# CAST Communications

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CAST (Computers and Systems Technology) is a division of the AIChE (American Institute of Chemical Engineers)


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# EDITORIAL NOTES

**About This Issue: A Time of Transition for CAST Communications**
By Peter Rony, Mike Malone, and Scott Keeler

With this issue, we commence the transition to a new era for the newsletter. Mike Malone replaces Jeff Siirola as Programming Chair for the CAST Division. Along with his submission of the file that contained the latest information on Meetings, Conferences, and Final Calls for Papers, Mike suggests that CAST Communications do the following:

"We need to find a way to streamline this newsletter editorial process if it is going to work. For the moment, I respectfully suggest the following, effective with the next issue of CAST Communications (or this one if you like)."

(a) "Delete the duplication between the sections on 'Meetings Conferences and ...' and 'Calls for Papers for CAST Sessions.' This means that there would be one single listing of CAST sessions in the second section and we would not have to duplicate entries for that in the first section. This means less work by eliminating the double entry, which also reduces the possibility of introducing errors."

(b) "If the same information is (or will be) on the Web at the time CAST Communications is published, e.g., AIChE 2000 Spring Atlanta Meeting, then CAST Communication should list only the title, deadlines and URL for that information. This reduces work and also the chances that people will get hold of out-of-date information because of updates on the Web after CAST Communications is finalized."

(c) "We should not carry the full text of Calls for Papers, since most sessions are well explained by the title. This would save an enormous amount of work and e-mail. The authors of contributed papers should be able to get this on the Web or send by e-mail in response to inquiries. Note: This might mean that these two sections could be combined into one. For CAST sessions, this would mean that we'd publish almost exactly the same materials that are in the Programming Board Reports for the CAST Exec. This would be a substantial simplification."

Other possible consequences of Mike's suggestion include:

(d) The page count and cost of printing and mailing the CAST Division newsletter would decrease.
(e) Since CAST Communications is the most significant CAST expense, it may be possible to cut the division dues once the cost of the newsletter decreases.
(f) In the limit, CAST Communications may become an exclusive, web-based publication. The CAST Communications expense item would therefore decline to the cost of maintaining a server for the CAST Division.

(g) An important question would arise: What would the incentive be for an AIChE member to join the CAST Division and pay CAST dues?

Please let us know your thoughts by sending messages to rony@usit.net, skeeler@dowagro.com, and mmalone@ecs.umass.edu.

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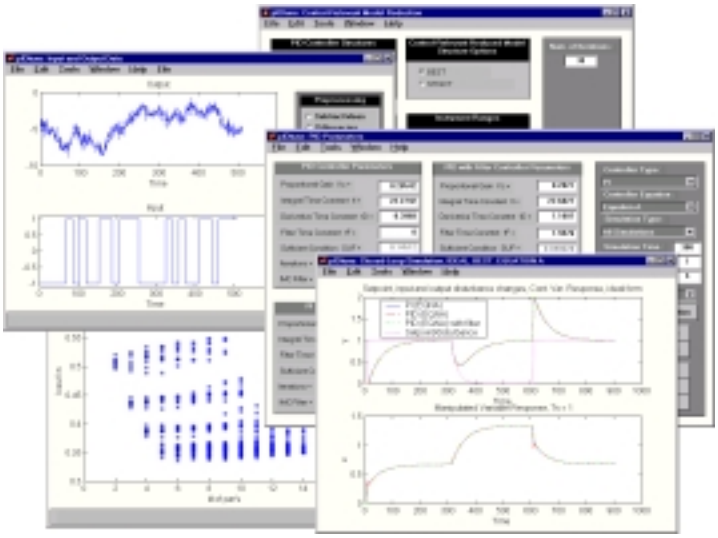

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ARTICLES

# An Interpretation of Control and Implications for Academe

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(This article substantially reproduces the "Editorial Viewpoint" published in *ISA Transactions*, vol. 37, no. 2, 1998, pp. 73-77, and is adapted with permission from Elsevier Science Ltd.)

Whenever someone realizes that their hobby embodies all of the lessons of life they claim, "Golf is life," "Baseball is Life," "Soccer is life," or such, and print T-shirts that proclaim the metaphor. But, really, control is life.

Continuing the parallel analysis, in training players for any game we can focus on the skills, techniques, and rules so that they play both smart and well. We normally instruct at this level in our control courses. However, if the players do not live the metaphor "Control is Life", if they only know the techniques and rules, they limit their maturity, creativity, vision, inspiration, and leadership potential. Here is my attempt to reveal the metaphor.

## WHAT IS CONTROL?

Control is a procedure we use to improve or maintain a process. Control is a continually repeated, four-step sequence: 1) Observe a process behavior, 2) Analyze for needed improvement, 3) Decide the right corrective action, and 4) Implement the action. In some circles they rename "control" as "management", and that's what our industry-bound graduates will come to call the procedure.

Normal people "do" control in their daily lives. When we change our facial expression from a frown to a smile as we talk with our children with the intent to influence their feelings, we are "doing" control. When we choose to wear our hair in a buzz, to express a personality style to others, we are doing control.

Control does not necessarily require fancy mathematics, or PID, or thermocouples; and for those of us within the academic depths of automatic control, a reflection on the big picture may be useful on two counts. First, our technical skills and understanding of control strategy have application opportunities and benefits for society well beyond the confines of our routine work. As an illustration, managing, supervising, training, and coaching are jobs in which the in-charge humans observe, analyze, decide, and implement. Our knowledge of control principles can help improve those human controllers.

Second, as a complement, today's low-cost computing power opens opportunities in our daily work, and allows us to integrate common-sense "management" into automatic control. Automatic control originated with lever-type governors, then evolved into pneumatic PID devices. Consequently, the language and technology we consider as "control" is the legacy of analog devices. As a result, our control technology and strategies often embody the limitations of those devices.

The message of this editorial is that we can work outside of the "boxes" of our daily routine, and of the classic elements of automatic control. We can understand the metaphor at the student level, and thereby grow to become inspired players.

## PROCESS

We need to understand "process" before we can consider process control. A process can be anything that has a cause-and-effect relationship.

Therefore, the process may be the national economy, where quality of life responds to government manipulation of the prime interest rate. The process may be company morale, where the productivity of the workers is influenced by the explicit appreciation from the boss. The process may be tanning, where skin color responds to sunlight exposure. The process may be a "simple" heat exchanger, where exit fluid temperature responds to a signal for the valve. In all of these processes there is a sequence of mechanisms that relates the process response to the stimulus.

Even if some of those mechanisms are only fuzzily understood, they are there. We can only hope to control processes that have a rational, non-chaotic, non-capricious behavior. That rational behavior may be masked by "noise" and may have ill-behaved dynamics. But, if there is no cause-and-effect relation between our influence and the outcome, our manipulations would just be tampering with the process.

Some of the processes, like a heat exchanger, are designed and built by humans for some purpose. Alternately, some of the processes are naturally occurring, like erosion from rain-swollen rivers. Regardless of the process origin, humans are still stakeholders in the response of the process, and have an interest in influencing the process behavior.
Batch or continuous matters not. For either there are influences and outcomes.

We realize that there are economics of "control." If the cost of the manipulation is greater than the benefit of the process improvement, we do not try. Perhaps we find another input to manipulate, or we design another process where control is possible.

This leads to a broadening of our normal view of a process. "Design" is a process, too. Design of the manufacturing process and design of the control system are human mental processes in which the designer is the controller. In the process of "designing," the designer uses trial-and-error and progressive insight to make design decisions, observe consequences of those choices, analyze how good the design is, then make new design decisions with the intent to improve the outcome.

The concepts of automatic control also apply to human decision processes. Other human processes include clerical processing of data and files, monthly balance sheet accounting, daily inspection of control loops, and weekly adjustment to measurements to rationalize material and inventory balances. In each of these processes the supervisor takes control action. Again, our understanding of control strategy can be applied to those routine human processes.

## OPERATIONAL OBJECTIVE

In all, the process outcome is important to some human purpose, and we need some measure of goodness in order to make a rational management decision.

The first step listed in the control sequence is to observe the process behavior. Usually, we observe values of the controlled variables (CV) that we keep at a setpoint (SP). For instance, we measure exit fluid temperature from a heat exchanger, the controlled variable (CV), and the traditional function of the control procedure has been to keep the CV at its SP.

But consider, no one purchased a heat exchanger for the purpose of keeping temperature, T, at $T_{sp}$. The heat exchanger process may have been installed to preheat a reactor feed, and its real purpose, its *raison d'etre*, its "operational objective" may be to improve reactor contribution to the enterprise. The impact on the enterprise is what we would like to manage, not an outlet temperature. Similarly, we do not install reboilers or surge tanks so that we can keep their liquid levels at setpoints. We do not landscape our company grounds so that we can keep grass cut to a height of 4 cm. We do not buy a car to keep either the oil level or the speedometer needle at their respective setpoints.

There is a reason for buying a process, be it a car, or a barbecue grill, or a dam, or a traffic light, or an airplane, or a chemical manufacturing plant. There is a reason for designing something. And even if the natural process already exists, there is a human objective that can be achieved by managing, or controlling, the process. These reasons reflect the desires and aspirations of the process stakeholders. These desires for function are the "operational objectives."

For the personal process of tanning or of grounds landscaping, the operational objective may be to create a desirable image. For the heat exchanger mentioned above, it is to enhance reactor efficiency. For dams, it may be flood control.

Good management, good control implements decisions that best make the process outcome meet the operational objectives.

There are usually several operational objectives which are combined to define the "goodness" of any one process. For instance in tanning, speed of tanning, comfort while tanning, freckle generation, and hair color highlights are all secondary operational objectives. There are also operational objectives that impose constraints. Don't burn. All of these several operational objectives must be considered when deciding how to best manage the process, how to optimize the process. For control of the tanning process we decide exposure time, location, and apparel. These are the manipulated variables (MV). Values for them are chosen to maximize performance on the operational objectives. In the field of optimization these are called the decision variables (DV).

As another example, good process management of a heat exchanger will consider the thermal stress associated with aggressive manipulations, equipment life as affected by excessive fluid velocities, and the economic impact of changes in operating conditions on the enterprise. The temperature, *per se*, is not important. What is important is maximizing the degree to which the operational objectives are met.

Desires for the economically best path can be one of the operational objectives. The dynamic objective would <u>not</u> be to achieve a quarter-amplitude-damped or minimum IAE servo response. These traditional desires do not include the cost of utilities, or allow for rapid over damped responses, or accommodate desires for constraints on MV action. Perhaps the dynamic objective would be to move to the best possible operating state along a best path.

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Whoever is in control, whoever is managing the process needs be able to quantify the degree to which the process is meeting the operational objectives. Only then, can rational decisions be made. A good process manager maximizes the process contribution to the operational objectives.

The situation is no different if we want to automate the control "loop" and call it "automatic control" or "management automation." The controller should integrate all of the relevant issues as it optimizes process performance.

Herein is a special privilege for our era of control professionals: Today's low-cost computing power makes it possible to automate what have been routine engineering and process management decisions.

With these concepts of "process" and "operational objectives" in mind, let's consider the control sequence of Observe, Analyze, Decide, and Implement.

## OBSERVE

Normally, one controller observes one 4-20 mA signal, but usually this does not provide enough information to make intelligent decisions. We need to observe the variables, which provide both a "complete" and an "accurate" measure of the operational objectives of the process.

A "complete" measure would include all of the variables that are needed to analyze the utility of the process. For the heat exchanger this may be the rate of utilities being used, the effect of operating conditions on equipment life (flow velocity), and other variables which signify the impact on the reactor contribution to the enterprise. Whatever the process, we need to understand both the cause-and-effect relations within the process and the impact of the process outcome on the human enterprise. Only then, can we know which measurements are necessary for control.

An "accurate" measure means the variables can be combined into a statistic or metric that provides a truthful indication of how well the operational objective is being met. For the heat exchanger this would require economic values for utility and reactor product (values that honestly reflect the impact of the control action on the enterprise), and accurate measurements from calibrated sensors and analyzers.

Here too, technical advances in sensing are opening opportunities. Valid observations are not limited to P, T, dP, and analyzers. Computers are functional with video vision to guide robots. They identify individuals from thumbprints, and use pattern recognition of acoustics to translate voice into written words. With a bit more work, new sensing technology can effectively become the remote eyes, ears, and noses of the operators. The computer will be able to observe cavitation, centrifuge burden, two-phase flow, etc.

We must be able to "see" the true values of this necessary data through the "noise" that confounds the measurements. The first-order filter is a simple technique, and a familiar leftover of the analog days of control. Often, techniques from statistical process control (SPC) or statistical quality control are more appropriate. And now, they can be automated.

Again, "control" has application to things other than a physical manufacturing process. We want to control the process of design so that loss prevention, reliability, process uniformity, resource conservation, etc. are maximized. What do we need to observe? We can obtain flow rates and compositions from the material and energy balance calculations. We can estimate equipment capital costs from the designed sizes. We can estimate operational expenses from these data. We can obtain reliability data from experience with the devices selected. We can calculate the process reliability from ANDOR logic. We can calculate the hazard associated with hypothesized events.

## ANALYZE

Typically, a controller uses an equation to convert a scaled signal into engineering units. For example, millivolts are converted and displayed as temperature. Sometimes three scaled signals, representing P, T and dP are used to reveal steam flow rate. These are simple analyses of field signals. We can do better.

After the values for a complete and accurate data set are obtained, they can be combined into a common statistic which reflects the impact of the process on each of the operational objectives. For the heat exchanger this means calculation of the economic benefit of the exchanger on the process. This may be a simple procedure involving mass and energy balances and empirical reactor yields. Alternately, it may require a first-principles model of both the reactor and its impact on the enterprise.

There are usually several operational objectives, several measures of goodness for each process. We must be able to quantify their relative importance. Then after performance on each is evaluated, their collective impact can be evaluated. This combination is probably nonlinear. For example, there may be no penalty for high pressure operation until an equipment constraint is approached.

Doing this analysis requires explicit, quantifiable knowledge of both the process and its impact on the human enterprise. This is a lot of work. But, once done and documented and programmed, the knowledge is resident to teach all that follow. Think of the benefit to the enterprise if all personnel

and controllers understand both the technical details and the big picture.

## DECIDE

Now that the "bottom line" impact can be evaluated, a controller can determine the value for the manipulated variables. In this heat exchanger case, the MV is the signal to a valve that moves the process toward optimizing the objective function.

This is neither PID, nor MPC, nor any controller that controls to a setpoint. This is an engineer's type of optimization. Often it can be automated with today's computing power, and the controller would likely be a constrained, nonlinear search using the process model. Alternately, it may be fuzzy logic which makes the decision. For rapid computation, the model may be a neural network which was trained by a combination of plant data and first-principles knowledge.

The operational objectives would define the objective function for the decision variable, or MV, search.

When the process is "design," and the objective is to provide an adequate safety level, the engineer can use standard reliability techniques to analyze what changes would make best improvements. Perhaps design decisions can not be automated. But, the control principles of complete and accurate observation, and explicit quantification of the operational objectives apply.

Should the controller output be implemented? The controller is a manager, recall, and it probably has as simple an understanding of the process and its impact on the enterprise as some other managers that you could name. With this view, you might agree that the decision of a controller should be questioned.

Statistical process control has proven its effectiveness in tempering management activity (where management allows it), and thereby preventing tampering and improving uniformity. The output instruction of a controller will respond to measurement noise. Perhaps we should use SPC to temper it. It is fun to impose SPC on managers, and easy when the managers are control programs.

Perhaps the controller has identified that moving the process from one operating region, or from one constraint to another, will have a savings or an improvement in the operational objective. Should the move be implemented? Consider that the metric for the operational objective is based on a lot of data, and that the values for those data are not precisely known. For example, there is probably considerable uncertainty in the economic values of process intermediates, the assigned penalty for large changes, and the relative importance of the several measures of goodness as chosen by the process owner. Perhaps, control action should only be implemented if the improvement in the operational objective is significant, when considering the sensitivity of the metric to the uncertainty in the data. Sensitivity analysis can be a key for rational control.

## IMPLEMENT

Do it, and repeat the sequence. One of the luxuries of control is due to the sampling frequency, or scan period. We do not take a control action, and then wait until the result fully plays out. The traditional rule of thumb is to have 30 control samplings within the open-loop settling time of the process. This means if the first control action is not exactly right, we still have about 29 chances to fine tune it within a natural transient period.

We can quantify this using an idealized analysis. If the controller is only 75% right on any one decision, on the next sampling it can fine tune its action to fix the residual 25%. If each residual 25% is 75% corrected, in 30 samplings the action will be (1-.25^30)*100=99.9999…% right. Automatic control suggests that we need neither perfect models nor analysis.

Complying with the K.I.S.S. principle of industrial success, automated "managers" will necessarily embody a simplistic and limited understanding of the process and of its impact on the enterprise. They could make naïve mistakes, or the numerical solution technique could get stuck, and these type events could be intolerable considering the hazard associated with certain processes. It seems that the job of the human supervisor of the controllers will shift from the current operator status toward becoming a job with an important parenting or coaching role. The human supervisor will give the controllers autonomy, Observe their behavior, Analyze if it is good, Decide how to correct their rules, then Implement the correction.

## FUTURE

Automatic control can be a way, a mindset, an approach to rational and continuous improvement. Moreover, measurement and control professionals of today have the historically unique opportunity to automate the routine activity of good process management. Let's do it!

With this viewpoint, some of the key elements in the future of control may be process modeling from both first principles and neural networks, fuzzy logic and other forms of artificial intelligence, automated statistical process control triggers, human-like sensors of vision and hearing, parallel processing computers, information technology management, fault detection and analysis, constrained nonlinear optimization, model-based sensor validation and

correction, in-process cost accounting systems, software development, software validation and safety analysis, etc.

Also, with this viewpoint, there is a challenge to control educators to let go of the technology legacy of PID control to a setpoint, and to prepare engineers to become the parents and coaches of intelligent controllers. Present the math and analysis that is fundamental to control as a secondary, supporting theme. As a primary objective, connect the concepts to life so that students experience control – not just recreational mathematics.

## Where Has All The FORTRAN Gone?

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*Abstract*: The authors suggest that much of the chemical engineering technology developed using FORTRAN is being lost. One way of preserving this technology is to integrate the FORTRAN into Excel. The reader's thoughts are solicited. Please send e-mail to the authors (Figure 4).

Microsoft's Excel has become a widely accepted tool for process engineering calculations. Used with Visual Basic for Applications (VBA), which is integrated into Excel, it can be a viable computational platform for engineering computations. A comprehensive example of the use of VBA to extend the capabilities of Excel is the SimTools™ flowsheet simulator (1).

Much of the chemical engineering technology developed over the last 40 years has been in the FORTRAN language. With the shift in academia to the teaching of Visual Basic and Excel and the retirement of many FORTRAN practitioners, the capability and interest in maintaining legacy FORTRAN programs is waning,

There are a number of advantages in maintaining FORTRAN code.
• FORTRAN often executes faster than VBA (or Visual Basic) code.
• There is considerable effort involved in recoding FORTRAN into VBA or Visual Basic.
• Although the FORTRAN program may be poorly understood and/or the documentation has been lost, the program has produced reliable results.

Excel, starting with version 5, provides a number of ways of accessing FORTRAN code using VBA. If the FORTRAN code is an executable module then the "shell" function can be utilized (2). If the FORTRAN code is in the form of a subroutine then the code can be recompiled as a DLL (Dynamic Link Library) and be called directly from VBA. Compilers such as Digital Visual FORTRAN version 5.0 or 6.0 (DVF) provide such a capability.

The advantages of using Excel with Digital Visual FORTRAN are numerous:
• Excel provides many mathematical function procedures.
• Excel provides a variety of output capabilities (graphical and printed).
• The IMSL numerical libraries with a wide range of numerical and statistical capabilities are included in DVF. Therefore, the development time for new applications is minimal.
• DVF provides an integrated program development environment for Windows 95/NT.

***An Example of Applying Legacy Code in Excel***

Consider the following equation in which it is desired to determine the Moody friction factor for fluid flow in pipes by the Colebrook equation (3) given the pipe roughness, pipe diameter and the Reynolds number:

$$\frac{1}{\sqrt{f}} = -0.86 * \ln\left[\frac{e/D}{3.7} + \frac{2.51}{\mathrm{Re}*\sqrt{f}}\right]$$

The value of the friction factor $f$ can be determined using the Goal Seek capability in Excel directly. However, the use of a FORTRAN subroutine and an IMSL routine will be described as an alternate.

The *first step* is to modify the legacy code for solving the Colebrook equation. Figure 1 contains a listing of the modified code. Only two new lines of code were required. The ATTRIBUTES statements (!DEC$…) must go at the very beginning of the subroutine. The DLLEXPORT ATTRIBUTE exports the desired subroutine from the DLL so that other programs can call it. The ALIAS ATTRIBUTE makes it easier to call the subroutine from VBA. It is needed due to a difference in the way that VB and FORTRAN handle subroutine names.

The *second step* is to compile and link this subroutine into a DLL. This can be done with DVF via a DOS window as:

```
DF /DLL:FVALUEC FVALUEC.FOR
```

FVALUEC is the name of the DLL and FVALUEC.FOR is the name of the subroutine to be compiled.

As a result of the compilation the following three files are created:

FVALUEC.DLL

FVALUEC.EXP
FVALUEC.LIB

The *third step* is to write a VBA function procedure in VBA to directly call the FORTRAN subroutine. This is shown in Figure 2. The DECLARE statement is required to link VBA with the DLL. If the DLL is not located in the active directory or in a PATH directory, then the full path name must be specified. The Declare statement also describes the subroutine arguments. The FVALUEC routine is then accessible in the VBA FrictionFactor routine by a standard CALL statement. The VBA code of Figure 2 goes into a module within the spreadsheet.

The *final (fourth) step* is to utilize the function procedure in spreadsheet cells. This is shown in Figure 3. Opposite the Friction Fraction label is the invocation:

=FrictionFactor($B$5,$B$6)

where $B$5 is the location of the Roughness/Diameter parameter and $B$6 is the location of the Reynolds number (4).

## ***Concluding Remarks***

The example shows a simple reuse of (legacy) FORTRAN code. The concept provides a means of giving new life to old software. The FORTRAN/Excel marriage is also an exciting platform for future software developments. DVF has an excellent program development environment for Windows 95/NT that it shares with Microsoft C/C++ for coding, compiling, linking and debugging. The Professional version includes the IMSL numerical libraries for a wide range of numerical and statistical functions. FORTRAN DLLs are small in size and fast in execution speed. The FORTRAN 95 standard includes many of the features like data structures, modules, recursive programming and pointers that may have enticed people to move to the C language in the past.

The readers' comments are solicited. Please e-mail your responses to the questions of Figure 4 to either author.

## ***References***

1. Partin, L. Web site: "http://pages.preferred.com/~lpartin"

2. Rosen, Edward M., "Executing FORTRAN Programs from Excel: Use of the Shell Function", *CACHE News*, No. 47, Fall, 1998

3. Streeter, V. L., "Fluid Mechanics", McGraw-Hill (1951).

4. Rosen, Edward M., "Calling FORTRAN Subroutines from Excel 7.0", *CACHE News*, No. 48, Spring, 1999

**SUBROUTINE FVALUEC (EPSX, RE, F)**

```
C The next two lines are needed for DLL specification
   !DEC$ ATTRIBUTES DLLEXPORT::FVALUEC
   !DEC$ ATTRIBUTES ALIAS:'FVALUEC'::FVALUEC

C The next line links to the IMSL numerical subroutine
C library
      USE NUMERICAL_LIBRARIES

C Declare variables
   DOUBLE PRECISION EVALUE,REVALUE,EPSX,RE
   DOUBLE PRECISION EPS, ERRABS,ERRREL,ETA,
  1    XGUESS(1),X(1)
   DOUBLE PRECISION F
   INTEGER ITMAX,NROOT,INFO(1)

C The COLEB function calculates the friction factor
C equation in the form f(x) = 0. The IMSL DZREAL
C function finds solution
   EXTERNAL COLEB
   DOUBLE PRECISION COLEB

C A COMMON block sends data to the COLEB function
   COMMON /PASSDATA/ EVALUE,REVALUE

   EVALUE = EPSX
   REVALUE = RE

C Use laminar flow calculations for the laminar and
C transition regimes
      IF (REVALUE  < 4000.D0) THEN
  1    F = 64.D0/REVALUE
C Apply DZREAL to solve the Colebrook equation
      ELSE
        ITMAX      = 100
        EPS        = 1.D-5
        ERRABS     = 1.D-5
        ERRREL     = 1.D-5
        ETA        = 1.D-2
        NROOT      = 1
        XGUESS(1)  = 0.05D0
       CALL DZREAL (COLEB, ERRABS, ERRREL, EPS,
  1    ETA, NROOT, ITMAX, XGUESS, X, INFO)
        F = X(1)
      END IF
     RETURN
     END

   DOUBLE PRECISION FUNCTION COLEB(F)
   DOUBLE PRECISION F,EVALUE,REVALUE
   COMMON /PASSDATA/ EVALUE,REVALUE
```

```
C Calculating Colebrook equation rearranged in form
C f(x) = 0 for DZREAL
   COLEB = F -(0.86D0*DLOG(EVALUE/3.7D0+2.51D0/
 1      REVALUE/DSQRT(F))**(-2)
   RETURN
   END
```

**Figure 1. FORTRAN Subroutine FVALUEC With Declarations**

```
Declare Sub FVALUEC Lib "FVALUE.DLL" _
 (ByRef eps As Double, ByRef Re As Double, _
  ByRef f As Double)

Function FrictionFactor(eps as Double,Re as Double) _
  As Double

   Dim f As Double
   Call FVALUE(eps, Re, f)
   FrictionFactor = f

 End Function
```

**Figure 2. VBA Function Procedure FrictionFactor**

**Figure 3. Spreadsheet Invoking FrictionFactor**

**Questions**

(Send responses as e-mail to the authors)

1. Is FORTRAN currently being used as a development language in your enterprise?

2. Do you believe FORTRAN programs containing (useful) technology are being lost?

3. Are there people capable in maintaining FORTRAN programs available?

4. Are older FORTRAN programs being recoded? In what language?

**Figure 4. Questionnaire for the Reader**

The CAST Email List provides a mechanism for rapid distribution by electronic mail of meeting announcements, calls for papers, and related types of information. To subscribe to the List, send a message consisting of the single word **subscribe** to cast10-REQUEST@bevo.che.wisc.edu.

```
Friction Factor
By The Colebrook
Equation

Parameter                          Value

Roughness/Diamete                 0.0005
r
Reynolds Number                    50000

Friction Factor              0.022982999
```

# COMMUNICATIONS

How to Contact the AIChE

Taken from the University of Florida AIChE web site, below are given several of the many ways to contact the American Institute of Chemical Engineers for information.

**"One-stop shopping" for admissions, publication sales, meeting registration, dues bills, and other AlChE products and services may be obtained from the:**

AIChExpress Service Center
3 Park Avenue
New York, NY 10016-5901
Telephone: 1-800-AIChemE
Fax: (212) 591-8888
E-mail: xpress@aiche.org

**For the AIChE Headquarters:**

American Institute of Chemical Engineers (AIChE)
3 Park Avenue
New York, NY 10016-5901
General Inquiries: (212) 591-7338
Fax: (212) 591-8882
AIChE WebSite: www.aiche.org
Insurance Programs
**Seabury & Smith**: (800) 982-4243

**For answers to special questions, try one of the following staff:**

Dean Kevlin
Director, Education Services
Telephone: (212) 591-7526
E-Mail: deank@aiche.org

Diana McCauley
Director, Member Services
Telephone: (212) 591-7329
E-Mail: dianm@aiche.org

Betty Feehan
Manager, Career Services, Member Services
Telephone: (212) 591-7524
E-Mail: bettf@aiche.org

Margie Joy Walden
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Telephone: (212) 591-7652
E-Mail: margw@aiche.org

Jo-Anne Hand
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Steve Smith
Senior Director, Publications and Information Systems
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E-Mail: steps@aiche.org

Lois DeLong
Manager, *ChAPTER ONE*, Publications & Information Systems
Telephone: (212) 591-7661
E-Mail: loisd@aiche.org

**Not sure who to call?** Try (212) 705-7338. The receptionist will refer you to the appropriate person.

Past postings on the CAST10
Email List are archived on the
World Wide Web at **http://www.che.wisc.edu/cast10**

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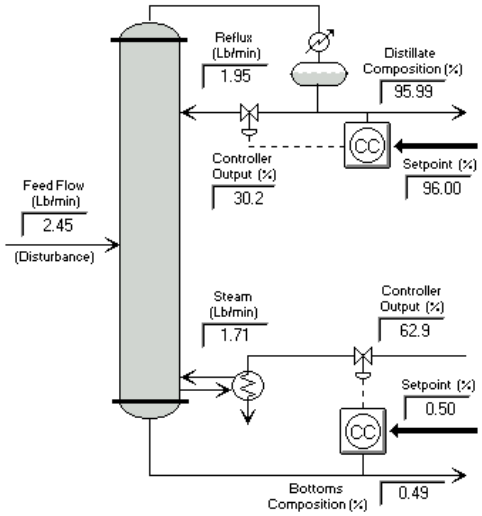


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# MEETINGS, CONFERENCES, CONGRESSES, SHORT COURSES AND WORKSHOPS

To submit a paper for consideration at any event listed below, please contact the symposium coordinator or session chair directly. For further information or details about each of the four CAST Division programming areas, contact the appropriate Area Program Coordinator as noted in the masthead. For general information concerning CAST Division sessions and scheduling, or to correct errors in this listing, please contact CAST Division Programming Chair: Michael F. Malone, Department of Chemical Engineering, University of Massachusetts, Amherst, MA 01003-3110, 413-545-0838, 413-545-1647 (FAX), mmalone@ecs.umass.edu. Many of these and other announcements of interest are distributed by electronic mail to the CAST Email List and are archived on the World Wide Web at http://www.che.wisc.edu/cast10/.

## 1999 AIChE Fall Annual Meeting
## Dallas, Texas
## October 31-November 5, 1999

Meeting Program Chair: Robert H. Davis, Department of Chemical Engineering, University of Colorado, Boulder, CO 80309-0424, 303-492-7314, 303-492-4341 (FAX), aiche99@spot.Colorado.edu.

The CAST Division is planning the following sessions for the Dallas Fall Annual Meeting which have been approved by AIChE and the Meeting Program Chair. A final call for papers for this meeting appears later in this issue. Deadline for submission of presentation proposals (through the AIChE web site only) for all sessions was May 1. The entire CAST program in Dallas is being cosponsored by the Society for Computer Simulation. Information and program updates are on the Web at http://www.aiche.org/docs/meeting/annual99/annual99.htm.

### CAST Division Plenary Session

1. Recent Developments in Computing and Systems Technology. B. Wayne Bequette, Rensselear Polytechnic Institute (Chair) and Mahmoud M. El-Halwagi, Auburn University (Co-Chair).

Area 10a: Systems and Process Design

1. Process Synthesis. Metin Türkay, Mitsubishi Chemical Corporation (Chair) and Andreas Linninger, University of Illinois Chicago (Co-Chair).

2. Design and Analysis. I and II. Katerina Papalexandri, Chemical Process Engineering Research Institute (Chair) and Jonathan M. Vinson, G. D. Searle (Co-Chair).

3. Advanced Process Integration. Priscilla J. Hill, Mitsubishi Chemical Corporation, (Chair) and Il Moon, Yonsei University (Co-Chair).

4. Technology Transfer in Process Design. Gavin P. Towler, UOP, LLC (Chair) and Vivek Julka, Aspen Technology, Inc. (Co-Chair).

5. Separations System Synthesis. Ashish Gupta, SUNY Buffalo (Chair) and Dante Bonaquist, Praxair (Co-Chair).

Joint Area 10a and Area 10b Session

1. Interaction of Design and Control. Dennis D. Sourlas, University of Missouri, Rolla (Chair) and Christine B. Seymour, Searle Company (Co-Chair), and Jorge A. Mandler, Air Products and Chemicals, Inc. (Co-Chair).

Joint Area 10a and Area 10c Session

1. Design and Operation of Batch Processes. Ekaterini Korovessi, E. I. du Pont de Nemours & Company (Chair) and Vipin Gopal, Honeywell Inc. (Co-Chair).

Joint Area 10a and Area 9 Session

1. Design for Environment. Urmila M. Diwekar, Carnegie Mellon University (Chair) and Mahmoud El-Halwagi, Auburn University (Co-Chair).

Area 10b: Systems and Process Control

1. Advances in Process Control. Oscar D. Crisalle, University of Florida (Chair) and Michael A. Henson, Louisiana State University (Co-Chair).

2. Nonlinear Control. Thomas A. Badgwell, Rice University (Chair) and Prodromos Daoutidis, University of Minnesota (Co-Chair).

3. Applications of Process Control. Sheyla L. Rivera, Frito-Lay, Inc. (Chair) and Kenneth R. Muske, Villanova University (Co-Chair).

4. Controller and Process Monitoring. Bhavik R. Bakshi, Ohio State University (Chair) and George N. Charos, Amoco Corporation (Co-Chair).

5. Process Modeling, Identification, and Estimation. I and II. Masoud Soroush, Drexel University (Chair) and Mikhail Skliar, University of Utah (Co-Chair).

6. Advances in Model Predictive Control. Alex Z. Q. Zheng, University of Massachusetts (Chair) and Michael Nikolaou, University of Houston (Co-Chair).

Joint Area 10b and Area 10c Session

1. Advances and Applications in SQC/SPC. S. Joe Qin, University of Texas (Chair) and Urmila M. Diwekar, Carnegie Mellon University (Co-Chair).

Joint Area 10b and Area 3c Session

1. Challenges in Control of Solids Processing Systems. George E. Klinzing, University of Pittsburgh (Chair) and B. Wayne Bequette, Rensselear Polytechnic Institute (Co-Chair).

Joint Area 10b and Area 8e Session

1. Control of Microelectronic Manufacturing. Stephanie Watts Butler, Texas Instruments (Chair) and Raymond Adomaitis, University of Maryland (Co-Chair).

Joint Area 10b and Area 17 Session

1. Process Control and Simulation in the Forest Products Industry. Eric M. Hanczyc, Weyerhaeuser (Chair) and Francis J. Doyle III, University of Delaware (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing in the Chemical Process Industries - Advances and Industrial Applications (Cosponsored by the International Cooperation Committee of the Society of Chemical Engineers, Japan). Shinji Hasebe, Kyoto University (Chair) and Conor M. McDonald, E. I. du Pont de Nemours & Company (Co-Chair).

2. Planning, Scheduling, and Supply Chain Management. I and II. Marianthi G. Ierapetritou, Rutgers University (Chair) and Antonis C. Kokossis, University of Manchester Institute of Science and Technology (Co-Chair).

Joint Area 10c and Area 12a Session

1. Advances in Optimization: I. Theory and Methodology, II. Case Studies. Yinlun Huang, Wayne State University (Chair) and Miguel J. Bagajewicz, University of Oklahoma (Co-Chair).

Joint Area 10c and Area 15a Session

1. Computational Methods in the Food Processing Industry. Stephen P. Lombardo, The Coca-Cola Company (Chair) and Joseph F. Pekny, Purdue University (Co-Chair).

Area 10d: Applied Mathematics and Numerical Analysis

1. Pattern Formation and Instabilities in Physicochemical Systems. Vemuri Balakotaiah, University of Houston (Chair) and Ranga Narayanan, University of Florida (Co-Chair).

2. Applications of Parallel Computing Strategies in Engineering Systems. Antony N. Beris, University of Delaware (Chair) and Jeffrey J. Derby, University of Minnesota (Co-Chair).

3. Stochastic Processes. Doraiswami Ramkrishna, Purdue University (Chair) and Kyriacos Zygourakis, Rice University (Co-Chair).

4. Fundamental Advances in Applied Mathematics. Raymond A. Adomaitis, University of Maryland (Chair) and Panagiotis D. Christofides, University of California, Los Angeles (Co-Chair).

5. D. Ramkrishna Symposium: Cybernetics, Operator-Theoretic, and Self-Similar Approaches in Chemical Engineering. Pedro Arce, FAMU/FSU College of Engineering (Chair) and E. Terry Papoutsakis, Northwestern University (Co-Chair).

Joint Area 10d and Area 15de Session

1. Applied Mathematics in Bioengineering. I and II. Roseanne M. Ford, University of Virginia (Chair) and Kyriacos Zygourakis, Rice University (Co-Chair).

## CAST DIVISION POSTER SESSION

Section A. Recent Developments in Systems and Process Design. I and II. Mahmoud El-Halwagi, Auburn University (Chair) and Urmila M. Diwekar, Carnegie Mellon University (Co-Chair)

Section B. Topics in Systems and Process Control. Kenneth R. Muske, Villanova University (Chair) and Richard D. Braatz, University of Illinois (Co-Chair).

Section C. High Performance Computing. Mark A. Stadtherr, University of Notre Dame (Chair) and Luke E. K. Achenie, University of Connecticut (Co-Chair).

Section D. Process Operability. Stratos Pistikopoulos, Imperial College (Chair) and Il Moon, Yonsei University (Co-Chair).

Section E. Issues in Computers in Operations and Information Processing. Nikolaos V. Sahinidis, University of Illinois (Chair) and Conor M. McDonald, E. I. du Pont de Nemours & Company (Co-Chair).

Section F. Advances in Applied Mathematics. Pedro Arce, FAMU/FSU College of Engineering (Chair) and Antony N. Beris, University of Delaware (Co-Chair).

EDUCATIONAL COMPUTER SOFTWARE DEMONSTRATIONS (Joint Effort with Group 4) Douglas J. Cooper, University of Connecticut (coordinator) and John T. Bell, University of Michigan (coordinator).

## 2000 AIChE Spring National Meeting
## Atlanta, Georgia
## March 5-9, 2000

Meeting Program Chair: W. S. Winston Ho, Commodore Separation Technologies, Inc., 3240 Town Point Drive, Suite 200, Kennesaw, GA 30144, 770-422-1518 x218, 770-422-1163 (FAX), WinstonHo1@aol.com.

The CAST Division is planning the following sessions for the Atlanta Spring National Meeting. A final call for papers for this meeting appears later in this issue. Deadline for submission of presentation proposals (through the AIChE web site only) is September 2, 1999. The entire CAST program in Atlanta is being cosponsored by the Society for Computer Simulation. Call for Papers and Meeting information on the Web at http://www.aiche.org/meeting/spring20/spring2k.htm.

Area 10a: Systems and Process Design

1. Challenges for Design in Practice. Russell F. Dunn, Solutia Inc. (Chair) and Kirtan K. Trivedi, Exxon Research and Engineering Company (Co-Chair).

2. Advances in Methods and Tools for Process Synthesis and Design. Raymond Rooks, Union Carbide Corporation (Chair) and Vicente Rico-Ramirez, Instituto Tecnologico de Celaya (Co-Chair).

3. Retrofitting, Debottlenecking, and Process Improvements. Miguel J. Bagajewicz, University of Oklahoma (Chair) and Frank X. X. Zhu, University of Manchester Institute of Science and Technology (Co-Chair).

4. Reviews and Tutorials in Process Design. Antonis C. Kokossis, University of Manchester Institute of Science and Technology (Chair) and Dilek Alkaya, Carnegie Mellon University (Co-Chair).

5. Process Information Management and Exchange. John Baldwin (Chair) Process Information Technologies and Neil Book, University of Missouri Rolla (Co-Chair).

Joint Area 10a and Area 9 Session

1. Environmental Issues in Design. Miguel J. Bagajewicz, University of Oklahoma (Chair) and Russell F. Dunn, Solutia Inc. (Co-Chair).

Area 10b: Systems and Process Control

1. Control of Pulp and Paper Processes. Yaman Arkun, Georgia Institute of Technology (Chair) and Francis J. Doyle III, University of Delaware (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Enterprise Resource Planning in the Process Industries. Joseph F. Pekny, Purdue University (Chair) and Miguel J. Bagajewicz, University of Oklahoma (Co-Chair).

Joint Area 10c and Area 12a Session

1. Process Innovation Case Studies. Cheryl Teich, Rohm and Haas Company (Chair) and Paul Bunch, Eli Lilly and Company (Co-Chair).

Joint Area 10c and Area 15b Session

1. Applications of Modeling and Optimization in Food, Pharmaceutical and Agricultural Chemical Design and Production. Stephen P. Lombardo, The Coca-Cola Company (Chair) and Matthew J. Realff, Georgia Institute of Technology (Co-Chair).

## ADCHEM 2000
## Pisa, Italy
## June 14-16, 2000

The ADCHEM 2000 meeting will be held on June 14-16, 2000 in Pisa, Italy. Organized under the auspices of IFAC, ADCHEM (International Symposium on Advanced Control of Chemical Processes) is a continuing series of international meetings held most recently in Banff, Canada (1997), Kyoto, Japan (1994), and Toulouse, France (1991). These meetings have traditionally focused on advances in methods for control and estimation and are part of a three year rotation of IFAC meetings in process control, which also include DYCOPS (Corfu, 1998) and the IFAC World Congress (Beijing, 1999). For the upcoming ADCHEM meeting, contributed papers will be considered in modeling and simulation (including first principle models, data driven models, and model reduction for control and optimization), model based control (including linear and nonlinear MPC, linearizations based geometric concepts, etc.), real-time optimization (including optimization of steady state and dynamic models, and integration with control systems), process and control monitoring (including PCA and other statistical techniques, auditing of sensors, etc.), process identification (including estimation and filtering of linear and nonlinear systems), and process control applications and

plant-wide control (including the control of environmental systems, petroleum refineries, etc.). The deadline for submission of contributed papers is September 6, 1999. For additional information, write to adchem2000@ing.unipi.it or see
http://adchem-2000.cheme.cmu.edu/.

**2000 American Control Conference**
**Chicago Illinois**
**June 28-30, 2000**

The American Automatic Control Council will hold the nineteenth ACC at the Hyatt Regency Hotel, Chicago, June 28-30, 2000. Held in cooperation with the International Federation of Automatic Control, this conference will bring together people working in control, automation, and related areas in the aerospace, chemical, electrical, mechanical, manufacturing, and process engineering fields. As in the past, the CAST Division will develop a number of invited, contributed, and tutorial sessions. The AIChE Society Review Chair is Ahmet Palazoglu, Department of Chemical Engineering and Materials Science, University of California, Davis, CA 95616-5294, 530-752-8774, 530-752-1031 (FAX), anpalazoglu@ucdavis.edu. The deadline for contributed papers is September 15, 1999. For more information, browse http://www.ece.nwu.edu/~ahaddad/aacc/acc.html.

**Seventh International Symposium on Process Systems Engineering (PSE-2000)**
**Keystone, Colorado**
**July 16-21, 2000**

PSE-2000 is the seventh in the triennial series of international symposia on process systems engineering and the first of the series to be held in the United States. The purpose of the meeting is to bring together the community of researchers and practitioners involved in the creation and application of computer-based methodologies for planning, design, operation, control, and maintenance of chemical processes. The special focus of PSE meetings is the integration of the enabling technologies and application domains. The conference is cosponsored by the European Federation of Chemical Engineering, The Interamerican Confederation of Chemical Engineering, and the Asian Pacific Confederation of Chemical Engineering and will be organized in large part by the CAST Division. The symposium will have both oral presentations and poster sessions in areas such as synthesis and design, modeling and simulation, control, planning and scheduling, operations, intelligent systems, and industrial applications and case studies. For further information, contact the conference chairs G. V. Reklaitis, School of Chemical Engineering, Purdue University, West Lafayette, IN 47907-1283, 765-494-4075, 765-494-0805 (FAX), reklaiti@ecn.purdue.edu or Jeffrey J. Siirola, Eastman Chemical Company, PO Box 1972, Kingsport, TN 37662-5150, 423-229-3069, 423-229-4558 (FAX), siirola@eastman.com. For more information browse http://atom.ecn.purdue.edu/~pse2000/.

**International Conference on Foundations of Molecular Modeling and Simulation (FOMMS-2000)**
**Keystone, Colorado**
**July 23-28, 2000**

The first Foundations of Molecular Modeling and Simulation conference (FOMMS-2000) is being organized by the Thermodynamics and Transport Properties programming group of AIChE, the CAST Division, and CACHE Corporation with an emphasis on applications for industry. The creation, design, and control of product properties often requires an understanding of how molecular and mesoscopic features influence macroscopic behavior. Quantum mechanical computations provide a means to understand atomic and molecular-scale interactions from which statistical mechanics can estimate mesoscopic and macroscopic behavior. Exponential growth in computing power and theoretical and algorithmic advances are allowing these methods to address questions of practical importance. The aim of this conference is to bring together molecular simulation and computational chemistry innovators, hardware and software providers, and customers who use the tools of molecular modeling and simulation. The conference will consist of both invited speakers and contributed poster presentations. Focus areas are expected to include thermochemistry, catalysis and reaction kinetics, phase equilibria, transport and porous media, adsorption, fluids, micelles, colloids, and polymers, metals, ceramics, and semiconductors, computing architecture, human resource development, and education. For additional information, contact the conference chairs Peter T. Cummings, Department of Chemical Engineering, University of Tennessee, Knoxville, TN 37996-2200, 423-974-0227, 423-974-4910 (FAX), ptc@utk.edu or Phillip R. Westmoreland, Department of Chemical Engineering, University of Massachusetts, Amherst, MA 01003-3110, 413-545-1750, 413-545-1647 (FAX), westm@ecs.umass.edu or browse http://www.ecs.umass.edu/topical/FOMMS.html.

**2000 AIChE Fall Annual Meeting**
**Los Angeles, California**
**November 12-17, 2000**

Meeting Program Chair: Mark J. McCready, Department of Chemical Engineering, University of Notre Dame, Notre Dame, IN 46556-5637, 219-631-7146, 219-631-8366 (FAX), la2000@nd.edu.

The CAST Division is planning the following sessions for the Los Angeles Fall Annual Meeting. A call for papers for

this meeting appears later in this issue. Deadline for submission of presentation proposals (through the AIChE web site only) is May 1, 2000. The entire CAST program in Los Angeles is being cosponsored by the Society for Computer Simulation. For more information and updates browse http://www.aiche.org/meeting/annual20/annual2k.htm.

CAST Division Plenary Session

1. Recent Developments in Computing and Systems Technology. Antony N. Beris, University of Delaware (Chair) and Conor M. McDonald, E. I. du Pont de Nemours & Company (Co-Chair).

Area 10a: Systems and Process Design

1. Process Synthesis. Andreas A. Linninger, University of Illinois at Chicago (Chair) and Il Moon, Yonsei University (Co-Chair).

2. Design and Analysis. Costas D. Maranas, Pennsylvania State University (Chair) and Priscilla J. Hill, Mitsubishi Chemical Corporation (Co-Chair).

3. Design for Flexible Manufacturing. Vassilis S. Vassiliadis, University of Cambridge (Chair) and Katerina Papalexandri, BP Amoco (Co-Chair).

Joint Area 10a and Area 10b Session

1. Integration of Design and Control. Vipin Gopal, Honeywell Inc. (Chair) and Michael L. Luyben, E. I. du Pont de Nemours & Company (Co-Chair).

Joint Area 10a and Area 10c Session

1. Batch Processing. Jonathan M. Vinson, G. D. Searle (Chair) and Yinlun Huang, Wayne State University (Co-Chair).

Joint Area 10a and Area 10d Session

1. Modeling and Computations for Process Design. Ashish Gupta, SUNY Buffalo (Chair) and Heinz A. Preisig, Eindhoven University of Technology (Co-Chair).

Joint Area 10a and Area 1a Session

1. Computational Chemistry in Design. Luke E. K. Achenie, University of Connecticut (Chair) and Claire S. Adjiman, Imperial College of Science, Technology and Medicine (Co-Chair).

Joint Area 10a and Area 2a Session

1. Design of Reactive Separation Systems. Viswanathan Visweswaran, Mobil Technology Company (Chair) and Vivek Julka, Aspen Technology, Inc. (Co-Chair).

Joint Area 10a and Area 2c Session

1. Computer-Aided Solvent Selection for Extraction. Jeffrey S. Kanel, Union Carbide Corporation (Chair) and Vincent Van Brunt, University of South Carolina (Co-Chair).

Joint Area 10a and Area 9 Session

1. Design for Environment and Safety. Marianthi G. Ierapetritou, Rutgers University (Chair) and Ahmad A. Hamad, Solutia Inc. (Co-Chair).

Area 10b: Systems and Process Control

1. Advances in Process Control. Vasilios I. Manousiouthakis, University of California, Los Angeles (Chair) and Mayuresh V. Kothare, Lehigh University (Co-Chair).

2. Modeling and Identification. Frank Allgöwer, ETH Zentrum (Chair) and Louis P. Russo, Exxon Chemical Company (Co-Chair).

3. Plant-Wide Control. Christos Georgakis, Lehigh University (Chair) and Kenneth A. Debelak, Vanderbilt University (Co-Chair).

4. Novel Methods in Nonlinear Process Control. Dennis D. Sourlas, University of Missouri, Rolla (Chair) and Martin Guay, Queen's University (Co-Chair).

5. Process and Control System Monitoring. Ali Cinar, Illinois Institute of Technology (Chair) and Michael A. Henson, Louisiana State University (Co-Chair).

Joint Area 10b and Area 10c Session

1. Real Time Optimization. Iauw-Bhieng Tjoa, Mitsubishi Chemical America, Inc. (Chair) and Thomas E. Marlin, McMaster University (Co-Chair).

Joint Area 10b and Area 10d Session

1. Distributed Parameter Systems. Panagiotis D. Christofides, University of California, Los Angeles (Chair) and Yannis G. Kevrekidis, Princeton University (Co-Chair).

Joint Area 10b and Area 2a Session

1. Control of Separation Processes. Athanasios Tsirukis, Air Products and Chemicals, Inc. (Chair) and To Be Announced by Area 2a (Co-Chair).

Joint Area 10b and Area 3d Session

1. Control of Particulate Systems. E. Scott Meadows, University of Delaware (Chair) and Doraiswami Ramkrishna, Purdue University (Co-Chair).

Joint Area 10b and Area 4 Session

1. Teaching Process Control and Dynamics with Practical Examples. Thomas F. Edgar, University of Texas (Chair) Dale E. Seborg, University of California, Santa Barbara (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing (Cosponsored by the International Cooperation Committee of the Society of Chemical Engineers, Japan). Frank X. X. Zhu, University of Manchester Institute of Science and Technology (Chair) and Matthew J. Realff, Georgia Institute of Technology (Co-Chair).

2. Planning and Scheduling. Viswanathan Visweswaran, Mobil Technology Company (Chair) and Marianthi G. Ierapetritou, Rutgers University (Co-Chair).

3. Simulation and Optimization of Dynamic Systems. Vipin Gopal, Honeywell Inc. (Chair) and Ashish Gupta, SUNY Buffalo (Co-Chair).

Joint Area 10c and Area 15a Session

1. Computational Methods in the Food, Agricultural, and Pharmaceutical Industries. Matthew H. Bassett, Dow AgroSciences (Chair) and Stephen P. Lombardo, The Coca-Cola Company (Co-Chair).

Joint Area 10c and Area 15d/e Session

1. Modeling and Operations Methods in Biosystems. Robert S. Parker, University of Delaware (Chair) and Vassily Hatzimanikatis, Cargill Corn Milling Division (Co-Chair).

Area 10d: Applied Mathematics and Numerical Analysis

1. Nonlinear Dynamics and Pattern Formation. Ranganathan Narayanan, University of Florida (Chair) and Vemuri Balakotaiah, University of Houston (Co-Chair).

2. Numerical Analysis. Yuriko Renardy, Virginia Polytechnic Institute and State University (Chair) and Duane T. Johnson, University of Alabama (Co-Chair).

3. Novel Computer Applications in Chemical Engineering. Ashish Gupta, SUNY Buffalo (Chair).

Joint Area 10d and Area 1j Session

1. Novel Numerical Methods in Fluid Mechanics. Radhakrishna Sureshkumar, Washington University (Chair) and Shiyi Chen, Los Alamos National Laboratory (Co-Chair).

Joint Area 10d and Area 8d Session

1. Applied Mathematics in Materials Processing. Stratos V. Sotirchos, University of Rochester (Chair) and Raymond A. Adomaitis, University of Maryland (Co-Chair).

Joint Area 10d and Area 15d/e Session

1. Applied Mathematics in Bioengineering. Kyriacos Zygourakis, Rice University (Chair), Ching-An Peng, University of Southern California (Co-Chair) and D. Rumschitzki, The City College of the City University of New York (Co-Chair).

## CAST DIVISION POSTER SESSION

Section A. Recent Developments in Systems and Process Design. Urmila M. Diwekar, Carnegie Mellon University (Chair) and Ka M. Ng, University of Massachusetts (Co-Chair).

Section B. Theory and Practice of Model Predictive Control. Alex Z. Q. Zheng, University of Massachusetts (Chair) and Evelio Hernandez, Shell Norco Refining Company (Co-Chair).

Section C. Topics in Systems and Process Control. Jorge A. Mandler, Air Products and Chemicals, Inc. (Chair) and Costas Kravaris, University of Michigan (Co-Chair).

Section D. Advances in Optimization. Miguel J. Bagajewicz, University of Oklahoma (Chair) and Scott E. Keeler, Dow AgroSciences (Co-Chair).

Section E. Process Safety - Design and Operation. Katerina Papalexandri, BP Amoco (Chair) and Il Moon, Yonsei University (Co-Chair).

Section F. Parallel Computing: Algorithms and Applications. Mark A. Stadtherr, University of Notre Dame (Chair) and Ioannis P. Androulakis, Exxon Research and Engineering Company (Co-Chair).

Section G. Issues and Topics in Computers in Operations and Information Processing. Paul I. Barton, Massachusetts Institute of Technology (Chair) and Conor M. McDonald, E. I. du Pont de Nemours & Company (Co-Chair).

Section H. Advances in Applied Mathematics. Antony N. Beris, University of Delaware (Chair) and Prodromos Daoutidis, University of Minnesota (Co-Chair).

EDUCATIONAL COMPUTER SOFTWARE DEMONSTRATIONS (Joint with Group 4) John T. Bell, University of Michigan (Chair) and Douglas J. Cooper, University of Connecticut (Co-Chair).

**Chemical Process Control: CPC 6**
**January 7-12, 2001**
**Location to be decided**

Meeting Co-Chairs:

James B. Rawlings, Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1415 Engineering Drive, Madison, WI 53706-1691, (608) 263-5859, 608-265-8794 (Fax), jbraw@bevo.che.wisc.edu.

Babatunde A. Ogunnaike, E. I. Dupont de Nemours and Co., Experimental Station, E1/104 Wilmington, DE 19880-0101, 302-695-2535, 302-695-2645 (Fax), ogunnaike@esspt0.dnet.dupont.com.

**2001 American Control Conference**
**June 18-20, 2001**
**Crystal Gateway Marriott**
**Arlington, Virginia**

General Chair: Bruce H. Krogh, Electrical and Computer Engineering Department, Carnegie Mellon University (412-268-2472 (voice) 412-268-3890 (fax) krogh@ece.cmu.edu, http://euler.ece.cmu.edu/people/fac/krogh.html).

Program Chair: B. Wayne Bequette, Rensselear Polytechnic Institute (518-276-6683 (voice) 518-276-4030 (fax) bequeb@rpi.edu, http://www.rpi.edu/dept/chem-eng/WWW/faculty/bequette/.

Web:
http://www.ece.nwu.edu/~ahaddad/aacc/acc.html#acc01

Important Note: The 2001 ACC takes place on Monday, Tuesday, and Wednesday.

**2002 American Control Conference**
**May 8-10, 2002**
**Anchorage Hilton Hotel**
**Anchorage, Alaska**

General Chair: R. R. Rhinehart (rrr@gibbs.cheng.okstate.edu)

Program Chair: Eduardo A. Misawa

Web:
http://www.ece.nwu.edu/~ahaddad/aacc/acc.html#acc02

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***Future CAST Division Programming:***
The CAST Division plans to actively participate at the AIChE Meetings listed below. Everyone interested in CAST program development is encouraged to attend the Area Programming Meetings at locations and times published in the Committee Meetings Directory available at the Meeting Registration Area. Programming for the two meetings in 2001 will be planned during the Dallas AIChE meeting in November. Those who cannot attend the area program meetings are encouraged to bring their specific ideas for programming to the attention of the Area Program Coordinators at the addresses indicated on the masthead.

**AIChE Spring National Meeting**
**March 26-29, 2001**
**Petrochemical & Refining Exposition**
**George R. Brown Convention Center**
**Houston, TX**

**AIChE Fall Annual Meeting,**
**October 21-26, 2001**
**Reno Hilton**
**Reno, NV**

**AIChE Spring National Meeting**
**March 10-15, 2002**
**New Orleans Hilton**
**New Orleans, LA**

**AIChE Fall Annual Meeting**
**2002--Dates and Location To Be Announced**
**(as of 8-17-99; please check for updates)**

**AIChE Spring National Meeting**
**March 9-13, 2003**
**Petrochemical Refining Exposition**
**George R. Brown Convention Center**
**Houston, TX**

**AIChE Fall Annual Meeting**
**November 16-21, 2003**
**San Francisco Hilton**
**San Francisco, CA**

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*Presented by*:

Edward M. Rosen
**EMR Technology Group**
Phone: 314-434-5498
e-mail: EMRose@compuserve.com

# CALLS FOR PAPERS FOR CAST SESSIONS

**Final Call for CAST Sessions**
**2000 AIChE Spring National Meeting**
**Atlanta, Georgia**
**March 5-9, 2000**

The names, addresses, and telephone numbers of the session chairs are given on the next several pages, as are brief statements of the topics to receive special emphasis in selecting manuscripts for these sessions. Prospective session participants are encouraged to observe the deadlines that have been established, but may be changed, by the Meeting Program Chair, Winston Ho. A complete call for papers for all sessions at this meeting may be accessed at http://www.aiche.org/meeting/spring20/spring2k.htm.

AIChE solicits electronic submission of proposals-to-present via the world wide web only. To submit to this meeting via the web, use the URL listed above. Do not send proposals-to-present to the session chair email addresses.

Atlanta Meeting deadlines:

September 2, 1999: Submit a proposal-to-present electronically to AIChE via web access at http://www.aiche.org. AIChE will forward proposals to the corresponding session chairs. Submission prior to this deadline is encouraged.

November 19, 1999: Session content finalized authors informed of selection by e-mail. Authors of accepted proposals may update abstracts electronically.

February 4, 2000: Authors submit hardcopy manuscript (presentation record) with a Permission to Reproduce Manuscript form to AIChE Manuscript Center.

March 5, 2000: Speakers bring 60 hardcopies of visual aids for distribution to the audience at the presentation. (This is a CAST Division policy intended to improve the quality of presentations and the benefit to the audience.)

Please note that there is an AIChE limitation that no person may author or coauthor more than four contributions at any one meeting.

Authors submitting by the above deadlines will be notified of decisions on acceptance as close to the deadlines above as the schedules of the session chairs, the Meeting Program Chair, and AIChE permit. Abstracts of accepted proposals will be available on the web for public browsing approximately one month before the meeting.

Presenters at AIChE meetings are reminded to send a hardcopy record of their presentation to the AIChE Manuscript Center no later than one month before the meeting. The purpose of this requirement is to improve the quality of presentations generally as well as to enable AIChE to more broadly disseminate ideas and results by filling requests for copies of presentation records during and after each meeting. AIChE and many of the programming groups encourage formal full-length manuscripts. The CAST Division has elected not to mandate any specific length or format requirements for presentation records for its sessions. However, the minimally acceptable content does consist of an introduction, results, discussion, and references which may be augmented with figures and tables, presentation visual aids, or poster panels. The Executive Board of the National Program Committee has adopted the policy that the advanced submission of a hardcopy presentation record is a condition for presenting at AIChE-sponsored meetings.

Area 10a: Systems and Process Design

1. Challenges for Design in Practice.

There has been considerable activity over the past decade focused toward the development of new process design methodologies and tools. However, the major benefit derived from new design tools occurs when the tools are applied to real chemical process problems to reduce costs, reduce emissions, debottleneck processes, increase capacity, etc. In this light, there are often significant challenges that are encountered when applying new design technology in industrial practice. Some of these hurdles include 1. Management-based issues - does management support new design technology from both a monetary and time allotment perspective, what are the benefits and drawbacks for employing technical resources within the industry to use new design technology versus using consultants, etc; 2. Technology-based issues - which design approaches should be used, for what types of design tasks, is the technical approach acceptable for the size of the design task (superstructure approaches for large problems, ability to obtain global solutions from non-linear programming design algorithms), etc; and 3. Personnel-based issues - how do we train engineers to use new design methodologies, how do we train engineers to accept new design approaches even if they can not use these approaches themselves, etc. Papers are invited that highlight actual experiences regarding these and other challenges encountered in design, in addition to papers that propose solutions to the above challenges.

**Session Chair**
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**Co-Chair**
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kktrive@fpe.erenj.com

2. Advances in Methods and Tools for Process Synthesis and Design.

Papers are requested that describe the development and use of systematic methods or computational tools for process synthesis and design. Of particular interest are those papers which describe successful applications in process development. While all papers are welcomed, we encourage industrial contributors to share their recent experiences in process design and synthesis. Commercial software vendors are also welcomed to describe new technological improvements in software tools.

**Session Chair**
Raymond Rooks
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**Co-Chair**
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3. Retrofitting, Debottlenecking, and Process Improvements.

Changes in economic structure and stricter environmental regulations have forced chemical industries to retrofit existing systems to improve production and performance. Retrofit projects are performed to improve process efficiency, energy efficiency, reduce emissions, debottleneck to increase throughput, and sometimes to address controllability. This session will focus on new methods, new techniques, and their applications in the above areas. Industrial experience and case studies are encouraged.

**Session Chair**
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**Co-Chair**
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4. Reviews and Tutorials in Process Design.

Review papers and tutorials are being sought for recent applications and developments in chemical process design. The contributions can address proven success stories both in academic and industrial practice. Tutorials on new concepts that have a high potential for successful implementations in industry in the context of process design are also encouraged.

**Session Chair**
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**CAST Programming Tips**
**1.** Submit Proposals-to-Present early via the world wide web. Submissions to the Fall Annual Meeting sessions participating in Centralized Review automatically will be considered for all appropriate sessions.

**Co-Chair**
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Joint Area 10a and Area 9 Session

1. Environmental Issues in Design.

Environmental regulations changed the structure of the chemical industry forcing the existing chemicals productions systems to be re-designed so that pollution is prevented. For a while, these retrofit projects consisted mainly of end-of-pipe designs whose goal is to remove pollutants and assure their proper disposal. Later, the term pollutant interception was coined to introduce the concept of removal of pollutants throughout the process and eventually recycling them so that disposal in whatever form is avoided. Finally, the idea of preventing the production of pollutants within the chemical process in the first place started to gain acceptance. All these forms of grassroots design and retrofit design coexist today and have to conform not only to the aforementioned regulations about disposal, but also make plants profitable, controllable, safe and flexible. This session will focus on theoretical and practical approaches, new trends, and new methods in the area of environmentally sensitive (green) designs. Topics of special interest include environmental design tools, design software packages, case studies, and techniques. Industrial case studies where systematic approaches have been used are especially encouraged to be submitted.

**Session Chair**
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Area 10b: Systems and Process Control

1. Control of Pulp and Paper Processes.

Papers are invited on topics related to the development and application of new control and systems theory and technology to pulp and paper processes. Applications can range from single process units (e.g. digester, lime kiln, paper machine) to collections of units (e.g., bleaching section) and complete mill operations. Topics of interest include, but are not limited to, mill-wide control and information systems; on-line optimization; performance monitoring and product quality control; dynamic modeling and model predictive control; integration of new sensors with advanced control implementations; data mining, and operator decision support systems.

**Session Chair**
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**Co-Chair**
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Area 10c: Computers in Operations and Information Processing

1. Enterprise Resource Planning in the Process Industries.

The process industries are making heavy investments in Enterprise Resource Planning (ERP) systems to serve as platforms for tighter cost control and more agile business. To realize gains from these investments, companies must grapple with issues such as data integrity, building business models, electronic interchange of data, collaborative inter-business planning, enterprise optimization, integration of ERP systems with lower level software platforms, and employee training. The purpose of this session is to serve as a review of ERP activity in the process industries and discuss technology trends that will have an impact on ERP systems.

**Session Chair**
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**Co-Chair**
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**CAST Programming Tips**
**2.** Submission of Proposals-to-Present to multiple sessions is permitted by AIChE and the web software, but may decrease chances of acceptance by the CAST Division.

Joint Area 10c and Area 12a Session

1. Process Innovation Case Studies.

**Session Chair**
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Joint Area 10c and Area 15b Session

1. Applications of Modeling and Optimization in Food, Pharmaceutical and Agricultural Chemical Design and Production.

The pharmaceutical, agricultural and food chemical segments have many features that have led to difficulty in applying traditional process analysis, design and simulation techniques. Several software vendors have produced tools to address this segment of the process simulation market. In this session we seek papers that describe the application of these types of tools to various industrial problems in these segments of the chemical industry. We particularly solicit submissions from practitioners who are willing to share their experiences in process modeling and simulation and who can address the outstanding needs of this segment within the process modeling and optimization domain. We also seek submissions that describe the application of computational modeling techniques in the broad areas of: 1. product design - e.g. use of molecular modeling techniques to predict and design product properties; 2. process design - e.g. methods for and case studies in supporting process design for the food industry, characterizing process variability, representing complex recipes, and modeling unit operations; 3. process planning, scheduling and operation - e.g. methods for proactive and reactive scheduling and batch recipe control; 4. process optimization - e.g. methods, and/or examples of successful optimization of processes using computational tools; and 5. online control and reactive scheduling - e.g. methods to respond to process variability in real time.

**Session Chair**
Stephen P. Lombardo
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**Co-Chair**
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## First Call for Papers, CAST Sessions 2000 AIChE Fall Annual Meeting Los Angeles, California November 12-17, 2000

The names, addresses, and telephone numbers of the session chairs are given on the next several pages, as are brief statements of the topics to receive special emphasis in selecting manuscripts for these sessions. Prospective session participants are encouraged to observe the deadlines, which have been established, but may be changed, by the Meeting Program Chair, Mark J. McCready. A complete listing of sessions for this meeting may be accessed at http://www.aiche.org/meeting/2000/annual/cfp/.

AIChE accepts electronic submission of proposals-to-present via the World Wide Web only. See the information on http://www.aiche.org. Do not send proposals-to-present to the session chair email addresses.

**CAST Programming Tips**
**3.** It is AIChE policy that a person may not author or co-author more than four presentations at any one meeting. The CAST Division supports this policy.

SPECIAL NOTE TO AUTHORS SUBMITTING ABSTRACTS FOR ANNUAL MEETING SESSIONS:

Because of the large number of anticipated presentation proposals for annual meetings and the limited symposia space available, and in order to maximize the number of good proposals that can be accepted and generally improve programming quality, all proposals for Fall 2000 CAST programming will be subjected to a Centralized Review process:

1. Abstracts will receive anonymous reviews by three or four session chairs, co-chairs, and Area Program Coordinators for technical content, novelty and style. Submissions may be shifted between sessions or other CAST areas as appropriate.

2. Each area will sponsor one or more sections of the Division Poster Session. Some areas may develop topical themes for their sections while others may have a more general scope to accommodate late news. Unless directed otherwise by the author, all proposals will be considered for both symposium and poster sessions.

## Los Angeles Meeting Deadlines:

May 1, 2000: Submit a proposal-to-present electronically to AIChE via web access at http://www.aiche.org. All proposals to CAST-sponsored sessions at the Los Angeles meeting will be subject to centralized reviews by the appropriate CAST area. Submission prior to this deadline is encouraged.

June 15, 2000: Session content finalized and authors informed of selection by e-mail. Authors of accepted proposals may update abstracts electronically.

October 15, 2000: Authors submit hardcopy manuscript (presentation record) with a Permission to Reproduce Manuscript form to the AIChE Manuscript Center in New York.

November 12, 2000: Speakers bring 60 hardcopies of visual aids for distribution to the audience at the presentation. (This is a CAST Division policy intended to improve the quality of presentations and the benefit to the audience.)

Please note that there is an AIChE limitation that no person may author or coauthor more than four contributions at any one meeting.

Authors submitting by the above deadlines will be notified of decisions on acceptance as close to June 15 as the schedules of the reviewers, session chairs, the Meeting Program Chair, and AIChE permit. Abstracts of accepted proposals will be available on the web for public browsing approximately one month before the meeting.

Presenters at AIChE meetings are reminded to send a hardcopy record of their presentation to the AIChE Manuscript Center in New York no later than one month before the meeting. The purpose of this requirement is to improve the quality of presentations generally as well as to enable AIChE to more broadly disseminate ideas and results by filling requests for copies of presentation records during and after each meeting. AIChE and many of the programming groups encourage formal full-length manuscripts. The CAST Division has elected not to mandate any specific length or format requirements for presentation records for its sessions. However, the minimally acceptable content does consist of an introduction, results, discussion, and references which may be augmented with figures and tables, presentation visual aids, or poster panels. The Executive Board of the National Program Committee has adopted the policy that the advanced submission of a hardcopy presentation record be a condition for presenting at AIChE-sponsored meetings.

## CAST Division Plenary Session

1. Recent Developments in Computing and Systems Technology.

Plenary papers describing recent advances, and new challenges in each of the CAST areas (Systems and Process Design, Systems and Process Control, Computers in Operations and Information Processing, and Applied Mathematics and Numerical Analysis) will be invited by the CAST programming board. The papers are intended to be accessible to a wide audience with interests in any and all of the CAST areas. It is anticipated that this session will be scheduled on Monday morning and that no other CAST sessions will be scheduled in parallel in order to facilitate the broadest possible communication.

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Area 10a: Systems and Process Design

1. Process Synthesis.

This session invites contributions from academia and industry in the area of process synthesis. Topics of interest include but are not limited to flowsheet synthesis, synthesis of energy integrated processes, reactor network synthesis, synthesis of separation and reactive separation systems, and synthesis of environmentally friendly processes. Practical applications, and new strategies for flowsheet generation, model development and solution techniques are particularly encouraged.

**Session Chair**
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2. Design and Analysis.

Papers are sought in the general area of design and analysis of continuous and batch processes. The session will focus on fundamental as well as application-oriented issues. Topics may include, but are not limited to, conceptual design methodologies, novel techniques for the design and analysis of process alternatives, retrofitting of process plants, thermodynamic issues in chemical process/product design and molecular design. The illustration of the proposed analysis and design techniques with case studies of industrial significance is encouraged.

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3. Design for Flexible Manufacturing.

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Joint Area 10a and Area 10b Session

1. Integration of Design and Control.

This session focuses on the general topic of the integration of process design and process control. Poor control of a chemical process can sometimes be the result of limitations in the plant design. Significant improvements in dynamic process controllability can often be achieved at the design stage by examining issues such as disturbance rejection, startup/shutdown, and variable grade/rate production. Both industrial and academic papers are sought which address the problem of incorporating controllability and operability into the process design (general procedures, methodologies, tools, case studies, etc.).

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Joint Area 10a and Area 10c Session

1. Batch Processing.

Papers are invited in the general area of design and operation of batch processes. Topics of interest include, but are not limited to, flowsheet synthesis, scale-up, process modeling, design, rating and/or retrofit of existing facilities, operations planning and modeling (including modeling under uncertainty), sequencing and scheduling, and optimization. Contributions that describe industrial applications are particularly encouraged.

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Joint Area 10a and Area 10d Session

1. Modeling and Computations for Process Design.

**Session Chair**
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Joint Area 10a and Area 1a Session

1. Computational Chemistry in Design.

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Joint Area 10a and Area 2a Session

1. Design of Reactive Separation Systems.

**Session Chair**
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Joint Area 10a and Area 2c Session

1. Computer-Aided Solvent Selection for Extraction.

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Joint Area 10a and Area 9 Session

1. Design for Environment and Safety.

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Area 10b: Systems and Process Control

1. Advances in Process Control.

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2. Modeling and Identification.

**Session Chair**
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3. Plant-Wide Control.

Contributions are sought in all aspect of Plant-Wide Control. Of special interest are methodological approaches to the problem as well as industrial application that reveal both the strengths as well as the weaknesses in a given methodology. Model based approaches are of critical interest. Priority will be given to submissions that treat large scale problems.

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4. Novel Methods in Nonlinear Process Control.

Contributions are sought in the general area of nonlinear control including, but not limited to, model predictive control, control of differential-algebraic systems, differential geometric control, modeling of nonlinear systems, and nonlinear dynamic analysis of control systems.

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5. Process and Control System Monitoring.

Contributions are sought on theoretical and application studies related to process and control system performance and diagnosis. The field covers methods to ensure process safety, high product quality, process operability, optimum process performance, and process profitability. Industrial implementations are particularly welcome. Topics include but are not limited to monitoring and diagnosis tools based on multivariate statistical methods, neural networks, process chemometrics, fuzzy logic, knowledge-based systems, and other system theoretic, statistical, and artificial intelligence methods.

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SUBMISSION AND PRESENTATION DETAILS

A one-page abstract and a completed proposal-to-present (PTP) form must be submitted electronically via the AIChE web page by 1 May 2000 (this is a hard deadline). Further submission details can be found on the world-wide-web at http://www.aiche.org/docs/meeting, and at http://www.aiche.org/meeting/2000/annual/cfp/.

The CAST 10b programming committee considers it unacceptable to submit the same abstract to more than one session; therefore, such multiple submissions may be disqualified. When sessions are oversubscribed, the committee will move papers to more appropriate sessions and actively seek permission for additional sessions from the Meeting Program Chair.

Joint Area 10b and Area 10c Session

1. Real Time Optimization.

**Session Chair**
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Joint Area 10b and Area 10d Session

1. Distributed Parameter Systems.

**Session Chair**

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Joint Area 10b and Area 2a Session

1. Control of Separation Processes.

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**Co-Chair**
To Be Announced by Area 2a

Joint Area 10b and Area 3d Session

1. Control of Particulate Systems.

**Session Chair**
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Joint Area 10b and Area 4 Session

1. Teaching Process Control and Dynamics with Practical Examples.

**Session Chair**
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Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing (Cosponsored by the International Cooperation Committee of the Society of Chemical Engineers, Japan).

Contributions are sought describing methodological developments, implementations, and experiences with all aspects of CIM in the process industries. Subjects of particular interest include integration of application areas such as plant information systems, monitoring, diagnosis, control, scheduling, planning, optimization, and design, as well as developments within application areas themselves that focus on integration issues. Presentations of industrial experiences with CIM technology and critical discussions of limitations/advantages of current approaches are also welcomed.

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2. Planning and Scheduling.

Papers are solicited in the area of process operations with an emphasis on contributions that present applications of optimization to planning, scheduling, and supply chain management problems. Papers with a strong relevance to industrial applications are particularly encouraged.

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3. Simulation and Optimization of Dynamic Systems.

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Joint Area 10c and Area 15a Session

1. Computational Methods in the Food, Agricultural, and Pharmaceutical Industries.

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Joint Area 10c and Area 15d/e Session

1. Modeling and Operations Methods in Biosystems.

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Area 10d: Applied Mathematics and Numerical Analysis

1. Nonlinear Dynamics and Pattern Formation.

Papers are sought on nonlinear spatio-temporal patterns in chemical systems. Of specific interests are reaction-diffusion systems, wave dynamics, mixing kinematics and fluid dynamics and dynamics of systems under control. Experimental, computational and theoretical papers are all welcomed.

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2. Numerical Analysis.

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3. Novel Computer Applications in Chemical Engineering.

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**Co-Chair**
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Joint Area 10d and Area 1j Session

1. Novel Numerical Methods in Fluid Mechanics.

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Joint Area 10d and Area 8d Session

1. Applied Mathematics in Materials Processing.

**Session Chair**
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Joint Area 10d and Area 15d/e Session

1. Applied Mathematics in Bioengineering.

The symposium will focus on the application of mathematics to bioengineering, with an emphasis on experimental results and computational simulations. Topics include (but are not limited to) models describing cell biophysics, drug delivery, microbial transport, environmental interactions, genetic engineering and pharmacokinetic applications, cybernetic model development and reflex circuitry modeling.

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**CAST Programming Tips**
**4.** Every presenter is expected to send a hardcopy record of their presentation (with a Permission to Reproduce Manuscript Form) to the AIChE Manuscript Center no later than one month before the meeting. Full-length manuscripts are encouraged by AIChE. The CAST Division has elected not to mandate any specific length or format requirements for presentation records for its sessions. However, the minimally acceptable content does consist of an introduction, results, discussion, and references which may be augmented with figures and tables, presentation visual aids, or poster panels.

## CAST DIVISION POSTER SESSION

Section A. Recent Developments in Systems and Process Design.

This poster session will present new and interesting results in systems and process design. Poster topics include but are not limited to process synthesis and optimization, design under uncertainty, synthesis of reaction, separation, heat exchanger networks, and hybrid systems, environmentally oriented design, and design for controllability and flexibility.

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Section B. Theory and Practice of Model Predictive Control.

Papers addressing new theoretical developments, applications and implementations in the area of model predictive control are solicited. Topics of interest include, but are not limited to novel MPC algorithms; stability issues; robustness issues; tracking; estimation techniques; implementation issues; applications and case studies.

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Section C. Topics in Systems and Process Control.

All interested persons are invited to submit poster presentations that address topics in the area of chemical process control. Papers that present new theoretical results, innovative strategies, new applications, and new problem areas are strongly encouraged. Prospective authors should clearly state the contribution of their work to the advancement of the current state of knowledge in the field. The topic and research area is open.

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Section D. Advances in Optimization.

Papers are solicited which describe optimization of processes in the chemical industries. Papers that address the following issues are especially encouraged: 1) New algorithms for nonlinear, mixed integer, global and stochastic optimization for design and retrofit as well as for process and product development, and 2) novel applications of optimization techniques for solving problems related to chemical process operations, scheduling and planning. Priority will be given to methods that have proven useful in practice. Industrial examples are especially welcomed.

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Section E. Process Safety - Design and Operation.

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Section F. Parallel Computing: Algorithms and Applications.

Impressive gains in computing technology, especially the widespread availability of parallel computing hardware, as well as recent advances in the enabling software technology, are making possible today the solution of large-scale, realistically modeled chemical process engineering problems, even in a real-time environment. Papers are sought that describe: 1. novel numerical algorithms and codes that promote the use of high performance computing

in process engineering; and 2. applications of high performance computing technology and techniques to solve large-scale process engineering problems. Applications of interest include process simulation, online and off-line optimization, and control. Also of interest are applications in fundamental process modeling, including transport phenomena, molecular dynamics, etc. Industrial applications are particularly welcome.

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Section G. Issues and Topics in Computers in Operations and Information Processing.

Poster papers are solicited that describe results in the area of process operations and information processing. Theoretical developments and applications are welcome. Topics may include, but are not limited to: planning, scheduling, and supply chain management; decision support systems; process performance monitoring and diagnosis; optimization; fault detection and classification; quality management; chemometrics and applied statistics.

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Section H. Advances in Applied Mathematics.

Posters describing recent original results of interest in the areas of applied mathematics and numerical analysis are solicited.

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## EDUCATIONAL COMPUTER SOFTWARE DEMONSTRATIONS (Joint with Group 4)

This session will present live software demonstrations, which showcase how computers are enhancing instruction in the chemical engineering curriculum. Software will be considered which show a novel pedagogy for the classroom or laboratory, for presenting information, assessing Student knowledge, helping students explore new concepts, or helping them analyze important problems. Presenters will be provided space including a table, power strip and bulletin board where you can demonstrate your software and display poster material.

**Chair**
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CAST Division Programming Chair: Michael F. Malone, Department of Chemical Engineering, University of Massachusetts, Amherst, MA 01003-3110, 413-545-0838, 413-545-1647 (FAX), mmalone@ecs.umass.edu.

Society for Computer Simulation: Ariel Sharon, Computer Simulation Technologies, Inc., 459 Quail Drive, Naperville, IL 60565, 708-983-5195, 708-983-5249 (FAX), asharon@ix.netcom.com.

Society of Chemical Engineers, Japan: Iori Hashimoto, Chemical Engineering Department, Kyoto University, Yoshida-Honmachi Sakyo-ku, Kyoto 606-01, JAPAN 81-75-753-5567, 81-75-752-9639 (FAX), hashimoto@cheme.kyoto-u.ac.jp.

**CAST Programming Tips**

**5.** In addition, it is a CAST Division requirement that every speaker bring a sufficient number of hardcopies of their visual aids for distribution to the audience at the presentation.

Past postings on the CAST10 Email List are archived on the World Wide Web at **http://www.che.wisc.edu/cast10**

# Join the CAST Division of AIChE!

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I am a member of AIChE: _____ Yes _____ No

(If not, I understand that I must join AIChE within a one-year period to continue as a CAST Division member.)

_____ My CAST dues of $10 are enclosed

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Please mail this application to:

**American Institute of Chemical Engineers**
**Computing and Systems Technology Division**
**3 Park Avenue**
**New York, NY 10016-5901**

# American Institute of Chemical Engineers

# 2000 Award Nomination Form*

## A. Background Data

1. Name of the Award _____ Today's Date _____

2. Name of Nominee _____ Date of Birth _____

3. Present Position (exact title)

_____

4. Education

| Institution | Degree Received | Year Received | Field |
|---|---|---|---|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

5. Positions Held

| Company or Institution | Position or Title | Dates |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

6. Academic and Professional Honors (include awards, memberships in honorary societies and fraternities, prizes) and date the honor was received. Use separate page.

7. Technical and Professional Society Memberships and Offices. Use separate page.

8. Sponsor's Name and Address

_____

_____

_____

Sponsor's Signature

_____

*A person may be nominated for only one award in a given year.

***THE DEADLINE FOR AWARD NOMINATIONS IS April 15, 2000.***

# B. Citation

1. A brief statement, not to exceed 250 words, of why the candidate should receive this award. (Use separate sheet of paper, please.)
2. Proposed citation (not more than 25 carefully edited words that reflect specific accomplishments).

# C. Qualifications

Each award has a different set of qualifications. These are described in the awards brochure. After reading them, please fill in the following information about the nominee where appropriate. Use a separate sheet for each item if necessary.

1. Selected Bibliography (include books, patents, and major papers published).
2. Specific identification and evaluation of the accomplishments on which the nomination is based.
3. If the nominee has previously received any award from AIChE or one of its Division, an explicit statement of new accomplishments or work over and above those cited for the earlier award(s).
4. Other pertinent information.

# D. Supporting Letters and Documents

List of no more than five individuals whose letters are attached.

| | **Name** | **Affiliation** |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |

**Please send the completed form and supplement sheets to the CAST Division 2nd Vice Chair, James F. Davis, Department of Chemical Engineering, Ohio State University, Columbus, OH 43210-1180, E-mail: jfdavis@osu.edu, Phone: 614-292-0090, Fax: 614-292-3769**

***THE DEADLINE FOR AWARD NOMINATIONS IS April 15, 2000.***

# CAST COMMUNICATIONS

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