SEMI-THERM® Thermal Technologies Workshop 2021

FINAL PROGRAM

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December 7-9, 2021

SEMI-THERM® TTW
Thermal Technologies Workshop

Message from the Organizing Committee

We are pleased to welcome our speakers, attendees, and sponsors to this thirtieth year of this workshop, which has gained industry attention for the excellence of keynote presentations and for detailed discussion of important technology developments. We originally planned to return to an in-person workshop for 2021, but the uncertainties of the current global pandemic required us to transition in October to a virtual event. Nonetheless, we are pleased to be able to move forward with three days of excellent presentations and discussion.

We have had keynote presentations in each of the last six years and these have included speakers from AMD, Collins Aerospace, Georgia Institute of Technology, HPE/Hewlett Packard Laboratories, IBM Corporation, Intel, Microsoft, Samsung (Korea), The Citadel, and several others. We set a new attendance record in 2019, with a move to a new location and extraordinary conference room at the Microsoft Corporation campus in Redmond WA, generating an exceptional commentary from speakers and attendees on the value of the networking achieved and the presentations. We normally design our workshop schedule to include breaks, lunches, and dinners, specifically to expand and capitalize on the opportunities for networking between attendees, exhibitors, keynote presenters, and speakers, which is the hallmark of this workshop.

For this year, we have two excellent and well-known senior industry participants for our keynote presentations. We are very pleased to have Justin Weibel, Director of the Cooling Technologies Research Center at Purdue University. Andy Delano of Microsoft Corporation will lead the second and will take an unusual and highly innovative approach, partnering with three other Microsoft thermal engineers and providing descriptions of thermal and packaging challenges within the latest Microsoft hardware products released.

Thank you to our speakers, keynote presenters, and speakers for 2021 – and to you as attendees, for your interest and participation. We encourage you to contact either of us if you have an interest in participating as speaker, sponsor, or exhibitor for 2022.

Dave Saums
Principal
DS&A LLC
General Chair Technologies

Vadim Gektin
Principal Engineer
Qualcomm Technologies, Inc.
Program Chair

Organizing Committee

Herman Chu, Engineering Design Director, Celestica, Inc.
Vadim Gektin, Principal Engineer, Qualcomm Technologies, Inc.
Katie Kirsch, Senior Research Engineer, Raytheon Technologies Research Center
Bill Maltz, President, Electronic Cooling Solutions, Inc.
Nader Nikfar, Director of Engineering – Thermal, Qualcomm Technologies, Inc.
Devin Pellicone, Lead Engineer – Product Development, Advanced Cooling Technologies, Inc.
Adriana Rangel, Mechanical Engineer, Cisco Systems Inc.
Dave Saums, Principal, DS&A LLC
Tejas Shah, Senior Thermal Architect, Intel Corporation
Guy Wagner, Director, Electronic Cooling Solutions, Inc.
Ross Wilcoxon, Technical Fellow, Collins Aerospace, Inc.

Keynote Speaker – Justin Weibel, Cooling Technologies Research Center, Purdue University

"Transformative Cooling Technologies for High-Power-Density Electronic Devices"

Justin A. Weibel is an Associate Professor in the School of Mechanical Engineering at Purdue University and Director of the Cooling Technologies Research Center (CTRC), a graduated NSF I/UCRC that addresses research and development needs of its member organizations in the area of high-performance heat removal from compact spaces. He received his PhD in 2012 from Purdue University. Dr. Weibel's research explores methodologies for prediction and control of heat transport to enhance the performance and efficiency of thermal management technologies. He has been a key contributor to the development of transformative cooling technologies supported by DARPA, NAVSEA, ONR, ARPA-E, and SRC programs, in addition to numerous industry sponsored research projects. Dr. Weibel has supervised 28 PhD and 12 MS students, current and former, co-authored over 160 refereed journal and conference papers (h-index of 33), and has been recognized as an Outstanding Engineering Teacher in the College of Engineering at Purdue University multiple times. He recently received the 2020 ASME Electronic & Photonic Packaging Division (EPPD) Young Engineer Award and 2021 ASME K-16 Outstanding Early Faculty Career in Thermal Management Award. Dr. Weibel is on the IEEE ITherm Executive Committee (Conference General Chair in 2021) and is Associate Editor of the IEEE Transactions on Components Packaging and Manufacturing Technology.

(all times US EST)	DAY ONE Tuesday, December 7
12:45 PM	**Workshop Welcome: Dave Saums, DS&A LLC**
1:00 PM	**Keynote 1:** **Justin Weibel** **Cooling Technologies Research Center, Purdue University, West Lafayette IN USA** ***"Transformative Cooling Technologies for High-Power-Density Electronic Devices"***
2:00 PM	**Mohamad Abo Ras, Tobias von Essen, Santiago Campus Böttges, Daniel May, Corinna Grosse-Kockert; Berliner Nanotest und Design GmbH, Berlin, Germany** ***"Thermal Characterization and Accelerated Aging Study of Novel TIMs for High Performance Vehicle Computers and Communication Systems for Autonomous Driving"***
2:30 PM	**Tim Jensen** **Indium Corporation, Clinton NY USA** ***"Next Generation Liquid Metal TIMs and Processes to Maximize Thermal Performance and Reliability"***
3:00 PM	**BREAK**
3:30 PM	**Sponsor Presentation: Yukari Tanimoto, Kaneka Corporation, Osaka, Japan** ***Overview of Kaneka Thermal Management Solutions and Proposed Uses in XR and IoT Devices***
3:45 PM	**Guy Wagner** **Electronic Cooling Solutions, Inc., Santa Clara CA USA** ***"Choosing the Proper CFD Model for an Air Mover"***
4:15 PM	**Serdar Ozguc (Student Abstract Competition Winner), Liang Pan, Justin A. Weibel** **Purdue University, West Lafayette IN USA** ***"Topology Optimization of Thermal Management Devices using a Homogenization Approach"***
4:45 PM	**John Wilson[1], Travis Mikjaniec[2]** **1. Siemens Digital Industries Software, Fremont CA USA 2. Juniper Networks, Sunnyvale CA USA** ***"System Level PCB Modeling with Joule Heating Point Cloud Mapping"***
5:15 PM	**ADJOURN**

(all times US EST)	DAY TWO Wednesday, December 8
12:45 PM	**Workshop Welcome: Dave Saums, DS&A LLC**
1:00 PM	**Safouene Ouenzerfi, Riadh Boubaker, Pin Chen, Souad Harmand;** **Université Polytechnique Hauts-de-France, Valenciennes, France** ***"Revolving Heat Pipe for Electrical Machines"***
1:30 PM	**Klaus Olesen** **Danfoss Silicon Power, Flensburg, Germany** ***"Development of Innovative Liquid Cooling of High-power Modules, ShowerPower®"***
2:00 PM	**Vito Di Pietro** **TWI Limited, Cambridge UK** ***"Manufacturing of Integrated Thermal Management Solutions Using CoreFlow™ Friction Stir Channeling Derived Process"***
2:30 PM	**Callum D. Chhokar (Student Abstract Competition Winner), Majida Bahrami** **Simon Fraser University, Burnaby BC, Canada** ***"Advances in Flexible Pulsating Heat Pipes"***
3:00 PM	**BREAK**
3:30 PM	**Panel Discussion: *"Semiconductor Packaging Advances and Thermal Challenges"*** **Chair and Moderator: Nader Nikfar, Director of Engineering – Thermal, Qualcomm Technologies, Inc.** **Panelists:** **Herman Chu, Director, Design Engineering – Celestica, Inc.** **Seung-Chul (S.C.) Song, Senior Director and Principal Engineer, 2.5/3D Packaging – Qualcomm Technologies, Inc.** **Cameron Nelson, Senior Manager, Packaging Technology Integration, Amkor Technology, Inc.**
4:30 PM	**Chien-Hue Chen, Debraliz Isaac Aragones, Richard Bonner** **Advanced Cooling Technologies, Inc., Lancaster PA USA** ***"Passive Loop Cooling Tower for Data Center Thermal Management"***
5:00 PM	**Elizabeth Langer** **Colder Products Company, Roseville MN USA** ***"Corrosion: Impact on Liquid Cooling Performance and Reliability"***
5:30 PM	**ADJOURN**

Keynote Speaker – Andy Delano, Microsoft Corporation
"2021 Microsoft Surface Product Line Thermal Design Tour"

Andy Delano leads the Microsoft Surface team's thermal architectural and technology efforts. Prior to joining Microsoft in 2012, Andy managed the thermal R&D team within Honeywell's electronic materials division developing and launching highly successful products for the electronics packaging industry. Andy started his career in 1998 as a thermal engineer at Hewlett-Packard designing server and workstation thermal systems. While at HP, Andy was also an adjunct professor at CU and taught heat transfer, thermodynamics, and thermal systems design between 1999 and 2005. Prior to his career, Andy obtained his Ph.D. in mechanical engineering from Georgia Tech in 1998, and his thesis was on a single pressure absorption refrigerator originally patented by Albert Einstein. During the first part of his graduate studies, Andy also worked on the design and production of the 1996 Olympic Torch and spent 6 weeks traveling with the torch relay.

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(all times US EST)	DAY THREE Thursday, December 9
12:45 PM	Workshop Welcome: Dave Saums, DS&A LLC
1:00 PM	Keynote 2 Andy Delano Bo Dan, Chau Ho, Gavin Stanley Microsoft Corporation, Redmond WA USA *"2021 Microsoft Surface Product Line Thermal Design Tour"*
2:00 PM	Tobias Grün[1] (Student Abstract Competition Winner), Daniel May[1], H. Straub[3], P. Gromala[3], B. Wunderle[1,2] 1. Technical University Chemnitz, Germany; 2. Fraunhofer ENAS, Chemnitz, Germany; 3. Robert Bosch GmbH, Germany *"Design, Technology, Validation of Novel Liquid Cooling Concepts for Automotive High-performance Processors"*
2:30 PM	Azita Soleymani, William Maltz Electronic Cooling Solutions, Inc., Santa Clara CA USA *"Design of a Thermal Solution for Battery Pack Systems"*
3:00 PM	BREAK
3:30 PM	Mark Hepokoski[1], Alex Ockfen[2], 1. Thermoanalytics Inc., Calumet MI USA, 2. Facebook Reality Labs, Redmond WA USA *"Thermal Comfort Considerations for Electronics Cooling and Design"*
4:00 PM	Dustin Kendig Microsanj LLC, Santa Clara CA USA *"Addressing the Thermal Challenges of Today's High-Performance Devices"*
4:30 PM	Metodi Zlatinov[1], Denver Schaffarzick[1], Burhan Ozmat[2], 1. ERG Aerospace Corporation, Oakland CA USA; 2. OZER Advanced Technologies, Altamont NY USA *"Metal Foam for Passive PCM Heat Exchangers"*
5:00 PM	Elizabeth Seber, Michael Ellis Advanced Cooling Technologies, Inc., Lancaster PA USA *"Electrically Isolated, CTE Matched, Hybrid Two-Phase Cold Plate for RF Applications "*

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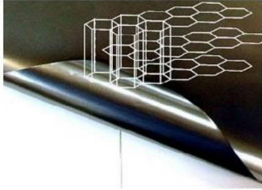

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SEMI-THERM®

Save the date:

38th Annual Semiconductor Thermal Measurement, Modeling and Management Symposium
March 21-25, 2022

SEMI-THERM thermal conference is a week full of technical presentations, exhibits, short courses, how to courses, and panel discussions. Visit www.semi-therm.org for additional details.

electronics COOLING

Electronics Cooling magazine has been providing a technical data column since 1997 with the intent of providing you, the readers, with pertinent material properties for use in thermal analyses. We have largely covered the most common materials and their associated thermal properties used in electronics packaging.