

15th International Material Handling Research Colloquium (IMHRC)

Savannah, Georgia. USA

July 23 – 26, 2018



15th International Material Handling Research Colloquium

Welcome

We are delighted that you have joined us for this exciting and unique program! This is a great opportunity to learn more about material handling, logistics, and the supply chain through exclusive speakers, research exchanges, poster sessions, visits to local plants and distribution centers, and networking with peers from around the world.

The 15th International Material Handling Research Colloquium is held at the Hotel Andaz in downtown Savannah, Georgia with sponsorship by the College Industry Council on Material Handling Education (CICMHE), Georgia Southern University, and funding provided by the Material Handling Industry (MHI).



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- **MHI**
www.mhi.org
- **College Industry Council on Material Handling Education (CICMHE)**
www.mhi.org/cicmhe
- **Allen E. Paulson College of Engineering and Computing at Georgia Southern University**
cec.georgiasouthern.edu

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Photography and videography will only be permitted during specified times. However, you are welcome to rave about IMHRC before or after the event using Twitter, Facebook, LinkedIn, and/or Instagram by using the hashtag #poweredbyMHI.

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Code of Conduct

The success of this program depends upon professional conduct by all who participate. This code of conduct shall be adhered to at all times. Violations of the code of conduct will result in disqualification for participants and their organizations from participation in future events.

Specific expectations of participants include:

- All sponsored attendees must attend the entirety of the event and participate in all activities.
- All participants should wear business casual clothing and comfortable, closed-toe walking shoes on days where offsite events will occur.
- Closed-toe shoes and pants are required during the tours. If needed, personal protective equipment will be provided.
- No use of phones, headsets, earphones, tablets, or cameras at specified times.
- Must be courteous and respectful at all times.
- Participants must attend all events unless otherwise arranged with the site hosts.

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William Ferrell (Clemson University)

Kimberly Ellis (Virginia Tech)

David Porter (Oregon State University)

Eric Ballot (Mines Paris Tech)

Doug Reed (MHI)

IMHRC Planning Committee

Jennifer Kist (MHI)

Doug Reed (MHI)

Delana Hopkins (MHI)

Andres Carrano (Georgia Southern University)

CICMHE

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David Porter (Vice President)

William Ferrell (Past President)

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Doug Reed (MHI Managing Director)

Andrew Johnson (Texas A&M)	Don Warsing (North Carolina State U.)
Hector Carlo (UPR Mayaguez – Fortna Inc.)	Alice Smith (Auburn University)
Suzanne Marcotte (U. Quebec a Montreal)	Jesus Jimenez (Texas State University)
Shanti Muthuswamy (Northern Illinois U.)	MD Sarder (Bowling Green State U.)
Tone Lerher (University of Maribor)	Victor Paquet (SUNY Buffalo)
Natalie Cherbaka (Virginia Tech)	Manjunath Kamath (Oklahoma State U.)

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Savannah Host Team

Doug Reed

MHI

Theresa Moore

MHI

Andres Carrano

Georgia Southern University

Brian Thorn

Rochester Institute of Technology

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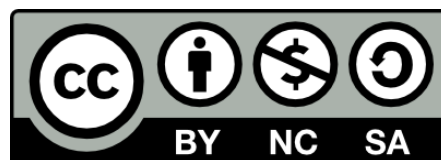
Proceedings

The proceedings for the 15th International Material Handling Research Colloquium will be digitally published shortly after the conference. The manuscripts will be migrated to the permanent conference open-access archives on August 31st, 2018, located at the following URL: <https://digitalcommons.georgiasouthern.edu/pmhr/>

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15th International Material Handling Research Colloquium

Keynote Speakers



Dr. John White served as the fourth Chancellor of the University of Arkansas for a period of 11 years. Previously, he served as the Dean of the College of Engineering at the Georgia Institute of Technology where he was part of its faculty for 22 years. He is the author of a widely used textbook in facilities planning and the recipient of two honorary doctorates. In addition to serving as a Director of the National Science Foundation in Washington D.C., Dr. White is a former member and Past President (1976-1977) of the College Industry Council on Material Handling Education (CICMHE).

Dr. Kevin Gue is Professor of Industrial Engineering at the J.B. Speed School of Engineering at the University of Louisville. He holds the Mary Lee and George F. Duthie Endowed Chair of Engineering Logistics and is Scientific Director of the Logistics and Distribution Institute. Prior to his service at Louisville, Dr. Gue held appointments at Auburn University and the Naval Postgraduate School. Dr. Gue is a former member and Past President (2006-2007) of the College Industry Council on Material Handling Education (CICMHE).



Mr. Matt Markham is the Director of the Georgia Center for Innovation for Logistics, which helps companies take advantage of the state's world-class logistics industry so that they can improve supply chain efficiencies, support growth, and increase global competitiveness. Matt brings to the position more than a decade of experience in transportation policy at the state of Georgia, having served in leadership roles at the Georgia Regional Transportation Authority, the State Road and Tollway Authority, and as a policy advisor to Lt. Governor Casey Cagle.

Dr. Leon McGinnis is a Professor Emeritus in the Stewart School of Industrial and Systems Engineering at Georgia Tech. A frequent speaker at conferences and events, he is internationally known for his leadership in the material handling research community. He has received multiple awards, including the David F. Barker Award from IISE, the Reed-Apple Award from the Material Handling Education Foundation and the Material Handling Innovation Pioneer Award. He is the author of 8 books and more than 110 technical publications. Dr. McGinnis is a former member and Past President (1986-1987) of the College-Industry Council on Material Handling Education.



Monday, July 23, 2018

AGENDA

3:00 PM – 6:00 PM	Registration / MHI Desk	Antebellum Studio
6:00 PM – 6:30 PM	Welcome Reception	Pool Terrace (rain backup: 22 Square Restaurant)
6:30 PM – 9:00 PM	Welcome Dinner	Pool Terrace (rain backup: 22 Square Restaurant)

Tuesday, July 24, 2018

AGENDA

7:00 AM – 8:30 AM	Breakfast	Hotel Restaurant
7:30 AM – 5:00 PM	Registration / MHI Desk	Antebellum Studio
8:30 AM – 9:30 AM	Welcome and Introductions	Decker Studio
9:30 AM – 10:30 AM	Opening Keynote: “CICMHE and its Impact” John White (University of Arkansas)	Decker Studio
10:30 AM – 12:00 PM	Poster Session # 1	Decker Studio

- A practical collaborative material handling strategy for cross-dock. (Hector Carlo, University of Puerto Rico Mayaguez - Fortna) [8]
- Home inventory management and last-mile logistics. (Michael Kay, North Carolina State University) [19]
- Environmental sustainability of pallet management through preemptive remanufacturing (Fabiana Tornese, University of Salento) [2]
- A framework for the study of human manufacturing repetitive motion. (Jesus Jimenez, Texas State University) [21]
- Economic and performance analysis of dual-bay vertical lift modules (Fabio Sgarbossa, University of Padova) [3]
- Managing the order picking process in for click and collect in grocery stores (Dale Masel, Ohio University) [14]
- Deployment of a distributed strategic material flow control for automated material flow systems consisting of autonomous modules (Christian Lieberoth-Leden Technical University of Munich) [10]
- Differences in throughput performance of the warehouse by quality of calculation parameters (David Sourek, University of Pardubice) [25]

12:00 PM – 1:00 PM	Lunch	Decker Studio
1:00 PM – 2:30 PM	Panel Session #1: “Industrie 4.0” Panelists: Kai Furmans, Fabio Sgarbossa, Tone Lerher Moderator: David Porter	Decker Studio
2:30 PM – 2:45 PM	Break	Decker Studio
3:00 PM – 4:00 PM	Keynote: “The Small World of Material Handling” Kevin Gue (University of Louisville)	Decker Studio
4:00 PM – 5:00 PM	Networking Reception (drinks and hors d’oeuvres)	Terrace
Evening	Free Evening: Explore Savannah.	Dinner on your own

Wednesday, July 25, 2018

AGENDA

6:30 AM – 7:45 AM	Breakfast	Hotel Restaurant
7:45 AM – 8:00 AM	Load bus	Hotel lobby
8:00 AM – 8:30 AM	Travel to Georgia Port Authority	
8:30 AM – 11:00 AM	Port of Savannah Tour and Presentation	
11:00 AM – 12:00 PM	Load bus and return to hotel	
12:00 PM – 1:00 PM	Lunch	Decker Studio
1:00 PM – 2:30 PM	Poster Session # 2	Decker Studio

- A design methodology to optimize supply chain network performance (J. David Porter, Oregon State University) [5]
- Pull-driven order fulfillment in distribution centers (Dima Nazzal, Fortna Inc.) [22]
- Synthetic order generation for warehouse operations design and experimentation (Jeffrey Smith, Auburn University) [4]
- Scalable heuristic for locating distribution centers on real road networks (Saeed Ghanbartehrani, Ohio University) [13]
- A space-syntax analysis of the relationship between function and form in facility layout (Alice Smith, Auburn University) [1]
- Optimization of a fast-pick area in a cosmetics distribution center (Mario Velez-Gallego, Universidad EAFIT) [18]
- Service flow networks for functional design of logistics centers (Detlef Spee, Fraunhofer Institute for Material Flow and Logistics) [15]
- Progress in autonomous picking as demonstrated by the Amazon Robotics Challenge (Kai Furmans, KIT) [17]

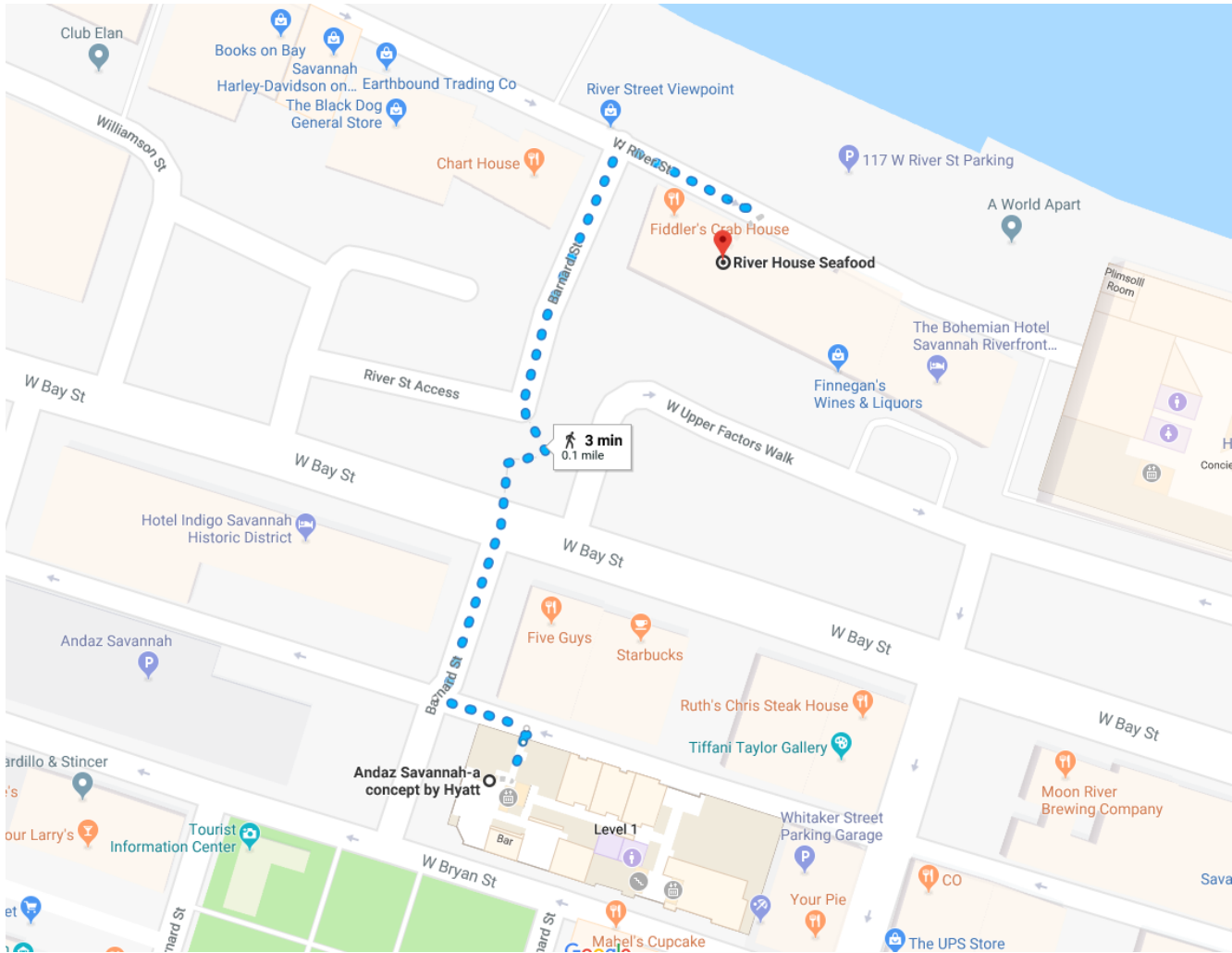
2:30 PM – 4:00 PM	Panel Session #2: “A Decade into the Physical Internet: Informing the Future” Panelists: Benoit Montreuil, Russell Meller and Eric Ballot Moderator: Kimberly Ellis	Decker Studio
4:00 PM – 5:30 PM	Poster Session # 3	Decker Studio

- Order batching in bucket brigade order picking (Yossi Bukchin, Tel-Aviv University) [9]
- Collaborative bots in distribution centers (Russell Meller, Fortna Inc.) [29]
- A framework for modeling material handling with decentralized control (Kevin Gue, University of Louisville) [23]
- Contribution of physical internet containers to mitigate the risk of cargo theft (Eric Ballot, Paris Mines Tech) [24]
- An integrated network model for analysis of multi-line order pick systems (Debjit Roy, Indian Institute of Management) [16]
- A measurement tool for circular economy practices: a case study in pallet supply chains (Maria Grazia Gnoni, University of Salento) [7]
- A performance calculator for shuttle-based storage and retrieval system design (Banu Ekren, Yasar University) [28]

6:15 PM	Departure to offsite dinner*	
6:30 PM – 9:00 PM	Offsite Dinner at the River House Seafood **	125 River Street.

* River House Seafood Restaurant is within walking distance (5 minutes away – map below). Shuttles between the two locations will be available during 6-9 pm.

** Beer, wine and non-alcoholic beverages are included. Liquor and cocktails are available but not included.



Thursday, July 26, 2018

AGENDA

7:00 AM – 8:30 AM	Breakfast	Hotel Restaurant
8:30 AM – 9:00 AM	Final Announcements	Decker Studio
9:00 AM – 10:30 AM	Poster Session #4	Decker Studio

- On the unique features and benefits of on-demand warehousing models (Jennifer Pazour, Rensselaer Polytechnic Institute) [6]
- Shuttle-based storage and retrieval systems with robotic order-picking shuttle carrier (Tone Lerher, University of Maribor) [12]
- Urban parcel logistics hub design: the impact of modularity and hyperconnectivity (Benoit Montreuil, Georgia Institute of Technology) [27]
- Dynamic batching for order picking in warehouses (Jelmer Pier van der Gaast, University of Groningen) [26]
- Transportation service provider collaboration: benefits and insights (Kimberly Ellis, Virginia Tech) [30]
- Digital design of intralogistics systems: flexible and agile solutions to short-cyclic fluctuations (Anike Murrenhoff, Fraunhofer Institute for Material Flow and Logistics) [20]
- Integrated intermodal network design with nonlinear inter-hub movement costs (Hector Vergara, Oregon State University) [11]

10:30 AM – 11:00 AM	Keynote: “Georgia’s Logistics Ecosystem” Matt Markham (Georgia Center of Innovations for Logistics)	Decker Studio
11:00 AM – 11:45 AM	Closing Keynote “Thoughts on the Future of Material Handling Research” Leon McGinnis (Georgia Institute of Technology)	Decker Studio
11:45 AM – 12:00 PM	Closing Remarks	Decker Studio
12:00 PM – 1:00 PM	Closing Lunch	Decker Studio

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