Home
Meetings and Conferences
Newsletters
WebCASTs
CAST Division Awards
Directors' Awards
Travel Grants
Executive Committee
CAST EMail List (Cast10)
CAST EMail (before Sep-04)
Contact Information
Links

Contact: Web Administrator
Last Updated: 06 Jan 2011

CAST Communications - Winter 2010-11

Table of Contents

Editorial Notes by Peter Rony and Karl Schnelle

Articles
- Broadcast Model Predictive Control of Multi-Cellular Systems by Gautam Kumar
- Design of Massive Energy Storage Systems for IGCC Based Electric Power Generation by Donald J. Chmielewski
- A Decomposition Algorithm for the Optimal Design of Integrated Sites under Uncertainty by Sebastian Terrazas-Moreno

Communications
- CAST Election Results by Karl Schnelle
- 2010 CAST Directors' Award by Martha Grover
- 2010 CAST Award Winners by Richard D. Braatz
- Award Lecture Introduction by Wayne Bequette
- 2010 Computing in Chemical Engineering Award Lecture by Nick Sahinidis
- Photos from the 2010 CAST Awards Dinner by Martha Grover and Matt Bassett
- 2010 Student Travel Grants Awarded by Ray Adomaitis

Announcements
- How to Contact AIChE
- CAST10 E-Mail List
- 2011 Award Nomination Form
- *CAST Communications* Advertising Policy
- Join the CAST Division of AIChE

Editorial Notes

by Karl Schnelle and Peter Rony

Welcome to the 14th online issue of *CAST Communications*. In this issue, we are publishing three articles based on recent AIChE Annual meeting presentations given at the CAST Division Plenary sessions. Also included in this issue are a variety of communications on election results, awards, and the annual banquet.

CAST Communications performs an important service to our Division members by publishing some of these presentations. **Only 10%** of our members attend the Annual Meeting; therefore, the Editors believe this publication is an important service to those CAST members who can not attend the talks in person. If you would like to see this service continue or to expand, please let us know [peter or kschnelle]. Having our CAST Division speakers submit their presentations for publication is an important benefit to the entire CAST Division membership. Therefore, it should be a specific responsibility for the area chairman to request that the best presentations be sent to *CAST Communications*.

We, as editors of CAST Communications, have many colleagues to thank for the completion of this Winter 2010-2011 issue. We thank Gautam Kumar, Donald Chmielewski, and Sebastian Terrazas-Moreno for their articles, which are based on their presentations given at CAST Plenary Sessions at the 2009 and 2010 Annual Meetings of AIChE. The first presentation, by Gautam Kumar, was given in 2009 in Nashville, while the other two were given in 2010 in Salt Lake City. We thank our 2010 Computing-in-Chemical-Engineering winner, Nick Sahinidis, for sharing his award paper and presentation with the entire CAST division membership. We also thank Martha Grover and Matt Basset for their photos at the CAST banquet.

In summary, the editors thank all contributors to this newsletter. [COPYRIGHT NOTICE: Contributions to this newsletter are copyrighted ©2011 in the name of the respective authors. All article rights are reserved by the authors or their respective organizations.] Peter Rony would also like to thank Karl Schnelle for his magnificent job at creating this issue of CAST Communications.

Finally, a significant achievement has just been accomplished! **All** old issues of *CAST Communications* from the beginnings of CAST have been scanned into PDF format and loaded into our online archive! Please thank Laura Shaheen and Nick Sahinidis of Carnegie Mellon for their efforts in service to the CAST Division!!!

Ex: *March 1982*

And the Quote of the Day is by Arthur C. Clarke.

Articles

NOTE: The following presentations were given at CAST Plenary Sessions at the 2009 and 2010 Annual Meetings of AIChE. The first presentation, by Gautam Kumar, was given in 2009 in Nashville, while the other two were given in 2010 in Salt Lake City.

Broadcast Model Predictive Control of Multi-Cellular Systems

by Gautam Kumar and Mayuresh V Kothare

In multi-cellular biological systems, the behavior of skeletal muscle cells and control of these vast numbers of cells through few available actuators are important and challenging problems. Key mechanisms through which a few selected cells activate from vast number of cells to produce the aggregate desired response is still an open question in cellular biology. Besides this, smooth functioning of muscle cells with partial available information to the central nervous system and control architecture for this integrated system is not known completely. To understand this integrated system, one of the approaches

among various possibilities is to apply engineering tools in order to develop theoretical models and control architectures. Several models and control architectures have been reported in the literature amongst which the idea of modeling these vast numbers of cells by taking a probabilistic approach and designing a control architecture based on broadcast feedback (Ueda et.al. [1, 2, 3, 4]) appears to be promising. Inspired by this idea, we have developed a probabilistic model for this multi-cellular system and control architecture using broadcast model predictive control. To the best of our knowledge, the idea of integrating broadcast feedback with model predictive control for this multi-cellular integrated system has never been introduced before.

This presentation introduces this new idea of integrating broadcast feedback with model predictive control applicable to various systems similar to multi-cellular integrated system. We develop a non-homogeneous Markov model to represent multi-cellular systems with the known fact from literature that muscle fibers show only “ON” (excited) and “OFF” (relaxed) states. We consider that muscle cells are identical and behave independently. Based on this assumption, we define a pair of transition probability for switching states of cells and show the existence of such transition probabilities for an ensemble of cells by assigning the same transition probabilities to all cells within the system. These transition probabilities are function of system error defined as the difference of the desired number of “ON” cells and number of “ON” cells at a particular time instant. We further show the stability of this multi-cellular system rigorously using super-martingale theory [5] and robustness against permanently dead cells within the system when the information about number of dead cells is not available to the controller.

The idea of broadcasting the same information to all the cells present in a multi-cellular system based on model predictive control is partly inspired by the functioning of our central nervous system. Whether the central nervous system makes decisions in a predictive sense is still unclear in the literature but intuitively it appears that our central nervous system may function as model predictive controller. Based on this, we design a model predictive control framework to compute transition probabilities which are then broadcast to all the cells within the multi-cellular system. We derive an expectation based model for the multi-cellular system in a predictive sense. Due to the dependence of transition probabilities on the system error, this model is non-linear. We consider a quadratic cost objective function and optimize it over the predefined prediction horizon with respect to transition probabilities. For this, we implement a strategy based on the sign of the system error. If the system error is positive then we restrict all the transitions from “ON” to “OFF” by setting transition probabilities of “ON” to “OFF” to zero over the prediction horizon. Similarly we put the restriction on transition of “OFF” to “ON” whenever the system error is negative. With this strategy we compute all pairs of transition probabilities over the prediction horizon. Out of all computed transition probabilities, we broadcast the first pair of transition probabilities to the multi-cellular system for the next sample time calculation. We obtain analytical expressions for transition probabilities for one step and two step predictors. Higher order predictor transition probabilities are obtained by solving non-linear coupled algebraic equations numerically. Further we design an observer for obtaining information such as time varying number of “ON” and “OFF” dead cells present within the multi-cellular system for better control strategy. Finally, the overall integrated multi-cellular system including observer is simulated in MatLab and future enhancement are proposed.

References

[1] Jun Ueda, Lael Odhner, and H. Harry Asada. Broadcast feedback of stochastic cellular actuators inspired by biological muscle control. International Journal of Robotics Research, Special Issue on Bio-Robotics, February 2007.
[2] Jun Ueda, Lael Odhner, and H. Harry Asada. A Broadcast-Probability Approach to the Control of Vast DOF Cellular Actuators. In Proceedings of the 2006 IEEE International Conference on Robotics and Automation, 1456-1461, May 2006.
[3] Lael Odhner, Jun Ueda, and H. Harry Asada. Stochastic Optimal Control Laws for Cellular Artificial Muscles. In Proceedings of the 2007 IEEE International Conference on Robotics and Automation, 1554-1559, April 2007.
[4] Lael Odhner, Jun Ueda, and H. Harry Asada. Feedback Control of Stochastic Cellular Actuators. Experimental Robotics, 481-490, 2008.
[5] Rick Durrett. Probability: Theory and Examples. Thomson, third edition, 2005.

The full presentation is in pdf [0.9MB] format.

Design of Massive Energy Storage Systems for IGCC Based Electric Power Generation
by Donald J. Chmielewski, Benjamin P. Omell and Ming-Wei Yang

The Integrated Gasification Combined Cycle (IGCC) possesses a number of benefits over traditional power generation plants, ranging from increased energy conversion efficiency to flex-fuel and carbon capture opportunities. Unfortunately, the large capital cost associated with an IGCC plant seems to outweigh its efficiency gain, as evidenced by the low interest in IGCC plant construction within the United States. A less known benefit of the IGCC configuration is the ability to load track electricity market demands. The idea being that the hydrogen product of the gasification unit can be stored during periods of low power demand. Then as demand increases along with the value of electric power, the stored hydrogen can be converted in combustion turbines. Exploitation of this load tracking feature will certainly increase profit margins and may push the IGCC process into economic viability. The objective of the current project is to size the hydrogen / energy storage unit as well as the set of combustion turbines used for hydrogen conversion.

The effort begins with the design of a high level (supervisory) control system that is capable of market responsiveness. That is, design a controller that uses the electricity spot price as a disturbance input to the decision making process. However, in contrast to traditional controller designs, where the objective is to attenuate disturbances, the Market Responsive Controller should judiciously amplify the spot price disturbance. We have found that a Linear Quadratic Gaussian controller can be forced to have such behavior if the cross-term weights of the objective function are utilized. However, it is a non-trivial task to select weights such that profit is maximized (by producing electricity when the price is high and storing when low), while observing the equipment limitations of the storage and conversion units. Thus, a core result of the paper is the development of a profit maximizing scheme for the selection of LQG weights subject to process equipment limitations. The resulting optimization problem will be shown to be convex and thus will yield a globally optimal solution.

Now turn to the question of sizing the storage and conversion equipment. Intuition suggests the following: Larger storage capacity coupled with larger conversion throughput will enhance the ability of the previous control scheme to exploit price swings. However, at some point the capital cost associated with ever larger equipment will begin to outweigh the increase in operating profit, resulting in a sign change in the levelized profit. Thus, the main result of the paper is the development of a levelized profit maximization scheme for the sizing of storage and conversion equipment. The resulting optimization problem is shown possess a linear objective function and convex constraints along with a small number of scalar reverse-convex constraints. Based on this formulation it will be shown that the optimization problem will yield a globally optimal solution with the aid of a branch and bound algorithm.

The full presentation is in pdf [1.7MB] format.

A Decomposition Algorithm for the Optimal Design of Integrated Sites under Uncertainty
by Sebastian Terrazas-Moreno, Ignacio E. Grossmann (Carnegie Mellon University), John M. Wassick, and Scott J. Bury (The Dow Chemical Company)

An integrated site is a process network where several manufacturing plants producing different chemicals, final products and intermediates, are closely coupled (Wassick, 2009; Terrazas-Moreno et al., 2010). The objective of this work is to design an integrated site with maximum “effective production capacity”, given a capital investment constraint. A set of failure modes can occur at random times, and with random durations, in any of the plants in the

network, decreasing its production capacity. To maximize the effective production capacity (minimize the effect of failures) a superstructure of the integrated site is postulated that includes parallel production units and intermediate storage tanks. The production capacity of the plants is also a degree of freedom, allowing excess capacity for building up inventories in the storage tanks.

This problem can be modeled as a two-stage mixed-integer stochastic programming problem with endogenous uncertainties. The design variables of the integrated site are first-stage decisions, while the second-stage decisions involve operational variables such as internal flows within the integrated site, and the rates of accumulation or depletion of storage tank levels.

Since the number of scenarios grows exponentially in the number of failure modes, the solution to large-scale instances of the problem becomes intractable. To overcome this challenge we propose a decomposition technique based on a novel implementation of Benders decomposition. The master problem includes the design variables and the operational variables of some of the scenarios with highest probability. The sub-problem includes the operational variables of the rest of the scenarios. The contribution of our method is that we solve the sub-problem in a reduced space that includes only the scenarios relevant to the flowsheet defined in the master problem. Furthermore, since the structure of the scenario tree in the sub-problem is known, we do not need to enforce non-anticipativity constraints

The method was tested with the design of an industrial integrated site consisting of nine potential production plants and about one hundred possible failure modes. The Pareto-optimal curve for maximizing the effective production capacity and minimizing the capital investment was obtained using the ε-constraint method. Reductions in computational time of up to an order of magnitude were obtained with the proposed Benders decomposition scheme when compared to the full-space solution of this example.

References

Wassick, J. M., (2009). Enterprise-wide optimization in an integrated chemical complex. *Computers and Chemical Engineering*, 33(12), 1950 – 1963.
Terrazas-Moreno S., I. E. Grossmann, J. M. Wassick and S. J. Bury (2010). Optimal design of reliable integrated chemical production sites. *Computers and Chemical Engineering*, 34(12), 1919 – 1936.

The full presentation is in pdf [0.4MB] format.

Communications

CAST Election Results
by Karl Schnelle, CAST Secretary

The CAST elections committee is pleased to announce the results of the election of officers for 2010.

Please join us in congratulating our new Second Vice-Chair and Director. Two Directors are normally elected per year to serve a two year term. However, we had a dead heat for Director last year and selected one extra then, so we are announcing the other Director now for 2011-13.

SECOND VICE-CHAIR: Mayuresh Kothare

Mayuresh V. Kothare is the R. L. McCann Professor of Chemical Engineering at Lehigh University, in Bethlehem, PA and a Visiting Professor at the Johns Hopkins School of Medicine in Biomedical Engineering. His research interests are in the areas of process control and applications in (micro)chemical and biomedical systems. He received his B.Tech. degree (1991) from the Indian Institute of Technology, Bombay (1991), and M.S. (1995) and Ph.D. (1997) degrees from the California Institute of Technology all in Chemical Engineering. He has held visiting positions at the Automatic Control Laboratory, ETH, Zurich, the Electrical Engineering department, Purdue and the Chemical Engineering department, City College New York. He spent one year as a postdoctoral scholar at Mobil Oil Corporation, Paulsboro, NJ. Most recently in 2008-2009, he was on sabbatical leave at the Johns Hopkins School of Medicine in Biomedical Engineering pursuing research in neuroengineering.

Kothare is recipient of the Institute Silver Medal from IIT Bombay, the Sumant Mulgaonkar award, the J. N. Tata Endowment Award and the Reliance Heat Transfer Award all for ranking first in his graduating class (B.Tech. 1991). While at Lehigh, Kothare received the NSF CAREER award, Lehigh's Alfred Noble Robinson Award for professional accomplishment and was named the P. C. Rossin Assistant Professor, the Frank Hook Assistant Professor, the Class of 1961 Associate Professor and more recently, the R. L. McCann Professor. In 2008, Kothare was one of 82 nationally selected participants (under age 40) at the 14th Frontiers of Engineering Symposium organized annually by the US National Academy of Engineering in Albuquerque, NM. Other recognitions include the CAST Ted Peterson Student Paper Award (2000) and the CAST Outstanding Young Researcher Award (2007).

Kothare has served as Program Coordinator for the Systems and Process Control Division 10B of CAST, AIChE Society Review Chair for the American Control Conference and Chair of the WebCAST Committee. In 2010, he was Chair of the International Program Committee for the IFAC conference DYCOPS2010 in Leuven, Belgium. He has served on the Conference Editorial Board of the IEEE Control Systems Society for the IEEE CDC and the ACC, and as an Associate Editor for the *IEEE Transactions on Automatic Control*. Currently, he is serving as Associate Editor for *Automatica*, and is Registration Chair for the 2011 American Control Conference.

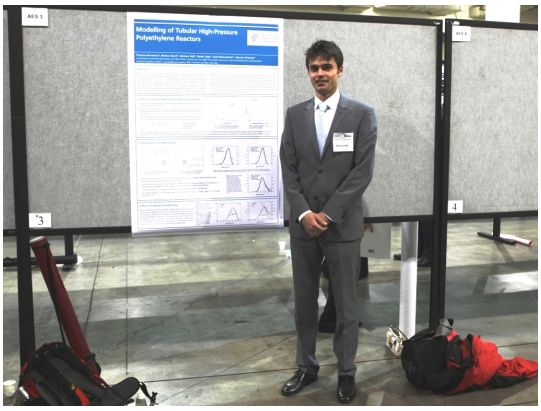
2011-2013 DIRECTOR: Robert Parker

Robert S. Parker is an associate professor in the Department of Chemical and Petroleum Engineering at the University of Pittsburgh. Bob received his BS from the University of Rochester in 1994 and his PhD from the University of Delaware in 1999, both in Chemical Engineering. He is also a member of the University of Pittsburgh Cancer Institute, the McGowan Institute for Regenerative Medicine, and serves as the advisor to Order of the Engineer Link #23. The Parker lab works primarily in the area of systems medicine - the integration of systems engineering and biology/medicine to aid the human condition - with disease foci in cancer chemotherapy, diabetes, and inflammation. This involves modeling and treatment algorithm synthesis/analysis in close collaboration with clinicians and experimentalists.

Bob has been active in CAST programming at the AIChE and ACC meetings since 2000, and he was recently appointed WebCAST chair. For the broader process control and biosystems community, Bob will chair the 2013 FOSBE (Foundations of Systems Biology in Engineering) meeting, and he serves as a member of the CACHE Bio Task Force. As CAST members translate our tools to address problems in biology, medicine, energy, and other areas, a greater degree of coordination between divisions will be necessary to provide broadly accessible and coherently scheduled programming. This is one item I hope to address while serving as the 2011 Chair for AIChE 15 d/e (Life Sciences).

2010 CAST Directors' Award
By Martha Grover

Given for the best poster presentations at the AIChE Annual Meeting.

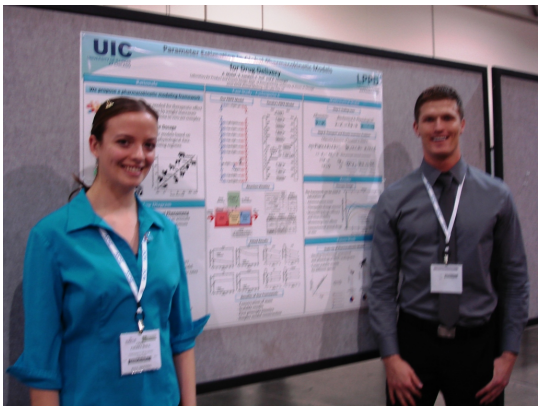


It is my pleasure to announce the winner of the Directors' Award for the Best Poster at the 2010 AIChE Annual Meeting.

The winner of the Directors' Award is:

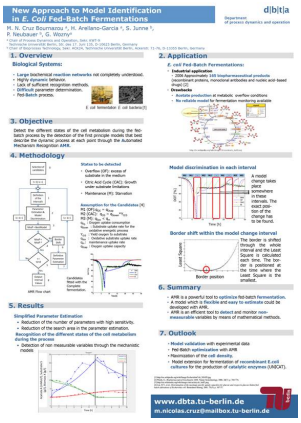
Modeling of Tubular High-Pressure Polyethylene Reactors, **Thomas Herrmann[1], Markus Busch[1], Barbara Gall[2], Dieter Lilge[2], Gerd Mannebach[2] and Iakovos Vittorias[2]**, (1)Ernst-Berl-Institut für Technische und Makromolekulare Chemie, TU Darmstadt, Darmstadt, Germany, (2)Basell Polyolefine GmbH, a LyondellBasell company, R & D, Frankfurt, Germany

Click on the photo [618KB] for the full-size pdf of the winning poster.



Two honorable mentions were also given:

Parameter Estimation In Global Pharmacokinetic Models for Drug Delivery, **Andrej Mošať, Eric Lueshen, Cierra Hall and Andreas A. Linninger**, Bioengineering, University of Illinois at Chicago, Chicago, IL



A New Approach to Model Identification In E. Coli Fed-Batch Fermentations, **Mariano Nicolas Cruz Bournazou[1], Harvey Arellano-Garcia[1], Peter Neubauer[2] and Günter Wozny[1]**, (1)Chair of Process Dynamics and Operation, Berlin Institute of Technology, Berlin, Germany, (2)Chair of Bioprocess Technology, Berlin Institute of Technology, Berlin, Germany

Click on the poster [4.6MB] for the full-size pdf.

2010 CAST Award Winners
by Richard D. Braatz, 2010 CAST Second Vice-Chair

NOTE: The 2010 CAST Division Awards were announced previously.

Nikolaos (Nick) V. Sahinidis is the recipient of the Computing in Chemical Engineering Award *for the development of global optimization algorithms and their application to molecular design, crystal structure determination, bioinformatics, and process scheduling and planning.* This award recognizes outstanding contributions in the application of computing and systems technology to chemical engineering, and is sponsored by The Dow Chemical Company.

Nick is the John E. Swearingen Professor of Chemical Engineering at Carnegie Mellon University. He joined Carnegie Mellon in 2007 after a sixteen-year long career at the University of Illinois at Urbana-Champaign. He holds a PhD from Carnegie Mellon and a Diploma from Aristotle University of Thessaloniki, both in chemical engineering. Nick's research interests are at the interface between computer science and operations research, with applications in chemical, biological, and energy systems. His research has focused on the development of theory, algorithms, and software for global optimization of mixed-integer nonlinear programs. His BARON global optimization software has found applications in fields ranging from computational chemistry to energy policy modeling.

Nick has served on the editorial boards of over ten journals, including *Computational Management Science, Journal of Global Optimization, Mathematical Programming Computation,* and *Industrial & Engineering Chemistry Research*. He is active in several professional societies, including AIChE, INFORMS, and the Mathematical Programming Society and he currently serves as the Chair of the INFORMS Optimization Society. His research activities have been recognized by the National Science Foundation CAREER award in 1995, the 2004 INFORMS Computing Society Prize, and the 2006 Beale-Orchard-Hays Prize from the Mathematical Programming Society.

William E. Schiesser is the recipient of the Computing Practice Award *for pioneering the application of computational methods in chemical engineering and through widespread dissemination of simulation software to universities, government laboratories, and industry.* This award recognizes outstanding contributions in the practice or application of chemical engineering to computing and systems technology, and is sponsored by Aspen Technology, Inc. and ExxonMobil Chemical Company.

Bill is the Emeritus R. L. McCann Professor of Chemical Engineering and Professor of Mathematics at Lehigh University. He received his BS degree from Lehigh University and his MS and PhD degrees from Princeton University. From the beginning of his career, Bill embraced scientific computing and numerical methods in all aspects of his teaching, research, and consulting, and in widely disseminating his software. His DSS routines for the solution of one-, two-, and three-dimensional partial differential equations has been used by more than 4000 universities, government laboratories, and companies, including at Air Products and Chemicals, Akzo Nobel Chemicals, ExxonMobil, General Electric, and Rohm and Haas Company.

Bill disseminated the computing methods through authorship and editing of 10 books, including (i) Numerical Methods for Differential Systems, (ii) The Numerical Methods of Lines Integration of Partial Differential Equations, (iii) Ordinary and Partial Differential Equation Routines in C, C++, Fortran, Java, Maple and Matlab, (iv) Adaptive Method of Lines, and (v) A Compendium of Partial Differential Equations Models: Method of Lines Analysis with Matlab. Honors include the Linback Teaching Award from Lehigh University and an Honorary Doctorate from the Polytechnique on Mons, Belgium.

Mark A. Snyder is the recipient of the 2010 W. David Smith, Jr. Graduation Publication Award for the journal paper: *Mesoscopic Modeling of Transport and Reaction in Microporous Crystalline Membranes*, **Chem. Eng. Sci.**, 58, 895-901, 2003. This award 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, and is sponsored by Process Systems Enterprise Limited.

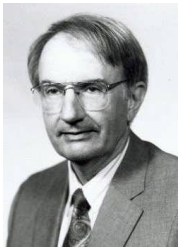
Mark obtained his BS with highest honors from Lehigh University in 2000 and PhD from the University of Delaware in 2006, both in chemical engineering. His PhD research with Prof. Dion Vlachos on the multiscale modeling of molecular transport in polycrystalline zeolite membranes was recognized by the Robert L. Pigford Graduate Fellowship (2000), the Robert L. Pigford Teaching Assistant Award (2003), the T.W. Fraser and Shirley Russell Teaching Fellowship (2004), and an AIChE Graduate Research Award (2005). Mark did a postdoc with Prof. Michael Tsapatsis at the University of Minnesota from 2006-2008, where he investigated the synthesis of metal-oxide nanoparticles and their assembly into mono- to multi-layer porous thin films, permselective encapsulation of living cells, and formation of replica and hierarchically porous structures.

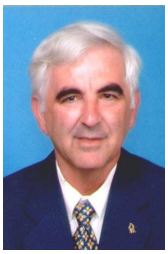
Mark joined the Department of Chemical Engineering at Lehigh University in August 2008 as an Assistant Professor where he is currently the P.C. Rossin Assistant Professor. Mark focuses on the rational design and engineering of functionalized inorganic nanoparticles and porous materials primarily for catalysis, membrane-based separations, and integrated reaction-separation technologies with applications in biofuels, renewable chemicals, dye-sensitized solar cells, and carbon capture. The objective is to elucidate synthesis-structure-properties relations guiding rational materials design by integrating materials synthesis and characterization with molecular and multiscale modeling of phenomena spanning molecular transport to device performance.

Juergen Hahn is the recipient of the 2010 CAST Outstanding Young Researcher Award *for contributions to nonlinear systems analysis and its application to chemical and biological systems.* This award recognizes an individual under the age of 40 for outstanding contributions to the chemical engineering computing and systems technology literature.

Juergen received his diploma degree in engineering from RWTH Aachen, Germany, in 1997, and his MS and PhD degrees in chemical engineering from the University of Texas, Austin, in 1998 and 2002, respectively. He was then a postdoctoral researcher in process systems engineering at RWTH Aachen, Germany. He joined the McFerrin Department of Chemical Engineering at Texas A&M University, College Station, as an assistant professor in 2003 and was promoted to associate professor in 2009. Dr. Hahn received a Fulbright scholarship for 1995-1996, the 2004 Best Referee Award from the Journal of Process Control, and the Chemical Process Control Outstanding Contributed Paper Award in 2006, and was named as an Outstanding Reviewer by Automatica in 2005, 2006, and 2007. He is currently the Ray Nesbitt II Professor in Chemical Engineering at Texas A&M University. His research interests deal with process modeling and analysis with a primary emphasis on systems biology, with over 55 articles and book chapters in print.

Michael B. Cutlip and Mordecai Shacham are the recipients of the 2010 David Himmelblau Award for Innovations in Computer-Based Chemical Engineering Education *for the continued development and widespread dissemination of POLYMATH for computer-based chemical engineering education.* This award recognizes an individual or group making new and novel contributions to computer aids for chemical engineering education, and is sponsored by the CACHE Corporation.





Michael is an Emeritus Professor within the Chemical, Materials and Biomolecular Engineering Department at the University of Connecticut and has served as department head and director of the University's Honors Program. He has BChE and MS degrees from The Ohio State University and a PhD from the University of Colorado. He has been the Chair and National Program Chair for the ASEE Chemical Engineering Division plus he co-chaired the ASEE Summer School for Chemical Engineering faculty in 2002. He has been an active CACHE Trustee for over 25 years and has served as CACHE president. His interests include the development of general software for numerical problem solving and application to chemical and biochemical engineering. Michael is also managing director of Polymath Software that develops and provides problem-solving software to higher educational institutions and to individual professional and academics users.

Mordechai is the Benjamin H. Swig Professor and Head of the Department of Chemical Engineering at the Ben-Gurion University of the Negev in Israel. He also serves as the chairman of the Israeli Inter-University Center for e-Learning (IUCEL). He received his BSc and DSc degrees from the Technion, Israel Institute of Technology. His research interests include analysis, modeling and regression of data, applied numerical methods, and prediction and consistency analysis of physical properties. Shacham is a co-author of the POLYMATH software package and the textbook: Problem Solving in Chemical and Biochemical Engineering with Polymath, Excel and MATLAB (Prentice-Hall, 2008). He is a past president and an honorary fellow of the Israel Institute of Chemical Engineers and the recipient of the 2000 CACHE Award for Excellence in Computing in Chemical Engineering Education.

Award Lecture Introduction
by B. Wayne Bequette, 2006 CAST Chair

Computing in Chemical Engineering Award - *Recognizes outstanding contributions in the application of computing and systems technology to chemical engineering*

Wayne presented an introduction [1.3MB] to the attendees of the 2010 CAST Awards Dinner in Salt Lake City.

[*cbe.rpi.edu*]

2010 Computing in Chemical Engineering Award Lecture
by Nick Sahinidis

The award talk, given at the 2010 CAST Awards Dinner in Salt Lake City, is entitled COMPUTING IN CHEMICAL ENGINEERING: Three decades in the development of algorithms and software. [1.1MB or 2.7MB ppt with animation]. A written paper [] of the talk is also available.

The CAST community has led the development of a variety of algorithms and software for over three decades now. These developments were motivated predominantly by problems in the design, control, and optimization of chemical processes. Nonetheless, some of these algorithms and software are increasingly utilized as enabling technologies even in areas that are well beyond the traditional boundaries of chemical engineering. This talk will review many of the enabling technologies developed by the CAST community, with an emphasis on technologies that have had an impact across disciplines.

Photos from the 2010 CAST Awards Dinner
taken by Martha Grover and Matt Bassett, CAST Directors

Scott receives plaque of appreciation as outgoing CAST Chair

Tunde Dokun receives 2009 Directors' Award

Mark receives his award

Juergen receives his award

Mordecai Shacham and Michael Cutlip

William Schiesser receives his awa

Nick receives the Computing Award

Wayne's intro to Nick

The Sahinidis'

Michael Cutlip and Mordecai Shacham

Student Travel Grants
by Ray Adomaitis

I am happy to announce the winners of the 2010 CAST Graduate Travel Awards. Each award winner will receive $500 in support of travel expenses to present one or more papers at the upcoming Annual AIChE meeting in Salt Lake City. Additionally, each awardee will receive a complementary ticket to the CAST banquet. The five award winners, (their advisors), and home institutions are:

- Jeremy Scheff (Ioannis Androulakis), Rutgers
- Jinfeng Liu (Panagiotis Christofides), UCLA
- Arul Sundaramoorthy (Christos Maravelias), Wisconsin
- Yulei Sun (Nael El-Farra), UC Davis
- Andres Hernandez Moreno (Martha Grover), GA Tech

Please join me in congratulating this year's winners. Nominations are due August 1st for the 2011 grants.

Ray Adomaitis
CAST Travel Grant Chair

Announcements

How to Contact AIChE

Publication sales, meeting registration, applications for membership, technical training, and other AIChE products and services may be obtained by visiting AIChE Contacts or using the On-line contact form.

For answers to specific questions, try one of the following AIChE Staff:

Felicia Guglielmi Director, Volunteer and Membership Activities	Bette Lawler Director, Operations
Joseph Cramer Director, Technical Programming	Steve Smith Director, Technical Activities and Publications

CAST10 E-Mail List

The following websites are used to participate in the list:

1. listserv.umd.edu/archives/cast10.html is the link that subscribers can use to read and post emails.
2. www.ench.umd.edu/cast10/ has lots of archived emails.

The address to post messages to the list is CAST10 at LISTSERV.UMD.EDU .

2011 Award Nomination Form

Please use the 2010 Award Nomination Form [52KB, MS Word], which should be completed by April 15, 2011. See CAST Division Awards for submission guidelines. Electronic submissions are required.

Quote of the Day

The only way of finding the limits of the possible is by going beyond them into the impossible. --- Arthur C. Clarke

---

***CAST Communications* Advertising Policy**

Advertising Rates:	1/4 page = $60; 1/3 page = $70; 1/2 page = $90; 2/3 page = $120; 1 page (8.5" x 11") = $150
Production Details:	Retain your original art, please. Submit an e-mail containing a WORD or PDF version (contact editor for preferred formats) of your advertisement, to the CAST newsletter editor: Peter R. Rony.
Deadlines:	December 1 for the Winter issue; July 1 for the Summer issue.
Payment Details:	Prior to publication of advertisement, please submit check payable to CAST Division, AIChE to the CAST Division Secretary/Treasurer
Questions:	Peter R. Rony, Telephone (540) 951-2805

Join the CAST Division of AIChE

Already a member? Please ask a colleague to join.

The Computing and Systems Technology (CAST) Division of AIChE is responsible for the wide range of activities within AIChE that involve the application of computers and mathematics to chemical engineering problems including process design, process control, operations, and applied mathematics. We arrange technical sessions at AIChE Meetings, organize special conferences, and publish this newsletter - *CAST Communications* - twice a year. These activities enable our members to keep abreast of the rapidly changing fields of computing and system technology. The cost is $10 per year, and includes a subscription to this newsletter. Shouldn't you join the CAST Division now?

To join the CAST Division, please contact AIChE.

CAST Communications - Winter 2010-11
The Pseudo-Annual Publication of the Computers and Systems Technology Division of AIChE
Editor: Peter R. Rony, Professor Emeritus of Chemical Engineering, Virginia Tech
Associate Editor: Karl D. Schnelle, Dow AgroSciences LLC