeling for Biomolecular Complexes	A New Approach with Independent Component Analysis for 3D Shape Analysis Applied to the Human Right Ventricle	High-Fidelity Modeling and Simulation of Hemodynamic Effect of Peripheral Arterial Stenoses	Computational Modelling of Effects of Plaque Variation on Coronary Stent Deployment		
	Tao Liao*, Yongjie Zhang	Jia Wu*, John Brigham	Liangwei Li*, Chunlei Liang, Bao-Ngoc Nguyen, Morton Friedman, Anton Sidaway	Sriram Tammareddi*, Qing Li		

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 2.7 Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics, Chair(s): W. Wall						
RCC205	Validation of an Open Source Framework for the Simulation of Blood Flow in Rigid and Deformable Vessels	A Fully Decoupled Scheme for the Interaction of a Thin-Walled Structure with an Incompressible Fluid	Fluid-Structure Interaction of Non-Newtonian Fluids and Elastic Solids: Applications to Bio-Fluid Dynamics	On the Modeling of Red Blood Cells Using a NURBS based Isogeometric Analysis	Continuum Approach to Hemolysis Modeling Employing Cell Deformation Field	
	Annalisa Quaini*, Tiziano Passerini, Umberto Villa, Alessandro Veneziani, Suncica Canic	Mikel Landajuela*, Miguel A. Fernndez	JaeHyuk Kwack*, Arif Masud	Venkat Keshav Chivukula*, Jia Lu, Sarah Vigmostad	Marek Behr*, Jaewook Nam, Matteo Pasquali, Lutz Pauli	
TS5: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): LQ Chen and Eric Homer						
RCC206	Phase Field Modeling and Simulation of Processing, Microstructure and Property of Ferroelectric Materials	Plastic Localization in Irradiated Ferritic Systems: New Insights from Modeling and Simulation	Elastic Properties of Coupled Mesoscale Systems	Multiscale Stochastic Model in Predicting Microstructure Evolution and Deformation Behavior of Irradiated Steel	Active Process Control System of Atmospheric Plasma Spray Process Using Support Vector Machines	
	Yu Wang*	Jaime Marian*	Shiyuan Gu*, Olle Heinonen, Serge Nakhmanson, Dmitry Karpeev, Byounghak Lee, Seungbum Hong	Dongsheng Li*, Hussein Zbib, Xin Sun, Moe Kahleel	Balachandar Guduri*, Romesh C. Batra	
TS5: 3.4 Computational Fluid Mechanics for Free and Moving Boundaries, Chair(s): Elie Hachem						
RCC301A	An Investigation of the Mesoscale Dynamics in a Three Dimensional Shocked Particle-Laden Flow	Constrained Optimization Framework for Interface-Aware Sub-Scale-Dynamics Closure Models for Multimaterial Cells in Lagrangian Hydrodynamics	Contact with Friction for the eXtended Eulerian Method	A Conformal Decomposition Finite Element Method for Burning Deformable Solids		
	Oishik Sen*, Sean Davis, Anil Kapahi, Gustaaf Jacobs, H.S. Udaykumar	Mikhail Shashkov*, Andrew Barlow, Ryan Hill	Efrem Vitali*	David Noble*, William Erikson, Scott Roberts		
TS5: 3.7 Finite Element Methods and High-Performance Computing for Environmental Fluid Mechanics, Chair(s): Ethan Kubatko						
RCC301B	A Parallel Finite Element Hurricane Storm Surge Model for Galveston Bay		Wave-Driven Morphology Modeling in Littoral Zones: Applications of the Coastal Storm Modeling System (CStorm)	The Finite-Elements Tree-Crown Hydrodynamics Model (FETCH): Assessing the Effects of Hydrodynamic Strategy in Different Tree Species	Discontinuous Galerkin Methods for Solving Green-Naghdi Equations : Resolving Highly Non-Linear and Dispersive Water Waves	
	Jennifer Proft*, Clint Dawson, Casey Dietrich		Corey Trahan*	Gil Bohrer*, Ashley Matheny	Nishant Panda*, Clint Dawson, Yao Zhang, Andrew Kennedy, Joannes Westerink	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Peter Wriggers						
RCC302A	Numerical Modelling of Interacting Structures with Complex Interfaces Using a Single Mesh Multivelocity Strategy	Freely Inserted, Finely Meshed, Sub-Domains	An Embedded Mesh Method in a Multiple Material ALE	A Robust Method for Handling Embedded Interfaces in Complex Fluid and Fluid-Structure (-contact) Interaction Problems	A Level Set Based Algorithm for Simulation of Large Sliding Contact Between Domains Modelled with Finite Element and Material Point Methods	
	Patrick Le Tallec*, Gauthier Folzan, Jean-Philippe Perlat	Samuel Key*	Michael Puso*, Jessica Sanders, Ben Liu, Bryan Simpkins	Wolfgang A. Wall*, Bendikt Schott, Yogaraj Sudhakar, Shadan Shahmiri	Andriy Andreykiv*, Liang Jin Lim, Ronald Brinkgreve	
TS5: 10.1 Fluid-Structure Interaction Algorithms & Applications, Chair(s): Scott Miller						
RCC302B	Verification of a Partitioned Overset Grid Enabled Fluid-Structure Interaction Algorithm	Simulation of a Proposed Three-Dimensional Fluid-Structure Interaction Validation Case	Coupled Mixed Finite Element Methods for Fluid-Structure Interaction Problems	An Efficient Approach in Structural Optimization of High-Aspect-Ratio Wings Using POD	A Stabilized and Multiscale Finite Element System for Fluid-Structure Interaction in Offshore Engineering	
	Jonathan Pitt*, Cooper Elsworth, Scott Miller	Cooper Elsworth*, Jonathan Pitt, Scott Miller, Robert Campbell, Brent Craven	Edward Swim*, Sonia Garcia, Padmanabhan Seshaiyer	Euiyoung Kim*, Seongmin Chang, Dongho Lee, Maenghyo Cho	Jose Alves*, Alvaro Coutinho, Fernando Rochinha, Carlos Silva, Nestor Guevara, Jr., Renato Elias, Adriano Cortes, Milton Goncalves, Bruno Correa, Daniel Carvalho	
TS5: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Armando Duarte and Haim Waisman						
RCC302C	Robust Crack Surface Representation within the Generalized Finite Element Method: Applications to Interaction and Coalescence of Multiple Crack Surfaces	An Extended Finite Element Method to Efficiently Estimate Leakage in Carbon Sequestration Systems	Recent Computational Simulations in Nonlinear Structural Analysis by the Generalized Finite Element Method	A GFEM Approach for Thermomechanical Effects Due to Highly Localized Thermal Gradients	Mesh Independent Modeling of Hertzian Contact	
	Patrick O'Hara*, Jorge Garzon, Armando Duarte, William Buttlar	Chris Ladubec*, Robert Gracie, James Craig	Sergio Proenca*, Dorival Piedade Neto	Julia Plews*, C. Armando Duarte, Thomas Eason	Ravi Burla*, Anand Tupsakhare, Ashok V. Kumar	
TS5: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): J.S. Chen						
RCC303	Multiscale Peridynamics and Its Applications to Fracture		Nonlinear Analysis of Kirchhoff-Love Shells Using Meshless Related Methods	Radial Basis Collocation Method for Incompressible Linear Elasticity	Meshfree Volume-Averaged Projection Methods for Nearly-Incompressible Elasticity	
	Wing Liu*, Shaofan Li, Zili Dai		Paulo M. Pimenta*, Vladimir Ivannikov, Jos Paulo Moitinho de Almeida, Carlos Manoel Tiago	Sheng-Wei Chi*, J. S. Chen, Hsin-Yun Hu	Alejandro Ortiz-Bernardin*	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 9.8 Geometric Methods in Computational Mechanics, Chair(s): Michael A. Scott						
RCC304	Subdivision Surfaces in Isogeometric Analysis	Shape Optimisation with Multiresolution Subdivision Surfaces	A Topology-Adaptive Level Set/Mesh Deformation Technique for Boundary Evolution Tracking: Applications to Brain Biomechanics	Conflict Between Bilinear Shell Finite Elements and Shell Theory		
	Jiri Kosinka*	Fehmi Cirak*	Suzanne Shontz*, David McLaurin, Corina Drapaca	Antti Niemi*		
TS5: 7.1 Enabling Technologies and their Application for Advancing Computational Mechanics, Chair(s): Alvaro Coutinho						
RCC305A	Remote and Collaborative Visualization of Large Scale Computational Data		Application Development on High-End Computing Systems Now and Henceforth	Transparent Performance Monitoring for Production HPC Resources	Performance Study on the Balancing Domain Decomposition Method with Additive Schwartz Framework	A Novel Framework for Particle Systems Based Entirely on Morton Codes
	Kelly Gaither*		Osni Marques*	William Barth*	Tomonori Yamada*, Shinobu Yoshimura	Jeff Amelang*, Sean Mauch
TS5: 9.4 Mini-Symposium on the Material Point Method and Other Similar Particle Methods, Chair(s): Duan Z. Zhang/Xudong Xin						
RCC305B	A Multiscale Material Point Method for Simulating Multiphase Interactions	Development of a Computer Simulation Tool for Discrete Element Method and Collision Driven Particle Dynamics Simulations	Modeling Rock Fractures Near a Tunnel Subjected to an Explosive	Three-Dimensional Parallel Godunov Smooth Particle Hydrodynamics (Godunov-SPH) and its Application to Granular Flows on Natural Terrrains		
	Zhen Chen*, Shan Jiang, Yong Gan, Thomas D. Sewell	Debanjan Mukherjee*, Tarek Zohdi	Ling Xu*, Howard Schreyer, Deborah Sulsky	Dinesh Kumar*, Abani Patra, Bruce Pitman		
TS5: 9.7 Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX, Chair(s): Franck Ledoux						
RCC306A	Automatic All-Hexahedral Mesh Generation: Accomplishments and New Challenges	Performance of Overlay Grid Meshes in Solid Mechanics	Automatic Meshing of Biomedical Data Sets with Hexahedra	A Frontal Approach to Mixed Hexahedral Mesh Generation	Hierarchical Template-Based Hexahedral Mesh Generation	
	Steven Owen*	Karl Merkley*, Steven Owen	Poorya Mirkhosravi*, Petr Krysl	Tristan Carrier Baudouin*, Jean-Francois Remacle, Emilie Marchandise	Antonio Miranda*, Luiz Martha	
TS5: 12.2 UQ Challenge Benchmarks, Chair(s): Roger Ghanem						
RCC306B	Benchmark Problems for Bayesian Inverse Problems	Uncertainty Quantification in Predicting Wall-Bounded Turbulent Flows	UQ Benchmark Problems for Subsurface Flows	USACM Benchmark Problems: Validation	Proposal for a 2014 Verification and Validation Challenge Workshop	
	Omar Ghattas*, Youssef Marzouk	Michael Emory*, Paul Constantine, Francisco Palacios, Gianluca Iaccarino	Dongxiao Zhang*, Hamdi Tchelepi, Yalchin Efendiev	Todd Oliver*	Kenneth Hu*, Gregory Weirs	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Paul Barbone						
RCC306C	Direct Computation of Inverse Problems of Elasticity for Biomedical Imaging		A Point-Source Sensitivity Approach for Source Localization	Novel Preconditioners for PDE-constrained Optimization		
	Isaac Harari*, Uri Albocher, Paul Barbone, Assad Oberai		Wilkins Aquino*, Anthony Sabelli	Youngsoo Choi*, Philip Avery, Walter Murray, Charbel Farhat, Michael Saunders		
TS5: 6.4 New Trends in Topology Optimization, Chair(s): Glaucio Paulino						
RCC307	New Trends in Topology Optimization: From Building Design to Reconstructive Craniofacial Surgery	Truss Layout Optimization Embedded in a Continuum	Optimal Design of 3d Woven Materials	Design Optimization Under Uncertainty for Rotor Blades Of Horizontal Axis Wind Turbines	System Reliability Based Topology Optimization for Structures Under Stochastic Excitations	
	Glaucio Paulino*, William Baker, Michael Miller	Tomas Zegard*, Glaucio Paulino	Seung-hyun Ha*, Sergey Kuznetsov, James Guest	Vahid Keshavarzzadeh*, Roger Ghanem	Junho Chun*, Junho Song, Glaucio H. Paulino	
TS5: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): Alessandro Reali						
RCC402	Blended Isogeometric Shells	Efficient Isogeometric NURBS-based Solid-Shell Elements: Mixed Formulation and Bbar-Method	An Isogeometric Solid-Like Shell Element for Modeling of Delamination in Composite Laminates	Treatment of Kinks in Isogeometric Reissner-Mindlin Shell Analysis	Isogeometric Structural Design Using Membrane Shell Theory	
	David Benson*, Stefan Hartmann, Yuri Bazilevs, Thomas Hughes	Robin Bouclier*, Thomas Elguedj, Alain Combescure	Saman Hosseini*, Joris J.C. Remmers, Clemens V. Verhoosel, Rene de Borst	Wolfgang Dornisch*, Sven Klinkel	Toby Mitchell*, Sanjay Govindjee, Robert Taylor, David Steigmann	
TS5: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. James D. Lee						
MAR-CA	An Atomistic-to-Continuum Multiscale Model of the Electric Double Layer		Construction of Multi-Dimensional Kernels for Nonlocal Elasticity from Phonon Dispersion Data and Validation through Molecular Simulations	Atomistic Effects in Electric Double Layers at High Voltages	The Molecular Simulations of GoldSulfur Interface in Solvent	
	Jeremy Templeton*, Reese Jones, Jonathan Lee, Kranthi Mandadapu		Susanta Ghosh*, Anthony Waas, Veera Sundararaghavan	Jonathan Lee*	Huachuan Wang*, Yongsheng Leng	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 4.5 Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials, Chair(s): L. Gambarotta						
MAR-CB	Product Properties of Two-phase Magneto-electric Composites		Computational Homogenization of Thin Structures Using a 7-Parameter Shell Formulation with Applications in Continuum and Nano Mechanics	A Space-Time Multiscale Coupling Strategy for Predicting Delamination Due to Impacts		
	Joerg Schroeder*, Marc Andre Keip, Matthias Labusch, Doru Lupascu		Yu Cong*, Saeid Nezamabadi, Hamid Zahrouni, Julien Yvonnet	Omar Bettinotti*, Olivier Allix, Benoit Malherbe, Victor Oancea		
TS5: 4.11 Multiscale Methods and Nonlocal Theories for Complex Material Behavior, Chair(s): Pablo Seleson						
MAR-CH	Peridynamics, Scaling, and Dynamic Fracture in Brittle Materials		Flux-Corrected Transport for Peridynamics	Multi-scale Peridynamic Simulations of Penetration of High-performance Concrete	Multiscale Modeling of Failure Evolution in Composite Materials: Transitioning from Diffuse Damage to Cracks	
	Robert Lipton*		Florin Bobaru*, Yenan Wang	Christopher Lammi*, Min Zhou	Michael Bogdanor*, Caglar Oskay, Robert Crouch, Stephen Clay	
TS5: 4.13 Recent Developments in Nanoscale Modeling of Materials of Materials, Chair(s): Jay Oswald & Xiaowei Zeng						
MAR-STB	Investigation of Electromechanical Response in Ferroelectric Nanostructures by An Atomistic Field Theory	DFT Studies of Advanced Mg- and Co-based Structural Alloys	Phase Field Modeling and Multi-Scale Simulation of Oxidation Kinetics: Transport of Charge Carriers Subject to Interfacial Reactions and Electrostatic Interaction	Molecular Dynamics Study of Mechanical Properties for CNT Embedded Nanocrystalline MgO		
	Liqiang Lin*, Xiaowei Zeng	James Saal*, Ahmed Issa, Chris Wolverton	Youhai Wen*	Zidong Yang*, James Lee, Xianqiao Wang, Azim Eskandarian		
TS5: 4.14 Multiscale Modeling of Materials Behavior in Extreme Environments, Chair(s): Donald W. Brenner, Leonid V. Zhigilei						
MAR-STE	Next Generation Potentials for Atomic-Scale Simulations	Fission Product Behavior in Nuclear Fuel	Microstructural Modeling of Failure Modes in Energetic Materials	Development of Multi-Scale Crystal Plasticity FEM Models for Nickel-Based Superalloys	Ab Initio Modeling of Dislocation and Dislocation Mobility in TiN Ceramic	
	S.B. Sinnott*	Chaitanya Deo*, Benjamin Beeler	Darrell LaBarbera*, Judith Brown, Mohammed Zikry	Shahriyar Keshavarzhadad*, Ahmad Shahba, Somnath Ghosh	Satyesh Yadav*, Ramamurthy Ramprasad, Richard Hoagland, Amit Misra, Xiang-Yang Liu	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS5: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Curt Bronkhorst						
MAR-UA	Localization of Deformation in Shear Bands and Cracks		Meshing Strategies for the Alleviation of Mesh-Induced Effects in Cohesive Element Models	A Computational Framework for the Treatment of Strain Localization in Metals under High Strain Rate Conditions	Investigation of Shear Damage Using an Anisotropic Damage Model	
	Elias C. Aifantis*		Julian J. Rimoli*, Juan J. Rojas	Hashem Mourad*, Curt Bronkhorst, Francis Addessio	Soondo Kweon*	
TS5: 5.3 Numerical Modeling and Engineering Design for Impact and Blast Problems, Chair(s): Matthew Whelan						
MAR-UB	On the Modeling of Woven Fabric Body Armor Under Ballistic Impacts	Experimental and Numerical Study on Tailor Welded Thin-Walled Structures for Impact Loading	Numerical Investigations of the Dynamic Behavior of a Rigid Shallow Foundation Under Varying Applied Vertical Impacts	Optimization of Airbag Deployment for Enhanced Passenger Safety in Vehicular Crashes		
	Matthew DiSogra*, Matthew Gutowski, Hongbing Fang, David Weggel	Guangyong Sun*	Corey Rice*, David Weggel, Miguel Pando	Qian Wang*, Ning Li, Hongbing Fang		
TS5: 5.5 New Challenges for the Computational Modeling of Solids at Failure, Chair(s): Christian Linder						
MAR-UC	Failure Predictions of Partially Saturated Quasi Brittle Materials with a Thermodynamically Consistent Gradient Poroplastic Theory	Homogenization Based Continuum Damage Model for Composites Under Monotonic and Cyclic Loading	A Deformation and Failure Model of Polyurea	An Anisotropic Elastic-Decohesive Constitutive Relation for Modeling Sea Ice		
	Guillermo Etse*, Antonio Caggiano	Shinu Baby*, Somnath Ghosh	Bo Li*, Stefanie Heyden, Kerstin Weinberg, Celia Reina Romo, Michael Ortiz	Han Tran*, Deborah Sulsky, Howard Schreyer		

Tuesday, July 23, Technical Session 6

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Per-Olof Persson						
RCC201	An Implicit High-Order Discontinuous Galerkin Solver for the Incompressible RANS and k-omega Equations	The Effect of Hanging Nodes on the Superconvergence of the HDG Method	Discontinuous Petrov-Galerkin Methods for Incompressible Flow: Stokes and Navier-Stokes	A Hybridized Discontinuous Galerkin Method for Time-Dependent and Stationary Convection-Diffusion Equations, Including the Compressible Navier-Stokes Equations		
	Antonio Ghidoni*, Francesco Bassi, Andrea Perbellini, Stefano Rebay, Andrea Crivellini	Yanlai Chen*, Bernardo Cockburn	Nathan Roberts*, Leszek Demkowicz	Jochen Schuetz*, Michael Woopen, Aravind Balan, Georg May		
TS6: 5.9 Pavement Mechanics and Simulation, Chair(s): John Bolander						
RCC202	Prediction of Dynamic Modulus of Asphalt Mixtures via Multiscale Micromechanical Simulation	Discrete Element Modeling of Asphalt Concrete Fracture Using Digital Image Correlation Displacement Fields	A Multiscale Virtual Testing Procedure towards the Prediction of Fatigue Performance of Asphalt Concrete	Developing New Mechanical Performance Test for Asphalt Mixtures		
	Amir Arshadi*, Hassan A Tabatabaee, Hussain U Bahia	Brian Hill*, Vivianne Carrilho Leao Ramos, William Buttlar, Glaucio Paulino	Arash Dehghan Banadaki*, Murthy N. Guddati, Y. Richard Kim	Behzad Behnia*, Brian Hill, Eshan Dave, William Buttlar, Nathan Kebede		
TS6: 9.9 Advances in BEM for Advanced Materials, Chair(s): J.R. Berger						
RCC203	Computation of the 2D Green's Function for Thick Soil Layers with Linearly Varying Stiffness	An Interpolation-Based Fast Multipole Boundary Integral Equation Method for Wave Equation	Localized Axial Green Function Method for Convection-Diffusion Equations on Complex Domain			
	Simon Jones*	Toru Takahashi*	Do Wan Kim*			
TS6: 2.6 Cardiovascular Biomechanics and Biomedical Engineering, Chair(s): John Brigham						
RCC204	Application of an Arterial Constitutive Model Accounting for Collagen Content and Crosslinking	Analysis of Aortic Root Rupture During Transcatheter Aortic Valve Implantation Using Computational Simulations	Parameter Free Outflow Boundary Conditions in Hemodynamics	An Analyses of Simulated Pressure Pilse in Human Pulmonary Arteries to Study the Wave Reflections During Health and Disease		
	Lian Tian*, Zhijie Wang, Jens Eickhoff, Ellen Arruda, Naomi Chesler	Qian Wang*, Susheel Kodali, Wei Sun	Pierre Gremaud*, Will Cousins, Daniel Tartakovsky	Muhammad Umar Qureshi*, Nicholas A Hill		

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 2.7 Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics, Chair(s): A. Figueroa						
RCC205	A Novel, Stable Loosely Coupled Scheme for Fluid-Multi-Layered Structure Interaction in Hemodynamics	Reduced Order Modeling based on Approximated Lax Pairs. Application to Cardiovascular Modeling.	Pulse Wave Propagation in the Embryonic Chick Heart	Conductivity Parameters Estimation for the Cardiac Bidomain Model	Validation of Computational Model Using ECG - A Systematic Study	
	Suncica Canic*, Martina Bukac, Roland Glowinski, Annalisa Quaini	Jean-Frederic Gerbeau*, Damiano Lombardi	Sevan Goenezen*, Liang Shi, Sandra Rugonyi	Huanhuan Yang*, Alessandro Veneziani	Shankarjee Krishnamoorthi*, Luigi Perotti, Olujimi Ajijola, Daniel Ennis, Alan Garfinkel, William Klug	
TS6: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): Cody Permann and Michael Short						
RCC206	Nanocomposites and Nanolaminates Subjected to Severe Plastic Deformation: Chemical Stability, Mechanical Properties, and Wear Resistance	Modeling the Crystallographic and Morphological Evolution of Cu/Nb Layered Composites by Accumulated Roll Bonding	Strength, Dislocation Density, and Size Effects in Metals: The Untold Story	Statistically Modeling Plastic Initiation in Nanodeformation	Modeling of Stochastic and Size Effects in Crystalline Materials	
	Pascal Bellon*, Robert Averback, Jian Zhou, Fuzeng Ren, Elvan Ekiz, Yinon Ashkenazy, Nhon Vo	Curt Bronkhorst*, Jason Mayeur, Irene Beyerlein, Hashem Mourad, Ben Hansen	Jaafar El-Awady*	James Morris*	Hussein Zbib*	
TS6: 3.4 Computational Fluid Mechanics for Free and Moving Boundaries, Chair(s): Jon Clausen						
RCC301A	Particle Methods: A Possibility to Solve in Real-Time the Incompressible Navier-Stokes Equations with Free and/or Internal Moving Boundaries	Lagrangian Particle Method for Compressible Euler Equations Based on Generalized Finite Differences	On the Oscillating Motion of a Red Blood Cell in Bounded Poiseuille Flows	An Interface Thickness Correlation for Efficient Smoothed Profile Modeling of Flow over Particles at Low Reynolds Numbers	Weak Imposition of Essential Boundary Conditions in the Finite Element Approximation of Elliptic Problems with Non-Matching Meshes	
	Sergio Idelsohn*, Eugenio Onate, Norberto Nigro	Hsin-Chiang Chen*, Wei Li, Tongfei Guo, Gaurish Telang, Roman Samulyak	Tsorng-Whay Pan*, Roland Glowinski, Lingling Shi, Yao Yu	Fazlolah Mohaghegh*, John Mousel, H. S. Udaykumar	Ramon Codina*, Joan Baiges	
TS6: 3.7 Finite Element Methods and High-Performance Computing for Environmental Fluid Mechanics, Chair(s): Kazuo Kashiyama						
RCC301B	Large Scale Tsunami Simulation by a Particle Method and its Application to Disaster Prediction	hp Discontinuous Galerkin Methods for the Vertical Extent of the Water Column	Development of a High-Resolution Tide-, Wind-, and Wave-Driven Ocean Circulation Model for the Northern Gulf of Mexico	Development and Validation of DG WAVE: a Discontinuous Galerkin-Based Numerical WAVe Prediction Model		
	Mitsuteru Asai Asai*	Colton Conroy*, Ethan Kubatko	Matthew Bilskie*, Stephen Medeiros, Scott Hagen	Angela Nappi*, Ethan Kubatko		

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Tod Laursen						
RCC302A	Handling Inequality Constraints Using Level Sets and the Extended Finite Element Method	A Nitsche Stabilized Embedded Finite Element Method for Frictional Sliding Problems	Finite Element Methods for Moving-Boundary Problems: High-Order Methods and Analysis	Embedded Finite Element Methods for Coupled Electro-Mechanical Field Simulation	Micro-Asperity-Based Multiscale Modeling of Friction and Wear Between Polymeric Engineering Surfaces	
	Nicolas Moes*, Nicolas Chevaugeon, Matthieu Graveleau	Chandrasekhar Annavarapu*, Martin Hautefeuille, John Dolbow	Evan Gawlik*, Adrian Lew	Gerd Brandstetter*, Sanjay Govindjee	Bhargava Sista*, Kumar Vemaganti	
TS6: 10.1 Fluid-Structure Interaction Algorithms & Applications, Chair(s): Cooper Elsworth						
RCC302B	Immersed Boundary Simulation of Flow Past Elastic Airfoils	Multi-Velocity Description of Material Interactions and Its Implementation Using the Material Point Method	A Novel Fluid-Structure-Thermal Interaction Algorithm for Modelling of Lubricating Gaps in External Gear Machines	FSI Analysis Using Monolithic Coupling Method Based on Level Sets	Direct Differentiation Analysis of Fluid-Structure Interaction Using the Particle Finite Element Method	
	Somnath Roy*, Somnath Sarangi, Manish Kumar	Xia Ma*, Duan Zhang	Sujan Dhar*, Andrea Vacca	Gaku Hashimoto*, Hiroshi Okuda	Michael Scott*, Minjie Zhu	
TS6: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Angelo Simone and JS Chen						
RCC302C	Immerse Finite Element Methods for Solving Interface Problems	Automatic Volume-Tracking Reconstruction of Interfaces in Multi-material Elements*	A Stable and Optimally Convergent Generalized FEM (SGFEM) for Linear Elastic Fracture Mechanics	A Partition of Unity Method with Penalty for Fourth Order Problems		
	Xu Zhang*, Tao Lin	Richard Kramer*, Stewart Mosso	Varun Gupta*, Armando Duarte, Ivo Babuska, Uday Banerjee	Christopher Davis*		
TS6: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): S. W. Chi						
RCC303	Stochastic Isogeometric Analysis for Uncertainty Quantification	Seamless Integration of Analysis and Design Using Implicit Boundary FEM	Simulation of Many Spherical Particles Moving in a Newtonian Fluid Using the Equivalent Inclusion Method	Isoparametric Reproducing Kernel Particle Method for Non-Linear Plate Analysis with High Order Nodal Integration		
	Sharif Rahman*	Ashok Kumar*, Zhiyuan Zhang	Huiming Yin*, Yingjie Liu, Po-Hua Lee	Chien-Ting Sun*, Pai-Chen Guan		
TS6: 9.8 Geometric Methods in Computational Mechanics, Chair(s): John A. Evans						
RCC304	Stokes Complexes and the Construction of Stable Finite Elements with Pointwise Mass Conservation	Serendipity Finite Element Methods for Computational Mechanics				
	Michael Neilan*, Richard Falk	Andrew Gillette*				

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 7.1 Enabling Technologies and their Application for Advancing Computational Mechanics, Chair(s): William Barth						
RCC305A	Multiple-Level Parallel Domain Decomposition Jobs with Chiron	Finite Element Method Parallelism on Novel Architectures	PMDL-2LM: A Domain Decomposition Method for the Helmholtz Equation	Benchmark Analytic Solutions of the Dynamic Response of a Small Deformation Plastic or Viscoplastic Sphere	Coupling Simulations on CPU and GPU to Simulate Efficient Dynamic Cracks and Fractures in Solids	A Model Reduction Approach for Partitioned Treatment of Uncertainty in Coupled Domain Problems
	Alvaro Coutinho*, Jonas Dias, Eduardo Ogasawara, Gabriel Guerra, Erb Lins, Fernando Rochinha, Marta Mattoso	Roy Stogner*, Benjamin Kirk, Paul Bauman	Ali Vaziri Astaneh*, Senganal Thirunavukkarasu, Murthy Guddati	Brandon Chabaud*, Jerry Brock, Todd Williams	Patrick Diehl*, Marc Alexander Schweitzer	Mohammad Hadigol*, Alireza Doostan, Hermann G. Matthies, Rainer Niekamp
TS6: 9.4 Mini-Symposium on the Material Point Method and Other Similar Particle Methods, Chair(s): Xudong Xin/Zhen Chen						
RCC305B	The MPM Combined with DEM for Large-Scale Simulation of Multi-Body Collisions	Development of Interparticle Potential for Dissipative Particle Dynamics Simulation of Metals				
	Youqing Yang*, Xiangjun Qiu, Zhen Chen	Yong Gan*, Zhen Chen				
TS6: 9.7 Symposium on Trends in Unstructured Mesh Generation - MeshTrends IX, Chair(s): Steven Owen						
RCC306A	Universal Meshes for Computing with Nonconforming Tetrahedralization.	Tracking Hydrocarbons on Dynamic Basins Using Hex-Dominant Meshes	An Automatic Finite Element Mesh Generation Method for Heterogeneous Semi-Solid Materials	Improved Poisson-Disk Sampling for Meshing Applications		
	Hardik Kabaria*, Adrian Lew, Ramsharan Rangarajan	Brahim Yahiaoui*, Houman Borouchaki, Abdallah Benali	Hamid Sharifi*, Daniel Larouche	Mohamed Ebeida*		
TS6: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Isaac Harari						
RCC306C	Computationally Efficient Optimal Design of Localized Activation and Actuation for Morphing SMP Structures Using the Adjoint Method	On SAR Imaging through the Earths Ionosphere	Solution of Inverse Heat Conduction Problems Using Boundary Element Method and Differential Evolution			
	Shuang Wang*, John Brigham	Mikhail Gilman*, Erick Smith, Semyon Tsynkov	Fran Lobato*, Antonio Silva Neto			

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 6.4 New Trends in Topology Optimization, Chair(s): Glaucio Paulino						
RCC307	Toward Nonlinear Topology Optimization Based on a Ground Structure Approach	Optimized Design of Piezocomposite Energy Harvesting Devices With Stress Constraints	Topology Optimization of Structures with Continuum Damage Accumulation and Material Failure Constraints	Isogeometric Topology Optimization with Consistent Filtering		
	Adeildo Ramos Jr*, Glucio Paulino	Cesar Kiyono*, Emlio Silva	Kai James*, Haim Waisman	Junyoung Hur*, Yu-Deok Seo, Sung-Kie Youn		
TS6: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): David Benson						
RCC402	GPU Accelerated Formulation of the IGA Stiffness Matrix		A Performance Analysis of Isogeometric Methods	PetIGA: High Performance Isogeometric Analysis	Preconditioning Techniques for Mass Matrices from Isogeometric Analysis	
	Manolis Papadrakakis*, Alexander Karatarakis, Panagiotis Karakitsios		Nathan Collier*, Lisandro Dalcin, David Pardo, Maciej Paszyski, Victor Calo	Lisandro Dalcin*, Nathaniel Collier, Victor Calo	Longfei Gao*, Victor Calo	
TS6: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Ms. Jiaoyan Li						
MAR-CA	Numerical Simulation of the Semi-Solid Binary Aluminium Alloy and Study of its Elastic Behaviour Under Tensile Loadings	Thermo-Mechanochemical Model for Stress Relaxation During Oxidation	Verification and Validation of Finite Element Modeling for Silicone-Based Elastomeric Foam Materials	Shear Band Mechanics in Metallic Plates: The Poissons Effect and Strength Softening	An Efficient Absorbing Boundary Condition for the Schrodinger Equation in a Periodic Media with Local Perturbation	A Yield Function for Granular Materials Based on Microstructures
	Hamid Sharifi*, Daniel Larouche	Hamed Attariani*, Valery I. Levitas	Matthew Lewis*, Partha Rangaswamy, Cheng Liu	Xianqi Lei*, Yujie Wei, Wei-Hua Wang, A. L. Greer	Hossein Pourmatin*, Kaushik Dayal	Sihong Liu*, Liping Weng, Junwen Liu
TS6: 4.5 Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials, Chair(s): M. Cho						
MAR-CB	Effect of Phase Interactions on Crystal Stress Evolution in Two-Phase Polycrystalline Solid	A Multi-Scale Material Design Space for Predicting Fracture Toughness of Polycrystalline Metals	Multiscale Computational Homogenization for Thermoelastoplastic Behavior and Damage Evolution in Metal Matrix Composites	Multiple Temporal Scale Life Prediction in Composite Structures Undergoing Cyclic Loadings	3D Analysis of Morphology Effects on Failure of Thin Heterogeneous Layers by Multiscale Computational Homogenization	Numerical Homogenization of Seismic Attenuation and Dispersion in Poroelastic Composites
	Tong-Seok Han*, Sang-Yeop Chung	Yan Li*, Min Zhou, David McDowell	Tian Tang*	Robert Crouch*, Caglar Oskay, Stephen Clay	Matthew Mosby*, Karel Matous	Ralf Janicke*, Beatriz Quintal, Holger Steeb
TS6: 4.11 Multiscale Methods and Nonlocal Theories for Complex Material Behavior, Chair(s): Florin Bobaru						
MAR-CH	Peridynamic Constitutive Equations of Particle Systems	Hydrogen Effects on Dislocation Motion in BCC Iron: Hybrid Quantum and Classical Simulation	Numerical Methods and Analysis for Fractional Diffusion Equations	Evolution of Gradient-Coupled Dislocation-Densities in Polycrystals	A Micromechanical-Based Model of Dynamic Ductile Fracture of Porous Materials including the Effects of Strain Gradients	
	Alexander Panchenko*	Ryo Kobayashi*, Tomoyuki Tamura, Shuji Ogata	Danping Yang*, Hong Wang	Khalil Elkhodary*, Pratheek Shanthraj, Mohamed AbdelAal	Koffi Enakoutsa*, Mensah Yaogan, Djimedo Kondo	

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS6: 8.3 The Atomistic Basis of Non-Equilibrium Thermal Processes in Materials, Chair(s): Kranthi Mandadapu						
MAR-STB	Thermal Conductivity of Ar at High Pressure from First Principles	Full-Scattering, Lattice-Dynamics-Based Thermal Conductivity for Complex Dielectric Crystals	High Temperature Multifuctional Thermomechanics of Metallic and Ceramic Interfaces	The Effects of Grain Boundary Structures on Mechanical and Thermal Properties of Silicon by Atomistic Study	Long-Time Simulation of Nonequilibrium Flows	
	Aleksandr Chernatynskiy*, Simon Phillpot	Brent Kraczek*, Peter Chung	Vikas Samvedi*	Xiang Chen*, Liming Xiong, Youping Chen	Matthew Dobson*, Frederic Legoll, Tony Lelievre, Gabriel Stoltz	
TS6: 4.14 Multiscale Modeling of Materials Behavior in Extreme Environments, Chair(s): Mohammed Zikry, Tarek Hatem						
MAR-STE	Mesoscale Modeling of Shock Wave Propogation and Dynamic Failure in Metallic Systems	Entropic Stabilization of Nanoscale Voids in Materials under Tension	Modeling Initiation and Self-Sustaining Reaction in Al-CuO Reactive Multilayer Foils	Predicting Phonon Drag on Dislocation Motions by Coarse-grained Atomistic Simulations	Strain-Polarization Coupling and Dielectric Response in Ultra-Thin PbTiO3 Nanowires	
	Avinash Dongare*	Danny Perez*, Arthur Voter, Timothy Germann	Farshad Saberi-Movahed*, Carissa. Goldstein, Edward Mily, Douglas Irving, Jon-Paul Maria, Donald Brenner	Liming Xiong*, David McDowell, Youping Chen	Ghanshyam Pilania*, R. Ramprasad	
TS6: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Hashem Mourad						
MAR-UA	Real-time Monitoring of Stochastic Damage	Modeling Progressive Damage and Failure of 3D Woven Textile Composites Under Compression	A New Global-Local Deep Shell Element for Multilayered Composite Analysis	A Multiscale-Based Model for Composite Materials with Embedded PZT Filaments	Highly Reliable Detection of Micro-Cracks from Macro-Scale Observables	
	Ernesto Prudencio*, Paul Bauman, Danial Faghihi, J.T. Oden, Krishnaswa Ravi-Chandar	Wooseok Ji*, Anthony Waas	Daniele Versino*, Hashem Mourad, Todd Williams	Tarek Hatem*, Mohamed Abdel-Meguid, Amany Georgy, Yehia Bahei-El-Din, Erasmo Carrera	Sourish Chakravarty*, Sonjoy Das	
TS6: 5.3 Numerical Modeling and Engineering Design for Impact and Blast Problems, Chair(s): Qing Li						
MAR-UB	Fast Calculation Method for Contact/Impact Problems in Automotive Industry Using Triangle Element and GPU	Inter-Element Stabilization for Large-Deformation Elements to Solve Coupled CFD/CSD Blast and Impact Problems	Finite Element Modeling of a Hybrid III Dummy for Highway Crash Simulations	Multi-Material Interaction Analysis with Stabilized Finite Element Method in Fixed Mesh		
	Guangyao Li*, Yong Cai	Orlando Soto*, Joseph Baum, Rainald Lohner	Ning Li*, Matthew Gutowski , Matthew DiSogra , Hongbing Fang	Shigenobu Okazawa*, Toru Hamasaki, Satoyuki Tanaka		

12th U.S. National Congress on Computational Mechanics Technical Program

Wednesday July 24, 2013

Panel on Careers in Computational Mechanics, Wednesday, July 24, 2013
9:00 – 9:45 am, RCC Ballroom B
Chaired by John Dolbow and Murthy Guddati
Panelists: J. Tinsley Oden (University of Texas at Austin), James Stewart (Sandia National Laboratories) Tod Laursen (Khalifa University)

A panel discussion on careers in computational mechanics will take place in Ballroom B of the Raleigh Convention Center. After presentations by each of the panelists, the session will be open for Q&A.

Semi-Plenary Lecture, Wednesday, July 24, 2013
1:00 – 1:45 pm, RCC Ballroom A
Algorithmic Adaptations to Extreme Scale
David Keyes, KAUST
Abstract: An oft-quoted motivation for extreme computing is to tackle critical energy and environmental simulations, to improve prediction

by: relaxing the decoupling, improving the fidelity of the physics, increasing the resolution, and quantifying the uncertainty. Meeting these objectives will indeed justify the daunting development, acquisition, and operation costs of the new hardware. New hardware is, however, only part of the challenge and carries perhaps neither the highest risk nor the highest payoff. Much mathematics and software appears to be missing if the hardware is to be used near its potential, since our existing scientific computing code base has been assembled under pressure to squeeze out as many floating point operations as possible and to improve the execution rate of the ones that remain. Instead, for reasons of energy and acquisition cost, algorithms must now focus on squeezing out synchronizations, memory, and memory transfers, including copies. For instance, the promises of multiphysics simulation will not be realized in extreme-scale computational environments in the primary manner through which codes are coupled today, through divide-and-conquer operator splitting, in which entire groups of interdependent fields are processed sequentially, each waiting for completion of the previous and each being copied back in for reading by another after being processed. High concurrency and power-efficient design of the individual cores put opposite pressures on algorithms: requiring both more data locality and more freedom to redistribute data and computation. Besides porting current algorithmic functionality to emerging architectures, new functionality needs to be developed to exploit the possibilities of the merger of the third and fourth paradigms of large-scale data and large-scale simulation, in areas such as data assimilation, inversion, optimization and design, sensitivity analysis, and uncertainty quantification. After decades of algorithm refinement during a period of programming model stability new programming models and new capabilities must be developed simultaneously. We extrapolate current trends and speculate on new directions.

Biography: David is the inaugural Dean of Computer, Electrical and Mathematical Sciences and Engineering at KAUST and an adjunct professor of Applied Mathematics at Columbia University. Keyes graduated in Aerospace and Mechanical Sciences from Princeton and earned a doctorate in Applied Mathematics from Harvard. With backgrounds in engineering, applied mathematics, and computer science, he works at the algorithmic interface between parallel computing and the numerical analysis of partial differential equations. For his algorithmic influence in simulation, Keyes has been named a Fellow of the Society for Industrial and Applied Mathematics (SIAM) and of the American Mathematical Society (AMS). The IEEE Computer Society gave him the Sidney Fernbach Award is 2007 and he was a co-winner of ACM's Gordon Bell Prize in 1999. Editor or co-author of many U.S. federal agency reports on computational science and engineering, Keyes received the SIAM Prize for Distinguished Service to the Profession in 2011.

Semi-Plenary Speaker, Wednesday, July 24, 2013
1:00 – 1:45 pm, RCC Ballroom C
The Hybridizable Discontinuous Galerkin Methods
Bernardo Cockburn, University of Minnesota

Abstract: We introduce the hybridizable discontinuous Galerkin (HDG) methods in the framework of steady-state diffusion problems and show why they can be implemented more efficiently than any other DG method and why they are also more accurate. We then give an

overview of the application of these methods to several problems including wave propagation, linear and nonlinear elasticity, convection-diffusion and the incompressible and compressible Navier-Stokes equations.

Biography: Dr. Cockburn received his PhD from the University of Chicago in 1986 under the direction of Jim Douglas, Jr. Since 1987, he has worked at the School of Mathematics at the University of Minnesota. In 2010, he was an Invited Speaker at the International Congress of Mathematicians. He is an ISIS Highly Cited author as well as a McKnight Distinguished University Professor. In addition, he is a Chair Professor at the Department of Mathematics and Statistics of King Fahd University of Petroleum and Minerals. Dr. Cockburn is best known for work on discontinuous Galerkin methods for partial differential equations. More information about Dr. Cockburn can be found at http://www.math.umn.edu/~cockburn/.

Wednesday, July 24, Technical Session 7

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Krzysztof Fidkowski						
RCC201	Artificial Viscosity for Shock Capturing and Turbulence Simulations with High-Order Discontinuous Galerkin Methods		Fully Compressible Flow Model and High-Order Simulation of Convection and Differential Rotation of the Sun	A Discontinuous Galerkin Approach for Direct Numerical Simulation of Compressible Turbulence	Simulation of An Oscillating-Wing Power Generator Using a High-Order CFD Method	
	Per-Olof Persson*		Junfeng Wang*, Chunlei Liang, Mark Miesch	Eric Johnsen*	Bin Zhang*, Chunlei Liang	
TS7: 5.9 Pavement Mechanics and Simulation, Chair(s): Silvia Caro						
RCC202	Backcalculation of Pavement Properties via System Identification with Applications for Road Evaluation Using FWD and GPR	DEM Applications within a General Purpose Finite Element Package	Calculation of Required Reclaimed Asphalt Pavement Particle Heating Times during Drum Heating	Asphalt Airport Pavement Backcalculation and Its Validation in FAAs NAPTF		
	Ali Sangghaleh*, Yingchun Cai, Ernian Pan	Ritwick Roy*, Victor Oancea, Harry Harkness, Jarek Konert	Christopher DeDene*, Vaughan Voller, Eshan Dave, Mihai Marasteanu	Yuanguo Chen*		
TS7: 9.9 Advances in BEM for Advanced Materials, Chair(s): J.R. Berger						
RCC203	A Topology Optimisation Method for Transmission Problems of Electromagnetic Wave in 2D with the Level Set Method and BEM	Dynamic Crack Growth Analysis in the Laplace-Space Frequency Domain by the Symmetric-Galerkin Boundary Element Method	Application of Hierarchical Matrices to Elastodynamic FEM-BEM Coupling in the Frequency Domain			
	Hiroshi Isakari*, Toshiro Matsumoto, Fumimasa Abe	Anh-Vu Phan*, Sayna Ebrahimi	Pieter Coulier*, Stijn Francois, Geert Lombaert, Geert Degrande			
TS7: 2.4 Computational Modeling of Native and Engineered Cardiovascular Tissue , Chair(s): Ilinca Stanciulescu						
RCC204	Towards a Mechanical Model of Human Heart Valves	An Investigation of Shape Analysis Methods for Assessment of Organ-Level Functional Changes in the Human Right Ventricle	Numerical Modeling of the Mechanical Behavior of Anisotropic Patterned Hydrogel	Analyses of the Influence Polymeric Scaffold Material Properties on the Mechanical Environment within Hollow Fiber Membrane Bioreactor	A Multi-Level Predictive Model for Reconstructive Microsurgical Flap Transfer	
	Stefanie Heyden*, Bo Li, Michael Ortiz, Wolfgang A. Wall	John Brigham*, Jia Wu	Tao Jin*, Ilinca Stanciulescu	Ginu Unnikrishnan*, Vinu Unnikrishnan, J N Reddy	Alok Sutradhar*, Michael Miller	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 2.7 Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics, Chair(s): M. Behr						
RCC205	A Multiscale Airflow Model for Aerosol Deposition Based on Healthy and Emphysematous Rat Lungs Data	"in vivo" Characterization of Patient-Specific Elasticity of Lung and Tumor Tissue from 4D CT Data	Transport and Deposition of Non-spherical Aerosols in Patient-specific Lung-airway Models	A Computational Hybrid Model of Inhaled Nanoparticle Deposition and Mass Transfer to Systemic Regions	A Non Linear Lumped Parameter Model of the Entire Compliant Lung Airway System: from Direct to Inverse Problems	
	Irene Vignon-Clementel*, Jessica Oakes, Celine Grandmont, Chantal Darquenne, Alison Marsden	Jaesung Eom*, Suvranu De	Yu Feng*, Clement Kleinstreuer	Arun Varghese Kolanjiyil*, Clement Kleinstreuer	Marcel Filoche*, Agnes Pradel, Kim Blanc, Christian Straus, Thomas Similowski	
TS7: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): David Field and Bala Radhakrishnan						
RCC206	Initial Stage of Creep in Ni Superalloys: a 3D Discrete Dislocation Dynamics Investigation		Investigation of Deformation Twins Using a DFT-informed 3D Phase Field Dislocation Dynamics (PFDD) Model	Observation and Modeling of Dislocation Structure Evolution		
	Marc Fivel*, Jean-Loup Strudel, Hyung-Jun Chang		Abigail Hunter*, Irene Beyerlein	David Field*, Zhe Leng		
TS7: 3.4 Computational Fluid Mechanics for Free and Moving Boundaries, Chair(s): Scott Roberts						
RCC301A	Multiphase Flow Computation with Anisotropic Adaptive Mesh		A Stabilized Edge-Based Finite Element Approach to Wave-Structure Interaction Assessment	Parallel Adaptive Simulation of Moving Boundary Problems Using Stabilized Finite Element Formulation and Allen-Cahn Phase Field Model	Flow Analysis in Complex Kneaders Using XFEM	
	Thierry Coupez*, Elie Hachem		Renato Elias*, Milton Gonalves, Alvaro Coutinho, Jos Alves, Nestor Guevara, Carlos Silva, Fernando Rochinha, Gabriel Guerra, Adriano Cortes, Daniel Silva	Andre Rossa*, Daniel Vasconcelos, Alvaro Coutinho	Patrick Anderson*, Iaroslav Vivat	
TS7: 3.7 Finite Element Methods and High-Performance Computing for Environmental Fluid Mechanics, Chair(s): Craig Michoski						
RCC301B	Finite Element System for Tsunami Waves	Towards Solving Near Shore Phase Resolving Nonlinear Waves Within the Framework of Green-Naghdi Type Solutions to the Pressure Poisson Equation	Analysis of Stabilization Methods for Discontinuous and Conforming Finite Element Formulations of the Variable Density Groundwater Flow and Solute Transport Model	Automatic Mesh Generation of Watersheds Using High-Resolution Digital Elevation Maps	Development of a Failure Analysis System of RC Structures Subjected to Dynamic Wave Impacts	
	Kazuo Kashiyama*, Yusuke Takahashi, Masaaki Sakuraba	Aaron Donahue*, Joannes Westerink, Andrew Kennedy	Timothy Povich*, Clint Dawson, Chris Kees, Matthew Farthing	Dustin West*, Ethan Kubatko	Seizo Tanaka*, Fangtao Sun, Muneo Hori, Tsuyoshi Ichimura, Maddegedara Wijerathne	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Michael Puso						
RCC302A	Discretization Methods for Large Sliding Contact	A Discrete Null-Space Method Applied to Frictional Contact and to Fluid-Rigid body Interaction Problems	Isogeometric Contact Element Enrichment			
	Ekkehard Ramm*, Manfred Bischoff, Martina Matzen, Christoph Wilking	Christian Hesch*, Peter Betsch	Callum Corbett*, Roger Sauer			
TS7: 9.6 Advances and Applications of the Generalized/Extended Finite Element Method, Chair(s): Angelo Simone and Sergio Proenca						
RCC302C	An Arbitrary Order Variationally Consistent Domain Integration Method for Galerkin Meshfree Methods		Reduced Meshfree Approximation of Static Singular Problems	Adaptively Weighted Numerical Integration Over Arbitrary Domains	A Genetic Algorithm for Efficient Numerical Integration of Nodal Forces in Extended Finite Element Simulations	
	J. S. Chen*, M. Hillman, Marcus Ruter		Camille Marodon*, J. S. Chen, Hsin-Yun Hu	Vaidyanathan Thiagarajan*, Vadim Shapiro	Xiao Liao*, Jay Oswald	
TS7: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): M. Ruter						
RCC303	Grading in the Generalized Finite Element Method and Quasi-Optimal Rates of Convergence		An Arbitrary Order Variationally Consistent Integration Method for Galerkin Thin Plate Analysis	Higher Order Stabilized Conforming Nodal Integration for Fracture Mechanics	Consistent Integration Schemes for Quadratic Meshfree Galerkin Methods	
	Victor Nistor*, Anna Mazzucato, Qingqin Qu		Michael Hillman*, J. S. Chen	Shih-Po Lin*, J. S. Chen	Qinglin Duan*, Xikui Li, Hongwu Zhang	
TS7: 9.2 Phase-Field Modeling and Simulation in Fluid Mechanics, Solid Mechanics and Life-Sciences, Chair(s): Kristoffer G. van der Zee						
RCC304	Diffuse Interface Surface Tension Models in an Expanding Flow		The Navier-Stokes-Korteweg Equations: Thermodynamics, Algorithms, and Applications	A Diffuse Interface Model for Electrowetting with Moving Contact Lines	Interface Tracking for Geophysical Mass Flows Using a Phase Field Method	
	Andrea Bertozzi*, Wangyi Liu, Theodore Kolokolnikov		Ju Liu*, Hector Gomez, Chad Landis, John Evans, Thomas Hughes	Abner Salgado*, Ricardo Nochetto, Shawn Walker	Hossein Aghakhani*, Abani Patra, David Salac	
TS7: 9.10 Advances in Numerical Methods for Linear and Non-Linear Dynamics, Chair(s): Gregory Hulbert						
RCC305B	Finite Element Modeling of Linear Elastodynamics Problems with Explicit Time-Integration Methods and Linear Elements with Reduced Eispersion: Comparative Study of Different Finite Element Techniques.		An Approximation of Transient Behavior of Semiconductor Devices by Mixed Finite Element Method and Characteristics-Mixed Finite Element Method	Multiple Length Scale and Time Scale Coupling for Linear Structural Dynamic Equations	A Pseudo-Pseudo Spectral Method for Shear Horizontal Circumferential Waves in Non-Homogenous Anisotropic Cylinders	
	Alexander Idesman*		Qing Yang*, Yirang Yuan	Tejas Ruparel*, Azim Eskandarian, James Lee	Vasudeva Rao Yerikalapudy*, Anu Radha Vema, Sudheer Gopinathan	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 9.3 General Polyhedral Discretizations: Meshing, Formulations, and Application, Chair(s): Joe Bishop						
RCC306A	Polyhedral Finite Elements: Their Promise and Challenges	Rapid Meshing of Complex Geometries Using Polyhedral Finite Elements.	New Perspectives on Polygonal and Polyhedral Finite Element Methods	A Displacement-Based Finite-Element Formulation for General Polyhedra Using Harmonic Shape Functions		
	Mark Rashid*	Samuel Key*	N. Sukumar*, Gianmarco Manzini, Alessandro Russo	Joseph Bishop*		
TS7: 12.3 Methods and Applications for Experimental Design with Uncertainties, Chair(s): Quan Long						
RCC306B	Sequential Bayesian Experimental Design with Applications to Biological Systems		Optimal Design of Experiments for Infinite Dimensional Statistical Linear Inverse Problems	Optimal Sequential Experimental Design via Dynamic Programming	Fast Estimation of Expected Information Gain for Experimental Design of Underdetermined Models	
	Gabriel Terejanu*, Xiao Lin		Alen Alexanderian*, Noemi Petra, Georg Stadler, Omar Ghattas	Xun Huan*, Youssef Marzouk	Quan Long*, Marco Scavino, Raul Tempone, Suojin Wang	
TS7: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Assad Oberai						
RCC306C	Ensemble Kalman Methods for Inverse Problems	A New Adaptive Inversion Algorithm Using Error-Controlling-Surrogates	An Adaptive Approach for Generation of Reduced-Order Models for Computational Inverse Mechanics Strategies			
	Kody Law*, Andrew Stuart, Marco Iglesias	Weixuan Li*, Dongxiao Zhang	Mohammad Ahmadpoor*, John Brigham			
TS7: 6.4 New Trends in Topology Optimization, Chair(s): Glaucio Paulino						
RCC307	Design of Tridimensional Electro-Thermo-Mechanical MEMS Based on Topology Optimization and Graphics Processing Units	Design of Electro-Thermo-Mechanical MEMS Based on Non-Linear Topology Optimization Method	Dynamic Design of Laminated Piezocomposites Structures (LAPS) Using Topology Optimization Method			
	Francisco Javier Ramirez Gil*, Wilfredo Montealegre Rubio, Marcos de Sales Guerra Tsuzuki	Claudia Marcela Prez Madrid*, Francisco Javier Ramrez Gil, Wilfredo Montealegre Rubio	Ruben Andres Salas*, Emilio Silva			
TS7: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): Trond Kvamsdal						
RCC402	Three-Dimensional Simulation of Unstable Gravity-dDriven Infiltration of Water into a Porous Medium Using Isogeometric Analysis		Accurate, Efficient, and (Iso)geometrically Flexible Collocation Methods for Phase-Field Models	Micromechanical Failure Modeling of Trabecular Bone Using Isogeometric Analysis	Optimization by Isogeometric Analysis for Cardiovascular Applications: Bypass Grafts Configuration	
	Hector Gomez*, Luis Cueto-Felgueroso, Ruben Juanes		Alessandro Reali*, Hector Gomez, Giancarlo Sangalli	Rene De Borst*, Clemens Verhoosel, Gertjan Van Zwieten	Luca Dede'*, Toni Lassila, Alfio Quarteroni	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. Xiaowei Zeng						
MAR-CA	Length Scale Dependent Deformation in Polymers Comparison of Simulations with Experiments	Modeling and Simulation of Cell Crawling	Numerical Crack Propagation Simulation in Polycrystalline Alloys Using Crystal Plasticity Finite Element Method	A Gradient Plasticity Formulation Homogenization Theory from Meso to Macro	Modeling and Simulation in Strain-Induced Phase Transformations in a Diamond Anvil Cell	
	Nitin Garg*, Chung-Souk Han	Xiaowei Zeng*	Shang Sun*, Veera Sundararaghavan	Leong Hien Poh*	Biao Feng*, Valery Levitas, Oleg Zarechneyy	
TS7: 4.5 Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials, Chair(s): V. Kouznetsova						
MAR-CB	Dispersive Wave Propagation in Anisotropic Materials with Periodic Microstructures		Two-Scale Thermo-Electro-Chemo-Mechanical Simulation of SOFC Subjected to Sintering	A Multi-Scale Analysis Procedure for the Piezoelectric ZnO Nanowires	Morphology Optimization of Microstructure for Dual-Component Structural Metals	Microstructural Models for Highly Dense Heterogeneous Materials
	Luigi Gambarotta*, Andrea Bacigalupo		Kenjiro Terada*, Ken Takahashi, Shinsuke Takase, Tatsuya Kawada	Jin-Myoung Lim*, Janghyuk Moon, Kyeongjae Cho, Maenghyo Cho	Ikumu Watanabe*, Gaku Nakamura, Kohei Yuge	Axinte Ionita*, Brian M. Patterson, Bradford E. Clements
TS7: 4.4 Multiscale Modeling and Simulations of Materials Phenomena, Chair(s): Shailendra P. Joshi						
MAR-CH	Image-Based Analysis Techniques for Multiscale Modeling Efforts		A Technique-Synergy for the 3-Dimensional, Spatial, Characterization and Quantification of the Microstructure of Metal Alloys	Efficient Methods for Implicit Geometrical Representation of Complex Material Microstructures	A Reduced-Order Model of Titanium Alloy for the Control of Microstructure-Sensitive Material Properties	
	Andrew Geltmacher*, Alexis Lewis, Siddiq Qidwai		Kiran Narayanan*, Peter Rautek, Geoff West, Tamer El Sayed	Rui Yuan*, Sudhanshu Singh, Nikhilesh Chawla, Jay Oswald	Abhishek Kumar*, Veera Sundararaghavan	
TS7: 4.7 Computational Methods for Materials with Intrinsic Microstructure, Chair(s): Dennis Kochmann						
MAR-STA	Investigation of the Non-Linear Couplings in Finite Deformation Thermo-Elasticity: Statistical Mechanics and Monte Carlo Methods		Microscopic Finite Element Approach for the Simulation of Biopolymer Networks	Stiffening, Softening and Damage in Filament Networks	Finite Element Micro-Field Simulation Illustrating the Effect of Filler-Filler Interaction on Stress Softening in Filled Elastomers	Computational Homogenization of Soft Matter Materials Based on the Maximal Advance Path Constraint
	Sanjay Govindjee*, Aurelie Azoug		Christian J. Cyron*, Kei W. Mueller, Robijn Bruinsma, Andreas R. Bausch, Wolfgang A. Wall	Prashant Purohit*	Deepanshu Sodhani*, Stefanie Reese	Christian Linder*
TS7: 4.9 Concurrent Multi-length Scale Modeling: From Finite Elements to Atoms and Electrons, Chair(s): Qing Peng						
MAR-STB	Some Observations on the Size Effects in Nanotwined Metals and their Theoretical Explanation		Variance Reduction Approaches in Stochastic Homogenization	Multiscale Quantum Mechanics and Molecular Mechanics Study of Intein Proteins	Fast Algorithms for Density Functional Theory for Metallic Systems	
	Yujie Wei*		Frederic Legoll*	Saroj Nayak*	Jianfeng Lu*	

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS7: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Hashem Mourad						
MAR-UA	Lie-Group Interpolation and Variational Recovery for Internal Variables	Internal Variable Mapping to Support Geometry Adaptive Modeling of Ductile Failure	Using Massively Parallel Processors to Simulate Crack Propagation Problems with the Phase-field Formulation	Crack Nucleation and Branching in the X-FEM	Adaptive Graph-Based Insertion of Generalized Cohesive Elements in Simplicial Finite Element Meshes	
	Alejandro Mota*, WaiChing Sun, Jakob Ostien, James Foulk, Kevin Long	Michael Veilleux*, Alejandro Mota, John Emery, James Foulk III	Yongxing Shen*, Vahid Ziaei-Rad	Mark Merewether*, John Dolbow, Andrew Stershic	James Thunes*, Spandan Maiti	
TS7: 5.3 Numerical Modeling and Engineering Design for Impact and Blast Problems, Chair(s): David C. Weggel						
MAR-UB	A Simplified Nonlinear Dynamic Response Model for Reinforced Concrete Bridge Columns Subjected to Small-Standoff Detonations		Progressive Collapse Analysis of Reinforced Concrete Structures Under Blast Loading	Numerical Simulation of a Masonry Infill Wall Subjected to Blast Load Using Applied Element Method	Air-Blast Structural Performance Evaluation Using Multi-Degree-of-Freedom Methods	
	Eric Williamson*, Eric Sammarco, John Puryear, David Stevens, C. Kennan Crane		Alaa Chehab*, Christopher Eamon	Timothy Kernicky*, Matthew Whelan, David Weggel	Arturo Montalva*, Hollice Stone, Michael Hahn	
TS7: 5.4 Recent Advances in Computational Fracture Mechanics, Chair(s): Hiroshi Okada						
MAR-UC	Fracture Analyses of CFRP Composite Laminate by XFEM Using the Cohesive Zone Model	Modeling Plastic Fracture Mechanics by Inelastic Extended Finite Element Method (IXFEM)	Capturing Fracture Modes in Soil-Based Materials Using Enhanced Finite Elements	Three Dimensional Augmented Finite Element Method for Modeling Arbitrary Discontinuities in Heterogeneous Materials		
	Toshio Nagashima*	Shahriyar Beizaee*, Kaspar Willam	David Weed*, Craig Foster	Mehdi Naderi*, Qingda Yang, Reza Mohammadizadeh		

Wednesday, July 24, Technical Session 8

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Krzysztof Fidkowski						
RCC201	Locally Conservative Discontinuous Petrov-Galerkin Finite Elements for Convection-Diffusion Problems	Weighted Upwind Compact Scheme	A Reconstructed Discontinuous Galerkin Method Based on a Hierarchical WENO Reconstruction on Hybrid Grids	A Discontinuous Galerkin Chimera Scheme with Implicit Artificial Boundaries		
	Truman Ellis*, Leszek Demkowicz	Zhengjie Wang*, Huankun Fu, Chaoqun Liu	Hong Luo*, Yidong Xia, Megan Frisbey	Marshall Galbraith*, Robert Knapke, Paul Orkwis, John Benek		
TS8: 13.3 Mathematical Modeling, Constitutive Theories, and Computations, Chair(s): Karan S. Surana						
RCC202	Giesekus Constitutive Model for Thermo-viscoelastic Fluids Based on Ordered Rate Constitutive Theories	A Simple Mixture Theory for Isothermal and Non-isothermal Flows of n Newtonian and Generalized Newtonian Constituents Including Interaction Effects	Unified Constitutive Modeling of Rubber-like Materials under Diverse Loading Conditions	Simulations of Diffusion Driven Phase Transformations in Stressed Multiphase Multicomponent Solids	Mathmatical Models and Numerical Studies for Fluid-Solid Interaction for Small Deformation of Solid Medium	A Robust General Locking-Free Shell Element with Thickness Strech for Large Deformation Analysis of FGM and Composite Structures
	Karan S. Surana*, Daniel Nunez, J. N. Reddy	Thomas Hirst*, Karan S. Surana, J.N. Reddy	Gerard-Philippe Zehil*, Henri P. Gavin	Subramanya Sadasiva*, Ganesh Subbarayan, Daniel Pantuso	Brian Blackwell*, Karan Surana, Michael Powell, J.N. Reddy	Venkat Vallala*, Gregory Payette, JN Reddy
TS8: 8.2 Continuum Theories for Modeling Atomic Scale Physics: Novel Models and Methods, Chair(s): Jonathan Zimmerman						
RCC203	Multiscale Modeling of Multi-physics from Atoms to Atom-based Continuum		Computational Treatment of Diffusive Phase Transformations in Battery Materials Driven by Free Energy Non-Convexities in Composition and Strain	Continuum Scale Constitutive Laws Extracted from Atomistic Simulations Using Bayesian Inference and Uncertainty Quantification Methods	Measuring Thermal Conductivity of Materials by Coarse-grained Atomistic Simulations	Youngs Modulus and Nanotube/Polymer Interfacial Binding Energy of Covalently Functionalized Single-Walled Carbon Nanotubes
	James Lee*, Jiaoyan Li		Shiva Rudraraju*, Anton van der Ven, Krishna Garikipati	Maher Salloum*, Jeremy Templeton	Youping Chen*, Liming Xiong	Priyal Shah*, Romesh Batra
TS8: 2.1 Biomechanics of Living Matter, Chair(s): Rafael Grytz/Ellen Kuhl						
RCC204	Biomechanics of Native and Tissue Engineered Anterior Cruciate Ligament		Finite Element Modeling of the Face: Wrinkle Formation in the Forehead	A Novel Computational Framework for to the Coupled Bio-Chemo-Mechanical Interaction During Wound Healing	Computational Analysis of Drug Jets for Transdermal Drug Delivery	A New Insight Into the Toughening Mechanism of Nacre
	Ellen Arruda*, Jinjin Ma		Johannes Weickenmeier*, Edoardo Mazza	Adrian Buganza Tepole*, Ellen Kuhl	Eduardo M. B. Campello*, Tarek Zohdi	Ning Zhang*, Youping Chen

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 2.7 Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics, Chair(s): A. Figueroa						
	Patient Specific Modeling of Blood Flow and Pressure Dynamics	3D Simulation of the Arterial Baroreflex Under the Effect of Gravity	Sensitivity of a Blood Flow Model of the Human Arterial Network on Anatomical Variations of the Circle of Willis	Multiscale Models for Perfusion, Microcirculation and Drug Release	Computational Analysis of Direct Tumor-Targeting with Therapeutic Micro- and Nano-Particles in a Representative Hepatic Artery System	
RCC205	Mette Olufsen*	Kevin D Lau*, C. Alberto Figueroa	Antony Beris*, Matthew Benjes, Alex Apostolidis	Laura Cattaneo*, Davide Ambrosi, Raimondo Penta, Alfio Quarteroni, Paolo Zunino	Emily Childress*, Clement Kleinstreuer	
TS8: 13.1 Predictive Modeling of the Co-Evolution of Microstructure and Properties, Chair(s): Marc Fivel and Jafaar El-Awady						
RCC206	Co-Evolution of Microstructure and Mechanical Properties in Structural Alloys - Case Studies	Discrete Dislocation Dynamics Simulations of Microstructure Evolution in Micro- and Nano-Crystals	Multi-Length Scale Modeling Of Martensitic Transformations In Stainless Steels Under Shock Loading	Frank-Read Source Operation within a Stress-Gradient	Multi-Scale Models of Shape Memory Alloys Actuator	
	Bala Radhakrishnan*, Sarma Gorti, Kevin Clarno	Giacomo Po*	Hemantha Kumar Yeddu*, Turab Lookman, Avadh Saxena	Ben Szajewski*, Srinath Chakravarthy, William Curtin	Sherif Elewa*, Tarek Hatem	
TS8: 3.4 Computational Fluid Mechanics for Free and Moving Boundaries, Chair(s): Patrick Anderson						
RCC301A	Improved Level-Set Algorithm for High Density-Ratio and Variable Density Flows	PAM-ReS: Polygonal Area Mapping on Rectangular Grids with Splinegons for Fourth-Order Interface Tracking	A RKDG Method for Inviscid Two-Phase Flow	Implicit Virtual Boundary Method for Moving Boundary Problems on Non-Staggered Cartesian Grid System	An Interface-Tracking Model for Charged Droplet Electro-Coalescence	
	Scott Roberts*, David Noble, Rekha Rao	Qinghai Zhang*, Aaron Fogelson	Scott Miller*, Jules Lindau	Shong-Leih Lee*, Ke-Wun Chen, Guo-Sian Cyue	Lindsay Crowl Erickson*	
TS8: 3.7 Finite Element Methods and High-Performance Computing for Environmental Fluid Mechanics, Chair(s): Peter Bacopoulos						
RCC301B	A Mathematical Model for Vibrio Cholera Colonization of the Human Intestine		Development and Application of a Discontinuous Galerkin Finite Element Model for the Great Lakes	Discontinuous Galerkin Solutions to the Shallow Water Equations in Channels with Curved Boundaries	Nonlinear Waves in Coastal Dynamics	Some Efficiency Improvements for Runge--Kutta Discontinuous Galerkin Methods
	Anna Spagnuolo*, Victor DiRita, Denise Kirschner		Ethan Kubatko*, David Dibling	Damrongsak Wirasaet*, Steven Brus, Ethan Kubatko, Craig Michoski, Joannes Westerink, Clint Dawson	Craig Michoski*, Clint Dawson, Kyle Mandli, Casey Dietrich	Benjamin Yeager*, Ethan Kubatko
TS8: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Jerome Solberg						
RCC302A	A Parallel Approach to Interface Description and Handling	Scalable TFETI with Variationally Consistent Discretization of Contact Conditions	Regularized Contact Conditions within a Dual Lagrange Mortar Contact Formulation	Data Transfer Operators for Three Dimensional Frictional Mortar Contact Problems		
	Rolf Krause*, Valentina Poletti, Petr Kotas, Patrick Zulian, Thomas Dickopf, Roberto Croce	Oldrich Vlach*, Zdenek Dostal, Tomas Brzobohaty	Kai Willner*, Saskia Sitzmann, Barbara Wohlmuth	Temesgen Kindo*, Tod Laursen, John Dolbow		

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 10.2 Recent Advances on Modeling Methods for Fluid-Structure Interaction Systems , Chair(s): Lucy Zhang						
RCC302B	Numerical Simulations of the Periciliary Liquid Layer of the Human Respiratory System by the Immersed Boundary Method		Stable Explicit Interface Advancing Scheme for Fluid-Structure Interaction with Applications to Fish Swimming Simulation: A Legacy of Euler, Cauchy and Piola	Efficient Method to Study the Influence of Immersed Structures in an Acoustic Fluid Using XFEM and Modal Reductions	Immersed Methods with Mass and Heat Transfer	
	Khoo Boo Cheong*, Pahala Gedara Jayathilake, Zhijun Tan, Duc Vinh Le, Heow Pueh Lee		Jie Liu*	Antoine Legay*	Sheldon Wang*	
TS8: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): V. Nistor						
RCC303	A Goal-oriented Error Estimator for Meshfree Methods Based on a Multi-space Approach		An Oscillation-Limited Meshfree Formulation for Shock Modeling	Cohesive Meshfree-Enriched Finite Element Method for Explicit Dynamic Fracture Analysis in Solids	Internal Penalty Method for Multi-Region Shell Problems Using Meshless Approximation	
	Marcus Ruter*, J.S. Chen		Michael Roth*, J. S. Chen, Thomas Slawson, Kent Danielson	Wei Hu*, C. T. Wu	Jorge Costa*, Paulo Pimenta, Carlos Tiago	
TS8: 9.2 Phase-Field Modeling and Simulation in Fluid Mechanics, Solid Mechanics and Life-Sciences, Chair(s): Kristoffer G. van der Zee						
RCC304	Modeling Fabrication of Thin Film Electronics: Fluid-Mechanics and Morphology Evolution		How Do Evaporating Thin Films Evolve: Understanding Phase Separation Mechanisms in Thin Films	Numerical Solution of Multispecies Tumor Growth Model	Mixture Theory and its Application to Growth Mechanics	
	Baskar Ganapathysubramanian*, Olga Wodo		Olga Wodo*, Baskar Ganapathysubramanian	Ernesto Augusto Bueno da Fonseca Lima*, Regina C. Almeida, J. Tinsley Oden	Yusheng Feng*	
TS8: 5.1 Mathematical and Numerical Modeling of Degradation of Materials and Structures, Chair(s): Kalyana Babu Nakshatrala						
RCC305A	Durability Prediction of Leached Hydraulic Concrete Based on Multi-scale Mechanism Analysis	On Modeling Thermal and Moisture Degradation of Materials and Structures	The Coupling of Damage and Plasticity for Concrete Materials	Mechanical Interaction of Brick and Mortar Interface in Unreinforced Masonry Triplets subjected to Shear and Compression		
	Fuheng Ma*, Jiang Hu, Haiying Pan, Ziyang Li	Maruti Kumar Mudunuru*, Kalyana Babu Nakshatrala, C. Xu	Giovanna Xotta*, Shahriyar Beizaee, Kaspar Willam	Mir Mohammad Reza Mousavi*, Bora Acun, Kaspar J Willam		
TS8: 9.10 Advances in Numerical Methods for Linear and Non-Linear Dynamics, Chair(s): Alexander Idesman						
RCC305B	Monolithic vs. Staggered Coupling Algorithms for First- and Second-Order Transient Systems	Computation of Cyclic Steady States in Rolling Bodies with Treaded Exterior Boundaries	Dynamic Contact Simulation and Fatigue Analysis of a Differential Gear	Effective Method for Modal Frequency Response Calculation	Do We Always Include the Concerned Nodes in the Condensed System?	Comparative Analysis of Results of Dynamic Behavior of Structures Obtained Using Numerical Models for Different Accuracies
	Saeed Karimi*, Kalyana Babu Nakshatrala	Trevor Potter*, Sanjay Govindjee, Jon Wilkening	Liangmo Wang*, Pingping Duanmu, Hanguan Xia, Hongjun Zhao, Yi Dong	Mikhail Belyi*	Dongjin Lee*, Seongmin Chang, Maenghyo Cho	Aleksandar Sedmak*, Boris Folic

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 9.1 Advances in Finite Element Methods for Tetrahedral Mesh Computations, Chair(s): M. Gee						
RCC306A	An Adapted Jameson-Schmidt-Turkel (JST) Scheme for Fast Solid Dynamics	Development of a Stabilised SUPG Formulation for a New Conservation Law Formulation in Lagrangian Fast Solid Dynamics	Pressure Stabilized Tetrahedral Element for Large Deformation Problem of Nearly Incompressible Hyperelasticity	A Stable Nodal Strain Tetrahedron for Finite Deformation Elasticity	A Stable and Accurate Nodal Tetrahedral Finite Element for Transient Solid Dynamics: A Variational Multiscale Approach	
	Miquel Aguirre*, Antonio J. Gil, Javier Bonet, Chun Hean Lee	Chun Hean Lee*, Antonio Gil, Javier Bonet, Miquel Aguirre	Takahiro Yamada*	Michael W. Gee*, Clark R. Dohrmann	Guglielmo Scovazzi*, Brian Carnes	
TS8: 12.3 Methods and Applications for Experimental Design with Uncertainties, Chair(s): Serge Prudhomme						
RCC306B	Assessing Extreme Event Risk - Study Case Volcanic Eruption Risks in Japan	Surrogate Construction and Dimensionality Reduction via Bayesian Compressive Sensing	Stochastic Collocation Methods for Stochastic Differential Equations Driven by White Noise	Compressed Sensing and Cross Validation for Quantifying Uncertainty in Black Box Models Using Grid Free Data		
	Ramona Stefanescu*, Abani Patra, Marcus Bursik	Khachik Sargsyan*, Cosmin Safta, Daniel Ricciuto, Bert Debusschere, Habib Najm, Peter Thornton	Zhongqiang Zhang*, Boris Rozovsky, George Karniadakis	John Jakeman*, Michael Eldred		
TS8: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Paul Barbone						
RCC306C	Fast Algorithms for Kalman Filters and Uncertainty Quantification		Efficiently Quantifying Parameter Uncertainty in Inverse Problems	Infinite Dimensional Uncertainty Quantification in Model Inadequacy for a Convection-Diffusion Model Problem	Solution of Inverse Problems with Limited Forward Model Evaluations: A Bayesian Framework	
	Eric Darve*, Sivaram Ambikasaran, Judith Yue Li, Peter K. Kitanidis		Bryan Chu*, Assad A. Oberai, Paul Barbone	Damon McDougall*, Todd Oliver, Robert D. Moser	Ilias Bilionis*, Nicholas Zabaras	
TS8: 9.11 Qualitative and Quantitative Comparison of Numerical Methods for Solving Partial Differential Equations, Chair(s): Scott Miller						
RCC307	Comparison of Solution Verification Techniques		Super-Geometric Convergence of Numerical Methods for Differential Equations	A Comparison of Fluid-Structure Interaction Coupling Algorithms Using the Finite Element Method		
	V Gregory Weirs*, James Kamm, Bill Rider		Tzon-Tzer Lu*	Jason Sheldon*, Scott Miller, Jonathan Pitt		
TS8: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): Yuri Bazilevs						
RCC402	Volumetric T-Spline Construction from Boundary Representations		Hierarchical T-Splines	Generalized Hierarchical Spline Spaces	Isogeometric Domain Parameterization Using Template Mapping	
	Jessica Zhang*		Emily J. Evans*, Michael Scott	Urska Zore*	Antonella Falini*, Angelos Mantzaflaris, Bert Juettler	

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 4.1 Continuum, Micro-scale and Nano-scale Material Modeling and Characterization, Chair(s): Dr. Lifeng Wang						
MAR-CA	Shape Memory Effect of Interpenetrating Phase Polymer Composites	Melting of Aluminum Nanoparticles within Alumina Shell at High Heating Rates	Meso-mechanically Motivated Modeling of Layered Fiber Reinforced Composites Accounting for the Onset of Delamination	Comparison of Numerical and Experimental Results of Woven Fiber Reinforced Plastics at the Mesoscale	Interfacial Mechanics of Carbon-Based Hierarchical Composites	
	Lifeng Wang*	Yong Seok Hwang*, Valery Levitas	Jaan-Willem Simon*, Bertram Stier, Stefanie Reese	Bertram Stier*, Jaan-Willem Simon, Stefanie Reese	Shanyi Du*, Xiaodong He, Yibin Li	
TS8: 4.5 Multiscale Computational Homogenization for Bridging Scales in the Mechanics and Physics of Complex Materials, Chair(s): K. Terada						
MAR-CB	A Predictive Multiscale Computational Framework for Viscoelastic Properties of Polymeric Materials	Microstructural Modeling of Heterogeneous Materials Using Spectral Methods	Analysis on Anisotropy of Void Distribution and Stiffness of Lightweight Aggregate Using CT Images	Micromechanical Model for Mullins Effect Induced Anisotropic Damage in Filled Elastomers	A Second-Order Computational Homogenization Scheme of Granular Materials with Nested FEM-DEM Solution Procedure	Micromechanics Modeling for the Ultra-High Temperature Creep Mechanisms of ZrB2-SiC Composites
	Ying Li*, Shan Tang, Brendan C. Abberton, Martin Kroger, Wing Kam Liu	Pratheek Shanthraj*, Martin Diehl, Philip Eisenlohr, Franz Roters	Sang-Yeop Chung*, Tong-Seok Han	Ajay Bangalore Harish*, Peter Wriggers	Xikui Li*, Yuanbo Liang, Qinglin Duan	Chi-Hua Yu*, Chang-Wei Huang, Chuin-Shan Chen, Yanfei Gao, Chun-Hway Hsueh
TS8: 4.4 Multiscale Modeling and Simulations of Materials Phenomena, Chair(s): Ajit Achuthan						
MAR-CH	A Molecular Dynamics (MD) Based Investigation on the Dislocation Dynamics Under Nanoindentation	Micromechanics of Pure Magnesium from Atomistic Investigations	Size and Strain Rate Effects on the Mechanical Response of Nanopillar Metallic Glasses: A Molecular Dynamics Study	Multiscale Modeling of Irradiated Polycrystalline FCC Metals		
	Ajit Achuthan*, Ajith UKwattta	Shailendra Joshi*, Ramin Aghababaei	Sara Adibi*, Paulo Branicio, Shailendra JOSHI	Rahul .*, Suvranu De		
TS8: 4.7 Computational Methods for Materials with Intrinsic Microstructure, Chair(s): Christian Linder						
MAR-STA	Finite Element Predictions of Grainscale Behavior in BCC Metals		A General Remodeling Law for Isotropic Rate Dependent Finite Plastic Deformations	Phase Field Modeling of Martensitic Transformations in Elastoplastic Materials	Enhancing the Ductility of Nanocrystalline Metals Using Disclinations	Modeling the Mechanical Behavior of Small-Scale Structural Materials
	Christopher Weinberger*, Hojun Lim, Jay Carrol, Corbett Battaile, Brad Boyce		Ben Nadler*	Regina Schmitt*, Ralf Mueller, Robert Skorupski, Marek Smaga, Dietmar Eifler	Michael Demkowicz*, Guoqiang Xu	Dennis M. Kochmann*, Jeffrey S. Amelang, Sebastian Kroedel, Gabriela N. Venturini

ROOM	02:00 PM	02:20 PM	02:40 PM	03:00 PM	03:20 PM	03:40 PM
TS8: 4.9 Concurrent Multi-length Scale Modeling: From Finite Elements to Atoms and Electrons, Chair(s): Qing Peng						
MAR-STB	Concurrently Coupled Atomistic and Continuum Simulation of Bi-crystal Strontium Titanate	A Damping Boundary Condition for Coupled Atomistic Continuum Simulations	Concurrent Coupling of Scale-Disparate Discrete and Continuous Dynamics	A Real Three-Dimentional QCDFT Model and its Applications	Almost Exact Boundary Condition for One-Dimensional Schrodinger Equations	
	Shengfeng Yang*, Youping Chen	A. Tabarraei*, A. Sadeghirad, S. Shadalou	Senganal Thirunavukkarasu*, Murthy Guddati	Qing Peng*, Suvranu De	Shaoqiang Tang*, Gang Pang, Lei Bian	
TS8: 4.10 Multi-scale Modeling of Dynamic Behavior of Materials, Chair(s): Nitin Daphalapurkar						
MAR-STE	High Strain Rate Plastic Deformation of Alpha Iron: A Multiscale Study	A 3D Extended Arlequin Method for Quasi-Brittle Dynamic Fracture	Non-Equilibrium Quasicontinuum Analysis of Deformation Twinning in Magnesium	An Efficient Approach for Constitutive Modeling of Dynamic Failure in Heterogeneous Brittle Materials	Multi-Scale Failure Modeling of Interfaces Tailored with Self-Assembled Monolayers	
	Meijie Tang*	Mohammad Silani*, Hossein Talebi, Timon Rabczuk	Kevin Wang*, Michael Ortiz	Junwei Liu*	Amnaya Awasthi*, Martha Grady, Nancy Sottos, Philippe Geubelle	
TS8: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Somnath Ghosh						
MAR-UA	A Large-Deformation Gradient Theory for Elastic-Plastic Materials: Strain Softening and Regularization of Shear Bands		Advances in Gradient-Enhanced Damage Models with Evolving Length Scale	Fully Adaptive Damage Analysis Using The New Simple And Cheap Error Estimator	Influence of Length Scale Parameters for Nonlocal Crystal Plasticity on Localization in Polycrystalline Specimens	
	Lallit Anand*		Angelo Simone*	Tymofiy Gerasimov*, Erwin Stein	Curt Bronkhorst*, D.J. Luscher, Jason Mayeur, David McDowell	
TS8: 5.3 Numerical Modeling and Engineering Design for Impact and Blast Problems, Chair(s): Qian Wang						
MAR-UB	Computational Design of Polymeric Transparent Armors Subjected to Low-Velocity Impact	Development of Shallow Foundation Streetscape Vehicular Anti-ram (SVAR) Systems through Modeling and Testing	Implementation and Validation of a Constitutive Model for Sand	Penetration Analysis of Concrete Plate by 3D FE-SPH Adaptive Coupling Algorithm		
	Guillaume Antoine*, Romesh Batra	Edward O'Hare*	David Littlefield*, Bradley Martin	De'an Hu*		
TS8: 5.4 Recent Advances in Computational Fracture Mechanics, Chair(s): Toshio Nagashima						
MAR-UC	Automated FEM Analysis Framework For Elastic-plastic Crack Growth	Modeling the Effects of Stress State and Residual Stress on Ductile Fracture	Small Scale Yielding Models of Crack Divider Delamination in Al-Li with Gradient Crystal Plasticity	Numerical Methods for the Simulation of Fracturing Solids in Multi-Physics Problems	Semi-Empirical Stress and Energy Analysis for a Crack Interacting with a Damage Zone in a Brittle Material	Boundary Element Analysis of Three-Dimensional Cracks in Transversely Isotropic Layered Media
	Yoshitaka Wada*	Xiaosheng Gao*, Jun Zhou, Matthew Hayden	Mark Messner*, Armand Beaudoin, Robert Dodds	Maurizio Chiaramonte*	Mohamed Chabaat*, Kahina Benabbas	Amirhossein Molavi Tabrizi*, Ernian Pan

Wednesday, July 24, Technical Session 9

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Krzysztof Fidkowski						
RCC201	A Higher-order Adaptive DPG Method for Compressible Flow Problems	Discrete Filter Operators for High-Order Spectral Difference Methods	A High-Order Hybrid FD-FV Method for Inviscid Flow Problems	Hybridizable Discontinuous Galerkin with Degree Adaptivity for Wave and Flow Problems		
	Jesse Chan*, Leszek Demkowicz	Guido Lodato*, Antony Jameson	Xianyi Zeng*	Antonio Huerta*, Giorgio Giorgiani, Sonia Fernandez-Mendez		
TS9: 8.2 Continuum Theories for Modeling Atomic Scale Physics: Novel Models and Methods, Chair(s): Jeremy Templeton						
RCC203	Multiscale Simulation of Electroosmotic Flows		A Quasi-Continuum Hydrodynamic Model for Transport in Nanofluidic Channels	Non-Continuum Hydrodynamics: Volume Diffusion and Bi-Velocity Methods	Polarization as a Field Variable from Molecular Dynamics Simulations: Applications to Electrical Double Layers	A Multiscale Approach for Self-Diffusivity of Confined Fluids
	Lin Guo*, Mark Robbins, Shiyi Chen, Jin Liu		Ravi Bhadauria*, Narayana Aluru	Kokou Dadzie*	Kranthi Mandadapu*, Jeremy Templeton, Jonathan Lee	Tarun Sanghi*, N R Aluru
TS9: 2.1 Biomechanics of Living Matter, Chair(s): Ellen Arruda/Fred Nugen						
RCC204	A Viscoplastic Theory of Saccular Aneurysm Enlargement and Growth	Concurrent Spatial Mapping of the Viscoelastic Behavior of Heterogeneous Soft Tissues via a Polymer-Based Microfluidic Device: A Preliminary Study	Computational Modeling of Coupled Cardiac Electromechanics Incorporating Cardiac Dysfunctions	A Growing Shell: Modeling Biological Membrane Adaptation to Mechanical Load	Theory and Numerics of Volume and Surface Growth in the Developing Brain	Age- and Race-Dependent Material Properties of the Human Sclera
	Fred Nugen*, Luca Dede', Thomas JR Hughes	Zhili Hao*	Ezgi Berberoglu*, Serdar Goktepe	Manuel Rausch*, Ellen Kuhl	Maria Holland*, Paul Steinmann, Ellen Kuhl	Rafael Grytz*, Massimo A. Fazio, Vincent Libertiaux, Luigi Bruno, Stuart Gardiner, Christopher A. Girkin, J. Crawford Downs
TS9: 2.7 Direct and Inverse Methods for Cardiovascular and Pulmonary Biomechanics, Chair(s): M. Behr						
RCC205	A POD Approach for In Vivo Estimation of Arterial Compliance from Medical Images	Identification of Parameters and Analysis of Constitutive Laws to Model Passive Myocardium Material Response	Estimation of Carotid Artery Stiffness in a Fluid-Structure Interaction Model Using Non-Invasive Clinical Measurements	Spline Based Microstructural Mapping and Patient Specific Modeling of Aortic Valve	An Eulerian Image-Based Flow Computation Framework Without User-Generated Meshes	
	Luca Bertagna*, Alessandro Veneziani	Luigi Perotti*, Shankarjee Krishnamoorthi, Vicky Wang, Daniel Ennis, Daniel Balzani, William Klug	Nan Xiao*	Ankush Aggarwal*, Vanessa Aguilar, Joseph Gorman, Robert Gorman, Michael Sacks	Seth Dillard*, John Mousel, Liza Shrestha, Madhavan Raghavan, Sarah Vigmostad	

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 13.4 Computational Soft Active Materials, Chair(s): Changyong Cao, Kamran Khan						
RCC206	On the Nonlinear Viscoelastic Responses of Dielectric Elastomers	Giant Tunable Stiffness of Electrorheological and Magnetorheological Elastomers by Designing Mesostructures	Full Eulerian Finite Element Formulation Using SUPG Method for Large Deformation Analysis of Pressure-Sensitive Adhesive			
	Kamran Khan*, Tamer El-Sayed	Changyong Cao*, Xuanhe Zhao	Koji Nishiguchi*, Kazuhisa Maeda, Shigenobu Okazawa, Satoyuki Tanaka			
TS9: 10.3 Computational Modeling of Embedded and Contact Interfaces, Chair(s): Jerome Solberg						
RCC302A	Finite Element Simulation of Frictional Contact Problems of Saturated Porous Medium Under Finite Deformation	Behavior of Soil-Structure-Interaction Systems Considering Sliding at the Soil-Foundation Interface	Homogenization-Based Multiscale Modeling of Lubricated Interfaces	Contact Algorithm for Eulerian High Speed Multimaterial Dynamic Simulations		
	Hassan Sabetamal*, Majid Nazem	Nima Tafazzoli*, Boris Jeremic	Gokberk Kabacaoglu*, Ilker Temizer	Nirmal Kumar Rai*, Anil Kapahi, H. S. Udaykumar		
TS9: 10.2 Recent Advances on Modeling Methods for Fluid-Structure Interaction Systems , Chair(s): Steven Mattis						
RCC302B	A New Algorithm to Simulate Coupled Dynamics for Fluid-Structure Interactions with an Application in Modeling Vocal Folds Vibrations	Fluid Structure Interaction with Fracture Modeled by the Extended Finite Element Method	Deformation of a Single Red Blood Cell in Bounded Poiseuille Flows			
	Lucy Zhang*, Xingshi Wang	Patrick Lea*, Kevin Wang, Charbel Farhat, Ted Belytschko	Lingling Shi*, Tsorng-Whay Pan, Roland Glowinski			
TS9: 4.8 Multi-scale and Multi-physics Computations in Fluids and Solids, Chair(s): Jeffrey Cipolla						
RCC302C	Optimal Design of Metallic Hexahedral Acoustic Metamaterials	Design of Pentamode Acoustic Metamaterials	A Finite Element Model for the Analysis of 3D Transient Coupled Electromagnetic Structural Dynamics Problems			
	Jeffrey Cipolla*, Kathleen Atkatsh, Nachiket Gokhale	Nachiket Gokhale*, Jeffrey Cipolla, Andrew Norris, Adam Nagy	Shu Guo*, Reza Yaghmaie, Somnath Ghosh			

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): M. Hillman						
RCC303	Partitioned Global Array Space Methods for Large-Scale Meshfree Simulations	Visco-Elastic SPH Method Applied to Analysis of Human Head Subjected to Impacts	Large Deformation Analysis of Offshore Marine Structures Using Meshfree Methods	Multilevel Solvers for Implicit SPH Methods		
	Thomas Williams*, Kent Danielson	Seiya Hagihara*, Sho Fumoto, Yutaka Hayama, Shinya Taketomi, Yuichi Tadano	Bala Shanmugam*	Kai Yang*, Nathaniel Trask		
TS9: 9.2 Phase-Field Modeling and Simulation in Fluid Mechanics, Solid Mechanics and Life-Sciences, Chair(s): Hector Gomez						
RCC304	Extended Smoothed Boundary Method for Simulating Phenomena in Materials with Complex Microstructures	Simulation of 3D Coupled Biomembrane Dynamics with a Phase-field Model in a Parallel Environment Based on PETSc	Modeling Microdomain Evolution on Giant Unilamellar Vesicles Using a Phase-Field Approach	Adaptive Refinement of the Hierarchical B-Spline Finite Element Method and Application to Phase Field Model of Vesicle Membranes		
	Katsuyo Thornton*, Hui-Chia Yu, Bernardo Orvananos	Christian Peco*, Marino Arroyo	Anand Embar*, John Dolbow, Eliot Fried	Wen Jiang*		
TS9: 5.1 Mathematical and Numerical Modeling of Degradation of Materials and Structures, Chair(s): Kaspar Willam						
RCC305A	Effective Spring Stiffness for a Periodic Array of Interacting Coplanar Penny-shaped Cracks at an Interface between Two Dissimilar Isotropic Materials	Modeling Diffusion Controlled Evolution of Pitting Corrosion Using the Extended Finite Element and Level Set Methods	A Multi-Temporal Scale Approach to High Cycle Fatigue Simulation	A New Tension-Compression Damage Model Applied to Modeling the Ferrocement Thin Walls Under Cyclic Loads		
	Noriko Katsube*, Huseyin Lekesiz, Stanislav Rokhlin, Robert Seghi	Ravindra Duddu*, Sundararajan Natarajan	Dong Qian*, Sagar Bhamare	Jairo A. Paredes*, Sergio Oller, Alex H. Barbat, Daniel Bedoya		

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 9.10 Advances in Numerical Methods for Linear and Non-Linear Dynamics, Chair(s): Alexander Idesman						
RCC305B	A State-of-the-Art Computational Framework Towards a Wide Variety of Ex-plicit Algorithms and Designs for Linear/ Nonlinear Dynamics: Single/Two-Field Forms	Dynamic Analysis of Multilayered Composite Beams With Partial Interaction	An Effective Model Formulation for 3D Analysis of Multi-Layer Beams - Riser Analysis Applications	Particle-Based Methods for Elliptic Boundary and Elliptic Interface Problems	Finite Element Analysis for Moving Boundary Problem Based on Fictitious Domain Method (Computation of Material Surface Temperature in Milling)	
	Kumar Tamma*, Masao Shimada	Joo Batista Sousa Jr.*	Carlos Almeida*, Ludimar Aguiar, Paulino Glaucio	Gaurish Telang*, Tongfei Guo, Roman Samulyak	Takahiko Kurahashi*, Masaki Li, Genjiro Sugisawa, Tetsuro Iyama	
TS9: 9.1 Advances in Finite Element Methods for Tetrahedral Mesh Computations, Chair(s): G. Scovazzi						
RCC306A	Superconvergent HDG Methods for Unstructured Tetrahedral Meshes		The Staggered DG Method is the Limit of a Hybridizable DG Method	A General Upscaled HDG Method for Second Order Elliptic Equations	A Novel Smoothed Finite Element Formulation Based on the Implicit Incremental Equilibrium Equation for Large Deformation Analysis with Mesh Rezoning	
	Bernardo Cockburn*, Ke Shi		Guosheng Fu*, Eric Chung, Bernardo Cockburn	Ke Shi*, Yalchin Efendiev, Raytcho Lazarov	Yuki Onishi*, Kenji Amaya	
TS9: 12.4 Goal-Oriented Error Estimation and Adaptivity, Chair(s): Serge Prudhomme						
RCC306B	Goal-Oriented Least-Squares Finite Element Methods	Remeshing Strategies for Large Deformation Problems with Contact and Incompressible Materials	Contraction in a Goal-Oriented Adaptive Finite Element Method			
	Jehanzeb Chaudhry*, Eric Cyr, Kuo Liu, Thomas Manteuffel, Luke Olson, Lei Tang	Ziyu Zhang*, John Dolbow	Kristoffer G. van der Zee*, Ricardo H. Nochetto, Abner J. Salgado			
TS9: 6.3 Inverse Problems: Theory, Algorithms, and Applications, Chair(s): Assad Oberai						
RCC306C	Recent Advances in the Inverse Medium Problem with Applications to Site Characterization	An Error in Constitutive Equation Approach for Frequency-Domain Viscoelasticity Imaging	Parameter Estimation in Frequency-Domain Coupled Acoustic-Structure Interaction Using an Error in Constitutive Equation Functional	Waveform Inversion in Time-Domain for Geophysical Applications	True Amplitude One-Way Wave Equation through Perfectly Matched Discrete Layer	
	Arash Fathi*, Loukas Kallivokas	Manuel Diaz*, James Warner, Wilkins Aquino	James Warner*, Manuel Diaz, Wilkins Aquino	Stefano Micheletti*, Simona Perotto	Mehran Eslaminia*, Murthy N. Guddati	

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 9.11 Qualitative and Quantitative Comparison of Numerical Methods for Solving Partial Differential Equations, Chair(s): Jason Sheldon						
RCC307	Comparison Results of Finite Element Methods for the Poisson Problem	Comparison of Finite Element Methods for Elastodynamics Problem	Investigations of Mixed Least-Squares Finite Element Formulations for Hyperelastic Problems	Comparison of Applicability Between the Direct and the Iterative Solver Technology in Commercial Finite Element Software		
	Daniel Peterseim*	Reza Abedi*, Scott Miller	Karl Steeger*, Alexander Schwarz, Joerg Schroeder, Gerhard Starke, Benjamin Mueller	Vladimir Belsky*		
TS9: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): Rene De Borst						
RCC402	Adaptive Isogeometric Analysis Based on Superconverge nt Patch Recovery	Algebraic Multilevel Iteration Method for Isogeometric Analysis	Weakly Enforced Boundary and Coupling Conditions in Isogeometric Analysis	Simulation of 3D Frictionless Large Deformation Contact Using Mortar-based Isogeometric Analysis	Shape Optimization of Trimmed Shell Structures Based on Isogeometric Analysis	
	Trond Kvamsdal*, Kjetil Johannessen, Mukesh Kumar, Knut Okstad	Satyendra Tomar*, Krishan P.S. Gahalaut	Martin Ruess*, Dominik Schillinger, Yuri Bazilevs, Ali zcan, Ernst Rank	Kjell Magne Mathisen*, Knut Okstad, Trond Kvamsdal, Siv Bente Raknes	Pilseong Kang*, Hyun-Jung Kim, Yu-Deok Seo, Sung-Kie Youn	
TS9: 4.4 Multiscale Modeling and Simulations of Materials Phenomena, Chair(s): Shuji Usui						
MAR-CH	Microstructural Modeling of Intrinsic Stresses in Multi-Junction Based Photovoltaic	Experimental Characterization of Component Phases in Super-High Strength Cementitious Composites	Advances in Prediction of Part Distortion and Tool Deflection of Machined Components			
	Mohamed Elewa*, Tarek Hatem	P.K. Basu*, William Heard, Nikolas Nordendale	Shuji Usui*, Troy Marusich, Deyao Ren, Ethan Erickson, Subramaniam Jayanti			
TS9: 4.7 Computational Methods for Materials with Intrinsic Microstructure, Chair(s): Sanjay Govindjee						
MAR-STA	From Microstructural Damage to Macroscale Failure: a Computational Homogenization Approach	On Certain Theoretical and Computational Aspects of Homogenization in Thermo-mechanical Continua	Homogenization of Structural Material Properties in Cylindrical Lithium-Ion Battery Cells	Statistically Similar RVEs for Two-Scale Calculations of DP Steel Forming Processes	A Micro-Mechanically Based Continuum Model for Strain-Induced Crystallization in Natural Rubber	
	Varvara Kouznetsova*, Erica Coenen, Emanuela Bosco, Marc Geers	Brian Mercer*, Kranthi K. Mandadapu, Arkaprabha Sengupta, Panayiotis Papadopoulos	Mehdi Gilaki*, Ilya Avdeev	Lisa Scheunemann*, Daniel Balzani, Dominik Brands, Joerg Schroeder	Sunny J. Mistry*, Sanjay Govindjee	

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 4.9 Concurrent Multi-length Scale Modeling: From Finite Elements to Atoms and Electrons						
MAR-STB	A First-Principles Multiscale Method to Investigate Defects in Metals	There is No Pointwise Consistent Quasicontinuum Energy	Methods for Multiscale Quantum/Atomistic Coupling	Analyzing Size Effects in Void Growth Using Taylor-Plasticity-Based Theories	Simulating Localized Heating Due To Electron Flow In Molecular Dynamics	
	Georg Schusteritsch*, Thomas Kuehne, Efthimios Kaxiras	Matthew Dobson*	W. A. Curtin*	Jinxing Liu*, Tamer ElSayed	Reese Jones*, Jeremy Templeton	
TS9: 4.10 Multi-scale Modeling of Dynamic Behavior of Materials, Chair(s): Nitin Daphalapurkar						
MAR-STE	Atom-to-Continuum Analysis of the Elastic Response of Shocked Aluminum Single Crystals	Correlating Flaw-Size Distributions with the Dynamic Failure Strength of Brittle Materials	Nonlocal Vibrational Modes in Nanoscale Dynamical Systems			
	Jonathan Zimmerman*, J. Michael Winey, Yogendra Gupta	N.P. Daphalapurkar*, K.T. Ramesh	Sondipon Adhikari*, Tony Murmu, Michael McCarthy			
TS9: 5.6 Advances in Modeling and Simulation of Damage Evolution, Strain Localization, and Failure, Chair(s): Curt Bronkhorst						
MAR-UA	Quantifying the Impact of Radiation Damage on Nuclear Fuel Behavior	High-Rate Structural Response and Some Challenges of Modeling System Failure	Ignition Criterion for Energetic Materials Based on Hotspot Criticality	Testing and Validation of Finite Element Modeling for Silicone-Based Elastomeric Foam Materials	Damage and Failure Modeling in an ASC Code (U)	
	Michael Tonks*, Pritam Chakraborty, Paul Millett, Bulent Biner, David Andersson	Robert Ferencz*, Anthony De Groot, Jerry Lin, Robert Sherwood, Edward Zywicz	Seokpum Kim*, Ananda Barua, Yasuyuki Horie, Min Zhou	Partha Rangaswamy*, Matthew Lewis, Cheng Liu	Thomas Canfield*, Theodore Carney, Abigail Hunter, Mark Potocki	
TS9: 5.2 Computational Methods for Blast and Impact in Mechanics of Materials, Chair(s): Jeong-Hoon Song						
MAR-UB	Modeling and Simulation of Electromagnetic Fabric Shielding		Multiscale Extended Finite Element Method for Strain Localization	Monolithic, Incrementally Objective Formulation for Shear Bands with Diffusive Regularization		
	Tarek Zohdi*		Iman Asareh*, Jeong-Hoon Song	Colin McAuliffe*, Haim Waisman		

ROOM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
TS9: 5.4 Recent Advances in Computational Fracture Mechanics, Chair(s): Xiaosheng Gao						
MAR-UC	Cracks Detection Using a Non Destructive Technique by Eddy Currents in Differential Mode	Three-dDimensional Mixed-Mode Stress Intensity Factor Analysis of Large-scale Cracked Structure Using Partitioned Iterative Coupling Method	J and Interaction Integral Evaluations Using the Tetrahedral Finite Element	Use of Stress Intensity Factor to Analysis the Crack Stability of Concrete Dam	Simulation of Compressive Failure in Concrete Involving Contact on Crack Interfaces	
	Salah Eddine Harzallah*, Mohamed Chabaat	Yasunori Yusa*, Shinobu Yoshimura	Hiroshi Okada*, Ryutaro Daimon, Shogo Ohata	Ziyang Li*, Li Guo, Fuheng Ma, Qun Dai	Mao Kurumatani*, Shinya Kamino, Kenjiro Terada	

12th U.S. National Congress on Computational Mechanics Technical Program

Thursday July 25, 2013

Plenary Speaker, Thursday, July 25, 2013
9:00 – 9:45 am, RCC Ballroom B

The "Materials Genome" Project: Accelerated and Large-Scale Materials Discovery through Computation

Gerbrand Ceder, Massachusetts Institute of Technology

Abstract: Novel materials design has become a critical capability to address several urgent societal problems. The need for novel materials is the technological Achilles Heel of our strategy to address the energy and climate problem facing the world, and over-reliance on critical elements has inspired large efforts to develop accelerated materials design strategies. The Materials Genome Project, originally started at MIT (www.materialsproject.com), has as its objective to use high-throughput first principles computations on an unparalleled scale to provide basic materials property data on all known and many potential new inorganic compounds, thereby facilitating the search for new materials.

I will show successful examples of high-throughput calculations in the field of lithium batterier, and show several new materials that have been discovered. I will discuss the public release version of the Materials Genome project which is making large quantities of computed data freely available to the materials community. The Materials Project is rapidly growing as a large collaborative environment for computed materials data.

Biography: Gerbrand Ceder is a Professor of Materials Science and Engineering at the Massachusetts Institute of Technology. He received an engineering degree from the University of Leuven, Belgium, and a Ph.D. in Materials Science from the University of California at Berkeley in 1991. Dr. Ceder's research interests lie in the computationally driven design of novel materials for energy generation and storage, including battery materials, thermoelectrics, photovoltaics, and photocatalysts. He has worked for 18 years in the Li-battery field, optimizing several new electrodes materials and has regularly served as scientific advisor to companies and investors in this area. He has published over 300 scientific papers, and holds several U.S. patents. He has served on MIT's Energy Council as well as on several DOE committees, including the workgroup preparing the Basic Needs for Electrical Energy Storage report. He has received the MRS Gold Medal, the Battery Research Award from the Electrochemical Society for his work on understanding battery materials, the Career Award from the National Science Foundation, and the Robert Lansing Hardy Award from The Metals, Minerals and Materials Society, as well as several teaching awards at MIT. He is a co-founder of Computational Modeling Consultants, Pellion Technologies, and The Materials Project, which provides computed materials property data to the research community. His work on high-throughput computing was the inspiration of the Presidential Materials Genome Initiative.

Thursday, July 25, Technical Session 10

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS10: 3.1 High-Order Methods for Computational Fluid Dynamics , Chair(s): Chunlei Liang						
RCC201	Energy Stable Flux Reconstruction Schemes for Advection-Diffusion Problems on Unstructured Mixed Grids	Target-Based Hp-Adaptive Hybridized Discontinuous Galerkin Methods for Compressible Flow	A Study of Flux Formulations for Solving Equations containing Higher Spatial Derivative terms in the Spectral Volume context	PyFR: A High-Order Python-Based Flux Reconstruction Flow Solver for Many-Core Platforms		
	David Williams*, Antony Jameson	Michael Woopen*, Aravind Balan, Georg May	Ravishekar Kannan*	Peter E. Vincent *, Freddie D. Witherden , Antony Farrington		
TS10: 8.2 Continuum Theories for Modeling Atomic Scale Physics: Novel Models and Methods, Chair(s): Reese Jones						
RCC203	Thermodynamic and Quasicontinuum Models of Equilibrium and Non-Equilibrium Thermomechanics of Alloys		Molecular Dynamics Based Study and Deformation Mechanisms Evolution Near Crack Tip in Crystalline Material	Mechanical Stability of AuNP-DNA Nanosystems	Analysis of Structural Changes During Plastic Deformations of Amorphous Polyethylene	
	Ignacio Romero*, Borja Gonzalez-Ferreiro, Michael Ortiz		Jiaxi Zhang*, Somnath Ghosh	Letisha McLaughlin*, Mohammed Zikry	Alejandro Pacheco*, Romesh Batra	
TS10: 13.4 Computational Soft Active Materials, Chair(s): Sulin Zhang, Shawn Chester						
RCC206	Coarse-Grained Modeling of Membrane-Mediated Biological Processes: Mechanical Deformation Regulates Biological Functions		A Finite Element Model for Wrinkling Analysis of Thin Films on Compliant Substrates	A Numerical Framework for Solving Multiphysics Phenomena Applied to Soft Active Materials	Coarse-Grained Simulation of Molecular Mechanisms of Recovery in Thermally Activated Shape-Memory Polymers	
	Sulin Zhang*		Fan Xu*, Salim Belouettar, Michel Potier-Ferry, Heng Hu	Shawn Chester*, David Henann	Brendan Abberton*, Wing Liu, Sinan Keten	
TS10: 3.6 Higher-Order Computational Methods for Modeling Transport in Porous Media, Chair(s): Rohan Panchadhara & Laurent White						
RCC301A	High Order Methods for Coupled Flow and Transport Problems		Using Coupled Implicit and p-Adaptive Discontinuous Galerkin Method to Model Miscible Displacement with Adverse Mobility Ratio	High Order Efficient Solver for ASP Flooding Processes in Heterogeneous Oil Reservoirs		
	Beatrice Riviere*		Hao Huang*, Huafei Sun, Aruna Mohan, Jichao Yin, Guglielmo Scovazzi	Sourav Dutta*, Prabir Daripa		

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS10: 10.2 Recent Advances on Modeling Methods for Fluid-Structure Interaction Systems , Chair(s): Khoo Boo Chang						
RCC302B	An Enhanced Immersed Structural Potential Method For Fluid Structure Interaction	An Immersed Boundary Method for Fluid-Vegetation Interaction	Vortex-Induced Vibration of a Circular Cylinder with Exact Geometry			
	Antonio J. Gil*, Aurelio Arranz Carreno, Javier Bonet, Clare Wood	Steven Mattis*, Clint Dawson, Christopher Kees, Matthew Farthing	Hyung Taek Ahn*			
TS10: 4.8 Multi-scale and Multi-physics Computations in Fluids and Solids, Chair(s): Glaucio Paulino						
RCC302C	A Hybrid Micro-Scale DNS and Macro-Scale Eulerian-Lagrangian Model for the Multi-Scale Computation of Shocked Particle-Laden Flows	New Residual-Based Large Eddy Simulation Models for Incompressible Magnetohydrodynamics Derived from the Variational-Multiscale Formulation	Multi-Phase Numerical Simulations to Estimate Steam Quality in Steam Injection Systems for SAGD Applications	Modeling of Lithium Segregation Induced Delamination of a-Si Thin Film Anode from Cu Current Collector in Li-ion Batteries	Finite Element Modeling of Gear Hobbing and Milling	
	Guus Jacobs*, Davis Sean, Oishik Sen, HS Udaykumar	David Sondak*, Assad Oberai, John Shadid	Kedar Deshpande*, Madhusuden Agrawal, Raju Gandikota, Brian Sternaman	Sameer S Damle*, Siladitya Pal, Prashant N. Kumta, Spandan Maiti	Troy Marusich*, Deyao Ren, Shuji Usui, Jon Wadell, Wenyang Liu	
TS10: 9.5 Meshfree Particle and Isogeometric Technologies, Chair(s): J. Roth						
RCC303	Modeling of Finite-Thickness Concrete Slab Penetration and Perforation Using RKPM	Coupled Finite Element Reproducing Kernel Approximation for Modeling Material Fragmentation	Particle Based Method for the Simulation of Blast Loading	Evolution of Damage and Fragmentation Produced by Impact on a Thin Glass-Polycarbonate Plate System		
	Jesse A. Sherburn*, M. Jason Roth, J. S. Chen, Thomas Slawson	Youcai Wu*, Joseph Magallanes, John Crawford	Hailong Teng*	Yenan Wang*, Florin Bobaru, Jian Yu, Chian-Fong Yen		
TS10: 9.2 Phase-Field Modeling and Simulation in Fluid Mechanics, Solid Mechanics and Life-Sciences, Chair(s): Hector Gomez						
RCC304	Phase Field Modeling of Grain Boundary Migration at Finite Deformation	Phase-Field Modeling and Simulations of 3D Cubic-to-Tetragonal Transformations in Shape Memory Alloy Nanostructures	Numerical Algorithms of Phase Field Model for Polycrystalline Systems Simulation	Phase-Field Modeling of Deformation Twinning in -HMX		
	Mostafa Jamshidian*, Timon Rabczuk	Rakesh Dhote*, Hector Gomez, Roderick Melnik, Jean Zu	Su Hao*	Suvranu De*, Rahul .		

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS10: 5.1 Mathematical and Numerical Modeling of Degradation of Materials and Structures, Chair(s): Ravindra Duddu						
RCC305A	Prediction of Crack Density and Electrical Resistance Changes in ITO/Polymer Thin Films Under Tensile Loading	Computational Modeling and Experimental Validation of Coupled Delamination and Damage Processes in Ceramic Matrix Composites				
	Angel Mora*, Kamran Khan, Tamer El Sayed	Rajesh Kumar*				
TS10: 9.1 Advances in Finite Element Methods for Tetrahedral Mesh Computations, Chair(s): G. Scovazzi						
RCC306A	Coupled Fluid/Solid Computations Using Tetrahedral Finite Elements	Unified Variational Multiscale Method for Compressible and Incompressible Turbulent Flows	Modeling of Nearly Incompressible Composite Materials Using a New Stabilized Mixed Method for Tetrahedral Elements	Sefea (Strain Enriched Finite Element Analysis) Theory, Benchmark and Applications		
	Brian Carnes*, Xianyi Zheng, Guglielmo Scovazzi	Elie Hachem*, Thierry Coupez	Timothy Truster*, Arif Masud	H. Theodore Lin*		
TS10: 12.4 Goal-Oriented Error Estimation and Adaptivity, Chair(s): Kris van der Zee						
RCC306B	Goal-oriented Control of PGD-based Simulations	Uncertainty Quantification of Hybrid RANS/LES Simulations Using Turbulence-Length-Scale-Based Adaptive Mesh Refinement	Variational Multiscale Analysis and the Fine-Scale Greens Functions for Simple Stochastic Partial Differential Equations	Adaptive Modeling for Concurrent Multiscale Models		
	Ludovic Chamoin*, Pierre Ladeveze, Florent Pled	Shanti Bhushan*, David McLaurin	Jayanth Jagalur-Mohan*, Assad Oberai, Onkar Sahni, Alireza Doostan	Serge Prudhomme*, Kristoffer van der Zee, J. Tinsley Oden		
TS10: 9.11 Qualitative and Quantitative Comparison of Numerical Methods for Solving Partial Differential Equations, Chair(s): Reza Abedi						
RCC307	A Comparison of Direct and Indirect Solvers for Reissner-Mindlin Legendre Spectral Finite Elements	Implicit Simulation of Multibody Systems Using Source Transformation Algorithmic Differentiation				
	Michael Sprague*	Sri Hari Krishna Narayanan*, Alfonso Callejo, Boyana Norris				

ROOM	10:00 AM	10:20 AM	10:40 AM	11:00 AM	11:20 AM	11:40 AM
TS10: 1.1 Isogeometric Methods: A Symposium Celebrating the 70th Birthday of Prof. T.J.R. Hughes, Chair(s): Clemens Verhoosel						
RCC402	An Isogeometric Boundary Element Method for Acoustic Analysis	Enriched Isogeometric Analysis for Elliptic Boundary Value Problems Containing Singularities	Multiscale IsoGeometric Analysis with Controlled Accuracy	Isogeometric Shape Design Sensitivity Analysis of Stress Intensity Factors in Curved Crack Problems		
	Robert Simpson*, Michael Scott, Matthias Taus	Hae-Soo Oh*, Hyunju Kim, Jae Woo Jeong	Alexandre Chemin*, Thomas Elguedj, Anthony Gravouil	Myung-Jin Choi*, Seung-Wook Lee, Seung-Ho Ahn, Seonho Cho, Minho Yoon		
TS10: 4.4 Multiscale Modeling and Simulations of Materials Phenomena, Chair(s): Andrew Gillman						
RCC202	An Image-Based Collocation Method for Multiscale Modeling of Bone Microstructures	Anisotropic Third-Order Bounds of Tomographically Characterized Polydisperse Granular Systems	Uncertainty Quantification in the Prediction of the In-Plane Young's Modulus of Thin Films with Fiber Texture			
	Judy Yang*, J. S. Chen	Andrew Gillman*, Karel Matous	Pedro Madrid*, Deborah Sulsky			
TS10: 4.7 Computational Methods for Materials with Intrinsic Microstructure, Chair(s): Christopher Weinberger						
RCC301B	Multiscale Modeling of Skeletal Muscle Growth	Comparison of Non-Periodic and Periodic Molecular Dynamics Modeling of Dislocation-Defect Interaction	Fully Non Local Multiscale Atomistic Simulation of Electromechanical Materials	Multi-Resolution Modeling of the Dynamic Loading of Metal Matrix Composites	On the Mechanics of Deformable Layered Materials	
	Alexander Zllner*	Bob Svendsen*, Jaber Rezaei Mianroodi	Jason Marshall*, Kaushik Dayal, Jaroslaw Knap	Remi Dingreville*, Joshua Robbins, Thomas Voth	Stephan Rudykh*, Mary Boyce	
TS10: 4.9 Concurrent Multi-length Scale Modeling: From Finite Elements to Atoms and Electrons, Chair(s): Qing Peng						
RCC302A	Multiscale Quantum/Atomistic Modeling of Materials		A Scalable Kernel Polynomial Method for Calculating Transition Rates	Mechanical Properties of Asymmetrical Tilt Grain Boundaries in Graphene		
	Xu Zhang*, Gang Lu, William A. Curtin		Chen Huang*	Jihoon Han*, Seyoung Im		
TS10: 5.2 Computational Methods for Blast and Impact in Mechanics of Materials, Chair(s): Colin McAuliffe						
RCC305B	Damage Initiation and Progression in Shock Loaded Curved Sandwich Structures	Multi-Scale Modeling Issues with Short Fiber Reinforced Cementitious Composites	Wave Propagation and Ballistic Properties of Polymer Matrix Composites	Multiscale Analysis of Nanocomposite Helmets for Blast Impact Mitigation		
	Arka Prabha Chattopadhyay*, Romesh C Batra	Nikolas Nordendale*, William Heard, P.K. Basu	Shrikant Nargund*, Anjolajesu Fagbe, Alireza Tabarraei	Daniel Jenson*, Vinu Unnikrishnan		

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