

2011

INTERNATIONAL CONGRESS ON ENERGY

Sustaining Supplies



Minneapolis Convention Center ■ Minneapolis, MN ■ October 16-21, 2011



Letter from the Conference Organizers

Dear Energy Professionals,

Welcome to the International Conference on Energy (<http://energycongress.org>) in Minneapolis, MN. "Sustaining Supplies," the theme of the conference, will focus on recent developments that will be instrumental to a better understanding of the technologies and the research and development that will stimulate innovative thinking to advance energy supply efforts.

The conference will address critical issues across five key areas:

- Lignocellulosics: biorefineries and sustainable energy
- Global solar and nuclear energy in the 21st century
- Hydrogen production and storage
- Innovations of green process engineering for sustainable energy and environment
- Carbon Capture and Storage

The uniqueness of this conference is that it brings together experts from many fields of energy. Keynote speakers will include:

The Future Fuels and Alternative Feedstocks – Recognizing Hype vs. Practical Limitations William Banholzer, Dow

Importance of Human Capital: Why Major in Chemical Engineering? John Anderson, Illinois Institute for Technology

The Future for Emerging Energy Technologies Anthony Cugini, National Energy Technology Laboratory, DOE

We are very happy to see you at this important event, which is being brought to you by the Center for Energy Initiatives, a technological community of AIChE.

David Thompson

Chair, International Congress on Energy: Sustaining Supplies
PhD, Biochemical Engineer – Renewable Resources
Idaho National Laboratory

T. Bond Calloway, Jr.

Co-Chair, International Congress on Energy: Sustaining Supplies
Manager, Alternative Energy Programs
Savannah River National Laboratory

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Stay tuned for additional Energy Congress events at www.energycongress.org

Acknowledgements

The International Congress on Energy would like to recognize the many volunteers and energy professionals who have worked tirelessly to bring this fine program to you. The AIChE technical divisions, their chairs, and session chairs and the 250 experts in the energy areas covered by the ICE program.

We would like to acknowledge the following area chairs; and please excuse any omissions as they were unintentional.

- **Concetta LaMarca** of Catalysis and Reaction Engineering
- **Mahmoud El-Hawagi** of Computing & Systems Technology
- **David Silverstein** of Education
- **Ralph Pike** of Environmental
- **John A. Morgan** of Food, Pharmaceutical & Bioengineering
- **Jeff Lindsay** of Forest Bioproducts
- **Colin Bowen** of Fuels & Petrochemical
- **George Golf** of Nuclear Engineering
- **Raymond Rooks** of Process Development
- **Benny Freeman** of Separations
- **Amy Miranda** of Transport and Energy Processes
- **Kristen Fichthorn** of Computational Molecular Science & Engineering
- **Kurt Rindfusz** of the Nanoscale Science & Engineering Forum
- **Suzanne Kresta** of the North American Mixing Forum
- **Helen Lou** of the Sustainable Engineering Forum
- **Ray Cocco** of the Particle Technology Forum
- **Jim Davis** of the Executive Board of the National Program Committee
- **Deborah L. Grubbe** of the Institute for Sustainability
- **Greg Stephanopoulos** of the Society for Biological Engineering
- **Annette Johnston** of the Research and New Technology Committee

Featured Topical Sessions Include:

- **Global Solar and Nuclear Energy in the 21st Century**
- **Nanomaterials for Energy Applications**
- **Lignocellulosics: Biorefineries and Sustainable Energy**
- **Hydrogen Production and Storage**
- **Sensors**
- **Systems Biology**
- **1st Annual World Congress on Sustainable Engineering**
- **Innovations of Green Process Engineering for Sustainable Energy and Environment**



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Upcoming Energy Conference

Energy Measurement Project

The project's objective is to identify gaps, barriers, and educational requirements that would enable an organization to report accurate, consistent, verifiable, timely, and parent green house gas values. The team's intent is to learn from early adopters and determine where the greater engineering community can assist in these calculations. What issues need to be addressed such that the integrity of the legislation can be met and with resulting environmental improvement.

The project is a cooperative effort of AIChE, ASCE, ASME, IEEE, and AIME.

Steering Committee Members:

T. Bond Calloway, Savannah River National Laboratory

Gary Gasperino, G2 Engineering

Darlene Schuster, Institute for Sustainability

David Thompson, Idaho National Laboratory

Nicholas F. Urbanski, ExxonMobil

Learn more at <http://fscarbonmanagement.org/>



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AICHE Announces Formation of the Center for Energy Initiatives

AICHE has formed the Center for Energy Initiatives. Because of its importance to energy, the Technical Divisions of AIChE Forum are coming together to work on leveraging projects in energy. In announcing the formation of the CEI, AIChE President Henry “Hank” T. Kohlbrand said, “Our members are already working on energy-related issues from multiple perspectives. The new Center will help us network and ‘cross-fertilize’ and integrate ideas that can advance energy efforts across the board.”

Divisions and Forums whose members also are in the CEI are the Catalysis and Reaction Engineering Division; the Computational Molecular Science and Engineering Forum; the Education Division; the Environmental Division; the Food, Pharmaceutical and Bioengineering Division; the Forest Bioproducts Division; the Fuels and Petrochemical Division; the Nanoscale Science and Engineering Forum; the North American Mixing Forum; the Nuclear Engineering Division; the Particle Technology Forum; the Process Development Division; the Separations Division; the Sustainable Engineering Forum; the Transport and Energy Processes Division. Other AIChE entities in CEI include the Institute for Sustainability, the Society for Biological Engineering, the Government Relations Committee, the Research and New Technology Committee, and the Executive Board of the National Program Committee.

CEI intends to identify, launch, and incubate energy initiatives and new projects that cross the boundaries of existing AIChE entities working in the energy area. CEI serves as a means to leverage breadth of work carried out and to enable integrated analysis of multi-disciplinary and multi-functional projects.

The CEI grew out of the work of AIChE’s Energy Advisory Board, which was formed in 2005 and has already undertaken a number of energy related research and education projects. It has coordinated a project on carbon management for a group of leading engineering societies, made awards for K-12 energy education projects, and developed a “Speakers Academy” of energy experts. Work is currently underway on an inter-society, inter-disciplinary project to develop energy metrics that will allow for consistent comparison of diverse energy options.

CEI is also developing energy education modules for the undergraduate chemical engineering curriculum. Periodic CEI newsletters about energy issues are e-mailed to the members of each entity. CEI also has a website that will provide more information about energy issues and important links: <http://www.aiche.org/energy/>.

One of CEI’s new functions is to highlight and promote energy programming at AIChE meetings and to develop joint energy meetings with other organizations. These are areas where participation by Divisions and Forums is especially needed. To kick off this effort, CEI is conducting the Second International Congress on Energy: Sustaining Supplies in conjunction with AIChE’s Annual Meeting.

For more information and to subscribe to the energy newsletter, contact energy@aiche.org.

What does a member of CEI get?

Members get a growing menu of benefits, including:

- A quarterly e-newsletter updating energy-related developments and CEI initiatives
- Access to a broad network of professionals working on energy-related issues from multiple perspectives
- The opportunity to shape and participate in CEI sponsored-projects and undertakings that directly address specific energy-related issues important to working professionals
- Involvement in energy-related primary, secondary and undergraduate education projects and competitions
- Greater recognition of, and appreciation for, chemical engineers’ important contributions to our energy future

To become a CEI member, just join one of the above Division and Forums of AIChE. You will not only become a member of CEI, you will also enjoy the full benefits of the Division or Forum that you join. Join by contacting energy@aiche.org

Stay tuned for additional Energy Congress events at www.energycongress.org

Monday	Session #	Session Title	Minneapolis Convention Center	Alternative Energy	Biorefinery	Hydrogen Production and Storage	Lignocellulosic/Biomass	Nuclear	Solar	Sustainability
8:30am-11:00am	10	Biological Conversions and Processes for Renewable Feedstocks I	Room 211 B		●					
	13	Catalytic Conversion of Renewable Resources to Synthesis Gases and Pyrolysis Oils	Room 211 C	●						
	22	Electrochemical Hydrogen Production	Room 207 A/B			●				
	35	Lithium Battery Technology and Materials	Room 208 B	●						
	43	Oxycombustion of Coal and Other Fuels I	Room 200 G							●
	51	Recent Advances In Drilling Under Extreme Conditions	Room 208 C	●						
12:30pm-3:00pm	54	Research Frontier of Water Sustainability	Room 208 D							●
	62	Advances In Algal Biorefineries I	Room 211 A		●					
	66	Advances In Thermochemical Hydrogen Production	Room 207 A/B			●				
	73	Biological Conversions and Processes for Renewable Feedstocks II	Room 211 B		●					
	90	Feedstock, Supply Chain, and Logistics of Forest Biorefineries	Room 210 A/B		●					
	97	International Forum on Energy Sustainability (plenary)	Room 208 D							●
3:15pm-5:45pm	110	Novel Battery Chemistry and Technology	Room 208 B	●						
	118	Reactor Engineering for Biomass Feedstocks	Room 211 C		●					
	130	What Makes Energy Clean? Plenary Session (Invited Papers)	Room 208 A							●
6:00pm-8:00pm	137	Annual Meeting Plenary - Chemical Science Innovation: Future of the US Chemical Enterprise II (co-sponsored by the Council for Chemical Research)	Auditorium Room 1							●
	153	Energy Sustainability, Challenges and Solutions	Room 209 A/B							
	192	Poster Session: Sustainable Forest Bioresources Engineering	Exhibit Hall B	●	●	●				●

Tuesday	Session #	Session Title	Minneapolis Convention Center	Alternative Energy	Biorefinery	Hydrogen Production and Storage	Lignocellulosic/Biomass	Nuclear	Solar	Sustainability
8:30am-11:00am	195	Advances In Algal Biorefineries II	Room 211 A		●					
	199	Advances In Gasification Research	Room 200 G	●						
	206	Catalytic Biofuels Refining I	Room 208 C		●					
	218	Flow Batteries for Energy Storage (In Memory of Bernard Lee)	Room 208 B	●						
	229	Innovations for Energy Intensive Industrial Processes and Building Technologies	Room 208 D							●
	231	Integrated Processes for Biochemical Conversion of Renewable Feedstocks to Fuels and Chemicals I	Room 211 C		●					
	249	Nuclear Engineering Division Student Paper Award Competition	Room 206 A/B					●		
	254	Process Development and Design for Solar-Grade Silicon Production	Room 208 A						●	
	258	Reaction Kinetics and Transport Fundamentals for Biomass Conversion	Room 211 B			●				
	259	Renewable Hydrogen Production I	Room 207 A/B			●				
	263	Sustainable Energy Plenary	Room 209 A/B							●
	265	Syngas Production and Gas-to-Liquids Technology	Room 200 J	●						
12:30pm-3:00pm	267	Thermochemical Conversion	Room 210 A/B			●				
	274	Biological and Chemical Conversion Processes In Forest Biorefineries I: Enzymatic and Other Biological Processes	Room 210 A/B		●					
	278	Catalytic Biofuels Refining II	Room 208 C		●					
	280	Chemical Looping Processes I	Room 200 G			●				
	286	Concentrated Solar for Power Generation and Chemical Processing I	Room 208 A						●	
	287	Capture, Control and Sequestration	Room 209 A/B							●
	294	Fuel Cell Technology I	Room 208 B	●						
	305	Life Cycle Analysis of Renewable Feedstock-Based Processes and Products I	Room 211 A		●					
	329	Process and Product Development for Sustainability I	Marquette V (Hilton Minneapolis)							●
	333	Reaction Kinetics and Transport Fundamentals for Biomass Conversion II	Room 211 B			●				
	334	Renewable Hydrogen Production II	Room 207 A/B			●				
	339	Sustainable Biomass Feedstock Production and Supply for the Emerging Biorefinery Industry	Room 211 C		●					
	343	Wilson Award Plenary Session on Nuclear Chemical Engineering (Invited Papers)	Room 206 A/B					●		

Tuesday				Minneapolis Convention Center	Alternative Energy	Biorefinery	Hydrogen Production and Storage	Lignocellulosic/Biomass	Nuclear	Solar	Sustainability
3:15pm-5:45pm	348	Biological and Chemical Conversions In Forest Biorefineries II: Ionic Liquids, Catalytic Conversions and Modeling	Room 210 A/B		●						
	349	Biomass Pyrolysis I	Room 208 C					●			
	354	Carbon Efficient Chemical Engineering Systems	Room 209 A/B								●
	358	Chemical Looping Processes II	Room 200 G			●					
	363	Concentrated Solar for Power Generation and Chemical Processing II	Room 208 A							●	
	364	Developments In the Pretreatment of Lignocellulosics for Bioconversion I	Room 211 B					●			
	378	Hydrogen Storage Systems: Designs, Analysis, and Safety Aspects	Room 207 A/B			●					
	388	Microbial Engineering for the Synthesis of Bulk and High-Value Products	Room 211 C		●						
	403	Process and Product Development for Sustainability II	Marquette V (Hilton Minneapolis)								●
6:00pm-8:00pm	421	Poster Session: Sustainability and Sustainable Biorefineries	Exhibit Hall B		●		●				●
Wednesday				Minneapolis Convention Center	Alternative Energy	Biorefinery	Hydrogen Production and Storage	Lignocellulosic/Biomass	Nuclear	Solar	Sustainability
8:30am-11:00am	428	Alternative Feedstocks for Energy and Chemicals	Red Wing Room (Hilton Minneapolis)								●
	429	Alternative Fuels and Enabling Technologies I	Room 208 B	●							
	435	Biomass Fractionation	Room 210 A/B					●			
	436	Biomass Pyrolysis II	Room 208 C					●			
	445	Complex Subsurface Processes I	Room 200 G								●
	450	Engineering Applications of Radioisotopes for Industry and Medicine	Room 206 A/B						●		
	456	Hydrogen Storage Systems and Materials: Modeling, Simulation, and Optimization	Room 207 A/B			●					
	461	Ionic Liquids and Membranes for Carbon Capture	Room 209 A/B								●
	471	Nanostructured Materials for Dye-Sensitized Solar Cells	Room 208 A							●	
12:30pm-3:00pm	481	Sustainable Biorefineries Plenary Session (Invited Papers)	Auditorium Room 2		●						
	485	Unconventional Technologies for CO ₂ Capture, Conversion and Utilization I	Room 208 D								●
	496	Alternative Fuels and Enabling Technologies II	Room 208 B	●							
	498	Aspects of Hydrogen Storage Materials	Room 207 A/B			●					
	508	Catalytic Biomass Conversion to Chemicals I	Room 208 C					●			
	509	Catalytic Hydrogen Generation - General I	Room 200 J			●					
	514	Chemical Engineering Advances In the Nuclear Fuel Cycle I	Room 208 A						●		
	522	Developments In Biobased Alternative Fuels I	Room 211 C	●							
	523	Developments In the Pretreatment of Lignocellulosics for Bioconversion II	Room 211 B					●			
3:15pm-5:45pm	544	Novel Catalytic and Separation Process Based on Ionic Liquids	Room 208 D								●
	554	Separation Processes In Biorefineries I: Membrane and Chromatographic Separations	Room 210 A/B					●			
	555	Solvent-Based Carbon Capture Processes	Room 209 A/B								●
	557	Unconventional Technologies for CO ₂ Capture, Conversion and Utilization II	Room 205 D								●
	560	Advances In Biofuels: DOE Bioenergy Research Centers II	Room 211 A		●						
	564	Alternative Fuels and Enabling Technologies III	Room 208 B	●							
	573	Catalytic Biomass Conversion to Chemicals II	Room 208 C					●			
	574	Catalytic Hydrogen Generation - General II	Room 200 J			●					
	578	Chemical Engineering Advances In the Nuclear Fuel Cycle II	Room 208 A						●		
	582	Developments In Biobased Alternative Fuels II	Room 211 C	●							
	583	Developments In the Pretreatment of Lignocellulosics for Bioconversion III	Room 211 B					●			
	589	High-Throughput and Compact Chemical Processing Technologies	Room 208 D								●
	610	Separation Processes In Biorefineries II: Ionic Liquids, Reactive Separations and Other Novel Processes	Room 210 A/B		●						
	611	Simultaneous Energy and Emission Reduction for Chemical Industries	Conrad D (Hilton Minneapolis)								●
	613	Sorbent Processes for Carbon Capture	Room 209 A/B								●



NOTES

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AICHE Center for Energy Initiatives Executive Committee

Chair: **Dale Keairns**, Executive Advisor, Booz Allen Hamilton and Past President, AIChE

The following individuals played a vital role in the development and launch of the AIChE Energy Initiative. Thanks to

Bond Calloway, Savannah River National Laboratory

Dennis Griffith, Granherne

Haroon Kheshgi, ExxonMobil

Mike Kline, University of Delaware

Darlene Schuster, AIChE Institute for Sustainability

June Wispelwey, AIChE Executive Director

Members of Center for Energy Initiatives Advisory Board

Bob Armstrong, Board appointment

Richard V. Calabrese, North American Mixing Forum

Bond Calloway, RANTC

John Chen, Particle Technology Forum

Mahmoud El-Halwagi, Computing & Systems Technology

Mary Ellen Ternes, Nanoscale Science &
Engineering Forum

Dennis Griffith, Government Relations Committee

Keith Hutchinson, Catalysis and Reaction Engineering

Jason Keith, Education

Haroon Kheshgi, Board Appointment

Jeff Lindsay, Forest Bioproducts

VK Mathur, Transport and Energy Processes

Jim McMillan, Society for Biological Engineering

Amy Miranda, Transport and Energy Processes

Ralph Pike, Fuels & Petrochemical

Syamal Podda, Fuels & Petrochemical

Joe Shroer, Process Development

David Sholl, Computation Molecular Science &
Engineering

Subhas Sikdar, Institute for Sustainability

Raymond Smith, Environmental

Stuart T. Arm, Nuclear Engineering

David Thompson, Sustainable Engineering Forum,
Executive Board of NPC

Nicholas Urbanski, Separations

Sarah Widder, Board Appointment

Shang-Tian Yang, Food, Pharma, and BioProcessing

Energy Initiative Sponsor





2011 International Pittsburgh Coal Conference

Business Sessions Offered at the 28th Annual International Pittsburgh Coal Conference (PCC)

PCC's *Major Carbon Capture and Sequestration (CCS) Demonstration Projects* session will feature technical and business discussions about major clean coal technology (CCT) demonstration projects. Six technical sessions will address current U.S. and international efforts. Three business sessions will cover—

- **Financing CCS and other CCT projects**
- **Investing in energy and power**
- **Insurance and risk management strategies**



Tour a coal-fired power plant!

Why address business issues at an energy technology conference?

Major technology demonstration projects can fail because developers lack adequate financial support. To improve the chances of success, financiers need to better understand the technologies proposed for deployment and the risks involved in these multimillion-dollar projects. Researchers and developers need to better understand government policy; potential financing options for projects; technical, financial, and insurance risks; and available risk management solutions.

Who will benefit?

Business professionals interested in interacting with leading scientists to learn about coal and power technology developments and deployment of applied energy research projects.

Energy, power, mining, and chemical industry executives interested in clean coal technologies and project development opportunities.

Energy and power technology developers interested in learning how financial markets evaluate demonstration project opportunities.

Entrepreneurs within the coal and power sector seeking to learn about trends in policy, technology, finance, insurance, and risk management.

Science and technical professionals and developers working in the coal, power, and energy sectors interested in licensing and project funding opportunities.

About the conference

PCC will be held at Pittsburgh's David L. Lawrence Convention Center and hosted by the University of Pittsburgh's Swanson School of Engineering in collaboration with the National Energy Technology Laboratory (NETL).

For additional information about *Major CCS Demonstration Projects*, contact Gary Stiegel at gary.stiegel@netl.doe.gov or Tom Sarkus at thomas.sarkus@netl.doe.gov or visit the NETL website at www.netl.doe.gov.

For registration and additional information about PCC, visit the conference website at www.engr.pitt.edu/pcc.

For media inquiries, contact Shelley Martin at shelley.martin@netl.doe.gov.

Internationally recognized keynote speakers

Charles McConnell, COO, Office of Fossil Energy, Department of Energy

Anthony Cugini, Director, National Energy Technology Laboratory

Thomas Bonner, President, Cogentrix Energy, LLC

Steve Orlins, President, National Committee on U.S.-China Relations

Steve Herman, Managing Director, Energy Capital Partners

Frank Princotta, Director, Air Pollution Prevention and Control Division, U.S. EPA

Activities will include a tour of the Cardinal coal-fired power plant



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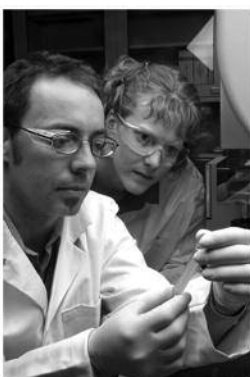
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**April 30 - May 3
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**Abstract
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opens
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34th SBFC Symposium on Biotechnology for Fuels and Chemicals

Sheraton New Orleans, New Orleans, LA





Waste-To-Energy Exchange



November 9, 2011
New York Institute
of Technology
8:30 am - 3:30 pm

Plan to attend November 9th in NYC

Learn about the value of solid waste as a replacement opportunity in a resource-limited global environment. Learn how packaging fits into the future of WTE via this educational day that brings together respected presenters from business, industry, and academia. The Waste-to-Energy Exchange program includes:

Sources of Waste for WTE and Opportunities for Packagers -

John Williams, *HDR Engineering*

Obstacles and Hurdles to WTE - Marco Castaldi, *Columbia Univ.*; Ted Michaels, *AJW Inc./ERC (Energy Recovery Council)*; Paul Gilman, *Covanta*

How WTE Complements Recycling -

Sandra Keil, *Earth911*

Lifecycle Assessment and Total Cost Assessment of WTE -

Lise Laurin, *Earthshift*

Emerging Technologies and Horizon Issues Industry Panel -

Paul Gilman, *Covanta*; Robert Brickner, *Gershman, Brickner and Bratton, Inc.*; Jason Gold, *KGRA Energy*; Greg Wilkison, *Third Oak Associates Inc.*; Darlene Schuster, *Institute for Sustainability/AICHE*

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Join us for a session on

Treatise on Sustainability of Energy Production!

When: Wednesday, October 19th at 12:30pm
Where: 203 B (Minneapolis Convention Center)

Description:

There is need for a well-structured, transparent and robust approach for evaluating energy systems that includes the three dimensions of sustainability: environmental, economic and societal.

Issues with system boundaries, and variability of data used in assessments and energy equivalents will remain apparent as we continue to employ technologies to find sustainable energy supplies and alternative feedstocks. Factor in the repercussions of oil and gas production on produced water, questions and concerns surrounding bio-fuels, and the impacts of solar and nuclear energy production expansion, and the need for a sustainable evaluation approach becomes even more apparent. Applying appropriate metrics along the energy supply chains will improve the decision measurement criteria necessary to aide technology developers as they guide the transition to new alternative feedstocks and sustainable energy sources. Additionally, the development of sustainability metrics permits analysis of the specific costs and benefits of new energy sources that could help inform federal decision-making.

Speakers Include: Dale Keairns, Booz Allen Hamilton
Hamid Arastoopour, IIT
Heriberto Cabezas, EPA
Tim Skone, NETL

Primary Sponsor: International Congress on Energy: Innovations of Green Process Engineering for Sustainable Energy and Environment

This session is co-chaired by Dale Keairns of Booz Allen Hamilton and Subhas Sikdar of US EPA.

Thesis on Sustainability Production:

- SEF Leadership Conference:
Monday, October 17th from 5:00-6:30pm, Ballroom G, Hilton
- SEF Programming Meeting (23A: General & 23C: Sustainable Energy):
Tuesday, October 18th from 5:00-6:00pm, 205A, Minneapolis Convention Center
- SEF Programming Meeting (23B: Sustainable Biorefineries):
Tuesday, October 18th from 6:00-7:00pm, 205A, Minneapolis Convention Center
- SEF Luncheon:
Wednesday, October 19th from 11:15am-12:15pm, Directors' Row 3, Hilton

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