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CAST Communications - Summer 2006

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Editorial Notes: Some Excitement at the Offices of CAST Communications – "Fake" Meetings

by Peter Rony and Karl Schnelle

Welcome to the ninth online issue of CAST Communications.

Rene' Schoof recently informed us about the possibility of "fake" meetings. This scam caught both of us by surprise, and may surprise you as well. We got caught in the scam by innocently listing, in the last issue, several meetings that we believed might be of potential interest to *CAST Communications* readers. We thank Rene' for his letter to the editor.

Another letter to the editor, plus response, allows us to alert you about CAST Communications policies. We have stated our policies in our response to Professor Ricker.

We are grateful for all manuscripts to contributors submit to CAST Communications. You do a service to the entire Division by doing so.

This Summer 2006 issue is, in our opinion, skimpy. We have no feature article. This issue consists of Communications, Letters to the Editors, and lots of color images. The substantial improvement in the CAST <u>Awards process</u> is notable, and described by Gavin Towler.

Our benchmark, best issue ever of *CAST Communications*, is the <u>Special Issue on IT</u> in late 2004. Eleven feature articles – all taken from the November 2004 AIChE special sessions on IT – are made available to those Division members who did not attend the 2004 annual meeting.

The Special Issue on IT received the highest accolade that we have ever received as editors - a written postcard compliment by University-of-Texas Emeritus Professor David Himmelblau, who was the editor of CACHE NEWS for many years.

In addition to articles from one or more CAST Division award winners, it appears that our best potential source of feature articles will be the CAST Division sessions at the Fall Annual AIChE meetings. Please let us know if you hear an outstanding paper at any meeting.

And don't miss the Quote of the Day by A. Einstein.

Latest News - "The Robot-Scientist"

Will you be replaced by a robot any time soon? In a recent futurist paper, the authors argue that not only are scientists being swamped by extreme amounts of data but also we "are unable to conceptualize the breadth and depth of the relationships between

relevant databases without computational support". In other words, the computer will be needed to gather and organize data, then analyze it and make conclusions from it! *The Economist* (<u>Mar 23rd 2006</u>) picked up the idea and referred to the next "big physics" experiment at CERN where a DVD of data will be generated every five seconds! So perhaps we will not be replaced by, but working with, "robot-scientists" sometime in the near future. (<u>Nature</u>, **440**, 23 Mar 2006)

Communications

2005 CAST Directors' Award

by Karen High and Oliver Smith

Given for the best poster presentations at the AIChE Annual Meeting. The following are for Work Presented at the 2005 AIChE Annual Meeting, Cincinnati, Ohio.

First Place:

Fadwa T. Eljack¹ (speaker), Mario R. Eden¹, Vasiliki Kazantzi², Mahmoud El-Halwagi², (1) Auburn University, Auburn University, AL, (2) Texas A&M University, College Station, TX.

"<u>Group Contribution and Property Clustering Techniques</u> for Simultaneous Process and Molecular Design." The <u>poster</u> [626 KB, ^(*)] is available in pdf format.

Pictured in front of the poster are Fadwa Eljack (left) and Mario Eden (right).





Honorable Mentions (in order of paper number):

Saravanan Swaminathan¹ (speaker), Donald P. Visco Jr.¹, Sarajit Sen², (1) Tennessee Technological University, Cookeville, TN, (2) University of Buffalo, SUNY, Amherst, NY.

"<u>Landmine Detection in Granular Beds</u>: Behavior of Cumulative Surface Kinetic Energy"

Pictured in front of the poster is Saravanan Swaminathan.



Babatunde A. Ogunnaike¹ (speaker), Claudio A. Gelmi¹, Amos Folarin², Sylvia Nagl², Moritz A. Konerding³, (1) University of Delaware, Newark, DE, (2) Royal Free Hospital & University College Medical School, London, United Kingdom, (3) Johannes Gutenberg-Universität, Mainz, Germany.

"Probability Model-Based Analysis of Tumor Vasculature Data"



Daniel E. Rivera (speaker), Hyunjin Lee, Hans D. Mittelmann, Gautam Pendse, Arizona State University, Tempe, AZ.

"<u>Optimization-Based Design</u> of Plant-Friendly Input Signals for Data-Centric Estimation and Control"

Pictured in front of the poster are Hyunjin Lee (left) and Daniel Rivera (right).

2006 CAST Award Winners by Gavin Towler

The CAST Division Awards Committee is pleased to announce the winners of the 2006 CAST Division Awards.

The **Computing in Chemical Engineering Award** recognizes outstanding contributions in the application of computing and systems technology to chemical engineering. Sponsored by **The Dow Chemical Company**.



in Chemical Engineering.

This year's winner of the Computing in Chemical Engineering Award is **Dr. Christodoulos Floudas**, Professor of Chemical Engineering at Princeton University. Professor Floudas is a world-renowned authority in mathematical modeling and optimization of complex systems at the macroscopic and microscopic level. His research interests lie at the interface of chemical engineering, applied mathematics, and operations research, with principal areas of focus including chemical process synthesis and design, process control and operations, discrete-continuous nonlinear optimization, local and global optimization, and computational biology. Professor Floudas is the author of two graduate textbooks, Nonlinear Mixed-Integer Optimization (Oxford University Press, 1995), and Deterministic Global Optimization (Kluwer Academic Publishers, 2000). He has co-edited seven monographs/books, has over 200 refereed publications, and has delivered over 300 invited lectures and seminars. He is the chief co-editor of the Encyclopedia of Optimization (Kluwer Academic Publishers, 2001). He is the recipient of numerous awards for teaching and research that include the NSF Presidential Young Investigator Award, 1988; the Engineering Council Teaching Award, Princeton University, 1995; the Bodossaki Foundation Award in Applied Sciences, 1997; the Best Paper Award in Computers and Chemical Engineering, 1998; the Aspen Tech Excellence in Teaching Award, 1999; and the 2001 AIChE Professional Progress Award for Outstanding Progress

Professor Floudas earned his B.S.E from Aristotle University of Thessaloniki, Greece, and Ph.D. from Carnegie Mellon University. In addition to his appointment in Chemical Engineering he also holds faculty positions in the Center for Quantitative Biology at Princeton University's Lewis-Sigler Institute, the Program of Computational and Applied Mathematics and the Department of Operations Research and Financial Engineering at Princeton University.

The **Computing Practice Award** recognizes outstanding contributions in the practice or application of chemical engineering to computing and systems technology. Sponsored by **Aspen Technology**, **Inc.** and **ExxonMobil Chemical Company**.



This year's winner of the Computing Practice Award is **Dr. Basil Joffe** of Aspen Technology Inc. Dr. Joffe has more than 30 years experience in the development and application of advanced optimization based planning and scheduling systems for the Process Industries. With his introduction to the market in 1984 of PIMS[™] (Processing Industry Modeling System), the first personal computer based application for optimized planning in the industry, Dr. Joffe revolutionized the planning function for the Process Industries worldwide. PIMS is currently used by more than 70% of the Refining and Petrochemical companies in the world and has brought billions of dollars of benefit to its users. Over the years since its introduction Dr. Joffe has extended the power of PIMS with many pioneering innovations including such things as MINLP and Global Optimization. Dr. Joffe currently serves as Vice President of Technology for Aspen Technology Inc. where he leads an Advanced Technology Innovation Group. The **W. David Smith, Jr. Graduate Publication Award** (formerly the Ted Peterson Student Paper 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. Sponsored by **E.I. du Pont de Nemours and Company**.



This year's winner of the W. David Smith, Jr. Graduate Publication Award is **Dr. Krishna Mahadevan**, Assistant Professor in the Department of Chemical Engineering & Applied Chemistry at the University of Toronto. His research interests are in the area of modeling, analysis and optimization of metabolism for applications in bioenergy, biochemicals production and biomedicine. He obtained his B. Tech in Chemical Engineering from Indian Institute of Technology, Madras and Ph.D. in Chemical Engineering from the University of Delaware in 2002. He was a research scientist at Genomatica Inc., San Diego from 2002-06 and has also held appointments as a visiting scholar and a guest lecturer at the Department of Bioengineering in the University of California, San Diego, and in the Department of Microbiology, University of Massachusetts, Amherst.

The **CAST Outstanding Young Researcher Award** recognizes an individual under the age of 40 for outstanding contributions to the chemical engineering computing and systems technology literature. The individual must be age 39 or less on December 31st of the Award year. An individual age 40 or over will be eligible for this Award if, on December 31st of the Award year, 12 years or less have elapsed since the individual received the Ph.D. degree.



This year's winner of the Outstanding Young Researcher Award is **Dr. Costas D. Maranas**, Donald B. Broughton Professor of Chemical Engineering at Pennsylvania State University. Professor Maranas has research interests in modeling and optimization of directed evolution protocols for protein engineering, analysis and optimization of metabolic and signaling networks, optimal design of biological circuits and synthetic biology, inference of gene regulatory networks, real options based optimization of product and R&D pipelines, and optimization theory and algorithms. He holds a B.S. in Chemical Engineering from Aristotle University, Greece, and an M.A. and Ph.D., both in Chemical Engineering from Princeton University. Dr. Maranas has also received the AIChE Allan P. Colburn Award for Excellence in Publication (2002). He serves on the Editorial Boards for Biophysical Journal, Computers & Chemical Engineering, Journal of Global Optimization and Metabolic Engineering.

The 2006 CAST Division Awards will be presented at the **CAST Awards Banquet**, which will be held on November 14 at the Empress of China Restaurant during the AIChE Annual Meeting. Professor Floudas will give a presentation titled "Systems-based Approaches at the Frontiers of Chemical Engineering and Computational Biology: Advances and Challenges". Please join us in honoring the accomplishments of this year's award winners.

More News from the 2005 CAST Awards Dinner

by Karen High

We would like to congratulate again all the award winners announced at the 2005 awards dinner: 2004 CAST Directors' Award, 2005 W. David Smith Jr. Award, 2005 Outstanding Young Researcher, and 2005 Computing and Chemical Engineering Award. The original announcements occurred in the <u>Spring 2005</u> and <u>Fall 2005</u> newsletters.

The winner of the 2005 Computing in Chemical Engineering Award, Frank Doyle, has expanded his Systems Biology ideas from his <u>award address</u> into an article entitled <u>"Systems interface biology"</u> (*Journal of The Royal Society Interface*, 2006) recently published with Jörg Stelling. Please have a look.



Karen High with Frank Doyle



with Richard Braatz



with Martha Gallivan



with Mike Morshedi



with Elizabeth Morel and Kyle Camarda

Electrification of the CAST Awards

by Gavin Towler (with grateful acknowledgement to Peter Rony and Karl Schnelle for solving the technical issues)

Each year the CAST Division gives out <u>awards</u> to recognize outstanding contributions to advancing the theory and practice of computing and systems technology. The call for nominations goes out in the spring and between April and June the nominations are reviewed and ranked by an Awards committee, made up of the elected officers of the Division and past award winners. One of the duties of the second Vice-Chair of the Division is to co-ordinate all this activity.

The CAST area is fortunate to have many very active researchers, and every year there is a broad selection of excellent candidates for the awards. The nominations are also extensively documented, with resumes, supporting letters and in some cases research papers (for example, for the graduate student paper award). Nominations remain open for three years, but can be renewed indefinitely subject to the eligibility constraints of the awards.

As a result of all this extensive documentation, over the years the CAST Division had accumulated an impressive pile of paper. When I took over the role of second Vice-Chair, Karen High shipped me two file boxes with about 70 pounds of resumes and endorsements, going back over ten years. After some discussion within the CAST Executive we agreed that most people were now comfortable enough reviewing electronic documents that we could take the bold step of eliminating paper from the Awards process.

The easiest part of converting to an electronic system was asking all new submissions to be submitted in .doc or .pdf format. The active submissions from previous years were converted to .pdf files. Using a Xerox 245 copier only took me about 45 minutes for the whole 12-inch stack. The hard part was finding a secure file transfer mechanism to get the total 47MB to the Awards Committee while maintaining the confidentiality of the information. Here our veteran web masters Peter Rony and Karl Schnelle stepped in and set up a secure web server from which the Awards Committee could download the nominations and supporting material. I'll omit the details of how this was done as I'm sure there are probably a few CAST members who could figure out how to hack into it if they put their minds to it! After solving a few minor technical problems due to different versions of Adobe Acrobat, all of the Awards committee members were able to view the material and cast their ballots electronically. The results are announced elsewhere in this newsletter.

The final act in this story was the archiving of all the paper files. Now that all the active information can be burned on to a single CD and is already held on the secure web server, I won't be mailing any boxes to next year's second Vice-Chair. After conferring with the current Chair and Vice Chair the paper archive was solemnly committed to UOP's confidential file shredder. From now on the CAST Awards process is all electronic!

The Nordic Process Control Award is awarded for lasting and significant contributions to the field of process control. The eighth recipient of this award is Professor Manfred Morari, head of Automatic Control Laboratory at ETH in Zurich.

Motivation: A leader in the area of process control for close to 30 years, who has pioneered several areas including robust control, model predictive control, plantwide control and, more lately, hybrid systems. Has also made seminal contributions in other areas, such as azeotropic distillation.



Manfred Morari was born in Graz, Austria in 1951. He received an MSc in Chemical Engineering from ETH In 2007 acobs 1974 and a PhD in Chemical Engineering from the University of Minnesota in 1977. He was with the Department of Chemical Engineering at University of Wisconsin from 1977 untill 1983, when he joined the faculty of Caltech. During his 12 years at Caltech he was the Executive Officer of both Chemical Engineering and the Center for Dynamical Systems. Since 1994 he heads the Automatic Control Laboratory at ETH in Zurich. During his career, Manfred Morari has graduated close to 50 PhDs, many of which are currently active in academia.

The award was presented to Professor Morari on January 26, 2006, during the 13th Nordic Process Control Workshop held in

Lyngby, Denmark. The award lecture was entitled <u>"Beyond Process Control"</u> [^{Jeck} 5.8MB]. The previous recipients of this award are Howard H. Rosenbrock (1995), Karl Johan Astrom (1997), F. Greg Shinskey (1998), Jens G. Balchen (2000), Charles Cutler (2001), Roger W. H. Sargent (2003) and Ernst Dieter Gilles (2004). The award is given by the <u>Nordic Working Group</u> on Process Control.

Letters to the Editor

Technical Articles and Citations from Larry Ricker

14 Dec 2005

Dear Sirs,

I was interested to see the article on <u>FT-NIR gasoline analysis</u> in the Fall 2005 CAST Newsletter. The use of NIR in combination with chemometrics can provide useful quality-control and quantitative analytical data on complex materials such as petroleum products. When I looked more closely, however, I was disappointed to see that it did not cite the considerable body of earlier work in this area. In fact, there were no literature citations at all.

Related work is not hard to find. For example, a simple Google search on the keywords 'nir gasoline analysis chemometrics' turns up the following in the first 10 hits: <u>11-0693_OctaneAN.pdf</u>

This is a 1993 application note that cites a 1989 paper in *Analytical Chemistry* by J.J. Kelly et al., which is one of the seminal works in this area. According to Science Citations, it has been cited 123 times.

There is also at least one commercial instrument for on-line analysis of refinery products, the Perkin Elmer PIONIR 1024 Process NIR Analyzer (not FT-NIR, but closely related technology).

This additional information would have made the CAST Newsletter article more useful to its readers.

Just before reading the CAST Newsletter I had been reviewing Elsevier's ethical standards for their publications. They include the following requirement: "Relevant prior and existing research and methodologies will be properly identified and referenced using the standard bibliographic and scientific conventions."

It isn't necessary to hold a newsletter publication to the same standards as an archival journal, but the above case suggests that it would be a good idea for the editors to ask prospective authors if they have done a literature search.

Sincerely, N L Ricker Professor and Associate Chair Department of Chemical Engineering University of Washington [via email]

Response from Santanu Talukdar

15 Dec 2005

Dear Sirs,

In response to Professor N.L. Ricker's comment about why I did not provide literature citations on NIR gasoline analysis by Chemometrics, let me share my thoughts. First, I thank Prof Ricker for his effort in pointing out an ethical question, which should be addressed.

This paper is a result of 5 years of field study, during which time I studied various blending dynamics in both ultra-low-sulphur, lowbenzene high-speed diesel and gasoline applications. Without naming the refiners, I observed the most common errors that creep into the various stages of the automation hierarchy and allow NIR to do accurate prediction are (1) a lack of a rigorous upstream model in planning and scheduling, and (2) the lack of blend-property simulation and optimization. The blending automation project falls within the "garbage in-garbage out" problem with NIR and within poor prediction accuracy.

However, there is a fundamental conceptual difference between previous NIR in gasoline applications and my present work. I have not attempted to re-invent the wheel on NIR applications in gasoline by Chemometrics. Literature and patent searches will reveal many works already done elsewhere, as mentioned by Professor Ricker. Neither have I attempted to focus on various commercial NIR products already available and their wave number characteristics for analyzing complex petroleum products in terms of wave number absorbance. The technology, as available and field-tested, has been selected for this study.

I have attempted to find answers to a few fundamental questions, such as:

- 1. What is the definition of and criteria for an outlier?
- 2. How does one decide on the gross errors associated with an outlier; that is, whether the model is wrong or the data is wrong?
- 3. What is the physico-chemical nature of a blending process that triggers the creation of an outlier?

This is the point where I obtained the help of data reconciliation techniques ("Balancing and Data Reconciliation", by Veverka & Madron). In my Powerpoint presentation, I described a data reconciliation application based on PCA and NIR. By assuming that the the model is correct, I concluded that the gross errors in the data could be removed by studying the various outlying characteristics and PCA. I also concluded that it may be necessary for the model to be split for extreme data characteristics. The criteria for outliers is briefly defined.

The nearest industrial application that I can cite is the Euro CHEM Project, Fifth RTD Program (1998~2002), <u>www.chem-dss.org</u>, where PCA was applied commercially in a blast furnace application as a tool box for fault detection and isolation techniques (FDT) for on-line process analysis.

My paper attempted to highlight the various errors in data structures through a consideration of its physicochemical nature and its impact on a blending process. The defined model, through its training data set, generates a set of regression coefficients. If the nature of such data set changes - which can happen due to changes in its physicochemical characters - its regression coefficients will change. The changes in the process sample brought about by various blending characteristics (the NIR absorption coefficient will change, but the model regression coefficient stays fixed) will be a major cause of outliers.

This definition of process outliers and the need to keep the process within the defined acceptable band (logic state 1) from the defined unacceptable band (logic state 0) needs to be understood in full by various Key Performance Indicators (KPIs) and interacting variables starting from feed, distillation performance, operations, catalysis, and others. (Reference: AIChE Presentations, "Managing Supply Chain and Operational Crisis using Scheduling Algorithm for Overall Refinery Operations", Dhaval Dave and Nan Zhang, Department of Process Integrations, UMIST, UK.)

My paper did not go into linking those KPIs with outlier definitions, so no reference is mentioned.

The underpinning of Chemometrics and the PCA technique ais done in the theoretical paper by the author (Reference: my PowerPoint presentation on Chemometrics).

I hope this response answers Prof Ricker's concerns. I do admit that the paper should not be read in isolation but needs to be linked with the two presentations.

Sincerely, Santanu Talukdar Yokogawa India Ltd. [via email, edited for clarity]

Response

from the Editors, Peter Rony and Karl Schnelle

The main issue in Professor Ricker's letter is whether or not a newsletter publication should insist on a thorough literature search. This case provides us with an opportunity to re-state our long-standing *CAST Communication* policies, something that we only occasionally do in the "Editorial Notes" section. Our only publication policy is that we never copyright articles. As stated in every newsletter, "all article rights are reserved by the authors or their respective organizations"

We personally believe that the above is not an issue at all. From our industrial perspective, rarely do we see references in an industrial presentation, which is not like a peer-reviewed publication. Please refer to the table below where we summarize the count of academic and industrial papers and presentations from all available issues of *CAST Communications*. Only those articles were

counted if they had some technical content. Overall 15 of 34 articles in the newsletter have had references or citations since 1997. So the above mentioned article is definitely not the first one published without citations.

Number of Technical Articles Published with Citations			
Issue	Academic	Industrial	Notes
S 97		1 of 1	
S 98		0 of 1	
W 98	1 of 1		
S 99	0 of 1	1 of 1	
W 99	1 of 1		
S 00	1 of 1		
F 00		0 of 1	
S 01	1 of 1	0 of 1	
W 01	0 of 1		
S 02	1 of 1	1 of 1	
S 03	1 of 1	1 of 2	papers accepted at AIChE
F 03	0 of 1	0 of 1	
S 04	1 of 1	1 of 2	
IT 04	0 of 1	1 of 10	papers accepted at AIChE
F 04		1 of 1	
S 05	1 of 1		paper accepted at AIChE
TOTAL	8 of 12	7 of 22	

Professor Ricker's Elsevier quote should not be applied to our Division's newsletter because we serve a competely different purpose.

On the other hand, references are never objectionable. Perhaps we should encourage industrial authors to include some background research more often in their internal or external presentations.

Our philosophy has been that: (a) Contributors to CAST Communications perform a service to CAST division members; (b) Contributed manuscripts are not refereed; (c) CAST Communications is certainly not an archival journal; (d) Contributors of manuscripts should feel free to submit their manuscripts to archival, refereed journals; and (e) Publication in CAST Communications should never be considered as an impediment to publication in an archival journal.

CAST and "Fake" Meetings

from Rene' Schoof

5 Jan 2006

This letter is in regards to the following meetings (advertised on MeetingsandConferences.htm):

- The 3rd Symposium on Risk Management and Cyber-Informatics
- 3rd International Conference on Cybernetics and Information Technologies, Systems and Applications

These meetings appear to be of a dubious nature. For your information, please see:

• goanna.cs.rmit.edu.au/~jz/sci/

http://anthony.liekens.net/index.php/Misc/FakeConferences - [Ed: no longer online, see pdf capture.]

Best regards, Rene' Schoof [via email]

Response

from the Editors, Peter Rony and Karl Schnelle

Mr Schoof communicated these concerns after the last newsletter was published. He pointed out that a few dubious or "fake" meetings were advertised by CAST. The Editors list meetings and conferences that we feel would be of interest to our members and do not charge the meeting organizers or solicit them. We had not heard about this new "type" of meeting until Rene' pointed them out to us. After reading his references and doing some google searches (<u>itre.cis.upenn.edu</u>, <u>3dpancakes.typepad.com</u>, ...), we pulled the two afore-mentioned meetings from our listing.

If you see other **spamferences** listed by CAST, please feel free to email the Editors. We appreciate the feedback - please continue to alert us to the changing world we live in. This is the most excitement that we have had since a squirrel chewed through a telephone line and knocked out the CAST server.

Announcements

Free CAST Membership Offered!

by Karen High

CAST membership is now free to Undergraduate AIChE members! This is a great mechanism for students to find out about what goes on in the CAST division. One of the best perks is their ability to participate in live <u>webCASTS</u>!

How to Contact AIChE

Publication sales, meeting registration, applications for membership, technical training, and other AIChE products and services may be obtained by using the contact information below or visiting <u>AIChE Contacts</u>.

American Institute of Chemical Engineers (AIChE) 3 Park Avenue New York, NY 10016-5991 General Inquiries: 800-242-4363 International calls: 212-591-8100 Fax: 212-591-8888 On-line contact form

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

Felicia Guglielmi Director of Volunteer & Membership Activities 212.591.7329	Bette Lawler Director of Operations (212) 591-7207
Director of Technical Programming	Anette Ngijol Volunteer & Membership Activities (212) 591-7478
	<u>Steve Smith</u> Director of Technical Activities & Journals (212) 591-7335

CAST10 E-Mail List

The following websites are used to participate in the list:

- 1. <u>lists.isr.umd.edu/mailman/listinfo/cast10</u> is the link subscribers (current and new) can use to manage their subscription properties.
- 2. <u>www.ench.umd.edu/cast10/</u> has lots of archive information and background information. The preferred address to post messages to the list is cast10 at ench.umd.edu.

2007 Award Nomination Form

^{*}Until updated, please use the <u>2006 Award Nomination Form</u> [52KB, MS Word], which should be completed by April 15, 2007. See <u>CAST Division Awards</u> for more information.

Quote of the Day

Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.

Albert Einstein [1879-1955]

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	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: <u>Peter R. Rony</u> .
Deadlines:	December 1 for the Winter issue; July 1 for the Summer issue.
-	Prior to publication of advertisement, please submit check payable to CAST Division, AIChE to the <u>CAST Division</u> 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.

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