

# NUMISHEET 2022

The 12th International Conference and Workshop on  
Numerical Simulation of 3D Sheet Metal Forming Processes

## FINAL PROGRAM

*This program is current as of July 4, 2022 and is subject to change.*  
To learn more about the event, visit [www.tms.org/NUMISHEET2022](http://www.tms.org/NUMISHEET2022).

**JULY 10-14, 2022**

**SHERATON CENTRE TORONTO HOTEL**

Toronto, Ontario, Canada



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Please be sure to visit the exhibit area during coffee breaks  
in the Dominion Ballroom Foyer.

## COMMITTEE MEMBERS

## ORGANIZING COMMITTEE

Chair: **Kaan Inal**,  
University of Waterloo, Canada

Co-Chairs: **Julie Lévesque**,  
Québec Metallurgy Center, Canada  
**Michael Worswick**,  
University of Waterloo, Canada

Secretary: **Cliff Butcher**,  
University of Waterloo, Canada

## STEERING COMMITTEE

- **Rui Cardoso**, Brunel University London (UK)
- **Pavel Hora**, ETH Zürich (Switzerland)
- **Toshihiko Kuwabara**, Tokyo University of Agriculture and Technology (Japan)
- **D.Y. Yang**, Korea Advanced Institute of Science and Technology (Korea)
- **Farhang Pournoghbat**, The Ohio State University (USA)
- **Thomas Stoughton**, General Motors (USA)
- **Robert Wagoner**, The Ohio State University (USA)
- **Jeong Whan Yoon**, Deakin University (Australia)

Visit the NUMISHEET 2022 website for a full list of the International Scientific Committee members.

Welcome to the 12th International Conference and Workshop on Numerical Simulation of 3D Sheet Metal Forming Processes. The NUMISHEET conference series is one of the most significant international conference on the area of the numerical simulation of sheet metal forming processes. It gathers the most prominent experts in numerical methods in sheet forming processes and is an outstanding forum for the exchange of ideas and for the discussion of technologies related to sheet metal forming processes.

## THANK YOU FOR YOUR EFFORTS TO MAKE NUMISHEET 2022 A SUCCESS!

Sincerely,

- **Kaan Inal**, University of Waterloo (Chair)
- **Julie Levesque**, Québec Metallurgy Center (Co-chair)
- **Michael Worswick**, University of Waterloo (Co-chair)
- **Cliff Butcher**, University of Waterloo (Secretary)

## ABOUT THE CONFERENCE AND VENUE

### REGISTRATION

The full-conference and student registration rates includes the following:

- Access to technical sessions
- Sunday evening Welcome Reception
- Wednesday evening conference banquet
- Continental breakfast, lunch, and coffee breaks Monday through Thursday
- Access to a PDF eBook of the post-conference proceedings

### REGISTRATION HOURS

The registration desk will be located in the Dominion Ballroom Foyer of the Sheraton Centre Toronto Hotel during the following hours:

- Sunday, July 10: 5:00 p.m. to 8:00 p.m.
- Monday, July 11: 7:00 a.m. to 7:00 p.m.
- Tuesday, July 12: 7:00 a.m. to 5:30 p.m.
- Wednesday, July 13: 7:00 a.m. to 6:15 p.m.
- Thursday, July 14: 7:00 a.m. to 12:00 p.m.

### TECHNICAL SESSIONS

All technical presentations will be located at the Sheraton Centre Toronto Hotel. See the Technical Program for locations.

### ABOUT THE VENUE



Sheraton Centre Toronto Hotel is a 4-star hotel located in the heart of downtown near attractions such as the convention center, Eaton Centre, and CN Tower. It offers city views, upscale amenities, plush bedding, an outdoor heated pool, and a 24-hour fitness center. Guests can easily walk to local businesses in Toronto's financial and entertainment districts or access the subway to explore what the city has to offer.

# CONFERENCE POLICIES AND INFORMATION

## BADGES

All attendees are encouraged to wear their NUMISHEET registration badges at all times during the conference to ensure admission to events included in the paid fee.

## CELL PHONE USE

In consideration of attendees and presenters, we kindly request that you minimize disturbances by setting all cell phones and other devices on "silent" while in meeting rooms.

## PHOTOGRAPHY AND RECORDING



Any recording of presentations (audio, video, still photography, etc.) intended for personal use, distribution, publication, or copyright without the express written consent of the individual authors is strictly prohibited. Attendees violating this policy may be asked to leave the session.

## EMERGENCY PROCEDURES

The chances of an emergency situation occurring at the conference are quite small. However, being prepared to react effectively in case of an incident is the most critical step in ensuring the health and safety of yourself and those around you.

- Please take a few moments to review the map of the Sheraton Centre Toronto printed in this program (inside back cover).
- When you enter the building, familiarize yourself with the exits and the stairs leading to those exits.
- When you arrive at your session or event location, look for the emergency exits that are in closest proximity to you.

Should an emergency situation occur, please follow the directions of the hotel staff.

## COVID-19 UPDATE

The NUMISHEET organizing committee, working in partnership with the conference venue, is complying with guidance from the Canadian Government and relevant provincial and local authorities to provide a safe and healthy environment for attendees during the ongoing COVID-19 pandemic. However, COVID-19 is an extremely contagious disease, and it is not possible to eliminate the risk of spreading or contracting COVID-19. An inherent risk of exposure to COVID-19 exists in any public place where people are present, and efforts to mitigate the risk of exposure to COVID-19 may not be sufficient to prevent spreading or contracting COVID-19.

Masks are not required at the conference or in most Toronto businesses and restaurants or on transit. As COVID-19 continues to circulate in the community, visitors and residents are encouraged to practice public health measures and are strongly encouraged to wear a high-quality, well-fitting mask, especially indoors and based on the setting and situation, and staying home if feeling unwell. More information is available at [www.toronto.ca/home/covid-19](http://www.toronto.ca/home/covid-19).

The events, speakers, and services listed here are current as of July 4, but changes may occur due to circumstances beyond our control. We thank you for your flexibility as we plan the best possible event for you and the materials community.

# TECHNICAL PROGRAM AT A GLANCE

Day	Time	Dominion Ballroom	Churchill Room	City Hall Room	Provincial - North	Provincial - South
Monday	AM	Plenary	MS7: Modelling of Failure I	MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton I	MS1: Numerical Implementation of Advanced Constitutive Models I	MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin I
		Chair: Kaan Inal, University of Waterloo	Chair: Max Boehnke, Paderborn University	Chair: Wolfram Volk, Technical University of Munich	Chair: Oana Cazacu, University of Florida	Chair: Pavel Hora, ETH Zurich Institute of Virtual Manufacturing
	PM	Plenary	MS7: Modelling of Failure II	MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton II	MS1: Numerical Implementation of Advanced Constitutive Models II	MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin II
		Chair: Michael Worswick, University of Waterloo	Chair: Niko Manopulo, AutoForm Development GmbH	Jeong Whan Yoon, KAIST	Chair: Shigeo Saimoto, Queens University	Chair: Tudor Balan, Arts et Metiers Institute of Technology
Tuesday	AM	Plenary	MS6: Modelling of Thermo-mechanical Sheet Forming I	MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton III	MS1: Numerical Implementation of Advanced Constitutive Models III	MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin III
		Chair :Jeong Whan Yoon, KAIST	Chair: A.Erman Tekkaya, Technical University Dortmund	Chair: Brad L. Kinsey, University of New Hampshire	Chair: Jai Tiwari, India Institute of Technology	Chair: Kanhu Nayak, Indian Institute of Technology Bombay
	PM	Plenary	MS6: Modelling of Thermo-mechanical Sheet Forming II	MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton IV	MS1: Numerical Implementation of Advanced Constitutive Models IV	MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin IV
		Chair: Frederic Barlat, Pohang Univ of Science & Technology	Chair: K. Narasimhan, IIT Bombay	Chair: Peidong Wu, McMaster University	Chair: Masahi Arai, JSOL Corporation	Chair: Frederic Barlat, Pohang University of Science and Technology
Wednesday	AM	Plenary	MS8: Modelling of Friction	MS4: Machine Learning and Big Data I	MS1: Numerical Implementation of Advanced Constitutive Models V	MS5: Multiscale Modeling of Deformation and Fracture Behavior of Metallic Materials I
		Chair: Peidong Wu, McMaster University	Srihari Kurukuri, National Research Council Canada	Chair: Shi Hoon Choi, Sunchon National University	Chair: Jean Savoie, NRC	Chair: Bruce Williams, Canmetmaterials Natural Resources Canada
	PM	Plenary	MS9: Challenges and Opportunities in Forming Aluminum	MS4: Machine Learning and Big Data II	MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin V	MS5: Multiscale Modeling of Deformation and Fracture Behavior of Metallic Materials II
		Chair: Pavel Hora, ETH Zurich Institute of Virtual Manufacturing	Chair: Cliff Butcher, University of Waterloo	Chair: Christian Roth, ETH Zurich	Chair: Albert Van Bael, Katholieke Universiteit Leuven	Chair: Roman Norz, Lehrstuhl für Umformtechnik & Gießereiwesen
Thursday	AM	Plenary		Benchmark Test Results		
		Chair: Yannis P. Korkolis, The Ohio State University				

**Monday AM Plenary**Monday AM  
July 11, 2022Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

8:00 AM Introductory Comments

8:10 AM Plenary

**Advanced Material Characterization at Large Plastic Strains: Recent Developments:** *A. Erman Tekkaya*<sup>1</sup>; <sup>1</sup>Technical University Dortmund

8:50 AM Question and Answer Period

**MS1: Numerical Implementation of Advanced Constitutive Models I**Monday AM  
July 11, 2022Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Modelling Transient Mechanical Behavior of Aluminum Alloy during Electric-assisted Forming:** *Jai Tiwari*<sup>1</sup>; Hariharan Krishnaswamy<sup>1</sup>; Murugaiyan Amirthalingam<sup>1</sup>; <sup>1</sup>Indian Institute of Technology Madras

9:40 AM

**Anisotropic Time-dependent Continuum Damage-coupled Plasticity Model for Predicting Ductile Fracture of 6xxx Series Aluminum Alloys:** *Georges Ayoub*<sup>1</sup>; Mustapha Makki<sup>1</sup>; Andrey Ilinich<sup>2</sup>; Ghassan Kridli<sup>1</sup>; <sup>1</sup>University of Michigan; <sup>2</sup>Ford Motor Company

10:00 AM Break

10:20 AM

**Decoding the Stress-strain Diagram of FCC Metals for Formability Assessment: Evolution of Soft Zones with Strain under Biaxial Stresses:** *Shigeo Saimoto*<sup>1</sup>; Kaan Inal<sup>2</sup>; Bradley Diak<sup>1</sup>; Marek Niewczas<sup>3</sup>; <sup>1</sup>Queen's University; <sup>2</sup>University of Waterloo; <sup>3</sup>McMaster University

10:40 AM

**Crystal Plasticity Modelling of Localization in Precipitation Hardened AA6060:** *Yan Li*<sup>1</sup>; Christopher Kohar<sup>1</sup>; Raja Mishra<sup>1</sup>; Kaan Inal<sup>1</sup>; <sup>1</sup>University of Waterloo

11:00 AM

**A New Trial Stress for Newton's Iteration Based on Plastic Strain Rate Potential:** *Seung-Yong Yang*<sup>1</sup>; *Wei Tong*<sup>2</sup>; <sup>1</sup>Korea University of Technology and Education; <sup>2</sup>Southern Methodist University**MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin I**Monday AM  
July 11, 2022Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**A Virtual Laboratory Based on Full-field Crystal Plasticity Simulations to Predict the Anisotropic Mechanical Properties of Advanced High Strength Steels:** *Haiming Zhang*<sup>1</sup>; Qian Li<sup>1</sup>; Dongkai Xu<sup>2</sup>; Zhenshan Cui<sup>1</sup>; <sup>1</sup>Shanghai Jiao Tong University; <sup>2</sup>Baoshan Iron & Steel Co., Ltd.

9:40 AM

**Modeling the Influence of Hydrostatic Stress on Plastic Behavior of Advanced High Strength Steels:** *Frederic Barlat*<sup>1</sup>; Seong-Yong Yoon<sup>1</sup>; Shin-Yeong Lee<sup>1</sup>; Ji-Min Kim<sup>1</sup>; Jin-Hwan Kim<sup>1</sup>; <sup>1</sup>Pohang University of Science and Technology

10:00 AM Break

10:20 AM

**Finite Element and Experimental Investigation of Multi-stage Deep Drawing of Stainless Steel 304 Sheets at Elevated Temperature:** *Vipin Yadav*<sup>1</sup>; *Kanhu Nayak*<sup>1</sup>; Prashant Date<sup>1</sup>; <sup>1</sup>Indian Institute of Technology Bombay

10:40 AM

**Finite Element Analysis of Micro/Meso-scale Parts Formed through Incremental Micro-forming ( $\mu$ ISF):** *Ankush Bansal*<sup>1</sup>; Alan Taub<sup>1</sup>; Jun Ni<sup>1</sup>; <sup>1</sup>University of Michigan

11:00 AM

**Tensile Mechanical Properties of Steel-Al Explosion-bonded Clad Plate:** *Ben Guan*<sup>1</sup>; Yong Zang<sup>1</sup>; He Cai<sup>1</sup>; Zhe Jia<sup>1</sup>; Yuekuo Sun<sup>1</sup>; <sup>1</sup>University of Science and Technology Beijing**MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton I**Monday AM  
July 11, 2022Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Recent Challenges of Constitutive and Failure Modeling for Sheet Metal Forming:** *Jeong Whan Yoon*<sup>1</sup>; Thomas Stoughton<sup>2</sup>; <sup>1</sup>Korea Advanced Institute of Science and Technology and Deakin University; <sup>2</sup>General Motors R&D

9:40 AM

**Redrawing of Dual-phase Steel Sheets: Experiments and Numerical Predictions:** *Diane Herault*<sup>1</sup>; Hongjin Choi<sup>2</sup>; Myoung-Gyu Lee<sup>2</sup>; Pierre Yves Manach<sup>3</sup>; M Ziane<sup>4</sup>; *Sandrine Thuillier*<sup>5</sup>; <sup>1</sup>IRD - UMR CNRS 6027; <sup>2</sup>Seoul National University; <sup>3</sup>Université Bretagne Sud; <sup>4</sup>ESI Group; <sup>5</sup>Univ. Bretagne Sud

10:00 AM Break

10:20 AM Keynote

**Effect of Strain Rate on Formability of 22MnB5 Steel during Hot Stamping Process:** *Amarjeet Kumar Singh*<sup>1</sup>; *K. Narasimhan*<sup>1</sup>; <sup>1</sup>IIT Bombay

10:50 AM

**On Strain Hardening Modeling in Associated and Non-Associated Orthotropic Plasticity:** *Jie Sheng*<sup>1</sup>; Mohammed Alharbi<sup>2</sup>; Seung-Yong Yang<sup>3</sup>; *Wei Tong*<sup>1</sup>; <sup>1</sup>Southern Methodist University; <sup>2</sup>Qassim University; <sup>3</sup>Korea University of Technology and Education

11:10 AM

**Prediction of Ductile Fracture in Bainitic Steel with Dependence on Stress States and Loading Orientation:** *Fuhui Shen*<sup>1</sup>; Sebastian Münstermann<sup>1</sup>; Junhe Lian<sup>2</sup>; <sup>1</sup>RWTH Aachen University, Steel Institute (IEHK); <sup>2</sup>Aalto University

11:30 AM

**On the Calculation of Anisotropic Behavior for F.S.S Sheet under Associated and Non-associated Flow Rule Approach:** *Oualid Chahaoui*<sup>1</sup>; <sup>1</sup>University of Khenchela

**MS7: Modelling of Failure I**

Monday AM  
July 11, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

**9:10 AM Keynote**

**Identification of Fracture Limits for Dual Phase Steels for Successful Industrial Application in Sheet Metal Forming Simulations:** *Niko Manopulo*<sup>1</sup>; A. R. Chezan<sup>2</sup>; Martin Sadhinoch<sup>2</sup>; <sup>1</sup>AutoForm Development GmbH; <sup>2</sup>Tata Steel

**9:40 AM**

**Investigation of a Pre-strain-specific Edge Crack Sensitivity Factor and Its Implementation in FEM:** *Alexander Kindsmueller*<sup>1</sup>; Roman Norz<sup>1</sup>; Niko Manopulo<sup>2</sup>; Wolfram Volk<sup>1</sup>; <sup>1</sup>Technical University of Munich; <sup>2</sup>AutoForm Development GmbH

**10:00 AM Break****10:20 AM**

**Predictions of Necking and Fracture in Sheet Metal Forming of the Laser-Welded Blank with GEN3 AHSS:** *Hyunok Kim*<sup>1</sup>; <sup>1</sup>EWI Forming Center

**10:40 AM**

**Experimental and Numerical Study on the Effect of Support Force in Double Sided Incremental Forming:** *Praveen Konka*<sup>1</sup>; Shivaprasad Cherukupally<sup>1</sup>; Venkata Reddy Nallagundla<sup>1</sup>; <sup>1</sup>Indian Institute of Technology Hyderabad

**Monday PM Plenary**

Monday PM  
July 11, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

**1:00 PM Introductory Comments****1:05 PM Plenary**

**An Effective Way to a Digital Process Model:** *Bart Carleer*<sup>1</sup>; Mike Selig<sup>1</sup>; Igor Burchitz<sup>1</sup>; <sup>1</sup>AutoForm

**1:45 PM Question and Answer Period****1:55 PM Introductory Comments****2:00 PM Plenary**

**Towards Machine-learning based Constitutive Modeling:** Colin Bonatti<sup>1</sup>; Christian Roth<sup>1</sup>; Vincent Grolleau<sup>1</sup>; *Dirk Mohr*<sup>1</sup>; <sup>1</sup>ETH Zurich

**2:40 PM Question and Answer Period****MS1: Numerical Implementation of Advanced Constitutive Models II**

Monday PM  
July 11, 2022

Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

**2:55 PM Keynote**

**Theoretical and Finite Element Analysis of New phenomena in Fully-dense Materials Displaying Tension-compression Asymmetry for Combined Axial-torsion Loadings:** *Oana Cazacu*<sup>1</sup>; Benoit Revil-Baudard<sup>1</sup>; <sup>1</sup>University of Florida, REEF

**3:25 PM**

**Constructing Exact Solutions to Modelling Problems:** *Mathew Aibinu*<sup>1</sup>; Surendra Thakur<sup>1</sup>; Sibusiso Moyo<sup>1</sup>; <sup>1</sup>Durban University of Technology

**3:45 PM**

**Overcoming Major Obstacles of Springback Compensation by Nonlinear Optimization:** *Luca Hornung*<sup>1</sup>; <sup>1</sup>Stampack GmbH

**4:05 PM Break****4:25 PM**

**Numerical Modeling for Progressive Crushing of Composite and Hybrid Metal-Composite Structures:** Saarvesh Jayakumar<sup>1</sup>; Lorenz Stolz<sup>1</sup>; Sharath Anand<sup>1</sup>; Amir Hajdarevic<sup>1</sup>; *Xiangfan Fang*<sup>1</sup>; <sup>1</sup>University of Siegen, Institute of Automotive Lightweight Design

**4:45 PM**

**Identification and Validation of Brass Material Parameters Using Single Point Incremental Forming:** *Ehssen Betaieb*<sup>1</sup>; Laurent Duchêne<sup>1</sup>; Anne Marie Habraken<sup>1</sup>; <sup>1</sup>University of Liège

**5:05 PM**

**DP1180 Material Calibration between Sheet Metal Simulation and Prototype:** *Rongfeng Liu*<sup>1</sup>; Dayong Li<sup>1</sup>; <sup>1</sup>JSOL Corporation

**MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin II**

Monday PM  
July 11, 2022

Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

**2:55 PM Keynote**

**On the Generalized Plane-Strain Constraints for Orthotropic Plasticity Modeling of Sheet Metals:** Jie Sheng<sup>1</sup>; Seung-Yong Yang<sup>2</sup>; *Wei Tong*<sup>1</sup>; <sup>1</sup>Southern Methodist University; <sup>2</sup>Korea University of Technology and Education

**3:25 PM**

**Numerical Residual Stress Analysis of Combined Tensile and Compressive Stress-superposed Incremental Sheet Forming:** *Fabian Maass*<sup>1</sup>; Marlon Hahn<sup>1</sup>; A. Erman Tekkaya<sup>1</sup>; <sup>1</sup>Institute of Forming Technology and Lightweight Components, TU Dortmund

**3:45 PM**

**Numerical Simulation on the Effect of Process Parameters on Earing Defect of AA6061 and Low Carbon Steel Alloy through Deep Drawing Process:** *Amirela Siraji*<sup>1</sup>; Tsegaye Bekele<sup>1</sup>; Habtamu Beri<sup>1</sup>; Janaki Ramulu Perumalla<sup>1</sup>; Venkateswar Reddy P<sup>2</sup>; <sup>1</sup>Adama Science and Technology University; <sup>2</sup>Vardhaman College of Engineering

**4:05 PM Break****4:25 PM**

**Experimental and Numerical Evaluation of DP600 Fracture Limits:** *Yang Song*<sup>1</sup>; Iman Sari Sarraf<sup>1</sup>; Daniel Green<sup>1</sup>; <sup>1</sup>University of Windsor

**MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton II**

Monday PM  
July 11, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

**2:55 PM Keynote**

**Potentials for Material Card Validation Using an Innovative Tool:** Matthias Eder<sup>1</sup>; Maximilian Gruber<sup>1</sup>; Niko Manopulo<sup>2</sup>; *Wolfram Volk*<sup>1</sup>; <sup>1</sup>Technical University of Munich; <sup>2</sup>AutoForm Development GmbH

3:25 PM

**Axisymmetric V-Bending: Identifying the Fracture Strain and Weakest Direction for Plane Strain Tension Loading from a Single Experiment:** *Christian Roth*<sup>1</sup>; Thomas Beerli<sup>1</sup>; Vincent Grolleau<sup>1</sup>; Dirk Mohr<sup>1</sup>; <sup>1</sup>ETH Zurich

3:45 PM Keynote

**Shape Optimization of a Cruciform-like Specimen for Combined Tension and Shear Loading:** Minki Kim<sup>1</sup>; Jinjin Ha<sup>1</sup>; *Yannis Korkolis*<sup>1</sup>; <sup>1</sup>The Ohio State University

4:15 PM Break

4:35 PM

**Influence of Kinematic Hardening on Clinch Joining of Dual-phase Steel HCT590X Sheet Metal:** *Johannes Friedlein*<sup>1</sup>; Julia Mergheim<sup>1</sup>; Paul Steinmann<sup>1</sup>; <sup>1</sup>Friedrich-Alexander-Universität Erlangen-Nürnberg

4:55 PM

**Characterization of Post-necking Hardening Response: An Assessment of Experimental Methods that Utilize DIC Surface Strains:** *Armin Abedini*<sup>1</sup>; Jacqueline Noder<sup>1</sup>; Cliff Butcher<sup>1</sup>; <sup>1</sup>University of Waterloo

5:15 PM

**A Novel Testing Methodology for *In-situ* Microstructural Characterisation during Continuous Strain Path Change:** *Sisir Dhara*<sup>1</sup>; Sumit Hazra<sup>1</sup>; Barbara Shollock<sup>2</sup>; Lukasz Figiel<sup>1</sup>; <sup>1</sup>WMG, University of Warwick; <sup>2</sup>Department of Engineering, King's College London

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## MS7: Modelling of Failure II

Monday PM  
July 11, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

2:55 PM Keynote

**Development of a Modified Punch Test for Investigating the Failure Behavior in Sheet Metal Materials:** *Max Boehnke*<sup>1</sup>; Christian Bielak<sup>1</sup>; Mathias Bobbert<sup>1</sup>; Gerson Meschut<sup>1</sup>; <sup>1</sup>Laboratory for Material and Joining Technology, Paderborn University

3:25 PM

**Strain Rate Dependent Hardening Behavior of Weld Metal in Laser Welded Blank with GEN3 AHSS:** Minki Kim<sup>1</sup>; Jiahui Gu<sup>2</sup>; *Hyunok Kim*<sup>2</sup>; <sup>1</sup>Korea Institute of Industrial Technology; <sup>2</sup>EWI

3:45 PM

**Effect of Tool Contact Pressure on Plastic Instability in Sheet Metal Forming:** *Jacqueline Noder*<sup>1</sup>; Clifford Butcher<sup>1</sup>; <sup>1</sup>University of Waterloo

4:05 PM Break

4:25 PM

**Prediction of Necking Initiation in Case of Abrupt Changes in the Loading Direction:** *Roman Norz*<sup>1</sup>; Niko Manopulo<sup>2</sup>; Mats Sigvant<sup>3</sup>; Anton Chezan<sup>4</sup>; Wolfram Volk<sup>1</sup>; <sup>1</sup>Lehrstuhl für Umformtechnik und Gießereiwesen utg; <sup>2</sup>AutoForm Development GmbH; <sup>3</sup>Volvo Var Corporation; <sup>4</sup>Tata Steel Europe

4:45 PM

**Characterization of the Formability of Al-Si Coated PHS1800 During Hot Stamping:** *Ruijian He*<sup>1</sup>; Ryan George<sup>1</sup>; Sante DiCecco<sup>1</sup>; Pedram Samadian<sup>1</sup>; Constantin Chiriac<sup>2</sup>; Stephen Luckey<sup>2</sup>; Jimi Tjong<sup>3</sup>; Cangji Shi<sup>4</sup>; Jason Boettger<sup>5</sup>; Cliff Butcher<sup>1</sup>; Michael Worswick<sup>1</sup>; <sup>1</sup>University of Waterloo; <sup>2</sup>Ford Motor Company; <sup>3</sup>Ford Motor Company of Canada; <sup>4</sup>Magna International; <sup>5</sup>Promatek Research Centre

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## Tuesday AM Plenary

Tuesday AM  
July 12, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

8:00 AM Introductory Comments

8:10 AM Plenary

**Revolutionary Solutions Using DIC Technology to Meet the Needs of the Metal Forming Industry:** *Thomas Stoughton*<sup>1</sup>; <sup>1</sup>General Motors R&D

8:50 AM Question and Answer Period

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## MS1: Numerical Implementation of Advanced Constitutive Models III

Tuesday AM  
July 12, 2022

Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Sheet Metal Forming Simulation System Strongly Coupled with Die Tool Deformation:** *Masahi Arai*<sup>1</sup>; Naoki Ichijo<sup>2</sup>; <sup>1</sup>J SOL Corporation; <sup>2</sup>Toyota Motor Corporation

9:40 AM

**Characterization of Impurities in Nanomaterials:** Kemi Adewale<sup>1</sup>; *Mathew Aibinu*<sup>2</sup>; <sup>1</sup>University of KwaZulu-Natal; <sup>2</sup>Durban University of Technology

10:00 AM Break

10:20 AM

**A Non-iterative Stress Update Method for Sheet Metal Forming Simulations:** *Seong-Yong Yoon*<sup>1</sup>; Frederic Barlat<sup>1</sup>; <sup>1</sup>POSTECH

10:40 AM

**Die Design for Flashless Forging of a Polymer Insulator Fitting:** *Pedram Khazaie*<sup>1</sup>; Sajjad Moein<sup>1</sup>; <sup>1</sup>Kaveh Forging Co

11:00 AM

**Numerical Prediction of Failure in Single Point Incremental Forming Using a New Yield Criterion for Sheet Metal:** Hung Quach<sup>1</sup>; Xiao Xiao<sup>1</sup>; Jin jae Kim<sup>1</sup>; *Young Suk Kim*<sup>1</sup>; <sup>1</sup>Kyungbook National University

11:20 AM

**Research on Simulation Analysis of Metal Rubber Sealing System Model:** *Xiaochu Gao*<sup>1</sup>; Hong Li<sup>1</sup>; Dongxu Zhang<sup>1</sup>; <sup>1</sup>College of Aerospace and Civil Engineering, Harbin Engineering University

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## MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin III

Tuesday AM  
July 12, 2022

Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Facet 3D: A Robust Crystal Plasticity Based Yield Function for Sheet Metal Forming Simulations:** Hadi Ghiabakloo<sup>1</sup>; Niko Manopulo<sup>2</sup>; Juan Mora<sup>3</sup>; Bart Carleer<sup>4</sup>; Leo Kestens<sup>5</sup>; *Albert Van Bael*<sup>1</sup>; <sup>1</sup>Department of Materials Engineering, Katholieke Universiteit Leuven; <sup>2</sup>AutoForm Development GmbH; <sup>3</sup>AutoForm Engineering B.V.; <sup>4</sup>AutoForm Engineering Deutschland GmbH; <sup>5</sup>Department of Electromechanical, Systems and Metals Engineering, Ghent University



9:40 AM

**Three-dimensional Control Point Based Surface Description for Data Reduction, Reverse Engineering and Springback Compensation in Sheet Metal Forming:** *Lorenz Maier*<sup>1</sup>; Christoph Hartmann<sup>1</sup>; Bogac Ünver<sup>1</sup>; Wolfram Volk<sup>1</sup>; <sup>1</sup>Technical University of Munich

10:00 AM Break

10:20 AM

**3D-Swivel-bending – A Flexible and Scalable Forming Technology:** *Michael Schiller*<sup>1</sup>; Bernd Engel<sup>1</sup>; <sup>1</sup>University of Siegen

10:40 AM

**Numerical Modeling and Optimization of Fiber Metal Laminates:** Sijia Sheng<sup>1</sup>; *Lihui Lang*<sup>1</sup>; <sup>1</sup>Beihang University

11:00 AM

**Numerical and Experimental Study of Single Point Incremental Forming of Sheet Metal:** *Zhigang Liu*<sup>1</sup>; <sup>1</sup>Institute of High Performance Computing

### MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton III

Tuesday AM  
July 12, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Why the Hardening Rate Can Attain a Maximum Value of One Third of the Elastic Modulus in Strongly Textured Mg Alloys under Twinning Dominated Conditions?:** Chao Ma<sup>1</sup>; Xiaoqian Guo<sup>2</sup>; Huamiao Wang<sup>3</sup>; Dayong Li<sup>3</sup>; Yinghong Peng<sup>3</sup>; *Peidong Wu*<sup>4</sup>; <sup>1</sup>Xuzhou University of Technology; <sup>2</sup>China University of Mining and Technology; <sup>3</sup>Shanghai Jiao Tong University; <sup>4</sup>McMaster University

9:40 AM

**Lightweighting through Stiffening Dart Formation and Its Rigidity Evaluation:** *Dohyun Leem*<sup>1</sup>; Lu Huang<sup>2</sup>; Joshua Solomon<sup>2</sup>; Hui-ping Wang<sup>2</sup>; Jian Cao<sup>1</sup>; <sup>1</sup>Northwestern University; <sup>2</sup>General Motors

10:00 AM Break

10:20 AM

**Automated Nakazima Experiments for Studying Anisotropy and Loading Path Dependence of Necking Failure:** *Vincent Grolleau*<sup>1</sup>; Christian Roth<sup>2</sup>; Dirk Mohr<sup>2</sup>; <sup>1</sup>UBS IRDL Lorient (F) and ETH Zurich (CH); <sup>2</sup>ETH Zurich

10:40 AM

**SD Effect of High Strength Steel Sheet and Its Effect on the Predictive Accuracy of Body Wrinkles:** *Ren Tachibana*<sup>1</sup>; Nobuyasu Noma<sup>2</sup>; Shinnosuke Uda<sup>2</sup>; Toshihiko Kuwabara<sup>1</sup>; <sup>1</sup>Tokyo University of Agriculture and Technology; <sup>2</sup>Advanced Engineering Development Center, Unipres Corporation

11:00 AM

**Draw Die Development to Maximize Aluminum Formability Potential for Making Styling Featured Outer Panels:** *Zhi Deng*<sup>1</sup>; Raj Dasu<sup>1</sup>; Anil Sachdev<sup>2</sup>; <sup>1</sup>Commonwealth Rolled Products; <sup>2</sup>General Motors Research and Development Center

11:20 AM

**Hydroforming Behaviour of TIG-welded Tubes of Austenitic Stainless Steel:** *Krishna Raju*<sup>1</sup>; Sandeep<sup>1</sup>; Amarjeet<sup>1</sup>; Krishnaiyer Narasimhan<sup>1</sup>; <sup>1</sup>IIT, Bombay

### MS6: Modelling of Thermo-mechanical Sheet Forming I

Tuesday AM  
July 12, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Modelling and Analysis of Adiabatic Blanking of AHSS with Different Heat Treatments:** *Fabian Schmitz*<sup>1</sup>; Benjamin Bohne<sup>2</sup>; Marlon Hahn<sup>1</sup>; Philipp Frint<sup>2</sup>; Till Clausmeyer<sup>1</sup>; Martin Wagner<sup>2</sup>; A. Erman Tekkaya<sup>1</sup>; <sup>1</sup>Institute of Forming Technology and Lightweight Components (IUL), TU Dortmund; <sup>2</sup>Technische Universität Chemnitz Institute of Materials Science and Engineering

9:40 AM

**Development of a Hot Cutting Process for Functional Parts by Stress State Dependent Damage Modeling:** Christian Löbbe<sup>1</sup>; *Juri Martschin*<sup>1</sup>; Detlef Putschkat<sup>2</sup>; Hosen Sulaiman<sup>3</sup>; Andreas Jäger<sup>2</sup>; A. Erman Tekkaya<sup>1</sup>; <sup>1</sup>Institute of Forming Technology and Lightweight Components (IUL), TU Dortmund University; <sup>2</sup>KODA Stanz- und Biegetechnik GmbH; <sup>3</sup>Faurecia Autositze GmbH

10:00 AM Break

10:20 AM

**Impact of Thermal Conditions on Predicted Formability of TRIP Steels:** *Daniel Connolly*<sup>1</sup>; Christopher Kohar<sup>1</sup>; Raja Mishra<sup>2</sup>; Kaan Inal<sup>1</sup>; <sup>1</sup>University of Waterloo; <sup>2</sup>General Motors Research & Development Center

10:40 AM

**Validation of Comprehensive Material and Friction Models for Simulation of Thermo Mechanical Forming of High Strength Aluminium Alloys Using HFQ Technology:** Damian Szege<sup>1</sup>; *Mohamed Mohamed*<sup>1</sup>; Rajab Said<sup>2</sup>; Mustapha Ziane<sup>2</sup>; <sup>1</sup>Impression Technologies Ltd; <sup>2</sup>ESI Group

11:00 AM

**Determination of Friction Coefficient at Elevated Temperature Using Bending Under Tension Machine:** Sakthivel A<sup>1</sup>; *K. Narasimhan*<sup>1</sup>; Amarjeet Singh<sup>1</sup>; <sup>1</sup>IIT Bombay

### Tuesday PM Plenary

Tuesday PM  
July 12, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

1:30 PM Introductory Comments

1:40 PM Plenary

**Simulation of Warm Forming of 7000-Series Aluminum Alloys for Automotive Structures:** Negar Baghbanie<sup>1</sup>; Hossein Pishyar<sup>1</sup>; Kenneth Cheong<sup>1</sup>; Sante DiCecco<sup>1</sup>; Ryan George<sup>1</sup>; Shahrzad Esmaeil<sup>1</sup>; Cliff Butcher<sup>1</sup>; *Michael Worswick*<sup>1</sup>; <sup>1</sup>University of Waterloo

2:20 PM Question and Answer Period

## MS1: Numerical Implementation of Advanced Constitutive Models IV

Tuesday PM  
July 12, 2022

Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

2:40 PM

**Numerically Coupled Tools for Double Sided Incremental Sheet Forming:** Vincent Raymond<sup>1</sup>; Jean Savoie<sup>1</sup>; <sup>1</sup>NRC

3:00 PM

**Characterization of Cohesive Zone Model Properties of Laminated Metal Sheet with a Thin Adhesive Layer:** Hyeonil Park<sup>1</sup>; Se-Jong Kim<sup>1</sup>; Jinwoo Lee<sup>2</sup>; Daeyong Kim<sup>3</sup>; <sup>1</sup>Korea Institute of Materials Science

3:20 PM

**Predictive Capabilities of a New Polycrystalline Model for Forming Operations:** Benoit Revil-Baudard<sup>1</sup>; Oana Cazacu<sup>1</sup>; Nitin Chandola<sup>1</sup>; <sup>1</sup>University of Florida, REEF

3:40 PM Break

4:00 PM

**Constitutive Modelling of Anisotropic Plasticity for Additively Manufactured Gas Turbine Components:** Omid Majidi<sup>1</sup>; Ali Amini Harandi<sup>2</sup>; Minh Quan Pham<sup>1</sup>; Mathias Legrand<sup>2</sup>; <sup>1</sup>Siemens Energy Canada Limited; <sup>2</sup>McGill University

4:20 PM

**Die Quench Thermal and Friction Boundary Conditions:** Raphael Boullis<sup>1</sup>; Sante DiCecco<sup>1</sup>; Ryan George<sup>1</sup>; Michael Worswick<sup>1</sup>; <sup>1</sup>University of Waterloo

4:40 PM

**Numerical Simulation of Chain-die Forming Based on LS-DYNA:** Yinghua Chen<sup>1</sup>; Rui He<sup>1</sup>; Lei Huan<sup>1</sup>; Yidong Bao<sup>1</sup>; <sup>1</sup>Nanjing University of Aeronautics and Astronautics

## MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin IV

Tuesday PM  
July 12, 2022

Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

2:40 PM Keynote

**Time Dependent Method for the Inverse Evaluation of Yield Locus Using Nakazima Experiments:** Konrad Barth<sup>1</sup>; Bekim Berisha<sup>2</sup>; Pavel Hora<sup>2</sup>; <sup>1</sup>ETH Zurich Institute of Virtual Manufacturing; <sup>2</sup>Inspire AG - Institute of Virtual Manufacturing

3:10 PM

**Analysis of Different Parameter Identification Strategies and Application to Forward Rod Extrusion:** Till Clausmeyer<sup>1</sup>; Jan Gerlach<sup>1</sup>; Alexander Schowtjak<sup>1</sup>; Robin Schulte<sup>1</sup>; Richard Ostwald<sup>1</sup>; <sup>1</sup>TU Dortmund University

3:30 PM

**An Experimental Methodology to Characterize the Uniaxial Fracture Strain of Sheet Metals using the Conical Hole Expansion Test:** Advait Naryanan<sup>1</sup>; Farinaz Khameneh<sup>1</sup>; Armin Abedini<sup>1</sup>; Cliff Butcher<sup>1</sup>; <sup>1</sup>University of Waterloo

3:50 PM Break

4:10 PM

**Numerical Study of the Newly Developed Sheet Metal Forming Process Transversal Compression Drawing:** David Briesenick<sup>1</sup>; Mathias Liewald<sup>1</sup>; <sup>1</sup>Institute for Metal Forming Technology

4:30 PM

**Development of a Numerical 3D Model for Analyzing Clinched Joints in Versatile Process Chains:** Christian Biela<sup>1</sup>; Max Böhnke<sup>1</sup>; Mathias Bobbert<sup>1</sup>; Gerson Meschut<sup>1</sup>; <sup>1</sup>Laboratory for Material and Joining Technology, Paderborn University

4:50 PM

**The Influence of Tool Types on Surface Topography in Incremental Sheet Forming:** Kai Han<sup>1</sup>; Xiaoqiang Li<sup>2</sup>; Yanle Li<sup>2</sup>; Yanfeng Yang<sup>1</sup>; Dongsheng Li<sup>1</sup>; <sup>1</sup>Beihang University; <sup>2</sup>Shandong University

## MS3: Mechanics and Materials of Sheet Forming in Honor of Thomas B. Stoughton IV

Tuesday PM  
July 12, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

2:40 PM Keynote

**Characterization of Martensite Transformation of SS304L under Proportional Loading Paths:** Jinjin Ha<sup>1</sup>; Jordan Hoffman<sup>1</sup>; Brad Kinsey<sup>1</sup>; <sup>1</sup>University of New Hampshire

3:10 PM

**Characterization of Sheet Metal Plasticity through In-plane Torsion Experiments with Full-field Measurements:** Vincent Grolleau<sup>1</sup>; Christian Roth<sup>2</sup>; Bertrand Galpin<sup>3</sup>; Dirk Mohr<sup>2</sup>; <sup>1</sup>UBS IRDL Lorient (F) and ETH Zurich (CH); <sup>2</sup>ETH Zurich; <sup>3</sup>UBS IRDL Lorient and AMCC Coetquidan (F)

3:30 PM

**Analysis of Plane Strain Tension Regions of Deviatoric Anisotropic Yield Criteria:** Cole Fast-Irvine<sup>1</sup>; Armin Abedini<sup>1</sup>; Advait Naryanan<sup>1</sup>; Cliff Butcher<sup>1</sup>; <sup>1</sup>University of Waterloo

3:50 PM Break

4:10 PM

**NIST Mechanical Tests for Generating Constitutive Data for the Numisheet 2020 Benchmark Materials:** Evan Rust<sup>1</sup>; William Luecke<sup>1</sup>; Mark Iadicola<sup>1</sup>; Dilip Banerjee<sup>1</sup>; <sup>1</sup>National Institute of Standards and Technology

4:30 PM

**Comparison of Experimental and Finite Element Analysis Results of a Car Body Part with the Optimization of Material Parameters:** Emin Tamer<sup>1</sup>; Sefa Bortucen<sup>2</sup>; Ugur Sahinoglu<sup>3</sup>; <sup>1</sup>Borcelik Steel Industry Trade Inc.; <sup>2</sup>TOFAS Turkish Automotive Factory; <sup>3</sup>ArcelorMittal Europe

4:50 PM

**A Study on Microstructural Evolution during Forming of Thin Foil of Commercially Pure Titanium:** Anurag Niranjan<sup>1</sup>; Narasimhan Krishnaiyengar<sup>2</sup>; <sup>1</sup>Element Materials Technology; <sup>2</sup>IIT Bombay

## MS6: Modelling of Thermo-mechanical Sheet Forming II

Tuesday PM  
July 12, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

2:40 PM Keynote

**Local Heat Treatment for Springback Reduction in Deep Drawing of Advanced High-strength Steel:** Josef Domitner<sup>1</sup>; Vladimir Boskovic<sup>1</sup>; Florian Grünbart<sup>1</sup>; Iris Baumgartner<sup>2</sup>; Christof Sommitsch<sup>1</sup>; Mustafa Kicin<sup>3</sup>; <sup>1</sup>Graz University of Technology; <sup>2</sup>Light Metals Technologies Ranshofen GmbH (LKR); <sup>3</sup>Cosma Engineering Europe GmbH

3:10 PM

**The Development of Constitutive Parameters for an 1800 MPa Press Hardening Steel:** *Stan Lu<sup>1</sup>; Michael Worswick<sup>1</sup>; Constantin Chiriac<sup>2</sup>; Cangji Shi<sup>3</sup>*; <sup>1</sup>University of Waterloo; <sup>2</sup>Ford Motor Company; <sup>3</sup>Promatek Research Centre

3:30 PM Break

### Wednesday AM Plenary

Wednesday AM  
July 13, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

8:00 AM Introductory Comments

8:10 AM Plenary

**Advanced Material Testing for Sheet Metals:** *Toshihiko Kuwabara<sup>1</sup>*; <sup>1</sup>Tokyo University of Agriculture and Technology

8:50 AM Question and Answer Period

### MS1: Numerical Implementation of Advanced Constitutive Models V

Wednesday AM  
July 13, 2022

Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Analysis on Deformation Behavior of High Strength Steel Using the Finite Element Method in Conjunction with Constitutive Model Considering the Elongation at Yield Point:** *Seung Chae Yoon<sup>1</sup>; Ki Joung Kim<sup>1</sup>; Gi Hak Yim<sup>1</sup>; Ju Sik Hyun<sup>1</sup>; Yoo Dong Chung<sup>1</sup>*; <sup>1</sup>Hyundai Steel Company

9:40 AM

**Validation of Strain Path-dependent Hardening Models to Forming of Martensitic Steel:** *Shin-Yeong Lee<sup>1</sup>; Jin-Hwan Kim<sup>1</sup>; Frédéric Barlat<sup>1</sup>; Kyung-Seok Oh<sup>2</sup>*; <sup>1</sup>POSTECH; <sup>2</sup>POSCO

10:00 AM Break

10:20 AM

**An Upper Bound Analysis of Friction Stir Spot Welding Processes:** *Deoksang Jo<sup>1</sup>; Hossein Ghorbani-Menghari<sup>1</sup>; Ji Hoon Kim<sup>1</sup>*; <sup>1</sup>Pusan National University

10:40 AM

**A New Sample for Oscillation Free Force Measurement at High Strain Rates and Its Physical Principles:** *Xiangfan Fang<sup>1</sup>*; <sup>1</sup>Institute of Automotive Light Weight Design

11:00 AM

**Multidimensional Numerical Simulation of the Electro-Hydrodynamic Force in a Plasma Actuator:** *Abdelkader Mekri<sup>1</sup>; Abdelghani Boukreris<sup>2</sup>; Ali Hennad<sup>3</sup>*; <sup>1</sup>Etablissement Hospitalier Universitaire d'Oran; <sup>2</sup>ATRSSV; <sup>3</sup>Université des Sciences et de la Technologie d'Oran

11:20 AM

**Numerical Modeling of Photoionization in Plasma by Using Approaches Methods:** *Abdelghani Boukreris<sup>1</sup>; Abdelkader Mekri<sup>2</sup>; Ali Hennad<sup>3</sup>*; <sup>1</sup>ATRSSV; <sup>2</sup>Etablissement Hospitalier Universitaire d'Oran; <sup>3</sup>Université des Sciences et de la Technologie d'Oran Mohamed-Boudiaf USTOMB

11:40 AM

**Analysis of Functional Cup of Titanium with Corrugated Structure:** *Takaki Ogawa<sup>1</sup>*; <sup>1</sup>JSOL Corporation

### MS4: Machine Learning and Big Data I

Wednesday AM  
July 13, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**An Advanced Machine Learning Model to Accelerate Sheet Forming Simulations:** *Daniel Connolly<sup>1</sup>; Kaan Inal<sup>2</sup>*; <sup>1</sup>Impact AI; <sup>2</sup>University of Waterloo

9:40 AM

**Automatic Extraction and Conversion of the Bending Line from Parametric and Discrete Data for the Free-form Bending Process:** *Lorenzo Scandola<sup>1</sup>; Daniel Maier<sup>1</sup>; Matthias Werner<sup>1</sup>; Christoph Hartmann<sup>1</sup>; Wolfram Volk<sup>1</sup>*; <sup>1</sup>Technical University of Munich

10:00 AM Break

10:20 AM

**Modeling the Rate and Temperature Response of Third Generation AHSS Considering the Effect of Dynamic Strain Aging:** *Xueyang Li<sup>1</sup>; Christian Roth<sup>1</sup>; Dirk Mohr<sup>1</sup>*; <sup>1</sup>ETH Zurich

10:40 AM

**Data Informed Process Control in Progressive Sheet Metal Forming using Neural Networks:** *Dylan Budnick<sup>1</sup>; Florian Steinlehner; Annika Weinschenk<sup>2</sup>; Wolfram Volk; S. Huhn<sup>2</sup>; W Melek<sup>1</sup>; Michael Worswick<sup>1</sup>*; <sup>1</sup>University of Waterloo; <sup>2</sup>Forming Technologies, Part of Hexagon

11:00 AM

**Towards Development of a Machine-learning Based Universal Plasticity Model of Sheet Metal under Arbitrary Loadings:** *Maysam Gorji<sup>1</sup>; Julian Heidenreich<sup>1</sup>; Dirk Mohr<sup>2</sup>*; <sup>1</sup>Massachusetts Institute of Technology; <sup>2</sup>ETH Zurich

11:20 AM

**Data-based Prediction Model for an Efficient Matching Process in the Body Shop:** *Arndt Birkert<sup>1</sup>; Johannes Weber<sup>2</sup>; Moritz Nowack<sup>1</sup>; Christian Schwarz<sup>2</sup>; Benjamin Hartmann<sup>1</sup>; Philipp Zimmermann<sup>1</sup>*; <sup>1</sup>inigence gmbh; <sup>2</sup>Fraunhofer

11:40 AM

**On the Potential of Convolutional Neural Networks for Estimating Structure-property Relationships:** *Julian Heidenreich<sup>1</sup>; Maysam Gorji<sup>1</sup>; Dirk Mohr<sup>1</sup>*; <sup>1</sup>Massachusetts Institute of Technology, ETH Zurich

### MS5: Multiscale Modeling of Deformation and Fracture Behavior of Metallic Materials I

Wednesday AM  
July 13, 2022

Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Influence of Loading Direction on the Mechanical Parameters of Pre-formed Materials in Tensile Test:** *Roman Norz<sup>1</sup>; Wolfram Volk<sup>1</sup>*; <sup>1</sup>Lehrstuhl für Umformtechnik und Gießereiwesen

9:40 AM

**Deformation and Failure Behavior of Steel under High Strain Rate and Multiaxial Loading:** *Chongyang Zeng<sup>1</sup>; Xiangfan Fang<sup>1</sup>*; <sup>1</sup>University of Siegen

10:00 AM Break

10:20 AM

**Forming-structural Coupled Analysis: The Method to Predict Die Deformation Using Quick Simulations:** *Kihoon Yun*<sup>1</sup>; Sang-Hwan Jun<sup>1</sup>; Myung-Soo Moon<sup>2</sup>; Jong-Sung Kim<sup>3</sup>; Hyoung-Soo Kim<sup>1</sup>; Kwang-Kyu Park<sup>4</sup>; <sup>1</sup>Kia Motors; <sup>2</sup>AutoForm Engineering Korea Ltd.; <sup>3</sup>MIDAS IT; <sup>4</sup>KIA Motors

10:40 AM

**Meso-scale Modeling of Spot Weld Failure in Hot Stamped Automotive Steel Using Hardness Mapping Approach:** *Alireza Mohamadizadeh*<sup>1</sup>; Elliot Biro<sup>1</sup>; Michael Worswick<sup>1</sup>; <sup>1</sup>University of Waterloo

11:00 AM

**Predicting the Flow and Failure Properties of Dual Phase Steel Using Phenomenological Models:** Arshdeepsingh Sardar<sup>1</sup>; Alexander Bardelcik<sup>1</sup>; Hari Simha<sup>1</sup>; <sup>1</sup>University of Guelph

11:20 AM

**Coupled Crystal Plasticity Finite Element-cellular Automaton Approach to Model Microstructural Evolution in AZ31 Magnesium Alloy Hot-rolled Sheet:** *Xiaohu Deng*<sup>1</sup>; <sup>1</sup>Tianjin University of Technology and Education

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### MS8: Modelling of Friction

Wednesday AM  
July 13, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

9:10 AM Keynote

**Surface Texture Design for Sheet Metal Forming Applications:** *Javad Hazrati*<sup>1</sup>; Meghshyam Shisode<sup>1</sup>; Ton van den Boogaard<sup>1</sup>; <sup>1</sup>University of Twente

9:40 AM

**Analysis and Evaluation of the Clamping Force on the Tool Surface during the Blanking Process:** Daniel Martin<sup>1</sup>; *Philipp Schumann*<sup>1</sup>; Christian Kubik<sup>1</sup>; Timo Schneider<sup>1</sup>; Peter Groche<sup>1</sup>; <sup>1</sup>Institute for Production Engineering and Forming Machines - TU Darmstadt

10:00 AM Break

10:20 AM

**Optimization of Slip Conditions in Roll Forming by Numerical Simulation:** *Marco Becker*<sup>1</sup>; Peter Groche<sup>1</sup>; <sup>1</sup>PtU Darmstadt

10:40 AM

**Increasing the Prediction Quality of Clinching Process Simulation with Extensible Die by Means of Friction Modeling as a Function of the Local Joining Process Parameters:** *Moritz Rossel*<sup>1</sup>; Gerson Meschut<sup>1</sup>; <sup>1</sup>Paderborn University

11:00 AM

**Tool Surface Functionalization for Improved Tribological System in Sheet Metal Forming Applications:** *Srihari Kurukur*<sup>1</sup>; Suwas Nikumb<sup>1</sup>; Mohammed Tauhiduzzaman<sup>1</sup>; Mihnea Ionescu<sup>1</sup>; <sup>1</sup>National Research Council Canada

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### Wednesday PM Plenary

Wednesday PM  
July 13, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

1:30 PM Introductory Comments

1:40 PM Plenary

**Transformation in the Transportation Industry: Recent Advances in Simulation Technology:** *Andre Haufe*<sup>1</sup>; M. Merten<sup>1</sup>; T. Koppel<sup>1</sup>; S. Hartmann<sup>1</sup>; B. Hochholdinger<sup>1</sup>; F. Andrade<sup>1</sup>; D. Koch<sup>1</sup>; P. Glay<sup>1</sup>; <sup>1</sup>DYNAMore GmbH

2:20 PM Question and Answer Period

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### MS2: Modeling of Sheet Metal Forming in Memory of Prof. Jean-Claude Gelin V

Wednesday PM  
July 13, 2022

Room: Provincial North  
Location: Sheraton Centre  
Toronto Hotel

2:40 PM Keynote

**Springback Investigation of Advanced Path-dependent Constitutive Models for Sheet Metal Forming:** Yanfeng Yang<sup>1</sup>; Hocine Chalal<sup>1</sup>; Cyrille Baudouin<sup>1</sup>; Gabriela Vincze<sup>2</sup>; *Tudor Balan*<sup>1</sup>; <sup>1</sup>Arts et Metiers Institute of Technology; <sup>2</sup>University of Aveiro

3:10 PM

**Numerical Description of the Physical Properties of Stretch Web Connectors in Progressive Die Stamping:** *Florian Steinlehner*<sup>1</sup>; Annika Weinschenk<sup>2</sup>; Sven Kolb<sup>1</sup>; Stefan Laumann<sup>3</sup>; Wolfram Volk<sup>1</sup>; <sup>1</sup>Technical University of Munich; <sup>2</sup>Hexagon Canada; <sup>3</sup>Men at Work GmbH

3:30 PM

**A Novel Benchmark Test for Validating the Modelling and Simulation Methodology of Modern Gas-based Hot Sheet Metal Forming Processes:** *Naveen Krishna Baru*<sup>1</sup>; Tobias Teeuwen<sup>1</sup>; David Bailly<sup>1</sup>; Gerhard Hirt<sup>1</sup>; <sup>1</sup>Institute of Metal Forming (IBF), RWTH Aachen University

3:50 PM Break

4:10 PM Keynote

**Experimental and Finite Element Based Analyses of FLCs for AA5052 and AA5083 Alloys:** Shahin Ahmad<sup>1</sup>; Vilas Tathavadkar<sup>1</sup>; Alankar Alankar<sup>2</sup>; *K. Narasimhan*<sup>2</sup>; <sup>1</sup>Aditya Birla Science & Technology Co. Pvt. Ltd.; <sup>2</sup>Indian Institute of Technology, Bombay

4:40 PM

**Improvement of the Strength of an Aluminum Liner by Beading under Consideration of Internal Pressure and Low Temperatures:** *Alina Reimer*<sup>1</sup>; Philipp Sturm<sup>1</sup>; Roman Norz<sup>1</sup>; Christoph Hartmann<sup>1</sup>; Wolfram Volk<sup>1</sup>; <sup>1</sup>TU Munich

5:00 PM

**Effect of Laser Patterning on Static Loading Performance in Cylindrical 22MnB5 Tube:** Hyung-Gyu Kim<sup>1</sup>; *Jonghun Yoon*<sup>1</sup>; Wonjoo Lee<sup>1</sup>; Yuhyeong Jeong<sup>1</sup>; <sup>1</sup>Hanyang University

**MS4: Machine Learning and Big Data II**

Wednesday PM  
July 13, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

**2:40 PM Keynote**

**Web Scraping and Data Mining of Microstructure and Formability Data of Aluminum Alloy Sheets for Machine Learning:** Lalit Kaushik<sup>1</sup>; Ki-Seong Park<sup>1</sup>; *Shi Hoon Choi*<sup>1</sup>; <sup>1</sup>Sunchon National University

**3:10 PM**

**A Machine Learning Based Framework to Predict Local Strain Distribution, Fracture and the Evolution of Plastic Anisotropy in AlSi10Mg Alloy:** Waqas Muhammad<sup>1</sup>; Olga Ibragimova<sup>1</sup>; Abhijit Brahme<sup>1</sup>; *Kaan Inal*<sup>1</sup>; <sup>1</sup>University of Waterloo

**3:30 PM**

**Deep Learning Based Defect Inspection in Sheet Metal Stamping Parts:** *Aru Singh*<sup>1</sup>; Thomas Bashford-Rogers<sup>2</sup>; Sumit Hazra<sup>1</sup>; Kurt Debattista<sup>1</sup>; <sup>1</sup>The University of Warwick; <sup>2</sup>University of the West of England

**3:50 PM Break****MS5: Multiscale Modeling of Deformation and Fracture Behavior of Metallic Materials II**

Wednesday PM  
July 13, 2022

Room: Provincial South  
Location: Sheraton Centre  
Toronto Hotel

**2:40 PM Keynote**

**Microstructure Modelling of the HEC Behaviour of a Novel Vanadium DP980 Cold Rolled Alloy:** *Bruce Williams*<sup>1</sup>; Khaled Abu-Samk<sup>2</sup>; Babak Shalchi Amirkhiz<sup>1</sup>; Colin Scott<sup>1</sup>; <sup>1</sup>CanmetMATERIALS, Natural Resources Canada; <sup>2</sup>McMaster University

**3:10 PM**

**The Effect of Twinning/Detwinning on the Evolution of Texture and Microstructure under Cyclic Loading of AZ31 Magnesium Alloy:** Alena Gracheva<sup>1</sup>; Waqas Muhammad<sup>1</sup>; Jaspreet Nagra<sup>1</sup>; Abhijit Brahme<sup>1</sup>; Julie Levesque<sup>2</sup>; *Kaan Inal*<sup>1</sup>; <sup>1</sup>University of Waterloo; <sup>2</sup>Quebec Metallurgy Center

**3:30 PM**

**Application of Elasto-visco-plastic Self-consistent Polycrystal Finite Element Model for Springback Analysis:** *Youngung Jeong*<sup>1</sup>; Mooyeong Joo<sup>1</sup>; Bohye Jeon<sup>1</sup>; Frederic Barlat<sup>2</sup>; Carlos Tome<sup>3</sup>; <sup>1</sup>Changwon National University; <sup>2</sup>Pohang University of Science and Technology; <sup>3</sup>Los Alamos National Laboratory

**3:50 PM Break****4:10 PM**

**On the Constitutive and Fracture Response of Tailor Hot-Stamped Ductibor® 1000-AS Steel: Experimental Characterization and Modelling:** *Pedram Samadian*<sup>1</sup>; Armin Abedini<sup>1</sup>; Cliff Butcher<sup>1</sup>; Michael Worswick<sup>1</sup>; <sup>1</sup>University of Waterloo

**4:30 PM**

**Damage Evolution in DP600 Sheets Using a Combined Finite Element – Cellular Automata Model:** *Iman Sari Sarraf*<sup>1</sup>; Daniel Green<sup>1</sup>; Yang Song<sup>1</sup>; Javad Samei<sup>1</sup>; <sup>1</sup>University of Windsor

**4:50 PM**

**Investigating the Formability and Failure Mechanism of an Advanced High Strength Steel by a Microstructure Based Hierarchy Modeling Approach:** *Haiming Zhang*<sup>1</sup>; Shuai Luo<sup>1</sup>; Jiaru Liu<sup>1</sup>; Zhenshan Cui<sup>1</sup>; <sup>1</sup>Shanghai Jiao Tong University

**5:10 PM**

**Multi-Objective Optimization of Sheet Metal Forming Process Using Finite Element Method, Response Surface Model and Multi-Objective Optimization:** *Parviz Kahhal*<sup>1</sup>; Mohammad Kashfi<sup>2</sup>; Hossein Ghorbani-Menghari<sup>1</sup>; Jaebong Jung<sup>1</sup>; Ji Hoon Kim<sup>1</sup>; <sup>1</sup>Pusan National University; <sup>2</sup>Ayatollah Boroujerdi University

**MS9: Challenges and Opportunities in Forming Aluminum**

Wednesday PM  
July 13, 2022

Room: Churchill Room  
Location: Sheraton Centre  
Toronto Hotel

**2:40 PM Keynote**

**Bending Deformation of Aluminum-wood Hybrid Sheets for Automotive Lightweight Applications:** *Peter Auer*<sup>1</sup>; Philipp Matz<sup>2</sup>; Eva Graf<sup>1</sup>; Christian Kurzböck<sup>2</sup>; Thomas Krenke<sup>3</sup>; Ulrich Müller<sup>4</sup>; Josef Domitner<sup>1</sup>; <sup>1</sup>Graz University of Technology; <sup>2</sup>Virtual Vehicle Research GmbH; <sup>3</sup>W.E.I.Z. Forschungs & Entwicklungs gGmbH; <sup>4</sup>University of Natural Resources and Life Sciences

**3:10 PM**

**Sensitivity Study of Plastic Anisotropy on Failure Prediction in Hole-expansion**  
: Jinjin Ha<sup>1</sup>; *Yannis Korkolis*<sup>1</sup>; <sup>1</sup>The Ohio State University

**3:30 PM**

**Evaluation of the Effect of Material Surface Texturing in the Galling and Friction of Aluminum Stamping:** *Nagore Otegi*<sup>1</sup>; Alaitz Zabala<sup>1</sup>; Joseba Mendiguren<sup>1</sup>; Lander Galdos<sup>1</sup>; Eneko Sáenz de Argandoña<sup>1</sup>; <sup>1</sup>Mondragon Unibertsitatea

**3:50 PM Break****4:10 PM**

**Effects of Temperature on Deep Drawing of an Aluminum Alloy for Different Yield Criteria and Hardening Models:** *Rasih Demirkol*<sup>1</sup>; Haluk Darendeliler<sup>2</sup>; <sup>1</sup>ASELSAN A.S.; <sup>2</sup>Middle East Technical University

**4:30 PM**

**Dynamic Deformation Behaviour of Al-Li Alloys under High Strain Rate Deformation:** *Ali Abdelaty*<sup>1</sup>; <sup>1</sup>Nanjing University of Aeronautics & Astronautics

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**Thursday AM Plenary**

Thursday AM  
July 14, 2022

Room: Dominion Ballroom  
Location: Sheraton Centre  
Toronto Hotel

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8:00 AM Introductory Comments

8:10 AM Plenary

**Ductile Failure of Aluminum Alloys: Experimental and Modeling Challenges:** *Stelios Kyriakides*<sup>1</sup>; <sup>1</sup>University of Texas at Austin

8:50 AM Question and Answer Period

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**Benchmark Test Results**

Thursday AM  
July 14, 2022

Room: City Hall Room  
Location: Sheraton Centre  
Toronto Hotel

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9:10 AM Introductory Comments

9:20 AM Benchmark Test Results

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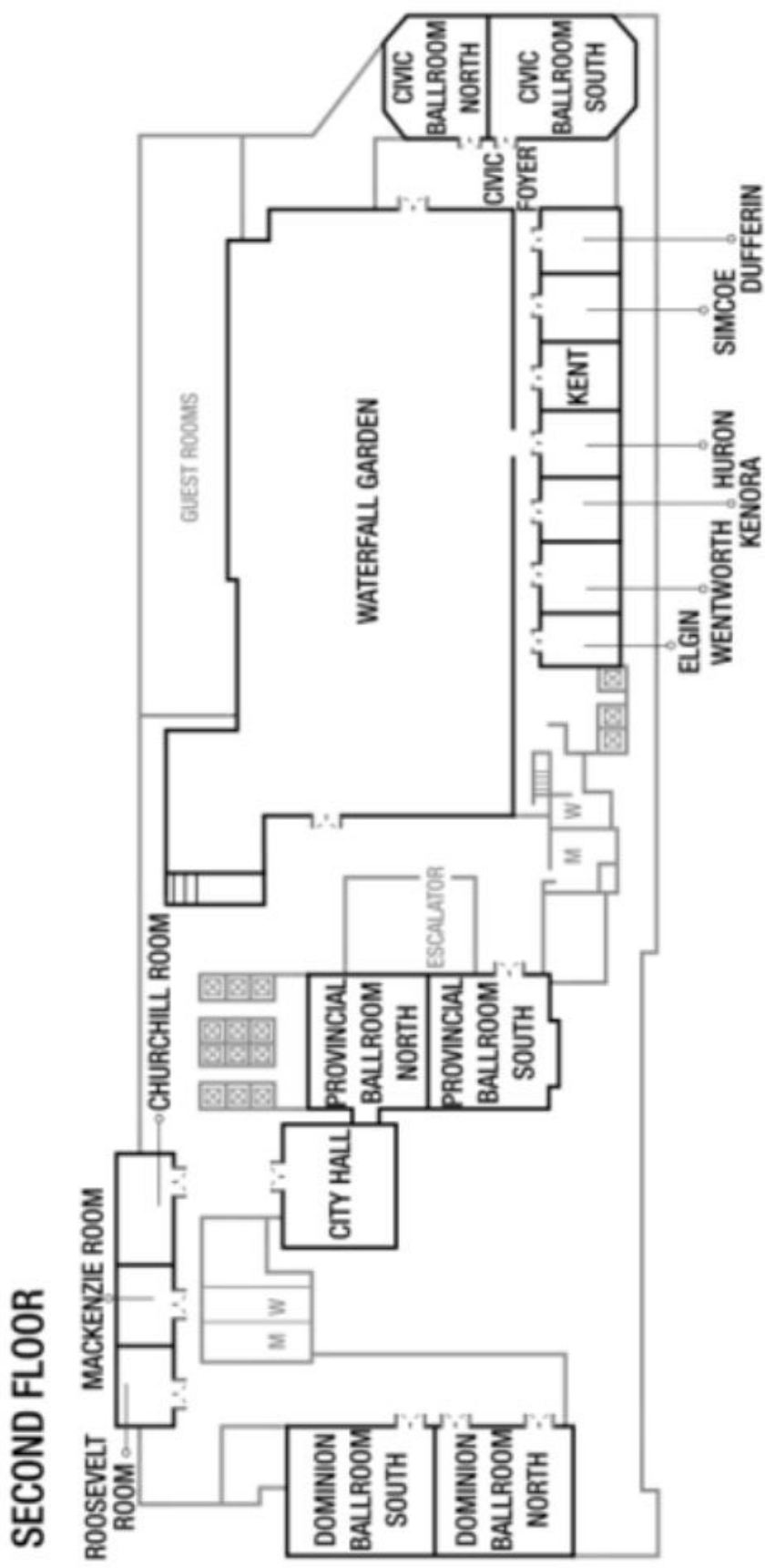
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# SCHEDULE AT A GLANCE

<b>Sunday, July 10</b>			
Registration	5:00 p.m.	8:00 p.m.	Dominion Foyer
Welcome reception	6:00 p.m.	7:00 p.m.	Provincial Ballroom
<b>Monday, July 11</b>			
Registration	7:00 a.m.	7:00 p.m.	Dominion Foyer
Continental Breakfast	7:00 a.m.	8:00 a.m.	Dominion Foyer
Plenary Session	8:00 a.m.	8:50 a.m.	Dominion Ballroom
Breakout Sessions	9:00 a.m.	12:00 p.m.	(See technical program)
- Break and Exhibit	10:00 a.m.	10:20 a.m.	Churchill Foyer
Lunch	12:00 p.m.	1:30 p.m.	Dominion Foyer
Plenary Session	1:00 p.m.	2:50 p.m.	Dominion Ballroom
Breakout Sessions	2:55 p.m.	5:30 p.m.	(See technical program)
- Break and Exhibit	3:40 p.m.	4:00 p.m.	Churchill Foyer
<b>Tuesday, July 12</b>			
Registration	7:00 a.m.	5:30 p.m.	Dominion Foyer
Continental Breakfast	7:00 a.m.	8:00 a.m.	Dominion Foyer
Plenary Session	8:00 a.m.	8:50 a.m.	Dominion Ballroom
Breakout Sessions	9:00 a.m.	12:00 p.m.	(See technical program)
- Break and Exhibit	10:00 a.m.	10:20 a.m.	Churchill Foyer
Lunch	12:00 p.m.	1:30 p.m.	Dominion Foyer
Plenary Session	1:30 p.m.	2:20 p.m.	Dominion Ballroom
Breakout Sessions	2:30 p.m.	5:30 p.m.	(See technical program)
- Break and Exhibit	3:40 p.m.	4:00 p.m.	Churchill Foyer
<b>Wednesday, July 13</b>			
Registration	7:00 a.m.	6:15 p.m.	Dominion Foyer
Continental Breakfast	7:00 a.m.	8:00 a.m.	Dominion Foyer
Plenary Session	8:00 a.m.	8:50 a.m.	Dominion Ballroom
Breakout Sessions	9:00 a.m.	12:00 p.m.	(See technical program)
- Break and Exhibit	10:00 a.m.	10:20 a.m.	Churchill Foyer
Lunch	12:00 p.m.	1:30 p.m.	Dominion Foyer
Plenary Session	1:30 p.m.	2:20 p.m.	Dominion Ballroom
Breakout Sessions	2:30 p.m.	5:30 p.m.	(See technical program)
- Break and Exhibit	3:40 p.m.	4:00 p.m.	Churchill Foyer
Conference Dinner Reception	5:45 p.m.	6:15 p.m.	Civic Ballroom Foyer
Conference Dinner and Entertainment	6:15 p.m.	9:00 p.m.	Civic Ballroom
<b>Thursday, July 14</b>			
Registration	7:00 a.m.	12:00 p.m.	Dominion Foyer
Continental Breakfast	7:00 a.m.	8:00 a.m.	Dominion Foyer
Plenary Session	8:00 a.m.	8:50 a.m.	Dominion Ballroom
Benchmark Session	9:00 a.m.	12:00 p.m.	Dominion Ballroom
- Break	10:00 a.m.	10:20 a.m.	Dominion Foyer
Lunch	12:00 p.m.	1:00 p.m.	Dominion Foyer