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Engineering Sustainability 2009

Innovations that Span Boundaries

April 19–21, 2009

David L. Lawrence Convention Center
Pittsburgh, Pa.

Final Program

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Swanson School of Engineering
Mascarocenter for Sustainable Innovation
1140 Benedum Hall
3700 O'Hara Street
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www.mascarocenter.pitt.edu/conference



Eric J. Beckman
 Faculty Director, Mascaro Center
 for Sustainable Innovation,
 University of Pittsburgh



David A. Dzombak
 Faculty Director, Steinbrenner Institute
 for Environmental Education and Research,
 Carnegie Mellon University

LETTER FROM THE CHAIRS

First, let us take this opportunity to welcome you all to Pittsburgh. We hope that you not only have a rewarding conference experience, but also that you have the opportunity to take advantage of the many amenities that our city has to offer. Our conference has been designed to showcase cutting-edge science and engineering that focuses on greening the built environment and the sustainable use of water. Progress in these areas will require innovations from professionals in a variety of disciplines, and we are grateful to have scientific contributions from researchers in fields ranging from engineering to architecture to public policy to the sciences. Designing more sustainable buildings and water use technologies is vital to the creation of sustainable global economies—hence our desire to showcase innovation in these areas.

We have arranged the program as a series of topical sessions, allowing you to focus your attention on a specific area or sample from a variety of topics.

This program contains comprehensive information about Engineering Sustainability (ES) 2009, but if you have questions or need help, please visit the registration area or ask any of the ES 2009 volunteers. If we can do anything to make your time in Pittsburgh more enjoyable and productive, please let us know.

Sincerely,

Eric J. Beckman

David Dzombak

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GENERAL INFORMATION

Registration Hours

Sunday 3–5:30 p.m.
 Monday 7:30 a.m.–5:30 p.m.
 Tuesday 7:30 a.m.–noon

Speaker Ready Room (Room 411)

There will be a computer and printer available during the conference for speakers to check presentations and make small changes if necessary.

Monday 7:30 a.m.–5:30 p.m.
 Tuesday 7:30 a.m.–2:30 p.m.

Poster Room (Room 411)

All posters are to be delivered to the Poster Room by noon on Monday. Posters can be picked up in the same room on Tuesday from 7:30 a.m. to 2:30 p.m.

Message Board

As a service to conference registrants, a message board will be located in the registration area. Registration staff will man the board from 8 a.m. to 5 p.m. April 20 and 21. Messages will be retained until the end of each day.

Photography and Recording

Photographing and/or recording (including with cell phone cameras) presentations other than your own is prohibited without the written consent of conference organizers.

CONFERENCE COSPONSORS

The Mascaro Center for Sustainable Innovation at the University of Pittsburgh is a center of excellence in sustainable engineering, focusing specifically on the design of sustainable neighborhoods. The Mascaro Center was created to encourage and nurture new collaborative projects based on strong and innovative research, helping to translate the fundamental science of sustainability into real products and processes. Research conducted under the auspices of the Mascaro Center includes projects on greening the built environment, the more sustainable use of water, and the design of distributed power systems. www.mascarocenter.pitt.edu

The Steinbrenner Institute for Environmental Education and Research champions Carnegie Mellon University's commitment to making a difference in the way the world thinks and acts about the environment. In keeping with Carnegie Mellon's distinguished track record in interdisciplinary approaches to education and research, the Steinbrenner Institute facilitates connections between faculty, students, and the outside community; promotes Carnegie Mellon's core academic strengths, housed in 15 research centers; and advances emerging and interdisciplinary interests in critical issues related to environmental sustainability. www.cmu.edu/steinbrenner

Transportation Information

Checker Cab: 412-381-5600
 Yellow Cab: 412-321-8100

Express Shuttle USA runs from the Pittsburgh International Airport to the Westin Convention Center, Pittsburgh, every hour on the hour. Pickup is in the baggage claim area, and the cost is \$20 one way and \$35 round-trip.

A public airport shuttle bus (Port Authority Transit bus 28X) boards just outside the baggage claim area approximately every 30 minutes from 6 a.m. to midnight. The cost is \$2.60. There is a stop two blocks from the Westin Convention Center, Pittsburgh.

Badge Information

Please wear your ES 2009 name badge at all times. Not only is the badge your passport to all conference activities, it also lists several important local phone numbers on the back. You may be denied access to educational sessions and events if you are not wearing your badge.

Cell Phone Usage

As a courtesy to the speakers and fellow attendees, the ES 2009 staff requests that all cell phones and pagers be turned off or switched to silent mode in all presentation rooms.



PLENARY SPEAKERS



**“Big Integration:
 The Next Sustainable
 Design Agenda”**
 Sandra Mendler
Monday April 20, 8:30 a.m.
Room 407

Sandra Mendler is a nationally recognized design leader and advocate for sustainable design. A principal with Mithun in San Francisco, Calif., Mendler has more than 20 years of professional experience. She has designed a variety of high-profile projects, including the NOAA Pacific Region Headquarters in Hawaii; a new laboratory for the University of California, Davis; and headquarters buildings for the U.S. Environmental Protection Agency, World Resources Institute, Nature Conservancy, and National Wildlife Federation. She currently is working on the innovative new plan for Treasure Island in the San Francisco Bay Area.

Mendler has been an active member of the American Institute of Architects Committee on the Environment (COTE) and served as chair from 1999 to 2001. She also served on the Board of Directors of the U.S. Green Building Council from 2000 to 2002 and 2004 to 2007. She was recognized by *Interiors & Sources* magazine as an Environmental Champion (2004), by the International Interior Design Association and Collins & Aikman with the Sustainable Design Leadership Award (2001), and by the Construction Specifiers Institute with its national Environmental Sensitivity Award (1998). She is coauthor of two books and of numerous articles, and her work is widely published in print and on the Internet.

Mithun is a nationally recognized, values-based design firm focusing on architecture, interiors, urban design, and ecology. Mithun’s mission is to inspire a sustainable world through leadership, innovation, and integrated design. For more information about Mithun, visit www.mithun.com.



**“The Four, Five, Six, or
 More Pillars of Sustainable
 Infrastructure”**
 G. Tracy Mehan III
Monday April 20, 9:30 a.m.
Room 407

G. Tracy Mehan III has been a principal with The Cadmus Group, Inc., an environmental consulting firm, since 2004. Mehan previously served as assistant administrator for water at the U.S. Environmental Protection Agency (EPA) from 2001 to 2003, as well as environmental stewardship counselor to the 2004 G-8 Summit Planning Organization. He also served as director of the Michigan Office of the Great Lakes (1993–2001) and as associate deputy administrator of EPA in 1992. He was director of the Missouri Department of Natural Resources from 1989 to 1992. Mehan is a graduate of Saint Louis University and its School of Law. Presently, Mehan serves on the Water Science and Technology Board, the Committee on the Mississippi River, and the Clean Water Act for the National Research Council of the National Academies. He also has served as an independent expert judge for the Municipal Water Conservation Achievement Award Program (2006), sponsored by the U.S. Conference of Mayors and its Urban Water Council.



**“Sustainable Engineering:
 A Model for Engineering
 Education in the 21st Century?”**
 David Allen
Tuesday, April 21, 8 a.m.
Room 407

David Allen is the Melvin H. Gertz Regents Chair in Chemical Engineering and the director of the Center for Energy and Environmental Resources at the University of Texas at Austin. He is the author of six books and more than 170 papers in areas ranging from coal liquefaction and heavy oil chemistry to the chemistry of urban atmospheres. For the past decade, Allen’s work has focused primarily on urban air quality and the development of materials for environmental education. Allen was a lead investigator for the first and second Texas Air Quality Studies, which involved hundreds of researchers from around the world and have made a substantial impact on the direction of air quality policies in Texas. He also has developed environmental educational materials for engineering curricula and for the university’s core curriculum. The quality of Allen’s work has received recognition from the National Science Foundation (through the Presidential Young Investigator Award), the AT&T Foundation (through an Industrial Ecology Fellowship), the American Institute of Chemical Engineers (through the Cecil Award for contributions to environmental engineering), and the State of Texas (through the Governor’s Environmental Excellence Award). He received teaching awards from the University of California, Los Angeles, and the University of Texas.

Allen earned a BS in chemical engineering, with distinction, from Cornell University in 1979 and MS and PhD degrees in chemical engineering from the California Institute of Technology in 1981 and 1983. He has held visiting faculty appointments at the California Institute of Technology; the University of California, Santa Barbara; and the U.S. Department of Energy.



**“Frontiers in Green Design
 for Innovation”**
 Julie Zimmerman
Tuesday, April 21, 8:45 a.m.
Room 407

Julie Zimmerman is an assistant professor jointly appointed in the School of Engineering and Applied Science (Environmental Engineering Program) and the School of Forestry and Environment at Yale University. Zimmerman also serves as the associate director for research for the Center for Green Chemistry and Green Engineering at Yale. Her research interests include green chemistry and engineering, systems dynamics modeling of natural and engineered water systems, environmentally benign design and manufacturing, and the fate and impacts of anthropogenic compounds in the environment, as well as appropriate water treatment technologies for the developing world. She also conducts research on corporate environmental behavior and governance interventions to enhance the integration of sustainability in industry and academia. Zimmerman previously served as an engineer in the Office of Research and Development at the U.S. Environmental Protection Agency, where she managed grants to academia and small businesses in the areas of pollution prevention and sustainability. She received a joint PhD from the University of Michigan in environmental engineering and natural resource policy.



INVITED SPEAKERS

Thomas Auer

Managing Director and Partner, Trans Solar

Second-Generation Green Building Design

Trained as a process engineer at the Technical University in Stuttgart, Germany, Thomas Auer is a partner and managing director of Trans Solar, a German building energy design consultancy with offices in Stuttgart and Munich, Germany, and New York, N.Y. A specialist in the fields of integrated building systems and energy efficiency in buildings, Auer has developed energy and building services concepts for projects around the world noted for their innovative design and low energy use. Among his projects in Germany are the Hochtief Prisma naturally ventilated office building in Frankfurt, a new spa in Bad Aibling, and the Federal Foreign Office in Berlin. The office tower for Manitoba Hydro—which currently is under construction in downtown Winnipeg, Manitoba, Canada—is considered one of the most energy-efficient high-rise buildings in North America. Outside of Trans Solar, Auer is teaching at the Yale University School of Architecture, and he speaks frequently at conferences and symposia.

Mark Dietrick

Director of Services, Case Technologies

Enhanced Sustainable Design Using Building Information Modeling Performance Analysis

Throughout a career spanning 25 years as an architect focused on technology and research in support of innovation in practice, Mark Dietrick has excelled at balancing a dedication to architecture with a nearly innate understanding of technology. As one of the first pioneers in the school of computer automated design, he continues to be involved with the latest technology as it relates to architecture. Dietrick is recognized nationally as a forerunner in the use of Building Information Modeling (BIM) technology in the practice of architecture, engineering, construction, and operations and has helped to drive this significant change within the industry. His work in BIM has promoted more efficient and innovative design processes, more effective sustainable design strategies, and tighter integration in project delivery. Collectively, his expertise in the strategic use of technology for the design, construction, and operation of real estate supports effective solutions to address significant current industry challenges and trends such as environmental sustainability, integrated project delivery, cost effectiveness, and lean project

delivery. Dietrick received his degree in architecture from the University of Detroit Mercy; is a registered architect in Pennsylvania; and worked for 23 years for Burt Hill in Pittsburgh as an architect, chief information officer, and director of research.

D. Yogi Goswami

John and Naida Ramil Professor in Chemical Engineering and Codirector of the Clean Energy Research Center, University of South Florida

Global Energy Future

D. Yogi Goswami conducts fundamental and applied research on solar thermal energy, thermodynamics, heat transfer, HVAC, photovoltaics, hydrogen, and fuel cells. Goswami has served as an advisor and has given testimonies on energy policy and the transition to renewable energy to the U.S. Congress and the government of India and has consulted with the U.S. Department of Energy, U.S. Agency for International Development (USAID), World Bank, and National Institute of Standards and Technology, among others. Goswami is editor in chief of the journal *Solar Energy and Advances in Solar Energy: Annual Review of Research and Development*. Within the field of renewable energy, he has published as an author or editor 14 books, 13 book chapters, six conference proceedings, and more than 200 refereed technical papers, and he has won numerous awards. He has delivered 35 keynote and plenary lectures at major international conferences and holds seven U.S. and one worldwide patent. A recognized leader in professional scientific and technical societies, Goswami has served both as a governor and senior vice president and is a fellow of the American Society of Mechanical Engineers (ASME) International. He also is president and has served as vice president of the International Solar Energy Society, is a fellow of the American Solar Energy Society, and has served as president of the International Association for Solar Energy Education.

Charles McSwain

Assistant Vice President, Regional Development, CSX Transportation, Inc.

Green Transportation: Reconnecting America to Rail

Charles McSwain has been engaged in real estate, economic development, and urban economics for 30 years, focusing on logistics for the past 15 years. Charged

with overseeing strategic initiatives for CSX, McSwain leads a group of geographically dispersed professionals whose sole purpose is to develop new facilities in the best possible configuration for freight services in the context of evolving logistics networks and sustainable systems. In addition to serving unit heads and CFOs as a real estate advisor, McSwain oversees a real estate group that is responsible for all real estate acquisitions, sales/leases to customers, and the leased space portfolio. Prior to joining CSX in 1988 as part of the CSX real estate development company, McSwain was managing general partner for American Tectonics, a regional real estate development firm in Florida, where he planned, constructed, marketed, and managed more than 1 million square feet of mixed-use properties. Serving as a basis for his business acumen in the market were successive positions as economist and urban planner for a regional planning group, economic developer for a statewide public utility, and director of Tampa's Committee of 100. A third-generation native of Florida, McSwain earned degrees from the University of Florida, University of South Florida, and York University.

John Sansalone

Professor of Engineering, University of Florida

Providing Sustainable Stormwater Management for the Urban Water Cycle

John Sansalone is a professor of engineering at the University of Florida. His academic areas of expertise are urban water treatment, the urban hydrologic cycle, fundamental treatment phenomena for best management practices and low-impact development systems, computational fluid dynamics, monitoring and measurement in complex urban drainage systems, geo-environmental phenomena, urban pollutant residual characterization, and green infrastructure systems such as permeable pavement. He has a PhD from the University

of Cincinnati in environmental engineering, an MSc in geotechnical engineering, and a BS in civil engineering. He has eight years of experience as a design/build engineer and 11 years of experience as a professor. He has graduated 14 PhDs, published 70 archival manuscripts, published more than 150 conference proceedings and papers, given more than 200 conference and invited talks, and been a principal investigator on \$2.5 million of funded research. He also is a visiting professor at five universities across Italy, lecturing and conducting research on issues of wet and dry weather urban flows and combined sewer flows in Italy.





INVITED SPEAKERS, continued

Gary Jay Saulson

Director, Corporate Real Estate, PNC Financial Services Group, Inc.

Going Green is Easier Than You Think

Gary Jay Saulson is responsible for all of PNC's non-lending real estate functions, including the management of properties, construction, and development, as well as the development and implementation of occupancy and ownership strategies for all PNC real estate. This includes both owned and leased as well as foreclosed other real estate owned (OREO) residential properties and commercial assets. Saulson also is responsible for leading PNC's environmental strategy that has resulted in PNC's having more buildings certified by the U.S. Green Building Council (USGBC) than any other company in the world. In addition, PNC is the first financial institution to build green bank branches using PNC's Green Branch® construction and the first company to qualify under the USGBC volume build program. PNC has constructed more than 50 green branches to date. Saulson served as president of the Pittsburgh Green Building Alliance, served as chair of the Transition Committee on Real Estate and Energy Matters for the former county executive of Allegheny County (Pa.), and was a member of the City of Pittsburgh's Plan C Committee. Saulson has received a number of awards, including the USGBC LEED Award for his advancement of the LEED Rating System and the Green Building Alliance's Shades of Green Leadership Award.

Robert G. Traver

Professor, Civil and Environmental Engineering, and Director, Villanova Urban Stormwater Partnership, Villanova University

Sustainable Stormwater

Robert G. Traver has been a member of the Water Resources and Environmental Engineering Program at Villanova University since 1988. He is a registered professional engineer and a Diplomat of the American Academy of Water Resource Engineers. Traver has conducted research on such topics as modeling of stream hydraulics, urban hydrology, water quality, and measures to mitigate adverse stormwater effects. He constructed the Stormwater Best Management Practice (BMP) Demonstration and Research Park on the Villanova campus and founded the Villanova Urban Stormwater Partnership to enable continuing research on sustainable stormwater. Recognizing the link between policy and engineering, Traver continues to be involved with the implementation of stormwater policy. He participated in a team study sponsored by the Pennsylvania Department of Environmental Resources to review the effects of Pennsylvania's water regulation on watershed sustainability (1994) and was appointed by the secretary of the Pennsylvania Department of Environmental Protection to the oversight committee for Pennsylvania's 2006 stormwater BMP manual. Traver served as chair for the 1998, 1999, 2001, 2003, 2005, and 2007 Pennsylvania Stormwater Management symposia held at Villanova. Most recently, he was honored with an appointment to a National Academies project titled Reducing Stormwater Discharge Contributions to Water Pollution.

SPECIAL EVENTS

WELCOME RECEPTION HOSTED BY SUSTAINABLE PITTSBURGH

Sunday, 5:30–7:30 p.m.
Westin Convention Center, Pittsburgh
Westmoreland Room

Sustainable Pittsburgh, a 501(c)(3) nonprofit, affects decision making in the Pittsburgh region to integrate economic prosperity, social equity, and environmental quality, bringing sustainable solutions to communities and businesses. As an organization focused on system change in Southwestern Pennsylvania, Sustainable Pittsburgh's strategy involves staying on top of emerging trends and intervening at key leverage points for progress.



Luncheon

Monday, 12:30 p.m.
David L. Lawrence Convention Center, Rooms 413–415

Sponsored by:



Tours

Monday, 4 p.m.
David L. Lawrence Convention Center
This LEED-NC Gold-certified building is the world's first LEED-certified convention center and the largest LEED building to date. Tours will commence at the ES 2009 registration desk on the fourth floor.

Poster Session and Social

Monday, 5:30–7:30 p.m.
David L. Lawrence Convention Center, Garrison Overlook
Sponsored by:



Luncheon

Tuesday, 11:30 a.m.
David L. Lawrence Convention Center, Rooms 413–415





CONFERENCE SCHEDULE

Sunday, April 19	Monday, April 20	Tuesday, April 21
	8:30 a.m.	8 a.m.
	Opening Plenary Session Sandra Mendler Principal, Mithun G. Tracy Mehan III Principal, The Cadmus Group, Inc.	Plenary Session David Allen Melvin H. Gertz Regents Chair in Chemical Engineering; Director, Center for Energy and Environmental Resources, University of Texas at Austin Julie Zimmerman Associate Director for Research, Center for Green Chemistry and Green Engineering, Yale University
	10:30 a.m.	9:30 a.m.
	Concurrent Sessions Business Case for Green Building Green Building Case Studies Sustainable Energy	Concurrent Sessions Green Building Tool Kit Sustainable Water II—Stormwater Green Building and Energy
	12:30 p.m.	11:30 a.m.
	Lunch	Lunch
3 p.m.	1:30 p.m.	12:30 p.m.
Registration Opens Westin Convention Center Lobby	Concurrent Sessions Sustainable Transportation I Sustainable Water I—Stormwater Green Building and Power	Concurrent Sessions Economics of Green Building Sustainable Water III—Water Management Green Design and Construction
	4 p.m.	2:45 p.m.
	David L. Lawrence Convention Center (DLCC) Tours	Concurrent Sessions Green Building and Materials International Case Studies Sustainable Transportation II
5:30 p.m.	5:30 p.m.	
Welcome Reception Westin Convention Center Westmoreland Room	Poster Session and Social DLCC Garrison Overlook	

AGENDA AT A GLANCE

Sunday, April 19	Tuesday, April 21
3 p.m. Registration Opens Westin Lobby	7:30 a.m. Registration Opens DLCC fourth floor
5:30 p.m. Welcome Reception Westmoreland Room <i>Hosted by Sustainable Pittsburgh</i>	8-9:30 a.m. Plenary Session Room 407
	Welcome Announcement of the 2008 Energy-Efficient Building Technologies Challenge Winners Eric J. Beckman , Conference Chair David Dzombak , Conference Chair
Monday, April 20	"Sustainable Engineering: A Model for Engineering Education in the 21st Century" David Allen , Melvin H. Gertz Regents Chair in Chemical Engineering; Director, Center for Energy and Environmental Resources, University of Texas at Austin
7:30 a.m. Registration Opens DLCC fourth floor	"Frontiers in Green Design for Innovation" Julie Zimmerman , Associate Director for Research, Center for Green Chemistry and Green Engineering, Yale University
8:30 -10:30a.m. Opening Plenary Session Room 407	9:30-11:30 a.m. Concurrent Sessions
Conference Welcome Eric J. Beckman , Conference Chair David Dzombak , Conference Chair	Green Building Tool Kit Room 408
"Big Integration: The Next Sustainable Design Agenda" Sandra Mendler , Principal, Mithun	Sustainable Water II— Stormwater Room 409
"The Four, Five, Six, or More Pillars of Sustainable Infrastructure" G. Tracy Mehan III , Principal, The Cadmus Group, Inc.	Green Building and Energy Room 410
10:30 a.m.-12:30 p.m. Concurrent Sessions	11:30 a.m.-12:30 p.m. Lunch and networking opportunities Rooms 413-415
Business Case for Green Building Room 408	12:30-2:30 p.m. Concurrent Sessions
Green Building Case Studies Room 409	Economics of Green Building Room 408
Sustainable Energy Room 410	Sustainable Water III— Water Management Room 409
12:30-1:30 p.m. Lunch and networking opportunities Rooms 413-415	Green Design and Construction Room 410
1:30-4 p.m. Concurrent Sessions	2:45-4:45 p.m. Concurrent Sessions
Sustainable Transportation I Room 408	Green Building and Materials Room 408
Sustainable Water I— Stormwater Room 409	International Case Studies Room 409
Green Building and Power Room 410	Sustainable Transportation II Room 410
4 p.m. David L. Lawrence Convention Center Tours Meet at ES 2009 registration desk, fourth floor	
5:30 p.m. Poster Session and Social Garrison Overlook	



ORAL PRESENTATIONS

Monday, April 20 10:30 a.m.–12:30 p.m.

Business Case for Green Building Room 408

- 10:30 a.m. **Going Green Is Easier Than You Think**
*Gary Jay Saulson, PNC Financial Services Group, Inc.
- 11:15 a.m. **Green Jobs and Their Economic Impact**
Richard Overmoyer, GSP Consulting
- 11:40 a.m. **Evolution to Revolution: The Triple Top Line**
Tom Paladino, Paladino and Company
- 12:05 p.m. **High-Performance Buildings**
John Gattuso, Liberty Property Trust

Green Building Case Studies Room 409

- 10:30 a.m. **A Green Wave in the Blue Ridge Mountains: Asheville's Strides toward Sustainability**
Dave Spector, Camp Dresser & McKee Inc.
- 10:55 a.m. **Elevating Sustainable Design to Achieve LEED Certification: A Case Study of the Erie Art Museum Project**
Anne Chen, EdgeStudio
- 11:20 a.m. **Zoning, Urban Form, and Civic Identity: The Future of Pittsburgh's Hillside**
William Peduto, Pittsburgh City Council
Stephen Quick, Perkins Eastman
- 11:45 a.m. **Sustainable Site Redevelopment: An Interdisciplinary Approach at Overlook Ridge**
Robert O. Button and Barry Squibb, Camp Dresser & McKee Inc.
- 12:10 p.m. **Clean Energy Initiatives of the New Orleans Holy Cross Redevelopment Project**
Mark Crowdis, Think Energy, Inc.

Sustainable Energy Room 410

- 10:30 a.m. **Second-Generation Green Building Design**
*Thomas Auer, Trans Solar
- 11 a.m. **Waste as a Resource: Turning Trash into Clean Energy**
Richard Jackson, Capital Technologies International
- 11:25 a.m. **Advances in Energy Storage Technologies and Applications for Renewable Energy Integration**
Gregory Reed, University of Pittsburgh
- 11:50 a.m. **Printed Solar Power: Scaling from Lab-Cells to Modules**
Ritesh Tiplis, Plextronics, Inc.

Monday, April 20 1:30–3:30 p.m.

Sustainable Transportation I Room 408

- 1:30 p.m. **Green Transportation: Reconnecting America to Rail**
*Charles McSwain, CSX Transportation, Inc.
- 2 p.m. **Global Supply Chain Connectivity for Future Economic Viability**
Peter Stone, Global Insight
- 2:25 p.m. **Site and Building Design Considerations for a Multimodal Transportation Platform**
Tim Feemster, Grubb & Ellis Company
- 2:50 p.m. **Greenroads: A Sustainability Rating System for Roadways**
Jeralee L. Anderson, University of Washington

Sustainable Water I—Stormwater Room 409

- 1:30 p.m. **Providing Sustainable Stormwater Management for the Urban Water Cycle**
*John J. Sansalone, University of Florida
- 2 p.m. **Waste Incorporated Sustainable Design of Stormwater Detention Basins**
Shauna Kocman, University of Colorado, Denver
- 2:25 p.m. **Parallel Replacement: An Innovative, Sustainable, Green Alternative to Conventional Sanitary Sewer Overflow Elimination**
Lawrence Lennon, Lennon, Smith, Souleret Engineering, Inc.
- 2:50 p.m. **The Effects of Green Infrastructure on Water Quantity and Quality Issues**
Kari Ann Mackenbach, URS Corporation

Green Building and Power Room 410

- 1:30 p.m. **Clean Energy Generators: The Next Generation of Sustainable Buildings**
Ali Vakili-Ardebili, University of Toronto, Canada
- 1:55 p.m. **Economic and Environmental Performance Analysis of PV Systems for Domestic Applications in Ireland**
Lacour Mody Ayompe, Dublin Institute of Technology, Ireland
- 2:20 p.m. **Hybrid Four Parameter Multijunction Cell Model**
Tony Kerzmann, University of Pittsburgh
- 2:45 p.m. **Occupant in Space Heating and Cooling Operation**
Yun Gu, Carnegie Mellon University

Tuesday, April 21 9:30–11:30 a.m.

Green Building Tool Kit Room 408

- 9:30 a.m. **Enhanced Sustainable Design Using Building Information Modeling Performance Analysis**
*Mark Dietrick, Case Technologies
- 10 a.m. **Global Tools Gathering and Dissemination: A Methodology for Establishing Best Practice for Large Design and Engineering Firms**
Engin Ayaz, Arup
- 10:25 a.m. **Modeling Urban Metabolism with Systems Dynamics**
Enrique Lopez-Calva, Camp Dresser & McKee Inc.
- 10:50 a.m. **Qualitative and Quantitative Environmental Impact Analysis of BFRC vs. GFRP: Green Building Construction Rehabilitation Systems**
Francisco De Caso y Basalo, University of Miami
- 11:15 a.m. **The Integration of Key Stakeholders in the Sustainable Design and Construction Process**
Timothy M. Henderson, Deloitte Financial Advisory Services LLP

Sustainable Water II—Stormwater Room 409

- 9:30 a.m. **Sustainable Stormwater**
*Robert G. Traver, Villanova University
- 10 a.m. **Sustainable Goals for Total Water Management**
Barry Liner, George Mason University
- 10:25 a.m. **Green Stormwater Management for Sustainable Urban Infrastructure**
Sam Shamsi, Michael Baker Corporation
- 10:50 a.m. **Sustainable Design of Pervious Concrete Pavements**
Angela S. Hager, University of Colorado, Denver

Green Building and Energy Room 410

- 9:30 a.m. **A Perspective on Global Energy Future**
*D. Yogi Goswami, University of South Florida
- 10 a.m. **Development of a Building Operations Decision Framework to Foster Innovation**
Angela Lewis, Penn State University
- 10:25 a.m. **Behavioral Influences on Professionals' Energy Decisions during Building Delivery**
Leidy Klotz, Clemson University
- 10:50 a.m. **Buildings: Center of the Green Universe**
John White, Eaton Corporation

Tuesday, April 21 12:30–2:30 p.m.

Economics of Green Building Room 408

- 12:30 p.m. **Economic Feasibility of a Residential Energy Services Company**
Kullapa Soratana, University of Pittsburgh
- 12:55 p.m. **Climate Protection through Intelligent Construction**
Mark Wiltman, Bayer MaterialScience
- 1:20 p.m. **A Comparative Sustainability Analysis of Water Management Options in Buildings**
Defne Apul, University of Toledo
- 1:45 p.m. **The Quality of Vernacular Functional Spaces Based on Salinger Residence**
Amirhossein Ghaffarian Hoseini, University Putra Malaysia
- 2:10 p.m. **Structural Stewardship: Shaping and Shopping**
David M. Foxe, Boston Architectural College

Sustainable Water III—Water Management Room 409

- 12:30 p.m. **Innovative Technology for Sustainable Reuse of Industrial Wastewater**
LNSP Nagghappan, N.A. Water Systems, a Veolia Water Solutions and Technologies company
- 12:55 p.m. **Water for Cooling in Thermoelectric Power Plants: The Impending Shortage and Alternative Sources**
Shih-Hsiang Chien and Radisav Vidic, University of Pittsburgh
- 1:20 p.m. **Thinking Sustainability in a 21st-Century Island Economy**
Chittaranjan Ray, University of Hawaii
- 1:45 p.m. **Sustainability and Disinfection: How to Incorporate Life Cycle Assessment into Wastewater Disinfection Design**
Leonard Casson, University of Pittsburgh
- 2:10 p.m. **Energy Recovery from Wastewater: Evaluation of Resource Management Alternatives for Appropriate and Environmentally Sustainable Energy Production**
Sherri Cook, University of Michigan

Green Design and Construction Room 410

- 12:30 p.m. **Education Challenges for Sustainable Design and Construction**
Vanessa Gomes da Silva, University of Campinas, Brazil
- 12:55 p.m. **Building Sustainable Communities: Measuring the Intersection of Transportation, the Built Environment, and Social Capital**
Shannon Rogers, University of New Hampshire
- 1:20 p.m. **Embodied Energy Analysis: A Sustainable Construction Design Assessment Tool**
Adolf Acquaye, Dublin Energy Lab, Ireland

- 1:45 p.m. **The Environmental Policy-Making Process in Brazil and Industrial Ecology**
Emilia W. Rutkowski, University of Campinas, Brazil

Tuesday, April 21 2:45–4:45 p.m.

Green Building and Materials Room 408

- 2:45 p.m. **How to Improve Indoor Air Quality in Existing Medical Offices**
Steven Bodnar, Center for Environmental Oncology
- 3:10 p.m. **Energy Savings and Global Warming Prevented by Using Spray Foam Insulation on Residential Housing**
James Lambach, Bayer MaterialScience
- 3:35 p.m. **Comparative Life Cycle Assessment of Insulating Concrete Forms with Traditional Residential Wall Sections**
Neethi Rajagopalan, University of Pittsburgh
- 4 p.m. **Intelligent Concrete Coating Solutions for Sustainable Construction**
Steven Reinstadtler, Bayer MaterialScience

International Case Studies Room 409

- 2:45 p.m. **Green Design in the Construction of China's National Stadium**
Yi Fei, Washington University in St. Louis
- 3:10 p.m. **Capacity Factor Analysis for the Selection of Sustainable Drinking Water Supply and Grey Water Reuse Systems for Developing Communities: Case Study in Cimahi, Indonesia**
Justin Henriques, University of Virginia
- 3:35 p.m. **Lesson Learned from Traditional Settlement for Sustainable Design of the Future (The Kingdom of Saudi Arabia)**
Yousef Al Ohali, King Faisal University, Saudi Arabia

Sustainable Transportation II Room 410

- 2:45 p.m. **Using Sustainability Resource and Waste Footprints to Evaluate Progress toward Transportation System Sustainability**
Adjo Amekudzi, Georgia Institute of Technology
- 3:10 p.m. **Relationship between Proximity to Transit and Ridership for Journey-to-Work Trips in Chicago**
Marshall Lindsey, Northwestern University
- 3:35 p.m. **Economic Forecasts and Environmental Impacts of Highway Construction Commodities**
Maria Fernanda Padilla, University of Pittsburgh
- 4 p.m. **Influences on Transportation Mode Choice: A Case Study**
Cynthia Carlson, University of New Hampshire
- 4:25 p.m. **Greening the Commute to Green Buildings**
Deanna Matthews, Carnegie Mellon University



POSTER PRESENTATIONS Poster Session and Social; **Garrison Overlook; Monday, April 20; 5:30 p.m.**

1	Novel Natural Oil-based Rigid Foams for Demanding Applications: A Class 1 Polyisocyanurate Foam for Insulated Metal Building Panels	Steven Schilling	<i>Bayer MaterialScience</i>
2	Developing Quality Sustainability Training Materials	Deborah Steinberg	<i>Chatham University</i>
3	Developing Sustainable Teams to Support Sustainable Projects	Lisa Brown	<i>Penn State University</i>
4	Monetary Valuation of the Environmental and Health Externalities Associated with Ethanol Production from Different Feedstocks	Jamil Kusiima	<i>Clarkson University</i>
5	Chlorine Residual Management for Sustainable Water Infrastructure	Damian E. Helbling	<i>Carnegie Mellon University</i>
6	Pilot Scale Biological Hydrogen Production Plant	Emily Raines and Lauren Staples	<i>Clemson University</i>
7	Aguaclara: Sustainable Small-scale Drinking Water Treatment	Narayana Pappu	<i>Cornell University</i>
8	Use of Wastewater for Cooling Power Plant Systems	Briana Niblick	<i>University of Pittsburgh</i>
9	Renovation and Addition to the Swanson School of Engineering at the University of Pittsburgh: The Process and Challenge of Providing a LEED Project for the Urban Campus	Gary Carlough	<i>EDGE Studio</i>
10	Environmentally Conscious Management of Wastes Deposited in Municipal Solid Waste Landfills	Banu Sizirci-Yildiz	<i>Florida International University</i>
11	Impacts Associated with Biodiesel Use in Fleets	Scott Shrake	<i>University of Pittsburgh</i>
12	Driving Green Building Product Innovation in Pennsylvania	Aurora Sharrard	<i>Green Building Alliance</i>
13	Early Removable Wood Formwork System Mechanic Experiment Analysis	Hou Zhang	<i>Heilongjiang Province Construction Group, China</i>
14	The Role of Nanotechnology in Construction: A Route toward Sustainable Heavy Civil Construction Materials	Heather Dylla	<i>Louisiana State University</i>
15	Recovery of Metal Cations from Lime Sludge Using Donnan Dialysis	Qianheng Wang	<i>Ohio State University</i>
16	An Evaluation of Sustainability Education Assessment Tools within Engineering Education	Kaitlin Vacca	<i>Penn State University</i>
17	Design for the Environment Course: Improving Learning Experiences through Activity-based Learning Labs	David Torick	<i>University of Pittsburgh</i>
18	Investigations on Nitrous Oxide Emissions from the Irvine Ranch Water District Wastewater Treatment Plant, Irvine, Calif.	Linda Tseng	<i>University of California, Irvine</i>
19	Sustainability as a Driving Force for an Integrated Building Design Process	Doris Kowaitowski	<i>University of Campinas, Brazil</i>
20	Facilitating Sustainable Activity in Cities through the Development of Greenhouse Gas Inventories and Climate Action Plans	Michael Blackhurst	<i>Carnegie Mellon University</i>
21	Physical Treatment of Wastewater: Design and Applications	Amr Safwat	<i>University of Cincinnati</i>
22	Physical and Chemical Characteristics of Ambient Particulate during Pm10 Episodes in Taichung Urban Areas	Li-Kai Lin	<i>Florida International University</i>
23	Achieving Stringent Effluent Standards through Sustainable Biological Wastewater Treatment	Alexander Mockos	<i>University of Idaho</i>
24	The Segregation of Silver Nanoparticles in Low-cost Ceramic Water Filters	Curtis Larimer	<i>University of Pittsburgh</i>
25	Evaluation of the Life Cycle Environmental Impacts of Algae-based Biofuels	Deana Aulisio	<i>University of New Hampshire</i>
26	Integrated Systems Control through HDR Imaging	Rhonda Lowe	<i>University of North Carolina, Charlotte</i>
27	Comparative Life Cycle Assessment of Lubricants: Rapeseed, Soybean, and Mineral	Phoebe Cuevas	<i>University of Pittsburgh</i>
28	Polyurea and Polyurea Hybrid Thick Film Coatings for Sustainable Protection of Wastewater Infrastructure	Chris Marshall	<i>Bayer MaterialScience</i>
29	Improving Environmental Profiles of Bioproducts via Optimizing Farming Practices	Xiaobo Xue	<i>University of Pittsburgh</i>

30	Challenges in Producing High-Quality Water in the Prairies	Kristina Nelson	<i>University of Regina, Canada</i>
31	The Strength, Breadth, and Depth of the Green Building Product Manufacturing Industry in Pennsylvania	Torrey Babson	<i>GSP Consulting</i>
32	Service Life Design (SLD): An Agenda to Improve Performance and Efficiency	Ali Vakill-Ardebili	<i>University of Toronto, Canada</i>
33	Using Morphological Models to Improve Current Land Development Practices Surrounding Dam Removal	Kristen Cannatelli	<i>University of Virginia</i>
34	Metropolitan Sewer District of Greater Cincinnati (MSDGC) Green Roof Flow Monitoring Assessment and Analyses	John Quinlisk	<i>URS Corporation</i>
35	Phytoremediation by Biofuel Crops on Marginal Lands	Emily Wolff and Amy Landis	<i>University of Pittsburgh</i>
36	Modified Energy Index for Water Utilities	Leon Gay	<i>Virginia Tech University</i>
37	Stormwater Runoff Monitoring on Hamerschlag Hall Green Roof at Carnegie Mellon	Ting Xie	<i>Carnegie Mellon University</i>
38	Embracing Green Technology in Video Surveillance: Cold Disk Technology for Video Storage and Archiving	Dale Gigandet	<i>Xtralis Inc.</i>
38	Green Manufacturing: A Case Study in Multidisciplinary Collaboration	Darrell Wallace	<i>Youngstown State University</i>
40	Global Climate Change: The Empirical Study of Sensitivity Model in China's Sustainable Development	Z. Olusheyi Ojekunle	<i>Tianjin University, China</i>
41	Sorption of Explosive Chemicals to Leaves and Leaf Litters of Tropical Plants from Hawaii	Matteo D'Alessio	<i>University of Hawaii</i>
42	An Analytic Network Process Approach to the Project Portfolio Management for Organizational Sustainability	Fikret Turan	<i>University of Pittsburgh</i>
43	The Implementation of Carbon Monoxide Wireless Sensor Networks for Ambient Air Monitoring	Chaichana Chaiwatpongsakorn	<i>University of Cincinnati</i>
44	Microfluidic Bacterial Fuel Cells: A Sustainable Battery for Remote Electronic Devices	Zhiqiang Li	<i>Carnegie Mellon University</i>

**New! Featured during the poster session:
2008 Energy-Efficient Building Technologies Challenge**

This challenge—open to all undergraduates in the region—was for student teams to work together to create innovative products for existing buildings, both residential and commercial, that would reduce the demand for energy from nonrenewable sources while exhibiting a payback time of one year or less. The four finalists' projects (listed at right) will be on display during the poster session.

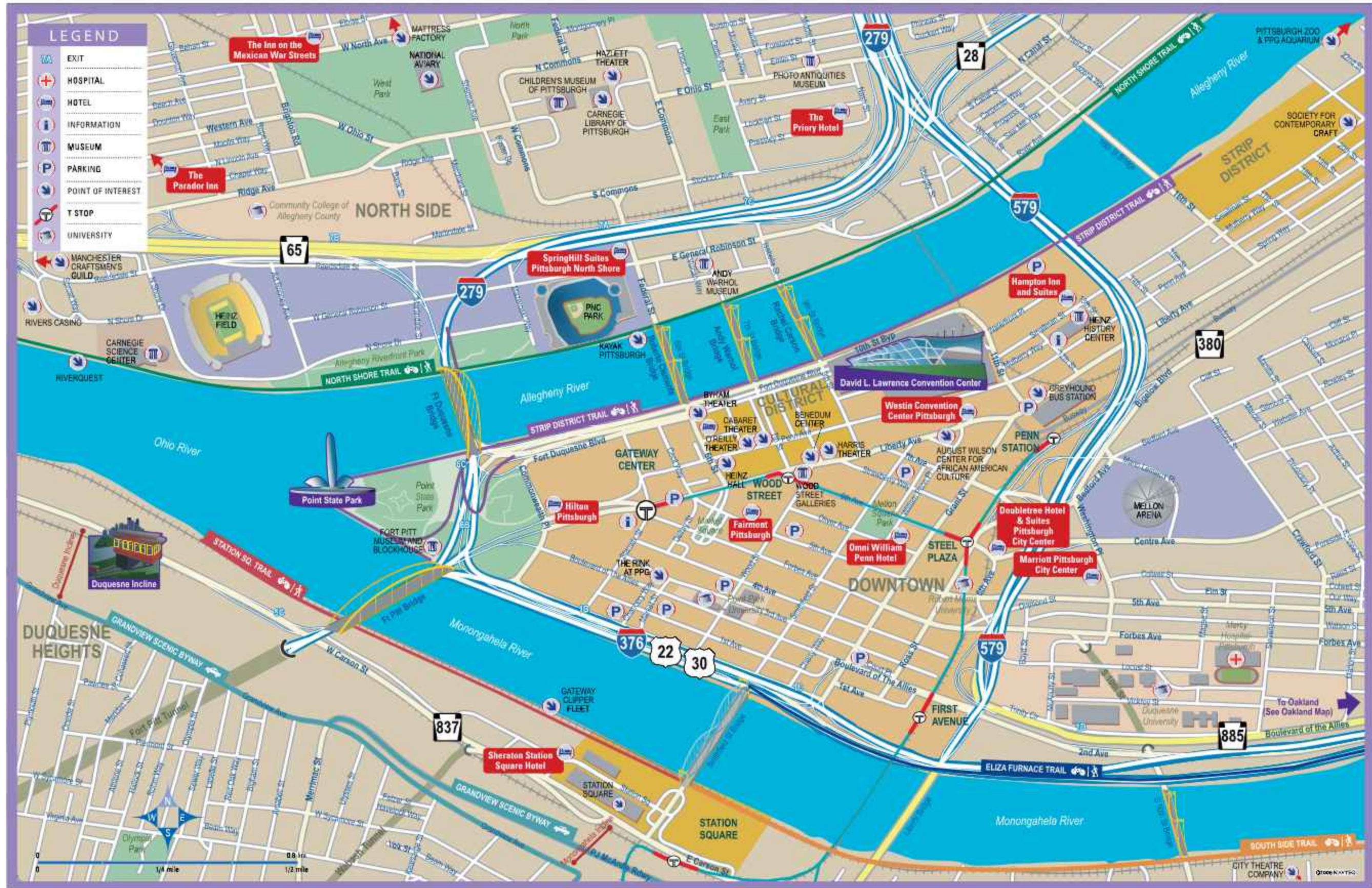
The winning team will be announced at the Tuesday morning plenary session.

Sponsored by the Mascaro Center for Sustainable Innovation and the Heinz Endowments

Finalists		
Urban Waterfall		
Rahool Padhye	Mechanical Engineering	Carnegie Mellon University
Joseph Meyer	Mechanical Engineering	Carnegie Mellon University
Colin O'Shea	Mechanical Engineering	Carnegie Mellon University
Francisco Santiago	Mechanical Engineering	Carnegie Mellon University
Greenbills		
Jacob Mohin	Chemistry	Carnegie Mellon University
David Kennedy	Architecture	Carnegie Mellon University
Benjamin Kwadwo Som-Pimpong	Mechanical Engineering	Carnegie Mellon University
Low-Cost Wind Turbine Tied with Energy-Saving Systems		
Micah Toll	Mechanical Engineering	University of Pittsburgh
Shaun Espenshade	Rhetoric and Classics	Duquesne University
Solar-Assisted Window Fan		
Patrick Wetherill	Mechanical Engineering	University of Pittsburgh
Stephen Palmer	Industrial Engineering	University of Pittsburgh



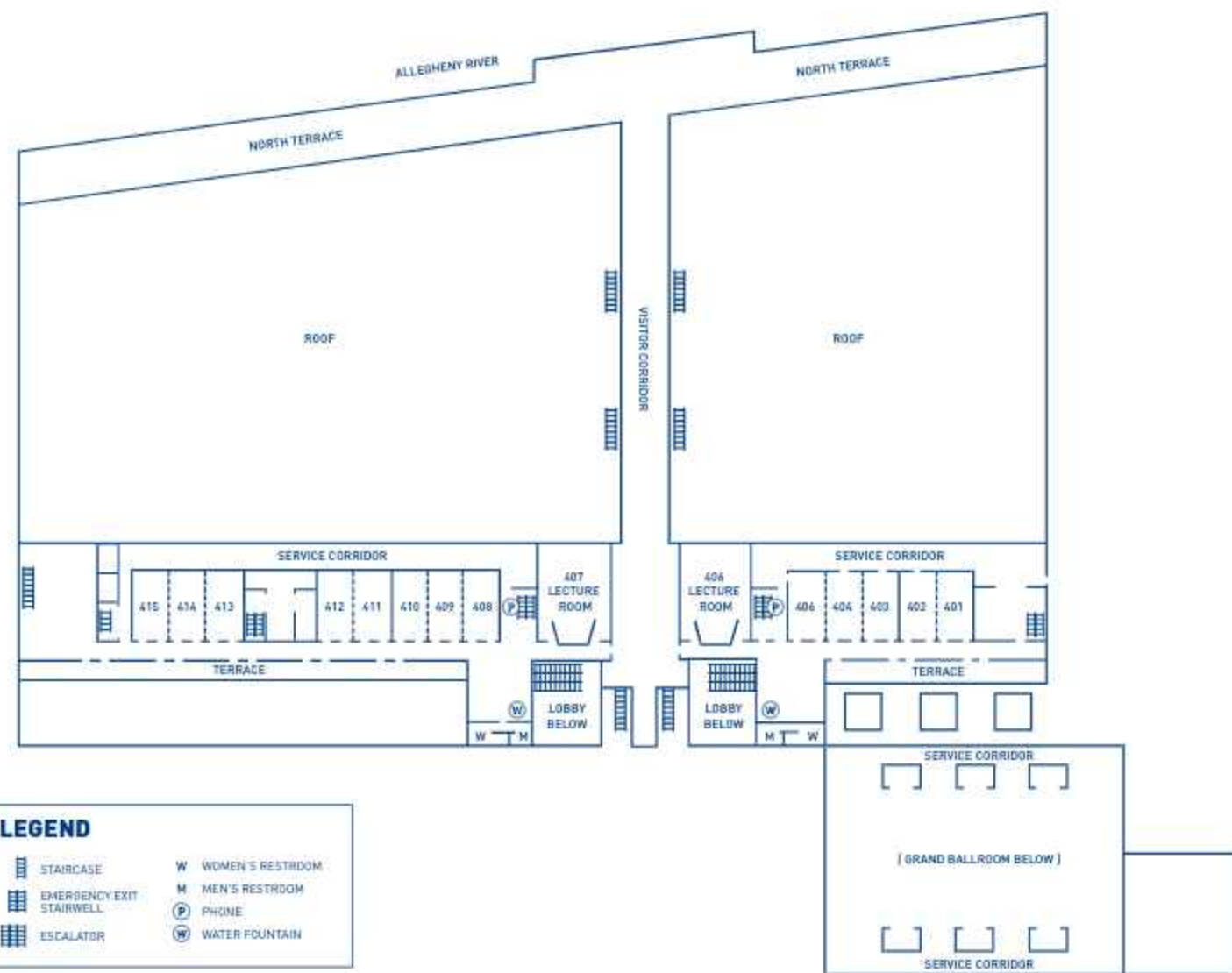
MAP OF PITTSBURGH



Map courtesy of VisitPittsburgh




DAVID L. LAWRENCE CONVENTION CENTER FOURTH FLOOR



CONFERENCE NOTES

This is a Climate-Friendly Event
 We are helping to build farm methane renewable energy projects in Pennsylvania and are keeping 97 tons of CO² out of the air to offset the greenhouse gas emissions from attendee travel, accommodations, and venue energy usage for Engineering Sustainability 2009.

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