AIChE
Computing and Systems Technology Division

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AIChE CAST Division Newsletter Spring 2014

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CAST News

Change in Editorial Team

By Ray Adomaitis and Lakshminarayanan Samavedham (Laksh)

We begin this newsletter by thanking Peter Rony and Karl Schnelle for serving as co-editors of the CAST newsletter. As described in the Summer 2013 Newsletter, Peter has served as newsletter editor for 27 years. Everyone in CAST appreciates Peter's work, particularly because the archived newsletters serve the important purpose of recording the history of the division and keeping our community informed and engaged.

With Peter's stepping down as editor and Karl taking on the position of CAST 2nd Vice Chair, the CAST executive committtee entrusted Laksh with the responsibility of contributing as the Publications Board Chair. Together, we will be building on the excellent work done by Peter and Karl. We will start off our work with the existing format but will transition to more multimedia-enriched and interactive newsletter over the next few editions. We look forward to your contributions and continued support for the newsletter.

Division report

From the 2013 Annual meeting: two by-law changes were voted upon by CAST members and approved

- Article IX, Section 5: W. David Smith, Jr. Graduate Publication Award -- added five year time limit from publication of nominated article
- Article IX, Section 7: The CAST Directors' Student Presentation Award -- added new section for new award

CAST contributed leaders to various conferences

1. IFAC DYCOPS
2. 2015 American Control Conference
3. Process Systems Engineering
4. FOCAPO

CAST produced WebCASTs, web format live seminars, and archived WebCASTs (available on CAST and AIChE webpages).

2013 CAST Awards

Because of the redesign of the CAST newsletter, we are a bit late with our article on the 2013 Annual CAST Awards Banquet held in San Francisco on November 8, 2013.

Computing In Chemical Engineering Award

- Second Vice-Chair: Karl D. Schnelle
- Secretary, Treasurer: Martha A. Grover
- 2014-2016 Director: Andreas A. Linninger
- 2014-2016 Director: Leo Chiang
- 2015-2017 Director: Mario R. Eden

Jay H. Lee obtained his B.S. degree in Chemical Engineering from the University of Washington, Seattle, in 1986, and his Ph.D. degree in Chemical Engineering from California Institute of Technology, Pasadena, in 1991. From 1991 to 2010, he was a faculty member at Auburn University, Purdue University, and Georgia Institute of Technology in the U.S. In 2010, he joined the faculty of KAIST, Korea where he is currently the Head of the Chemical and Biomolecular Engineering Department. He was a recipient of the National Science Foundation's Young Investigator Award in 1993. He was elected as IEEE Fellow and IFAC Fellow and a full member of the Korean Academy of Science and Technology. For the CAST Division, he served as the Area 10B Programming Chair and a Director in the past. He is currently serving as an Editor of Computers and Chemical Engineering and the Chair of IFAC's TC 6.1 Chemical Process Control. His research interests are in the areas of state estimation, robust control, model predictive control, and approximate dynamic programming with applications to energy and biological systems.

This award is sponsored by the Dow Chemical Company and recognizes outstanding contributions in the application of computing and systems technology to chemical engineering.

Access the presentation slides of Jay Lee's talk by clicking here.

Computing Practice Award

Thomas A. (Tom) Badgwell Ph.D., P.E., is a Research Associate in the Data Analytics & Optimization Section, Corporate Strategic Research, at the ExxonMobil Research & Engineering Company in Clinton, NJ. He received a BS degree in Chemical Engineering from Rice University and MS and PhD degrees from the University of Texas at Austin. Tom's career has focused on modeling, optimization, and control of chemical processes, with past positions at Setpoint, Fisher/Rosemount, Rice University, and Aspen Technology. He is a Fellow of the American Institute of Chemical Engineers, where he recently served as a Director of the Computing and Systems Technology Division. He currently serves as an Associate Editor for the Journal of Process Control, published by the International Federation of Automatic Control.

This award is sponsored by Aspen Technology, Inc. and ExxonMobil Chemical Company and recognizes outstanding contributions in the practice or application of chemical engineering to computing and systems technology.

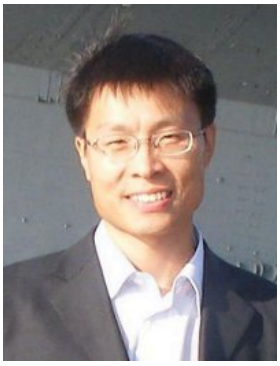
Outstanding Young Researcher

Christos Maravelias obtained his Diploma in Chemical

Engineering from the National Technical University of Athens, an MS in Operational Research from the London School of Economics, and his PhD from Carnegie Mellon University. He joined the Department of Chemical and Biological Engineering at the University of Wisconsin â€“ Madison in 2004. He is the recipient of the Inaugural Olaf A. Hougen Fellowship, an NSF CAREER award, as well as the 2008 W. David Smith Jr. Award from the CAST division of AIChE. Christosâ€™ research interests are in the areas of a) production planning and scheduling, b) chemical supply chain optimization, c) process synthesis and technology assessment for renewable energy, and d) computational methods for novel material discovery.

This award is sponsored by Air Products and Chemicals, Inc. and recognizes an individual under the age of 40 for outstanding contributions to the chemical engineering computing and systems technology literature.

W. David Smith, Jr. Publication Award



Zukui Li holds a Bachelor's degree (2002) in Automatic Control and a Master's degree (2005) in Control Theory and Control Engineering from the University of Science and Technology of China. Zukui Li received his Ph.D. in Chemical Engineering from Rutgers University in 2010. He was a postdoctoral research associate in Princeton University from June 2010 to December 2012. He joined the University of Alberta as an Assistant Professor in January 2013. The award recognizes the publication:

"Integrated production planning and scheduling using a decomposition framework" by Z. Li and M. G. Ierapetritou, *Chem Engng Sci*, **64** pp. 3585-3597 (2009).

This award is sponsored by Process Systems Enterprise, Inc. and recognizes an individual for published work on the application of computing and systems technology to chemical engineering. The work must have been done by the individual while pursuing graduate or undergraduate studies.

David Himmelblau Award

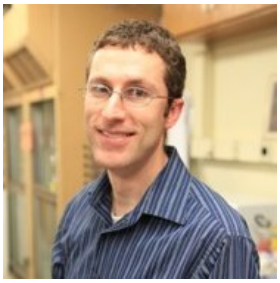
Jason M. Keith is Professor, Earnest W. Deavenport, Jr. Chair, and Director of the Dave C. Swalm School of Chemical Engineering at Mississippi State University. Prior to joining Mississippi State University, Jason Keith was employed at Michigan Technological University as an Assistant Professor and then as an Associate Professor. Keith has received numerous teaching and research awards, most notably the Raymond W. Fahien Award from the Chemical Engineering Division of the American Society for Engineering Education. He leads research programs in modeling of transport systems for pollution reduction and alternative energy applications. He has taught courses in process control, engineering mathematics, transport phenomena, separations, fuel cells, and hydrogen energy

fundamentals during his academic career. He is a member of ASEE and AIChE. Jason and his wife, Salvadora, live in Starkville, MS, with their four children â€“ Andrew, Maria, Isabel, and Sophia, and a chocolate Labrador retriever, Pennant.

This award is sponsored by CACHE Corporation and recognizes an individual or group making new and novel contributions to computer aids for chemical engineering education. Educational innovators working in industry or in a company that develop computer-based educational aids also are eligible for the award.

Directors' Student Presentation Award

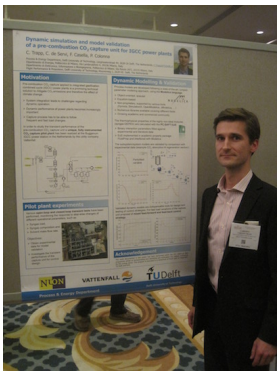
By Bob Parker



The CAST Executive Committee is pleased to announce that the 2013 CAST Presentation award for work presented at the 2013 AIChE meeting in San Francisco is Mr. Wesley Cole, from the University of Texas at Austin, for his presentation "Community-Scale Residential Air Conditioning Control for Effective Grid Management" (555b). This work was co-authored by Joshua D. Rhodes, William Gorman, Michael E. Webber, and Thomas F. Edgar.

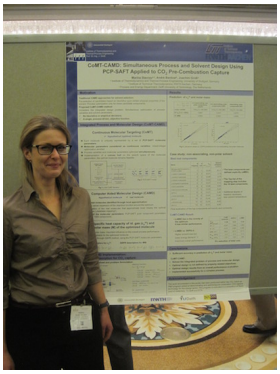
2014 Directors' Poster Award

By Bob Parker



Awardee

Carsten Trapp, Delft University of Technology, 203y Dynamic simulation and model validation of a pre-combustion CO2 capture unit for IGCC power plants

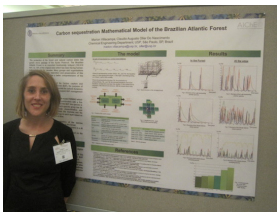


Awardee

Marina Stavrou, Stuttgart University, 203m COMT-CAMD: Simultaneous process and solvent design using PCP_SAFT applied to CO2 pre-combustion capture

Honorable Mention

Marion Villacampa, Universidade de Sao Paulo, 200f Carbon sequestration: mathematical model of the Brazilian Atlantic forest

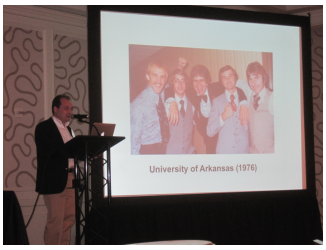


2013 Poster and Presentation Awards

The 2013 CAST Directors' Poster Award winner (Curtisha Travis of the University of Maryland) and CAST Presentation Award winner (Cara Touretsky of the University of Texas, Austin) also were acknowledged during the CAST Awards Banquet.

Recognition for CAST service

Other CAST members were recognized for their service to CAST during the 2013 Awards Banquet: Mayuresh Kothare was given a plauqe in appreciation for his service as 2013 Chair of CAST (below, left) and Wayne Bequette received a plaque in recognition of his service as 2013 CAST programming chair (below, center). This recognition also was acknowledged by a retrospective on Wayne's career presented by Nick Sahinidis (below, right).



2013 Travel Grant Winners

- Wesley Cole, University of Texas at Austin, Wednesday, 3:35PM, (555b) Community-Scale Residential Air Conditioning Control for Effective Grid Management
- Matthew Ellis, UCLA, Monday, 12:30PM, (137a) Optimal Time-Varying Operation of Nonlinear Process Systems With a Two-Layer Economic Model Predictive Control Scheme
- Thang Ho, University of Pittsburgh, Wednesday, 1:24PM, (509d) An Algorithm for Patient-Specific Cancer Chemotherapy Scheduling
- Sara Velez, University of Wisconsin-Madison, Thursday, 2:24 PM, (696g) A Mixed-Integer Programming Model and Tightening Methods for Scheduling in General Chemical Production Environments
- Dajun Yue, Northwestern University, Wednesday, 3:15PM, (573a) Sustainable Design of Supply Chains Using Life Cycle Optimization Framework Based On Functional Unit With Application On Hydrocarbon Biofuel Product Systems

CAST 2013 Plenary Talks

Included below is a summary of the CAST Division plenary talks given at the AIChE Annual Meeting, San Francisco, USA (November 2013).

1. Paper Title: CAST Division Overview (Paper 46a; Slides used in this talk can be accessed here)

2. Paper Title: Superstructure-based shale plays water management optimization (Paper 46b; Presentation Slides)

Authors: Linlin Yang (Carnegie Mellon University, USA), Jeremy Manno (Carrizo Oil & Gas) and Ignacio E. Grossmann (Carnegie Mellon University, USA)

Abstract: Water use makes up approximately 10% of the overall shale gas drilling and completion costs. Even though the Marcellus Shale Play overlies a water-rich region, regulatory restrictions pose considerable logistics challenges that demand sophisticated management strategies. There are four key aspects for water use in hydraulic fracturing, including source water acquisition, wastewater production, reuse and recycle, and subsequent transportation, storage, and disposal. The difficulty with surface water acquisition is that withdrawal is only permitted if the minimum flowrate requirement is met. Once a well is fractured, there is considerable flowback water. The total dissolved solids (TDS) concentration in the flowback water is the key criterion for determining the volume of freshwater to be blended to make up the source water used for the next fracture. The flowback water can be recycle reused or disposed. Of these options, disposal is not economically viable since it requires transporting wastewater to Ohio. In addition, transportation is a major expense since ninety percent of the trucks required for the completion of a wellpad are associated with the fracturing process. Alternatively, permanent or temporary piping could be considered. Finally, water storage is also heavily regulated, making storage of wastewater undesirable.

This presentation optimizes water use life cycle for wellpads through a mixed-integer linear programming (MILP) discrete-time representation. The objective is to minimize transportation, treatment, storage, and disposal cost. Assuming freshwater sources, wellpads, and treatment facilities are given, the goal is to determine an optimal fracturing schedule. The formulation involves a large number of binary variables mainly due to the long time horizon under consideration. Several examples are presented to illustrate the effectiveness of the formulation and to identify additional optimization opportunities that can improve the economics of water use.

3. Paper Title: A Stochastic PDE Framework for Natural Gas Network Operations (Paper 46d; Presentation Slides)

Author: Victor M. Zavala (Argonne National Laboratory and University of Chicago)

Abstract: We present a stochastic optimal control model to optimize gas network inventories in the face of system uncertainties. The model captures detailed network dynamics and operational constraints and uses a weighted risk-mean objective. We perform a degrees-of-freedom analysis to assess operational flexibility and to determine conditions for model consistency. We compare the control policies obtained with the stochastic model against those of deterministic and robust counterparts. In addition, we demonstrate that the use of risk metrics can help operators to systematically mitigate system volatility. Moreover, we discuss computational scalability issues and effects of discretization resolution on economic performance.

4. Paper Title: Study of Mechano-Electric Feedback On Cardiac Wave Propagation (Paper 46e; Presentation Slides)

Authors: Azzam Hazim, Youssef Belmhadia and Stevan Dubljevic (University of Alberta, Canada)

Abstract: Electrical alternans is a physiological phenomenon that is a beat-to-beat oscillation (alternation) of the cardiac Action Potential Duration (APD). Alternans have been shown to be a precursor to arrhythmias (Makarov L et al., 2010) and sudden cardiac death (SCD), which is the most common cause of death in the industrialized world. The presence of electrical alternans induces, through the mechanism of the excitation-contraction coupling (ECC), an alternation in the heart muscle contractile activity. Contraction of cardiac tissue also affects the process of cardiac electric wave propagation through the mechanism of so called mechano-electrical feedback (MEF) (Kiseleva I et al.,2000). The study of mechano-electrical feedback is an important direction of research in current cardiac electrophysiology.

A valuable method to study mechano-electrical feedback is mathematical modeling allowing the study of the coupled mechanical and electrical activity of the heart tissue. In our study, we use the Nash-Panfilov (NP) model (Nash and Panfilov, 2004), which describes electro-mechanical coupling in a 3D isotropic cardiac tissue at the most basic level. The Mooney-Rivlin material response is used to describe passive mechanical properties of the cardiac tissue. The coupled model includes an additional variable to represent the active stress which is responsible for mechanical deformation and is coupled to the stress equilibrium equations (Nash and Panfilov, 2004; Alvarez-Lacalle and Echebarria, 2009). The active and passive stress components are linearly superimposed to define the total state of stress in the tissue.

In this work, numerical examples are provided to illustrate the effects of mechanical deformation (perturbation) on wave propagation. This will serve to demonstrate that a significant contribution to the physiological and contractile tissue features is linked through the tissue mechanics as an underlying mechanism through the mechano-electric feedback. In addition, we will explore the possibility of cardiac alternans annihilation by applied mechanical perturbation.

5. Paper Title: Real-time Particle Size Estimation for Crystallization Processes through GPU-based Multivariate Image Analysis (Paper 46f; Presentation Slides)

Authors: Mai Chan Lau (National University of Singapore, Singapore) & Rajagopalan Srinivasan (Indian Institute of Technology, Gandhinagar, India)

Abstract: The capability to estimate crystal size distribution in real-time is important for effective control and optimization of particulate processes. Appropriately controlled crystal size distribution not only ensures high efficiency of downstream operations like filtering, drying and formulation, it also safeguards the efficacy of final product which is in crystal form. In order to achieve fast online measurement of crystal size, automated image analysis has recently been developed (Sarkar 2009). The methods have been shown to be quite accurate in terms of the particle size distribution estimated in real-time. However, this comes at the cost of computational efficiency. The major objective of the current work is to improve the computational efficiency of multivariate image analysis (MIA) such that the computational speed is at least on par with the image generation speed.

CAST EC elections

The CAST Executive Committee is pleased to announce the results of the election of officers for 2014.

- Two new Directors are elected every year to serve a three year term (this year we have three elected Directors owing to a tie in the number of votes; Dr.

Mario Eden has been appointed as a Director for 2014 and will start his elected three-year term in 2015).
- The CAST Secretary/Treasurer is elected every two years. Please join us in congratulating our new leadership team.

Chair: Marianthi Ierapetritou

Marianthi Ierapetritou is a Professor and Chair in the Department of Chemical and Biochemical Engineering at Rutgers University in Piscataway, New Jersey. She obtained her BS from National Technical University in Athens, Greece, her PhD from Imperial College (London, UK) in 1995 and subsequently completed post-doctoral research at Princeton University (Princeton, NJ) before joining Rutgers University in 1998. Among her accomplishments are the Rutgers Outstanding faculty Award in 2012, the Rutgers Board of Trustees Research Fellowship for Scholarly Excellence in 2004, and the prestigious NSF CAREER award in 2000.

Marianthi's research focuses on the following areas: Product and Process Synthesis and Design with emphasis in Pharmaceuticals and Biomass conversion; 2) Process Operations in a Dynamic Environment including Planning, Scheduling, Control under uncertainty; 3) Modeling of Reactive Flow Processes focusing in fossil and alternative fuels. She has published 180 papers and presented in national and international conferences (159 presentations). She was invited to present her work in a number of universities and conferences around the world (55 invitations). She is also a member of INFORMS and SIAM and she is an active participant in the scientific advisory committees of ESCAPE 16, 17, 21 and PSE 2006, 2009, 2015, FOCAPD 2009, 2014, and FOCAPO/CPC 2012. In 2008 she organized the fifth international FOCAPO conference. She is an active educator both in the classroom teaching graduate and undergraduate classes in the Chemical Engineering department and as an advisor currently supervising the Ph.D. of 7 students and 1 postdoctoral fellow. Her research work is supported by federal (NSF, ONR, PRF, EPA, NIH) and industrial support (Pfizer, ExxonMobil, BMS).

Marianthi has been active in CAST as a chair of area 10A in 2006, program director, second vice chair, first vice chair and now as a chair. As a director she initiated the Student presentation award, which is in its 3rd year. She is also an elected Trustee of CACHE for the last several years in which she currently serves as a Vice president.

First Vice-Chair: Ray Adomaitis

Ray Adomaitis received his B.S. and Ph.D. in Chemical Engineering from the Illinois Institute of Technology. After two years working on computational nonlinear dynamics as a postdoctoral researcher at Princeton University, he joined the Institute for Systems Research (ISR) at the University of Maryland as a postdoctoral fellow. Currently, he is a Professor and Associate Chair for Undergraduate Studies in the Chemical and Biomolecular Engineering Department with a joint appointment at the ISR at the University of Maryland. He also is affiliated with the Maryland Nanocenter and the University of Maryland Energy Research Center (UMERC).

Ray's research and teaching interests focus on simulation and design of thin-film manufacturing processes with applications in microelectronics, alternative energy, nanomanufacturing, and spacecraft systems. Most of his current efforts are directed to developing physically based models of atomic layer deposition surface reaction

kinetics to provide simulation tools for the scale-up of these processes to large-substrate formats. Ray has been an active member of the executive committees of the CAST division and National Capital section of AIChE, and more recently as a member of the AIChE Public Affairs and Information Committee. He is a fellow of the AIChE.

Second Vice-Chair: Karl D. Schnelle

Karl D. Schnelle is a senior R&D Scientist at Dow AgroSciences LLC. He received a BS degree from Vanderbilt University, and then received a PhD degree in Artificial Intelligence Applications in 1992 from Northwestern University - both in Chemical Engineering. Prior to his PhD, Karl had worked as a process engineer for DuPont. Currently, he is transitioning from a Senior Research Leader in R&D Analytics to a role as Master Black Belt in Strategic Planning and Operations at Dow. Karl also provides leadership in training across R&D so that researchers are well versed in design of experiments and statistical analysis of data.

In Analytics, Karl developed and applied multivariate statistical techniques, simulation, and optimization to solve issues in both the Agrochemical and Seeds & Traits (traditional plant breeding and transgenic crops) business units. Significant projects include prediction of environmental fate of agrochemicals, crop growth modeling, human health risk assessment, design and scheduling of manufacturing plants, supply chain planning, multivariate statistical analysis of batch plant data, and design and analysis of clinical trials and large field trial programs.

Karl has been involved with 16 industrial & academic collaborations at Dow and has authored or co-authored 14 external papers and book chapters. In addition he has co-authored 80 internal R&D reports and has recently received the Dow AgroSciences Increase the Slope Award for the most impactful R&D project of 2013.

Since 1992, Karl has been an active member of the CAST Division. Currently he is the CAST Secretary / Treasurer, Associate Editor of CAST Communications, and a member of the AIChE / Wiley Press New Book Committee. Furthermore, he helps update the AIChE CAST website content throughout the year. Karl also supports the local Indianapolis Chapter by being Webmaster and on the Executive Committee. Previous roles include being a CAST Director from 2003-2005. Karl enjoys collecting 1/43 scale model cars, as well as bicycling and hiking in the great outdoors.

Secretary, Treasurer: Martha A. Grover

Martha Grover is an Associate Professor of Chemical & Biomolecular Engineering at the Georgia Institute of Technology. She is the Duncan Mellichamp Faculty Fellow, and program faculty in bioengineering. She earned her BS at the University of Illinois, Urbana-Champaign, and her PhD at the California Institute of Technology. Honors include the NSF CAREER award, the CAST David W. Smith Graduate Publication Award, and the CAST Outstanding Young Researcher Award. Her research program is focused on the control of molecular-scale self-assembly. Applications in materials self-assembly include feedback control of colloidal photonic crystal processing, and recipe optimization for morphology control of organic electronics manufacturing. Application to biological self-organization is investigated through the NSF/NASA Center for Chemical Evolution.

2014-2016 Director: Andreas A. Linninger

Andreas Linninger is a professor of bioengineering, chemical engineering and computer science at the University of Illinois in Chicago. His special interests lie in computer-aided design of chemical and biological processes. At the Stephanopoulos lab at MIT, he co-developed Batch Design Kit, a virtual laboratory for the synthesis of pharmaceuticals and specialty chemicals. His research also aimed at clean manufacturing of pharmaceutical processes with ecological considerations under uncertainty. Current interests include applications of systems engineering methods in biochemistry and cellular dynamics. His lab is developing virtual reality methods for the real time analysis and simulation of hemodynamics and metabolic processes in the brain.

He is the recipient of numerous international awards including the Kosaka award for basic science and several Mimics Innovation Awards. His work won best paper in the Computers and Chemical Engineering Journal, and best doctoral dissertation of the Vienna University of Technology. Conference posters were honored at the AICHE CAST, the workshop of Cybernetics and Systems Research, the International Anesthesia Research Society, and the Scientific Visualization, VisWeek. He was invited to deliver 100 presentations including keynote lectures at the ESCAPE, PSE, and the International Chemical Engineering Symposium. He is the author of more than 100 scientific publications and gave over 200 conference presentations at national and international conferences.

Dr. Linninger is an elected Editorial Board Member of the Computers and Chemical Engineering (CACE) journal and a subject editor for the Chemical Engineering Research and Design (CERD) journal. He co-organized the Foundation Conference of Computer-Aided Process Design (FOCAPD). He was chosen CAST Program Coordinator Area 10a. He served as session chair or co chair for 25 sessions at AICHE Annual National Meetings. â€ƒ

2014-2016 Director: Leo Chiang

Leo Chiang is Senior Technical Manager at The Dow Chemical Company in Freeport, Texas. He has 13 years of experience with Dow in technical and managerial positions leading on-line fault detection, soft sensor implementation, chemometrics, multivariate statistical modeling, and applied statistics. He is accountable to partner with academia to develop and transfer emerging data-driven modeling technologies for Dow globally. Leo has developed and implemented several systems techniques to solve complex manufacturing problems and to improve product quality and yield, resulting in 10 Manufacturing Technology Center Awards. In 2010, he received the Vernon A. Stenger Award, which is the highest individual honor in Dow Analytical Sciences R&D.

Leo has a B.S. degree from University of Wisconsin at Madison and M.S. and Ph.D. degrees from the University of Illinois at Urbana-Champaign, all in Chemical Engineering. Leo has authored 17 peer-reviewed papers, 26 conference presentations, and 2 books published by Springer Verlag. His textbook Fault Detection and Diagnosis in Industrial Systems is available in English and Chinese and has received nearly 1000 citations according to Google Scholar.

Leo holds a number of AIChE CAST executive positions including 2015 Spring Big Data topical chair and 2016 10E chair. He has served on the AIChE CAST Directors' Award committee and program committees for the IFAC Symposium in Dynamics and Control of Process Systems, the IFAC Symposium for Advanced Control of Chemical Processes, and the American Control Conference. He has served as

Session Chair/Co-chair for 13 AIChE-CAST sessions and as reviewer for 20+ journals. Leo has delivered a dozen invited talks on his industrial success stories at conferences and universities.

2015-2017 Director: Mario R. Eden

Dr. Mario R. Eden is the Department Chair and Joe T. & Billie Carole McMillan Professor in the Department of Chemical Engineering at Auburn University. He is also the Director of a NSF-IGERT on Integrated Biorefining. Dr. Eden's research interests include process design, integration and optimization, as well as molecular synthesis and product design. He is the co-author of 4 book chapters, over 85 refereed papers, over 35 invited lectures and seminars, and almost 240 presentations at national/international conferences. Dr. Eden is the recipient of several research awards including the NSF Faculty Early Development (CAREER) award (2006), the Auburn Engineering Alumni Council Junior Faculty Research Award for Excellence (2006), the Auburn Engineering Alumni Council Senior Faculty Research Award for Excellence (2012), and the Auburn University President's Outstanding Collaborative Units Award (2012) as a founding member of Auburn's Center for Bioenergy and Bioproducts. At the 2009 FOCAPD meeting, he was honored with the Best Faculty Contribution Award. Dr. Eden's teaching has focused on the senior capstone design sequence and he has been recognized with several awards for his efforts including the William F. Walker Superior Teaching Award (2007, 2014), the Fred H. Pumphrey Teaching Award for Excellence (2009 and 2011), the SGA Award for Outstanding Faculty Member in the Samuel Ginn College of Engineering (2009 and 2011), the Outstanding Faculty Member in the Department of Chemical Engineering (2009, 2011, 2013, and 2014), and he was selected to participate in the 2010 National Academy of Engineering Frontiers of Engineering Education Symposium. Dr. Eden received his M.Sc. (1999) and Ph.D. (2003) in Chemical Engineering from the Technical University of Denmark.

Dr. Eden has been an active member of the CAST and PSE communities for almost 15 years. He has organized, chaired and presented in numerous sessions at AIChE meetings (both 10A and 10E) as well as the ESCAPE/PSE symposium series. He served as the Area 10A Programming Coordinator in 2012 and has served on the scientific committees of ESCAPE-21, PSE-2012, and ESCAPE-23, PSE-2015/ESCAPE-25. Dr. Eden is currently co-chairing the FOCAPD-2014 conference with Drs. John Siirola and Gavin Towler.

Written by Ray Adomaitis and Lakshminarayanan Samavedham (Laksh); last updated 5 May 2014.