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

by Jeffrey Siirola, Peter R. Rony, and Scott Keeler

As our most important item of information, we report highlights of the manuscript policy adopted by the executive board of the AIChE national program committee.

"The intent of this policy is that every presenter at AIChE meetings submit a meaningful written record of the presentation to AIChE in advance of the meeting. This is intended to both improve the quality of the presentation and also to enable AIChE to make copies of the record available to all who may request them.

"Formal full-length manuscripts are specifically encouraged as a format for this presentation record. However, freedom is given to Programming Groups to develop suggested or mandatory presentation record requirements, for example length, format, and content, if they so choose. In the absence of other requirements, a minimally acceptable content specification is defined as an extended abstract including an introduction, results, discussion, and references which may be augmented with figures and tables, presentation visual aids, or poster panels. No obligations are placed on Programming Groups that choose to mandate specific presentation record requirements, for example formal full-length manuscripts. However, it is anticipated that Programming Groups that demand such effort, but do not subject the resulting manuscripts to a quality peer review and publication process will in time attract few presenters.

"Likewise, presenters planning on publication elsewhere will probably not propose to present at sessions requiring full-length manuscripts. All presenters are expected to comply with this policy. Failure to comply may affect acceptance of future Proposals-to-Present submitted by the presenter, and future session allocation to the sponsoring Programming Group. Session Chairs will have the responsibility to encourage presenters to meet the presentation record submission deadline."

Jeffrey Siirola reports that the CAST Division executive committee has not yet met to consider whether as a programming group it will (as allowed by the policy) encourage, suggest, or mandate any particular manuscript format or length – for the presentation record – to be submitted by presenters at sessions that the CAST Division organizes. In the meantime, the minimal content acceptable to AIChE will be acceptable to CAST.

The CAST Division expects all of its speakers to submit a presentation record to AIChE headquarters by the manuscript deadline, and in addition to bring copies of their visual aids to their presentation for distribution to the audience. This requirement starts with the Fall Annual Meeting in Los Angeles. The deadline for submission of manuscripts for the Fall Annual Meeting in Los Angeles is October 16, 1997.

The CAST Division is at a crossroads concerning the possibility of a future transition from mailed, hard- copy-based issues of CAST Communications to a complete web site. The Publications Board shall begin evaluating the advantages and disadvantages of such a transition starting in late September 1997. We solicit the opinions of CAST Division members, either written or by email (please send your opinions both to Peter Rony and Scott Keeler). Some matters to consider include the following:

1. Each issue – feature articles, communications, award winner write-ups, meetings, seminars, Calls for Papers, and so forth -- could be placed on the World Wide Web at the rate of two issues per year.

2. If a transition is made from hard copy to an all-electronic CAST Communications, it should be possible to reduce the amount of the CAST Division annual dues.

3. If a transition is made to a web-based CAST Communications, would it even be appropriate to charge CAST Division member any dues at all? It should be noted that though CAST Communications is the dominant CAST division expense, there exist other, minor divisional expenses.

4. Many local AIChE sections now have web sites, which have to be registered with AIChE headquarters to assure conformance with minimal standards. Therefore, mutual links between the proposed CAST Division web site and AIChE local sections could be created as a service to all AIChE members who participate in local sections. The same would be true for all AIChE divisions that maintain web sites.

5. Should the CAST Division maintain its own web site? Who would like to be a webmaster for the CAST Division, exclusive of CAST Communications? Should the CAST Division have two webmasters, one for the Division site and a second for the newsletter?

The programming and editorial boards did not receive all the paper calls for the Miami Beach that we needed. Once the flow trickled to a halt, we moved forward with the publication of this newsletter issue. Jeff Siirola took the liberty of supplying some paragraphs based upon earlier editions (e.g., CAST plenary session 10c-1 (CIM), 10c/15a-

1 (Food Processing), 10d-2 (Nonlinear Dynamics), and the poster sessions for 10b, 10c, and 10d.

In this Summer issue, we engage in our annual tradition of reporting on the CAST Division award winners. John MacGregor, Chair and Professor of Chemical Engineering at McMaster University, will receive the 1997 CAST Computing in Chemical Engineering at the Los Angeles Annual meeting CAST Division banquet, at which time he will deliver an award address. Gary Blau, a former chairman of the CAST Division, will receive the 1997 CAST Computing Practice Award. Finally, Metin Turkay will receive the Ted Peterson Student Paper Award. We would like to have all CAST Division members at the LA meeting participate in the CAST Division banquet to both listen to and acknowledge our honorees.

ARTICLES

A Systems Engineering Approach to New Product Development

by Gary Blau, Fellow
DowElanco--Indianapolis, Indiana

Gary Blau is this year's winner of the CAST Chemical Practice Award. The editors invited him to contribute a paper to this issue of CAST communications describing some aspect of the work for which he is being recognized.

Introduction

I am truly honored to receive the CAST Chemical Practice Award. I have the greatest respect and admiration for the previous award winners, and I am delighted to be included as one of them.

After graduating from the chemical engineering department of Stanford University, I joined the Dow Chemical Company in Midland, Michigan. Since that time, I have been involved with promoting quantitative thinking and mathematical modeling throughout the company. In the early years of my career, the applications centered around improving the design and operation of chemical plants. Inherent to this activity was the need to build and validate mechanistic models describing the chemical reactor itself, the heart of any chemical process. Much of my research work dealt with combining optimization theory and statistical analyses into a sequential experimentation-analyses methodology for accomplishing this task [1,2,3,4]. In the past, this approach was extended and applied to a variety of problems ranging from reactor modeling to environmental modeling [5,6]and pharmacokinetic modeling [7,8,9]. Eventually, it was incorporated into the SimuSolv* computer program which is widely used both inside and outside Dow [10,11].

In 1989, DowElanco was formed. DowElanco, a joint venture of Dow Chemical Company and Eli Lilly and Company, resulted from the merger of the agrochemical businesses of the two parent companies. Because of its focus on a particular segment of the chemical industry, I was afforded the opportunity to apply my modeling expertise to business work processes. In this article, I would like to describe one of these applications; the improvement of the new product development process. Although specifically designed for developing new agrochemical products, the methodology can be used in any growth industry where cooperation and communication between diverse work processes, technical breakthroughs, regulatory hurdles and market uncertainties play important roles.

Decision Making in a Growth Company

Any growth company is faced with making decisions at various levels in the organization. The company's board of directors has to decide:

How should resources be deployed to maximize the impact on company profits?
How do we gain the most bang from our Capital bucks?
What is the appropriate funding level for new products?

For example, the board of DowElanco, with sales exceeding 2 billion, must decide how what fraction of sales to allocate to new product R&D.

Once decisions are made at the board level, management of the growth areas must decide:

How can new products/markets be identified?
How should we prioritize R&D projects to maximize long-term company profits?
How do we manage the product development process from identification to product launch?

Finally, the managers of the individual work processes (e.g. make product, test product etc.) need to grapple with the following different, but related issues:

How do we improve the efficiency of the individual work processes?
How do we acquire/deploy resources and monitor activities?
How can we insure successful scale-up and product launch?

This decision making hierarchy is shown in Figure 1.

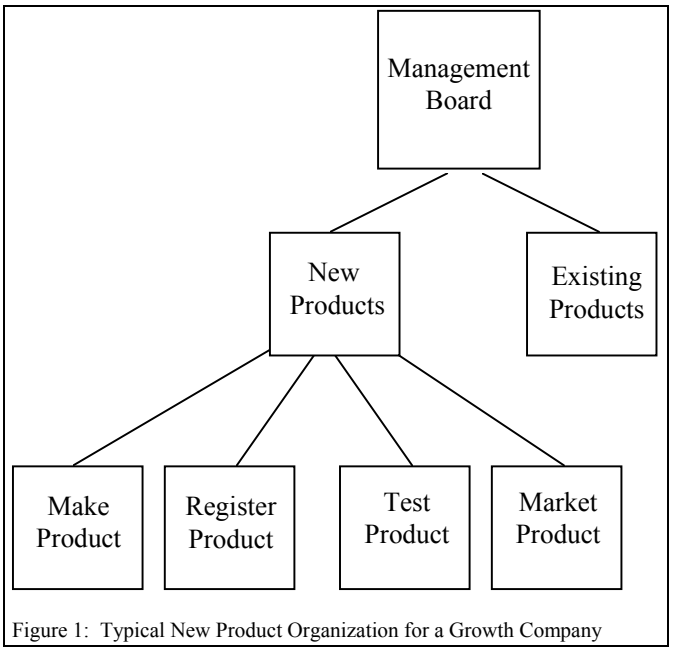

Figure 1: Typical New Product Organization for a Growth Company

The diagram does not show the work processes involved with existing products since that is not the subject of this paper. However, new products eventually become existing products and some of the work processes are shared by both functions (e.g. make product, market products).

The situation is not as "top-down" as the diagram would indicate. The status of the current new product portfolio and the queue of new product ideas waiting to enter the pipeline greatly influences the extent to which upper management will support growth projects.

From its inception, one of the guiding principles of R&D in DowElanco was to use quantitative thinking and mathematical modeling throughout the organization from discovery of new products through product launch and commercialization. This provided the entree needed for me and my mathematical modeling colleagues to introduce the use of quantitative decision making tools to help managers answer the above questions.

Introducing Uncertainty into the Decision Making Process

One of the claims of the Information Management revolution is that "it places a wealth of data and information in the hands of the decision maker at the time he/she needs it." It has been my experience that there is so much data available, it is frequently ignored. Quality decision making requires more than mountains of data. An essential component is the ability to extract relevant knowledge from the data. At DowElanco, we have found that mathematical modeling is an essential tool for "knowledge mining", i.e. translating data and information into knowledge that will help produce quality decisions.

Data is frequently conflicting or uncertain. One of my challenges was to help management deal with this uncertainty rather than conveniently ignore its existence. I found the use of simple cumulative probability distributions very helpful. Rather than reporting a single value for a performance criterion, e.g. NPV, management was exposed to "probability speak". Let me relate a particular example: Using a conventional deterministic approach, the business case for a new biotechnology project brought forward for management support indicated an NPV of $50,000,000 and a launch date of 10 years for a fixed resource level. However, after subjecting the project to a probabilistic modeling approach (detailed below) to accommodate uncertainties in future price and volume forecasts, technical feasibility and resource variations, the distributions shown in Figures 2 and 3 were obtained:

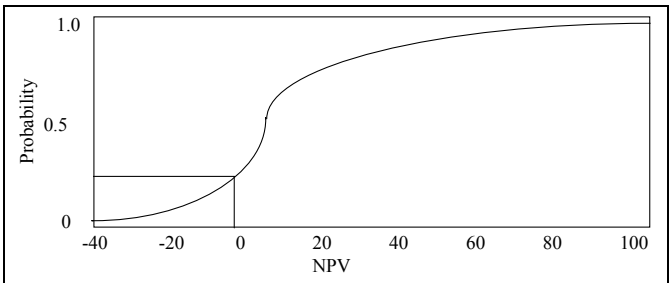

Figure 2: Cumulative Distribution of NPV for Biotech Project

There is a wealth of additional information in Figure 2 to help management make decisions. The cumulative distribution of NPV indicates a probability of 25% that the NPV will be less than zero, only a 10% chance that it will be $50,000,000 or greater and a paltry 1% probability that the NPV will be greater than $100,000,000. The upside and downside economic risks associated with the project are now apparent.

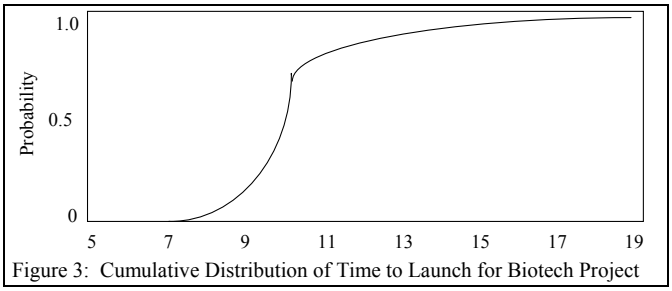

Figure 3: Cumulative Distribution of Time to Launch for Biotech Project

If the project is technically successful, then Figure 3. indicates the time before the project is launched. There is a non-zero probability of launching the project as early as eight years, but a more foreboding 18 years is equally likely. Thankfully, there is a high probability (>75%) that the launch time will be less than 11 years.

Although not included here, it is easy to calculate the probabilities of specific technical activities terminating or delaying a project. It is also possible to quantify the effect on NPV and the time to launch of changing the level of resources committed to the project. These studies can help management better manage risk and plan future resources.

Project Planning and Prioritization

If a company has unlimited resources, then decisions to advance projects could be made using a similar type of analysis. Unfortunately, or fortunately depending on your perspective, there are generally many more projects than available resources. In DowElanco, the challenge of allocating scarce resources among the many available projects is referred to as "that wonderful terrible problem". The problem is to define a multiyear project portfolio which will maximize the long term benefits to the company. This involves both project prioritization as well as resourcing issues. At DowElanco, we have evolved an approach which has been used both for new and existing projects.

The first step is to agree on one or more performance criteria, definitely a non-trivial task. Then, each sponsoring organization (e.g. global areas, businesses, etc.) for each project must supply the following:

I. Anticipated price and volume forecasts with the uncertainties for the life of the project
II. Expected contribution to enhanced product quality and/or environmental impact (generally difficult to quantify)
III. Assessment of technical risk for project
IV. Resource requirements by major work processes for the next three years

All of this data is brought into a central spread sheet database, such as Excel*. Once values for all of the variables are specified, Excel can be used to solve the following integer program (IP), known in the Operations Research literature as a multiple resource constrained knapsack problem [12]:

$$\underset{X_i}{\text{maximize}} \quad \sum_{i=1}^{M} (NPV_i + Q_i + E_i)R_iX_i$$

subject to the constraints:

$$\sum_{i=1}^{M} a_{ijk}X_i < b_{jk} \qquad = 1,,,N \; ; \; k = 1,\ldots,P$$

where Xi = (1 if project is selected/ 0 if project not selected)

a_{ijk} = resource requirements for ith project in jth year for the kth work process.

b_{jk} = available resources in the jth year for the kth work process.

NPV_i = Net present value for project i (or some other performance measure)

Q_i = quality contribution for project i

E_i = environmental contribution for project i

R_i = technical risk factor for project i (between 0 and 1)

M,N,P = number of projects, years and work processes, respectively.

The challenge, as usual, is to incorporate uncertainties into the analysis. We accomplish this task by simply embedding the spread sheet in a monte carlo shell using Crystal Ball*. Then, price and sales volume distributions can be used directly to calculate NPV's for each project. IP's are solved for each set of NPV's. The next step is to use the results from the IP solutions to prioritize the M projects. This is done simply by counting the number of times a project is in the optimal solution and ranking it based on the relative frequencies. It turns out, in practice, that certain projects are always in the optimal solution while others never appear. For larger problems, this may prove to be computationally not feasible. However, we have found this approach to work effectively for M <50, N<3 and P <3.

A final step in the prioritization process is to determine the sensitivity of the solution compared to changing resource levels. The impact on the overall expected NPV is a strong driver for reallocating resource levels in the various work functions. This will be addressed in more detail in the next section.

New Product Ideation and Development

Project prioritization is generally performed after the total growth budget has been set by the management board. In this section, we will touch on two issues: 1) identifying new growth projects for input into the prioritization process, and 2) managing the projects once they have been prioritized to insure that they are completed on time and within budget. Figure 4 represents the steps involved in generating new products from idea to ultimate commercialization.

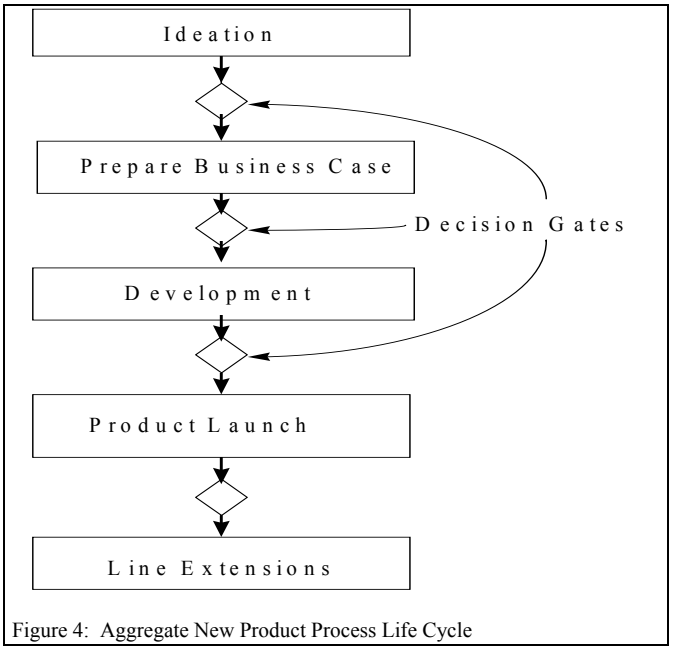

Figure 4: Aggregate New Product Process Life Cycle

In its simplest form, new ideas are generated from various sources internally and externally to an enterprise. These ideas are then loosely screened for technical and economic feasibility with a business case developed for the more promising candidates. We have evolved a mathematical modeling approach to help generate ideas.

The first step is to define a product area consistent with the mission of the company. For example, DowElanco's mission is "to satisfy customer needs by providing improved solutions in crop production and specialty products". The area selected was "food production". Then, quantitative thinking is used to define all of the processes and products involved in this area along with technological and economic parameters. In the case of food production, all of the processes involved from clearing rain forests for arable land to the manufacture of diamonds from peanut butter; the information collected is used to guide brainstorming sessions designed to identify potential process breakthroughs using enabling technologies. The final step is to match these breakthroughs against the resource base of the company and develop a list of the most attractive opportunities for consideration in the prioritization process.

A word of caution is in order: despite any advantages quantitative thinking may provide, ideation remains an exercise in creativity and organizational dynamics. Only with effective leadership and a willingness to change can it thrive within any enterprise.

Probabilistic Network Modeling

When Dow and Lilly combined their agrochemical divisions to form DowElanco, one of the first organizational tasks was to put a "process" in place to meet the company strategy of launching one new product per year. The agrochemical industry is highly regulated not only by the EPA in the United States, but also by other government agencies around the world. Both parent companies had their own processes in place for getting their new products submitted for registration. The challenge was to put a single, global process in place that would use the combined resource base of both companies to accomplish the following objectives: 1) submit products for registration as fast as possible, consistent with a quality requirement that the registration package have a high probability of acceptance by the agencies and, 2) be cost effective. A cross-functional team was put in place with representatives from all of the work processes involved with the new product development. After reviewing first some principles in project planning and control [13], a major initiative was launched to build probabilistic networks of activities required in each of the major work processes. Each of these activities was characterized by the time required to perform them and the resources required as people time. For each of these estimates, most likely, pessimistic and optimistic values were obtained similar to those required for a PERT analysis [14]. Not surprisingly, it was apparent that certain compounds required significantly more resources than others depending on the physiochemical characteristics of the molecule and the anticipated end use. For example, the water solubility of a molecule has a major impact on the extent of environmental testing, while disease control agents require more field trials than herbicides. To accommodate this inherent difference between molecules, we defined a parameter called the "degree of difficulty" which becomes a multiplier on the nominal resource levels.

In a conventional PERT analysis, the activities are simply linked together once a precedence relationship is specified. The problem is more complicated for new product development in the agrochemical, biotech and pharmaceutical industries because:

1) projects may be terminated at any point in the pipeline based on the outcomes from certain activities (e.g., untoward toxic end points in rodents, unexpected results in clinical or field trials),

2) activities may need to be repeated if the results are inconclusive (e.g. ineffective clinical or field trials), or

3) the execution of certain activities is conditional on the results of previous activities (e.g. additional environmental field trials may be conducted to assure regulatory compliance).

A highly aggregated schematic of the activities in one of the earlier years of developing an agrochemical is shown in Figure 5

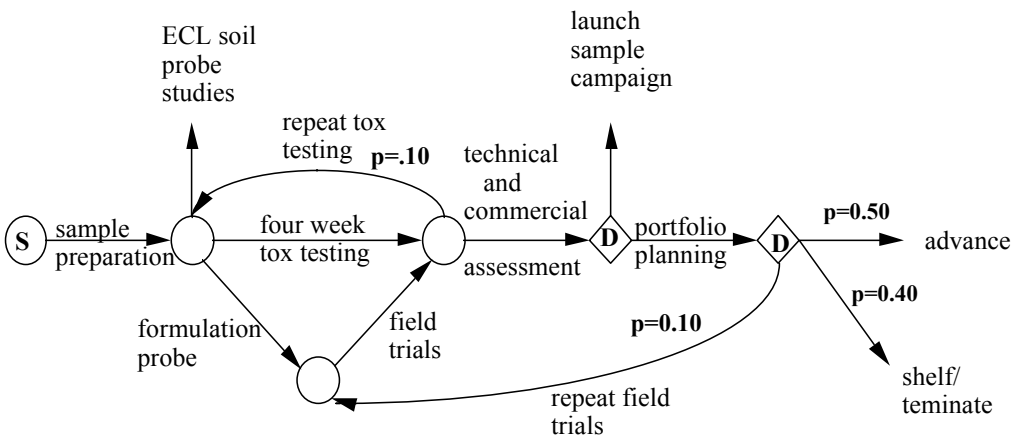

Figure 5. Aggregate Diagram for an Early Stage in the Development of an Agrochemical

This aggregated version was built from individual detailed work process models. The initial activity is to prepare a sample of the active ingredient. There are numerous subtasks or activities involved in preparing this sample. Times and resource requirements for each of them are recorded in a probabilistic network model for the work process responsible for preparing samples. The active ingredient is then formulated and used for field trials. Simultaneously, a portion of the active is used for early stage toxicology testing. At the end of the tox testing it may be necessary to repeat the test (e.g. if the dose was so low that no effect was observed). The probability of repeating this test with the associated cost and manpower requirements are recorded in the probabilistic network model of the work process responsible for toxicology testing. Once the tox tests and field trials have been completed, a technical and commercial assessment is conducted. If things still look promising, the signal is given to launch another sample campaign to produce material for further evaluation. Field results are combined with the tox profile to assess the marketability of the molecule and the ability to register the molecule. A major advancement decision gate is now reached.

Combining the information from this study and the information from other products in the pipeline and outside market research studies, the management steering team has to decide whether to advance the project, terminate or shelf the project, or repeat some of the trials to get additional information. Historical data as well as subjective assessments are used by the teams to estimate the probabilities of moving along the various aggregated paths shown in Figure 5.

Building network models resulted in several major contributions. First, it forced discipline upon the organization by requiring each of the work processes to quantify their individual activities and resource requirements. Secondly, it created an awareness among the entire group as to the complexity of the process and, more specifically, of the information and material flow requirements between the various work processes. Finally, it identified possible disconnects and raised opportunities to improve the process. In fact, once the entire process was detailed, the order in the which the actives were changed was made simply by inspection. These changes were built into a new network referred to as the "Should" model to contrast it with the original, "Is" model.

Unfortunately, there was no way to quantify the impact of these changes and compare the "Is" versus the "Should" scenarios or any other suggestions that might be made. We recognized the need to define metrics and incorporate them into a simulator. Two metrics were chosen: 1) the number of compounds that can move through the new product pipeline for a given resource level, and 2) the resources required to move some portfolio of compounds thorough the pipeline. The individual activities were captured within a discrete simulation language. The system we chose was, SLAMsystem*, since it enabled us to deal with probabilistic networks including conditional branching and repeated activities. Once completed, the model consisted of over 125 activities.

Simulation Results

The first application of the simulator was to try to understand the dynamics of the resource requirements. We assumed that 1) the rate at which new active molecules were fed to the development process mimicked the experience of the two parent companies, 2) the "degree of difficulty" of new molecules entering the pipeline followed the same distribution as the current product mix in the pipeline and 3) there were no resource constraints on any of the work processes.

Several hundred simulation runs were required to produce smooth cumulative distributions. Although the actual times and dollar amounts have been modified for proprietary reasons, insights gained from the simulation are discussed below.

The time required to submit a typical compound for registration in the should model is shown in Figure 6.

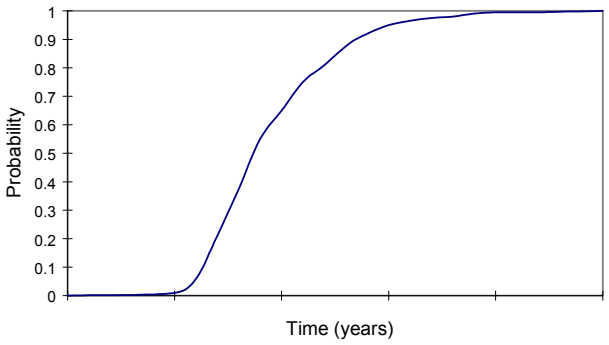

Figure 6: Time to Submit a typical compound for registration

The outputs from the simulation give insights into explaining the wide variability in submission time. Low "degree of difficulty" compounds without repeats can move through the pipeline rapidly, but it takes 50% longer to prepare the registration package for more challenging compounds requiring extra testing.

The metric for comparing the cost of preparing the registration package for the "Is" and "Should" model is shown in Figure 7.

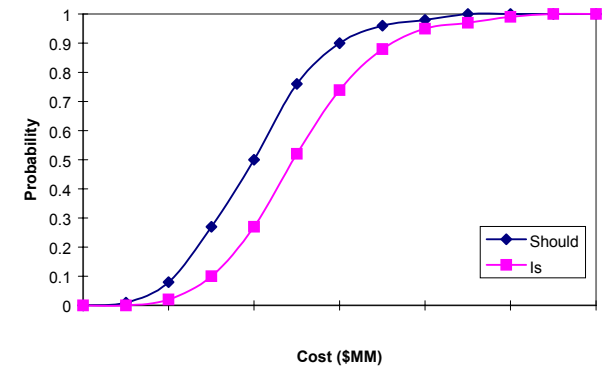

Figure 7: Annual Cost of Developing New products

Figure 7 shows a 15% annual cost savings in moving from the "Is" to the "Should" model, or stated in a different way, a 15% increase in productivity of the pipeline for the same resource level.. The cost reduction realized by the "Should" model is the result of conducting tests which could result in project termination earlier then with the "Is" model. Needless to say, this significant productivity impact was appreciated by all levels of management

Another characteristic of Figure 7 was not as enthusiastically received. It indicates a greater than 50% variation in annual resource requirements for the pipeline. The major source of this variability is the erratic rate at which new compounds both enter and are terminated in the pipeline. Leaving the question of termination for now, the variability at which new product opportunities are presented to the pipeline make allocating resources a management nightmare. The analogy used to describe this phenomenon to management is the eating habits of a snake, Figure 8.

Figure 8. Reptilian Digestive Habits

The reptile consumes his food in gulps, and then digests these gulps slowly. Analogously, new product ideas are not generated uniformly, but appear to arrive in clusters and the pipeline is forced to respond.

An example of the impact of this behavior on an individual

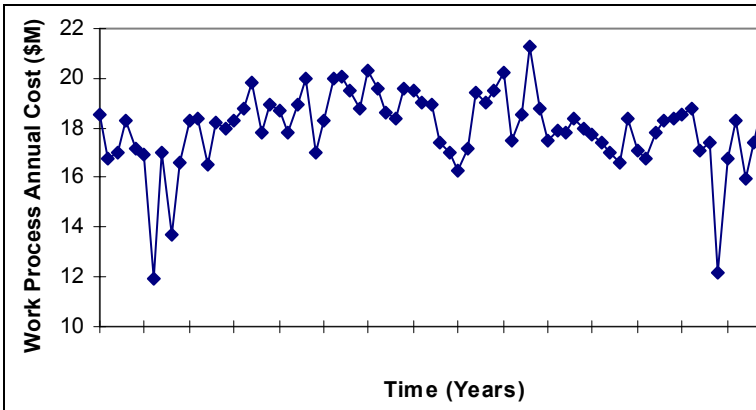

Figure 9. Annual Resource Requirements for an Individual Work Process

work process is shown in Figure 9. (Shown on next page)

I have chosen not to present the results as a cumulative distribution, since the year-to-year variation is as important as the extent of the variation. Similar plots for the other work processes can be prepared. They indicate the same pattern of variations, although correlated with the other functions, as the slug of compounds moves through the pipeline. For example, high resource requirements for preparing samples for testing is followed by high resource requirements in the testing areas and low resource levels for additional sample preparation. There are two options. We

can convince our scientists to produce ideas at a uniform rate, or we can learn how to manage a process which has dynamically changing work process requirements.

To address this issue, a resource model has been built for the pipeline. First, each distinct discipline within the company was defined (e.g. organic chemist, analytical chemist, etc.). Then, a flexibility matrix capturing the extent to which each discipline could perform the task of other disciplines was constructed. Finally, a simple Markov chain model was constructed for each of the work processes annually and by discipline. Figure 10 shows this model for a typical work process.

The Markov chain model represents a dynamic pool of human resources within the company. By matching this resource pool with the resource requirement of the probabilistic network model, it is possible to identify "gaps" which need to be filled either by hiring or by enlisting scientists in skill transformation programs. It is being used as an ideal vehicle for developing a long term hiring plan as well as addressing the skill set needs for a changing market place.

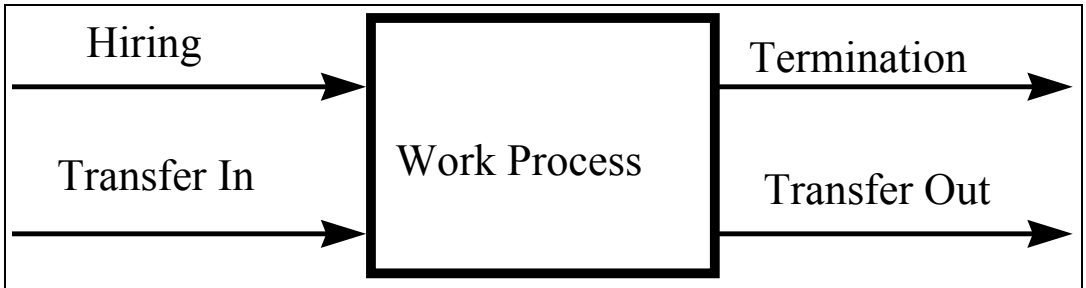

Figure 10. Annual Resource Flow Diagram for Typical Work Process.

In the simulation studies, it was assumed that unlimited resources were available to handle any eventuality. In practice, resource limitations must be imposed on the model. A resource constrained SLAM model has been built and is being used to measure the impact of constrained resources on the pipeline (e.g. delayed launch times). This problem is particularly critical in the seasonal agrochemical industry since failure to meet spring planting deadlines forces a one year delay. The economic consequences of these time delays drive the dynamic resource allocation described above.

Optimization of the New Product Development Process

The "should" model which evolved from the probabilistic model building exercise was generated from the experiences and intuition of the various work team leaders. Although the model was used to answer various "what if" questions, no attempt was made to optimize the process with any type of mathematical formalism. It was felt that the mathematical optimization of a probabilistic discrete event model was best left to academia. Toward that end, a research program was initiated with Ignacio Grossmann at Carnegie Mellon University. Craig Schmidt, a former summer intern with DowElanco who is presently a graduate student at Carnegie Mellon, has developed a method which optimizes the expected return from the pipeline by determining the best schedule of activities. This program, jointly funded by DowElanco and the National Science Foundation [15], is beginning to yield some very interesting results.

The activity network is modified by adding new technical precedence constraints due to physical factors. In Figure 5, for example, the sample preparation must be done before the toxicology testing. It is possible to add more precedence constraints to the network, between tasks which could be done in parallel. It makes sense, for example, to delay an expensive task until a risky task is finished, so you don't have to pay for the expensive task if the risky task fails and the project is canceled. The downside of adding precedence constraints is that it can lengthen the time to complete the project and submit for registration, delaying the eventual introduction of the new product. The optimal scheduling policy generated by their work is quite intuitive; scheduling those activities which may result in termination of the project as early as possible, and leaving other activities until the last possible minute (i.e. just in time).

Schmidt and Grossmann [16,17] have developed Mixed Integer Linear models for finding the optimal schedule for activities. These models can include the income received from selling the new product as a function of the project completion time. However, time to market is often the major factor in the success of a new product. In this case the models can compute the minimum cost network subject to the constraint that the network is completed in the minimum time. Their work can handle repeated tasks or conditional tasks through the use of discrete scenarios. This uncertainty representation is really only practical for very small problem sizes. They are currently working on a new technique for handling the full stochastic problem with repeated activities and conditional activities.

Computational results reported in [17] suggested that random problems of up to only 19 tasks could be solved to global optimality. However, real world problems having many more tasks appear to have a nice structure that allowed them to be solved. They have been able to optimize

the DowElanco new product development process in about two hours of computer time. The optimized activity network has up to 20% less cost than the "Should" model. We are in the process of reducing this result to practice. If only a fraction of the cost reduction is realized, it will have a major impact on the productivity of the new product pipeline. It is an excellent example of how leveraging resource of industry, academia, and the government can benefit all parties.

Conclusions

I have described the use of quantitative thinking and modeling through personal examples from the agrochemical area. However, we are finding utility for these tools in many analogous fields, particularly in the biotech area. Currently, we are in the process of building probabilistic network models for the development of new biotech compounds. Here, each application is slightly different, but the basic principles still apply. I have failed to address some of the exciting work we are doing in collaboration with Joe Pekny and Rex Reklaitis at Purdue University using combinometric optimization tools to design new multiproduct plants for those compounds coming through the pipeline. If this review is well received, perhaps the editors will give me the opportunity to describe this interaction in a subsequent issue of CAST communications.

Acknowledgments

I have sprinkled the word "I" quite liberally throughout this essay. In reality much of the work was carried out by various scientists in the mathematical modeling group. In particular, Kay Kuenker, Felica Stein and Laurie Rolston all contributed, at one time or another, to building the probabilistic network model of the new product development process. Kent Steele implemented the project prioritization processes. Kent and Matt Bassett are currently revising the model to accommodate recent software upgrades and organizational changes as well as leading the thrust into the biotechnology field.

I also would be totally remiss in not acknowledging the support of Perry Gehring, R&D vice-president at DowElanco. His belief in the importance of quantitative thinking and mathematical modeling allowed me the freedom to operate throughout the company.

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COMMUNICATIONS

John MacGregor Wins the Computing in Engineering Award, Will Deliver Address at the Los Angeles Annual AIChE Meeting

John F. MacGregor, Chair and Professor of Chemical Engineering at McMaster University, will receive the Computing in Chemical Engineering Award at the Los Angeles CAST Division banquet, at which time he will deliver an award address. John was selected "For outstanding contributions to the fundamentals and practical application of methods for polymerization reactor modeling, advanced process control, and statistical monitoring, and for distinguished service to our profession through advanced courses, the development of consortiums and conference contributions."

In a summary of his accomplishments, the following was stated:

Dr. MacGregor is a world leader in the following three areas: he gives dedicated service to his profession.

Process Monitoring and Applied Statistics: MacGregor is internationally known for his work in advanced statistical techniques applied to process monitoring and control. Specific contributions to statistical process control have earned accolades from industry and the popular press, where in a 1991 Business Week story he was cited as one of five academics leading in this field. His recent work on the use of principal components and partial least squares techniques is especially noteworthy because it tackles problems with large data sets, confounded information, and because it is of major importance to industries in pursuit of better quality. His citation on the 1993 W. G. Hunter Award is "for excellent in statistics as communicator, a consultant, an educator, an innovator, an integrator of statistics with other disciplines and an implementer who obtains meaningful results."

Process Control.: The major areas of contribution have been through improved methods and techniques for model identification, relationship between SPC and advanced process control and stochastic control. In each area, Dr. MacGregor's work has led to insight into the failure or success of existing algorithms and provided new directions for significant improvement.

Polymer Reaction Engineering: He has collaborated for many years with Dr. A. E. Hamielec in the McMaster Institute for Polymer Production Technology (MIPPT). His work has led to the widespread use of deterministic polymer reaction models for use in design and control. More recent work has also developed novel on-line polymer characterization sensors and control and monitoring algorithms for their use. The excellent synthesis of polymer reaction engineering and process control is one of the many unique contributions that Dr. MacGregor has made.

Service to the Profession: Through advanced short courses, organizing conferences, presenting plenary invited lectures, and creating two industrial-academic consortia, Dr. MacGregor unstintingly gives superb service to the profession.

Supporting letters on behalf of John MacGregor's candidacy included the following comments:

"John MacGregor's contributions to modeling, analysis and control of processing systems have been many, profound, extremely influential, and with extensive presence and impact on the industrial practice. Among our chemical engineering peers, John is the undisputed leader in many areas, such as: (a) statistical analysis of process data, (b) monitoring and diagnosis of processes and process control system's performance, and (c) identification and control of stochastic processes. . . Over the last 20 years he has been a strong, innovative and influential voice and force with worldwide impact."

"Leading companies are applying John's work, and he is widely sought after as a consultant. For many years he has taught short courses for industry, both on traditional process control, and more recently statistical process control. These courses have been very well received. John has also carried out important research on the control of polymer processes. He is exceptional in his breadth of knowledge. John is both a superb theoretician, and he ranks right at the top in terms of understanding applications and in the practical impact of research. His presence at McMaster has certainly helped to advance the industrial process control consortium there."

"He has made important contributions to the theory and development of the techniques themselves, but is as an evangelist for the value and proper use of these techniques that he has become so widely known and so often sought after for advice. He has thus had an influence far wider than through his own very considerable technical contributions, and it is this combined contribution which makes him such a strong candidate for the award."

"Among the techniques he has improved upon to bring them to industrial practice are ARMA and other discrete time dynamic models, SQC monitoring algorithms, and the use of PLS for process and product quality monitoring and control. John is the person most responsible for the widespread use of these methods by industry. His research made them applicable, his consulting validated their

success, and his short courses brought the message to a wide audience. I think these accomplishments are well deserving of this award."

"John is the recognized leader within the Chemical Engineering and Statistics community in the area of general, on-line Statistical Process Control (SPC) monitoring. He was a pioneer in this area among chemical engineers when SPC had little following among academics. Now this work is widely recognized as vital particularly by industry but also has won the acceptance of academia based on the need for engineers to make more effective use of on-line data to improve process operations. A major contribution in this area especially worth noting has been the use of PCA and PLS biased regression technologies for more straightforward multivariate monitoring of processes. He has also extended these concepts to include time trajectory monitoring problems, such as in batch reactor systems. John has written several papers on this subject and has demonstrated the value of the technology with industrial data."

The CAST 1997 Computing Practice Award is Bestowed upon DowElanco's Gary Blau

Gary Blau received the CAST Division 1997 Computing Practice Award "for visionary leadership in the development and application, by both industrial practitioners and academic researchers, of quantitative, decision-making approaches to solve 'real-world' problems.

Gary's numerous contributions were summarized with the following highlights:

1) Gary has led the application of probabilistic modeling concepts and engineering systems approach to bring the concept of uncertainty into DowElanco decision-making processes, ranging from marketing and sales forecasting, to the design and operation of multproduct plants, to the optimization of the R&D new product development process. . . . His work has potentially saved DowElanco tens of millions of dollars.

2) Gary has led the development and application of quantitative, decision-making tools throughout DowElanco and the Dow Chemical Company. For example, Gary developed and applied methods that combined statistics and optimization theory. These methods were used to build nonlinear pharmacokinetic models to predict the toxicity and carcinogenicity of chemicals. The concepts that he and collaborators developed still serve as the foundation of current toxicological risk assessment approaches. In addition, these methods have also been used in the development and optimization of numerous, fundamental, first-principle models of Dow, DowElanco, and Eli Lilly processes, again returning potentially millions of dollars to the bottom line of these companies.

3) Gary developed the vision, and led the implementation project, for the SimuSolv computer program, a software product for building statistically valid, non-linear models characterizing the dynamic behavior of processes in the chemical engineering, toxicological, agricultural and environmental arenas. SimuSolv was the first commercially available package that combined statistical rigor with the ability to readily develop and optimize dynamic models. It is used extensively throughout the Dow Chemical Company on a global basis, as well as numerous companies around the world.

4) Gary's close collaboration with various academic institutions have resulted in significant new areas of research that have been pursued at these and other research institutions. He continually challenges academic researchers to solve 'real-world' problems, and then supports their work by involving significant internal resources in collaborating with the researchers to obtain real data, to be involved throughout the development of the research, and to led the implementation of the solution. Several strong Dow and DowElanco scientists started as summer interns doing graduate work on a 'real-world' problem for Gary.

5) Gary has always played an active role in teaching and education. These efforts range from developing and presenting courses and seminars internally, at other companies, and at numerous academic institution; to supporting the work of professors and graduate students economically, intellectually, and (where appropriate) with significant personnel resources and confidential data.

6) Gary has been a significant mentor to many scientists in both industry and academia. His unselfish sharing of his knowledge, experience, and opportunities, and his enthusiastic support for his collaborators and his 'students' brings out the best technical strengths of his proteges, and encourages them to grow into even better scientists.

7) Gary has also been strongly involved in various professional organizations and has served on the editorial boards of key journals. Most recently, Gary

was Chairman of CAST, where he initiated a survey of the Division membership. The results have the potential to significantly alter the services that CAST provides to its current members, and to potential members throughout the AIChE.

Letters from colleagues enthusiastically – and quantitatively -- supported Gary's nomination:

"Within the Dow Chemical Company, Gary has provided leadership and vision for the application and development of advanced numerical and computing techniques in the solution of difficult industrial problems. He has contributed millions of dollars of impact (increased productivity, yield, and process alternatives) in the basic chemicals and agricultural chemicals areas. He established the vision for the development of the SIMULSOLV ™ computer tool which allowed a wide variety of technical people to easily use advanced numerical tools successfully. His application of fundamental engineering principles provided models and tools that were able to extend Dow's understanding of reactor and system technology while balancing the need for expensive experimental work with the use of numerical techniques. This effort has ultimately resulted in at least a 20% productivity increase in two of our laboratories."

"First and foremost, Gary has been and continues to be an advocate and a leader in the area of applied modeling and statistics. Among the early proponents of these technologies in practice, Gary has been instrumental in showing industry and academia how th4ese kinds of technologies can be of benefit and in raising the general awareness. One does not have to spend much time in either Dow Chemical or DowElanco to observe the widespread impact of Gary's technical influence across the company. As an early proponent of the technologies and an outspoken advocate, Gary has been willing to extend these practices beyond his own company and has been successful at communicating them industry wide. His broader influence in both industry and academia are apparent as measured by the awareness of Gary's activities and the application of related technologies."

"As manager of Dow's technical computer applications effort for almost 15 years during a portion of Gary's career, I can say without any hesitancy that there was (and still is, from what I can see) no single person that has had a greater impact on leading the technology advance in technical computing in Dow than Gary Blau. He led the way in so many areas of computer practice for Dow, including kinetic modeling, new product and process assessment, nonlinear optimization, mass balancing, environmental fate modeling, new product planning, and on and on."

Metin Turkay Receives the Ted Peterson Student Paper Award for a Major Contribution in Discrete Optimization and Process Synthesis

"For the development of pioneering, logic-based algorithms for non-linear disjunctive programming models for the structural optimization of process flowsheets", Dr. Metin Turkay (Carnegie-Mellon '96) is the recipient of the 1997 Ted Peterson Student Paper Award. Rather than repeat the densely-written citation, instead we provide the more leisurely written qualifications statement:

Metin Turkay's Ph.D. research work dealt with the development of logic-based algorithms for MINLP problems that are posed as generalized disjunctive programs. These are novel, mathematical, optimization models that are expressed in terms of continuous and Boolean variables, and involve equations, disjunctions, and propositional logic statements. The application of these models is aimed mainly at the optimal synthesis of process flowsheets, e.g., structural, flowsheet optimization. In the paper, "Logic-Based MINLP Algorithms for the Optimal Synthesis of Process Networks" (*Computers and Chemical Engineering* **20,** 959-978 (1996), Metin developed a logic version of both the outer-approximation (OA) and the generalized Benders decomposition (GBD) algorithms. For fixed values of the Boolean variables (true, false), the model gives rise to the NLP of the corresponding configuration in which only the relevant equations are included (that is, the solution and linearization of functions at zero values are avoided).

The master problem takes the form of a disjunctive, linear programming problem in which linear approximations are accumulated for the nonlinear equations and constraints. These linearizations must be initially generated by optimizing different flowsheets so as to "cover" all the units. The logic-based Generalized Benders Decomposition (GBD) method can be derived by exploiting the property that each GBD iteration is equivalent to performing one Benders iteration on the cuts corresponding to the linearizations of OA. Based on this property, Metin devised a method in which, instead of solving the MILP version of the OA disjunctive master, the Benders cuts are derived by performing one iteration on the MILP master. Metin was able to apply the logic-based OA and GBD algorithms to a flowsheet example involving the selection of two feedstocks, two reactors, and either 1- or 2-stage compressors. The significant result was that both methods solve the problem in a much more robust fashion, as compared to solving the "conventional "MINLP for the flowsheet.

Based upon Metin's work, we have been developing the code LOGMIP, a new, logic-based MINLP code that we expect in a few years will replace DICOPT.

The paper that is being nominated for this award motivated the application of generalized disjunctive programming to the optimization of cost functions that exhibit discontinuities over several size ranges (Turkay, M. and I. E. Grossmann, "Disjunctive Optimization Techniques for the Optimization of Process Systems with Discontinuous Investment Costs. Multiple-Size Regions", *Ind. Eng. Chem. Res.* **35**, 2611-2623 (1996). These functions arise whenever there are "critical" sizes that require additional fixed cost investment. Metin explored the use of disjunctive programming and theoretically showed that the convex hull formulation of the disjunctions is the tightest. This was confirmed with numerical results. Also, this approach was extended to more complex, discontinuous cost functions (e.g., temperature- and pressure-dependent cost parameters) and incorporated in the synthesis of flowsheets (Turkay, M. and I. E. Grossmann, "Structural Flowsheet Optimization with Complex Investment Cost Functions", accepted for publication in *Computers and Chemical Engineering* (1996). In this paper, a fairly complex vinyl chloride plant was synthesized using these techniques.

Finally, another interesting by-product of Metin's paper was the solution of systems of disjunctive equations that are closely related to conditional modeling [Grossmann, I. E. and M. Turkay, "Solution of Algebraic Systems of Disjunctive Equations", *Computers and Chemical Engineering* 20, S339-S344 (1996)]

One of the supporting letters commented as follows:

"The history of superstructure optimization approaches to process synthesis has been plagued with problems related to design equations and constraints associated with units with zero flow, that is, units not included in a particular flowsheet structure. Recently, a modeling framework for the discrete optimization of a class of network problems was proposed in which structural alternatives were represented through disjunctions. Metin Turkay has expanded this idea to nonlinear systems in this very elegant and readable paper. With his generalized disjunctive programming model, NLP optimization sub-problems only require the relevant equations for units existing in a particular flowsheet, thus avoiding satisfaction of constraints associated with nonexistent units, while also reducing problem size and some of the difficulties associated with non-convexities. The proposed method uses a set covering algorithm to formulate a number of initial feasible flowsheet structures that are individually optimized to obtain enough linearizations so that the structural optimization problem may be solved with logic-based MINLP. Metin further developed logic-based Outer Approximation and logic-based Generalized Benders Decomposition methods for this second task. This method was then applied to several examples, which represent perhaps the first, non-trivial demonstration of the structural-optimization approach to flowsheet synthesis on industrial problems of practical complexity and size.

AIChE and the World Wide Web

Strategic Plan Objective
Apply emerging information and communication technologies as they become
useful to our stakeholders.

Strategic Plan Strategies

1. Deploy resources to expand and maintain on-line services as a major means of communication with stakeholders

2. Expand electronic dissemination of Institute offerings such as publications, programs, and abstracts, consistent with financial objectives

3. Utilize advanced media to conduct education and training, meetings and conferences, and employment services in a "virtual" environment

4. Create on-line databases and directories to serve stakeholders' information needs and to facilitate operations of organizational units

Resource Commitments and Priorities

In 1996 and 1997, AIChE has made major capital and operating commitments (approximately $425,000) to the development of an enhanced presence on the World Wide Web. Given these costs and the Institute's budgetary realities, revenue generation has become an integral part of our web strategy.

We plan to generate revenue in a number of ways:

- advertising by affinity partners, print advertisers, web businesses, and lodging and travel providers related to meetings and courses

- using the web to better market our existing products, and to make them more available globally

- conducting secure transactions on-line

In fact, the 1997 budget calls for $85,000 in revenue from affinity partners, advertisers, and other sources. Our near-term priorities are geared to these quicker results, rather than transactional capability, which will be a mid-term goal. (Please see the attached timeline.)

Progress is also continuing toward the web's use as a productivity tool and information resource for members, with special attention to sections, divisions, and educational services. A team of developers representing different AIChE departments and groups has created, converted, and coordinated content that will be the basis of our relaunch of our site this summer, and piloted here in Houston.

Certain members of the staff, including a advertising director now being recruited, will be developing an advertising plan. Given the nature of our targeted advertisers, we have already created an enhanced presence for AIChE financial services and Chemical Engineering Progress.

Other members of our Intermedia Development Team have been expanding product and service information which will improve marketing and enhance revenue. Each department and group has established its own priority list, in coordination with the staff's Web Strategy Team: Joe Roseti, manager, art and intermedia services; Tom Crowe, web technology administrator; and Tony Plescia, director, information technology and services; Mary Markette, managing director, administration; Rich Larson, director, finance and assistant treasurer; and Steve Smith, managing director, publications and communications. This team also reviews and prioritizes web-related requests from volunteer leaders and members.

Accountability

Given the importance of revenue generation and the nature of a volunteer organization, staff accountability is essential. However, the staff is working closely with volunteer advisors, although the Organization Structure Task Force created under the Institute's Strategic Plan, may want to consider the creation of some more formalized board or standing committee, so the staff's Web Strategy Team and Intermedia Development Team can benefit from available expertise, while monitoring our success in meeting member needs.

The Publications and Communications Department, with Joe Roseti taking the leadership role, has assumed accountability for look and feel, content, and coordination with internal and external groups, while the Information Technology and Services Department, with Tom Crowe taking the leadership role, is accountable for internal technical support and, in consultation with the Finance Department, for capital expenditures.

Pioneers and Early Users

Through its strategic planning process, AIChE Council embraced an approach which would make the Institute an early user of, rather than a pioneer in, emerging information technologies. Therefore, to measure and benchmark our progress, we monitor other societies' practices regarding on-line access to material, ease of use, searchability, editing, pricing, and partnerships, particularly as they relate to the availability of journals-an area in which some of our members have expressed great interest.

While there is considerable debate about when and if usage-independent pricing might yield to pay-for-use pricing, the scientific and technical journals currently on-line are using the subscription model, and offering a varied price structure-some sensibly dependent on site licenses, sub-nets, etc. Interestingly, fewer are including a print copy with that subscription, although that hasn't led to any discount in price. In fact, the added functionality of links to references, etc., may be pushing journal prices even higher.

From our review, it's clear that the scientific societies (the American Institute of Physics and the American Chemical Society, for example) with their research emphasis, tend to be much further along than the engineering societies, with their large practitioner memberships (the Institution of Electrical and Electronic Engineers is something of an exception). In fact, we are in a position that's comparable to the American Society of Mechanical Engineers and a bit more advanced than American Society of Civil Engineers (which has invested heavily in CD-ROM availability of all its journals).

Access to the on-line journals surveyed works on a password basis, which could pose a threat to revenue through password sharing. Most of the US-based societies are using the PDF format/Acrobat to recreate the look and feel of the printed page. (The Royal Society of Chemistry and the Institution of Chemical Engineers are using RealPage browser software.)

What does seem to distinguish AIChE from these other organizations is our focus on creating revenue opportunities from advertising and other partnerships, in addition to subscription-based revenue, as well as our goal of expanded transaction capability.

AIChE's Inaugural On-line Publication

To protect the AIChE Journal's position as the premier journal in its class and the Institute's most significant net revenue generator-and to continue its growth in citation and visibility, we recommend making its on-line availability a priority when appropriate security measures are in place. (We could outsource this process for speed, but would anticipate some long-term negative impact on net revenue.)

We believe we should launch this, if possible, in conjunction with the 1998 subscription year.

Future Content Development

The New Tech Task Force, volunteer leaders, and many members are developing ideas for enhanced content and functionality. The Web Strategy Team and the Intermedia Development Team welcome these suggestions.

Content proposals have included developing a "clearinghouse" for evaluated and edited undergraduate education material that's available on line. Others have recommended the hiring of a dedicated on-line editor who could evaluate material, designate appropriate links, as well as construct appropriate search words and mechanisms. Still others have suggested ways to expand on-line services for local sections.

Certainly these activities would be worthwhile. However, unless we find ways to make these activities self-supporting (a modest "accreditation" fee in terms of the first?) or identify other sources of revenue which could subsidize them, we don't feel they can be near-term priorities.

Still other content proposals (and independent actions by volunteers using other web sites) are, in fact, jeopardizing Institute revenue streams. Certain employment service activities sponsored by sections or individual members and the on-line version of the AIChE Faculties Directory are examples. In many cases, these are well-intentioned projects over which AIChE can exert little control, other than trying to inform these volunteers about the implications of their efforts or, if appropriate, denying links.

In Conclusion

We ask Council's continued support for keeping implementation of information technologies consistent with financial objectives. Additionally, we ask your endorsement of our commitment to revenue generation in setting priorities for web development.

Web Strategy Team:

Joe Roseti
Tom Crowe
Rich Larson
Mary Markette
Tony Plescia
Steve Smith

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
345 East 47 Street
New York, NY 10017-2395
Telephone: 1-800-AIChemE
Fax: (212) 705-8400
E-mail: xpress@aiche.org

For the AIChE Headquarters:

American Institute of Chemical Engineers (AIChE)
345 East 47 Street
New York, NY 10017-2395
General Inquiries: (212) 705-7338
Reprint Sales: (212) 705-7342
Fax: (212) 752-3294
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P&G University Exploratory Research Program

by Paul R. Maurath, The Procter & Gamble Company

The purpose of this message is to publicize this company funded research grant program. Please feel free to further distribute this announcement to other academic research colleagues who may be interested.

The University Exploratory Research Program, inaugurated in 1981, was expressly designed to provide access to new scientific understanding, particularly in areas new to Procter & Gamble. The program was expanded to include chemical engineering and process technology two years ago.

The Focus—Exploratory Research

Most systems for selecting university research projects tend to favor proposals for the logical and systematic extension of current knowledge. Such proposals are low risk, they have more predictable outcomes, and they are relatively easy to defend. In contrast, research proposals which depart dramatically from the current knowledge base entail substantial uncertainty in both methods and outcomes. Such proposals may have difficulty surviving the peer review process of project selection; thus, a radically new concept with a potentially high value to society may go unfunded.

The focus of this program is Exploratory Research which, even though it has intriguing potential, might be seen as too speculative to be funded otherwise.

In other words, funding potential breakaway insight or discovery is the primary objective of this program. The goal is to fund projects that aim to provide an important and needed advance in basic understanding, i.e., radically new knowledge. It is our experience that this frequently arises as a result of combining insights of more than one discipline. Hence, multidisciplinary project proposals are encouraged. As a corollary, it is entirely acceptable to designate one or more co-principal investigators in the application.

The Program

The exploratory research intended to be supported in this program falls within the broad areas of chemistry, the biological sciences, chemical engineering, and process technology. Up to five proposals will be selected for funding this year at an amount of up to $50,000 per year for up to three years. Because the grant is intended to be used to initiate research, it is not renewable at the end of the three years.

The deadline for submission of proposals for this year's program is January 15, 1998.

Who May Apply

Application may be made by regularly appointed faculty members or post-doctoral appointees at any academic institution that confers the doctorate degree, worldwide. Application from investigators seeking to inaugurate new research areas, either at the beginning of their academic careers or later, are particularly encouraged.

Additional Information

Additional information and a copy of the brochure and application form can be requested from the program administrator at the following email address:
extresprg.im@pg.com

or by regular mail or FAX

The Procter & Gamble Company
University Exploratory Research Program
Miami Valley laboratories, P.O. Box 538707
Cincinnati, Ohio 45253-8707
FAX (513) 627-1153

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 Chair as noted in the masthead. For general information concerning CAST Division sessions and scheduling, or to correct errors in this listing, please contact Jeffrey J. Siirola (CAST Division Programming Chair), Eastman Chemical Company, PO Box 1972, Kingsport, TN 37662-5150, 423-229-3069, 423-229-4558 (FAX), siirola@eastman.com. Many of these postings are archived on the World Wide Web at http://www.che.wisc.edu/cast10/.

Nonlinear Model Based Process Control
Antalya, Turkey
August 10-20, 1997

This NATO Advanced Study Institute is a continuation of a previous event in August 1994 on Methods of Model Based Process Control which convincingly showed that industrial process control would increasingly rely on nonlinear models. Lectures will include nonlinear model predictive control, nonlinear PID controllers, nonlinear process identification and state estimation, geometric methods of nonlinear process control, Newton-type controllers, regularization and control of nonlinear DAE systems, control of multivariable two-time-scale nonlinear systems with disturbances, constraint handling and stability issues, accommodating parametric uncertainty in nonlinear processes, nonlinear adaptive control, and applications in batch/biochemical reactors, pulp and paper processes, and film and sheet forming. Updated information is available at http://www.ankara.edu.tr/science/chemical-eng/psce/natoasi or contact Ridvan Berber, Department of Chemical Engineering, Ankara University, Tandogan, 06100 Ankara, TURKEY, 90-312-221-2425, 90-312-223-2395 (FAX), berber@science.ankara.edu.tr.

First Congress on Process Engineering for the MERCOSUR
ENPROMER '97
Bahia Blanca, Argentina
September 1-4, 1997

The first congress on Process Engineering for the MERCOSUR is being organized by the Southern National University Research Institute and the Argentine National Council for Scientific and Technical Research. The aim of the symposium is to bring together professionals from process industries, universities and research and development institutes in order to exchange information and latest developments in process engineering, covering technological, scientific and educational aspects. Topics will include unit operations, simulation and optimization, computational applications industrial case studies, transport phenomena, synthesis and design, chemical reactors, risk analysis, material processing, food engineering and biotechnology, process thermodynamics, control and dynamics, batch processes, education, and environmental impact. Contributions can be in Spanish, Portuguese, or English. For more information, contact Alberto Bandoni, ENPROMER '97, PLAPIQUI (UNS-CONICET), 12 de Octobre No. 1842, CC 717, (8000) Bahia Blanca, ARGENTINA, 54-91-88-2541, 54-91-88-3764 (FAX), enpromer@plapiqui.criba.edu.ar, http://www.plapiqui.criba.edu.ar/enpromer97.

Distillation & Absorption '97
Maastricht, Netherlands
September 8-10, 1997

The sixth international conference on Distillation and Absorption is being organized jointly by the Institution of Chemical Engineers and the Nederlandse Proces Technologen (Dutch Process Engineers). This is the first time that a conference in this well-known series is being held in the Netherlands. The Maastricht Exhibition and Conference Centre was selected as the venue for the conference because of its central position, and also because of the area's charm and hospitality. Colleagues in the fields

of research, development and processing will be presenting the newest innovations and latest trends in distillation and absorption. A number of recognized international experts will be giving their views about the future of the field in plenary sessions. There will be an exhibition featuring processes, equipment, software and books running parallel with the conference. The conference program will address thermodynamics and physical and chemical properties, dynamics and process control, energy and process integration, design methods, absorption and desorption, distillation processes including hybrid processes, and equipment. For more information, contact Tracy Lepkowska, IChemE Conferences Department, 165-189 Railway Terrace, Rugby CV21 3HQ, UNITED KINGDOM, 44-1788-578214 x4220, 44-1788-577182 (FAX), tlepkowska@icheme.org.uk.

A Practical Review of Process Control Workshop
Seattle, Washington
September 8-12, 1997

Control Applications in the Pulp & Paper Industry Workshop
Seattle, Washington
September 15-19, 1997

Two workshops are being organized by Integrated Engineering Technologies on the synergy between process control methodologies and process knowledge. The first workshop will cover dynamic process simulation, process stability, design of PID controllers, self-regulation, noise measurement and filtering, multivariable interactions, dead time compensation, feedforward and cascade control, controller tuning, internal model control, and model predictive control. The second workshop will cover valve characteristics and flow, pressure, and liquid level control, chip bin level control, impregnation and digester level and rate control, Kappa Number control, grade transition management, oxygen bleaching control, lime kiln and recausticizing control, level and consistency control, and paper machine control and sheet profile analysis. The instructors for both workshops will be Ferhan Kayihan of IETek, Yaman Arkun of Georgia Institute of Technology, and Frank Doyle of Purdue University. For additional information, contact Integrated Engineering Technologies, 5533 Beverly Ave. NE., Tacoma, WA 98422-1402, 206-925-2179, 206-925-5023 (FAX), fkayihan_ietek@msn.com or browse http://volterra.ecn.purdue.edu/~fdoyle/workshop.html.

CONTROL-97
Sydney, Australia
October 20-22, 1997

"Bringing together industrial and theoretical control advances" is the theme for this biennial conference hosted by the National Committee for Automation Control and Instrumentation of The Institution of Engineers, Australia. The general aim is to provide a balance between presenting advances in control methodology (theory, design and implementation) and application to major industrial sectors. The technical program will be built around invited plenary speakers, invited tutorial papers, and mini symposia in the areas of process control, petrochemical, power systems, minerals processing, automotive, steel and aluminum, and biomedical. Papers in all theoretical and applied areas are welcome. Deadline for papers is March 21, 1997. For more information, contact International Convention Management Services Pty Ltd, PO Box 547, Manly NSW 2095, AUSTRALIA, 61-2-9976-3245, 61-2-9976-3774 (FAX), control.97@icms.com.au, http://www.ee.usyd.edu.au/~control97/.

1997 AIChE Annual Meeting
Los Angeles, California
November 16-21, 1997

Meeting Program Chair: Dianne Dorland, Department of Chemical Engineering, University of Minnesota Duluth, Duluth, MN 55812-2496, 218-726-7127, 218-726-6360 (FAX), dorland@d.umn.edu. Speakers are reminded that the deadline for submission of manuscripts to AIChE Headquarters in New York is October 16, 1997.

The CAST Division is planning the following sessions at the Los Angeles Annual Meeting which is being cosponsored by the Society for Computer Simulation.

CAST Division Plenary Session

1. Recent Developments in Computing and Systems Technology. Michael F. Malone, University of Massachusetts (Chair) and James B. Rawlings, University of Wisconsin (Co-Chair).

Area 10a: Systems and Process Design

1. Design and Analysis. Ka M. Ng, University of Massachusetts (Chair) and Jonathan Vinson, G. D. Searle (Co-Chair).
2. Process Synthesis. Vasilios Manousiouthakis, University of California Los Angeles (Chair) and Pricilla J. Hill, Mitsubishi Chemical Corporation (Co-Chair).

3. Advances in Process Integration. Antonis C. Kokossis, University of Manchester Institute of Science and Technology (Chair) and Mahmoud El-Halwagi, Auburn University (Co-Chair).
4. Reactor System Synthesis and Analysis. Luke Achenie, University of Connecticut (Chair) and Gavin Towler, University of Manchester Institute of Science and Technology (Co-Chair).

Joint Area 10a and Area 10b Session

1. Interaction of Design and Control. Michael L. Luyben, E. I. du Pont de Nemours & Company (Chair) and Michael F. Malone, University of Massachusetts (Co-Chair).

Joint Area 10a and Area 8e Session

1. Simulation and Control in Electronic Materials Processing. T. J. Mountziaris, State University of New York at Buffalo (Chair) and B. Wayne Bequette, Rensselear Polytechnic Institute (Co-Chair).

Area 10b: Systems and Process Control

1. Advances in Process Control. Dale E. Seborg, University of California Santa Barbara (Chair) and Dennis D. Sourlas, University of Missouri Rolla (Co-Chair).
2. Nonlinear Control. Masoud Soroush, Drexel University (Chair) and Karlene A. Kosanovich, University of South Carolina (Co-Chair).
3. Applications of Process Control. Thomas A. Badgwell, Rice University (Chair) and Kenneth A. Debelak, Vanderbilt University (Co-Chair).
4. Controller and Process Monitoring. George N. Charos, Amoco Corporation (Chair) and Sheyla L. Rivera, Stevens Institute of Technology (Co-Chair).
5. On-line Dynamic Optimization. Jorge A. Mandler, Air Products and Chemicals, Inc. (Chair) and Oscar D. Crisalle, University of Florida (Co-Chair).
6. Robust Control. Richard D. Braatz, University of Illinois (Chair) and Michael J. Piovoso, E. I. du Pont de Nemours & Company (Co-Chair).
7. Issues in Modeling for Process Control and Monitoring. Michael A. Henson, Louisiana State University (Chair) and Kenneth R. Muske, Villanova University (Co-Chair).

Joint Area 10b and Area 3d Session

1. Control of Particulate Systems. Francis J. Doyle, Purdue University (Chair) and Anthony A. Adetayo, E. I. du Pont de Nemours & Company (Co-Chair).

Joint Area 10b and Area 15c Session

1. Advances in Biosensors and Bioprocess Control. Yuris O. Fuentes, E. I. du Pont de Nemours & Company (Chair) and Robert S. Cherry, Idaho National Engineering Laboratory (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing in the Chemical Process Industries (Cosponsored by the International Cooperation Committee of the Society of Chemical Engineers, Japan). Bhavik R. Bakshi, Ohio State University (Chair) and Shinji Hasebe, Kyoto University (Co-Chair).
2. Industrial Applications of Plant and Enterprise-Wide Optimization. Vicky Papageorgaki, Air Products and Chemicals, Inc. (Chair) and Alan B. Coon, UOP, Inc. (Co-Chair).
3. High Performance Computing in Chemical Process Engineering. Mark A. Stadtherr, University of Notre Dame (Chair) and Thanos Tsirukis, Air Products and Chemicals, Inc. (Co-Chair).
4. Computer-Aided Strategic Decision Making in the Supply Chain. Nikolaos V. Sahinidis, University of Illinois (Chair) and Christopher Wilhelm, Dow Chemical Company (Co-Chair).

Joint Area 10c and Area 15a Session

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

Area 10d: Applied Mathematics and Numerical Analysis

1. Nonlinear Dynamics and Pattern Formation. Vemuri Balakotaiah, University of Houston (Chair) and Hsueh-Chia Chang, University of Notre Dame (Co-Chair).
2. Chemical Engineering Applications of Stochastic Processes. Doraiswami Ramkrishna, Purdue University (Chair) and Kyriacos Zygourakis, Rice University (Co-Chair).
3. Parallel Computing Applications in Chemical Engineering. Antony N. Beris, University of Delaware (Chair) and Jeffrey J. Derby, University of Minnesota (Co-Chair).
4. Discretization Methods in Computational Strategies for Chemical Engineering Applications. Pedro Arce, FAMU/FSU College of Engineering (Chair) and Andrew N. Hrymak, McMaster University (Co-Chair).

Joint Area 10d and Area 15d/e Sessions

1-2. Applied Mathematics in Bioengineering I and II. Sriram Neelamegham, State University of New York at Buffalo (Chair) and Paul D. Frymier, University of Tennessee (Co-Chair).

CAST DIVISION POSTER SESSION

Section A. Recent News in Systems and Process Design. Michael L. Mavrovouniotis, Northwestern University (Chair) and Amy R. Ciric, University of Cincinnati (Co-Chair).

Section B. Topics in Systems and Process Control. Babatunde A. Ogunnaike, E. I. du Pont de Nemours & Company (Chair) and B. Wayne Bequette, Rensselear Polytechnic Institute (Co-Chair).

Section C. Statistical Aspects of Process Operations and Information Processing. Karen Yin, University of Minnesota Duluth (Chair) and Scott E. Keeler, DowElanco (Co-Chair).

Section D. Advances in Applied Mathematics. Kyriacos Zygourakis, Rice University (Chair) and Pedro Arce, FAMU/FSU College of Engineering (Co-Chair).

Section E. Issues and Topics in Computers in Operations and Information Processing. Scott E. Keeler, DowElanco (Chair), and Nikolaos V. Sahinidis, University of Illinois (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).

1998 AIChE Spring National Meeting
New Orleans, Louisiana
March 8-12, 1998

Meeting Chair: George R. Lappin, Albemarle Corporation, PO Box 14799, Baton Rouge, LA 70898, 504-768-6181, pvcb99a@prodigy.com. Speakers are reminded that the deadline for submission of manuscripts to AIChE Headquarters in New York is February 6, 1998.

The CAST Division is planning the following program for the New Orleans National Meeting. AIChE which was finalized by the Meeting Program Chair at the 1997 Programming Retreat in February. A final call for papers for this meeting appears later in this issue. Deadline for submission of presentation proposals is August 1, 1997. The entire CAST program in New Orleans is being cosponsored by the Society for Computer Simulation.

Area 10a: Systems and Process Design

1. Design for Retrofit. Miguel J. Bagajewicz, University of Oklahoma (Chair) and Metin Türkay, Rutgers University (Co-Chair).
2. Practical Approaches to Process Design. Mahmoud El-Halwagi, Auburn University (Chair) and Srinivas K. Bagepalli, General Electric Company (Co-Chair).
3. Tutorials in Batch Process Design and Operations. Urmila M. Diwekar, Carnegie Mellon University (Chair) and Russell F. Dunn, Monsanto Chemical Company (Co-Chair).

Joint Area 10a and Area 9d Session

1. Computer Applications in Chemical Engineering for the Environment. Juan J. Ferrada, Oak Ridge National Laboratory (Chair) and Urmila M. Diwekar, Carnegie Mellon University (Co-Chair).

Area 10b: Systems and Process Control

1. Model Predictive Control. Michael A. Henson, Louisiana State University (Chair) and Martin Pottmann, E. I. du Pont de Nemours & Company (Co-Chair).
2. Applications of Process Control. Michael A. Henson, Louisiana State University (Chair) and Robert E. Young, Exxon Chemical Company (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Industrial Applications of Optimization. Urmila M. Diwekar, Carnegie Mellon University (Chair) and Scott E. Keeler, DowElanco (Co-Chair).
2. Tutorial/Survey of Issues in Process Operations. Bhavik R. Bakshi, Ohio State University (Chair) and Matthew H. Bassett, DowElanco (Co-Chair).

Revamps, Training, Troubleshooting for Petroleum Refining and Distillation.
Pittsburgh, Pennsylvania
May 13-16, 1998

The International Association of Science and Technology for Development, in association with the International Society for Mini and Microcomputers will sponsor a conference on distillation, simulation, modeling, petroleum refining, troubleshooting, and process plant revamps. The scope is expected to include modeling, animation, simulation, visualization, hardware, multimedia, languages, bond graphs, numerical methods, petri nets, analysis and

design, stochastic processes, neural networks, parallel and distributed processing, software engineering and CASE. Deadline for submission of abstracts or proposals for tutorials is October 15, 1997. For further information, contact the IASTED Secretariat - MS'98, 1811 West Katella Avenue, Suite 101, Anaheim, CA 92804, 800-995-2161, 714-778-3230, 714-778-5463 (FAX), iasted@cadvision.com, or browse http://www.iasted.com.

European Symposium on Computer Aided Process Engineering (ESCAPE 8)
Brugge, Belgium
May 24-27, 1998

The 1998 ESCAPE event will be held in the restored Oud Sint Jan (Saint Jans Hospital) in Brugge, Belgium. The symposium will focus on recent developments requiring substantial computer power and on new challenges in the more traditional topics of the ESCAPE meetings. Focus topics include molecular dynamics and modeling in process design, use of computational fluid dynamics in process modeling, integration of processes on an industrial site, on line management of process operations, and industrial applications and case studies. For more information, contact the conference secretariat Rita Peys, Desguinlei 214, B-2018 Antwerp 1, BELGIUM, 32-3-216-0996, 32-3-216-0689 (FAX), escape8@ti.kviv.be or browse http://www.kviv.be/ti/escape8.htm.

Seventh International Conference on Computer Applications in Biotechnology (CAB7)
Osaka, Japan
May 31 - June 4, 1998

We will hold the IFAC symposium entitled Computer Applications in Biotechnology from May 31 through June 4, 1998 in Osaka, Japan. This conference is the continuation of a successful series of conferences at which all major areas in biotechnology where computers are used to aid process supervision, diagnosis, operation, optimization and control will be addressed. Essential bioprocess systems engineering aspects ranging from metabolic engineering to control of bioproduction plants will be covered. It is intended to focus in particular on aspects of bioprocess systems engineering in the 21st century. For further information browse http://www.icb.osaka-u.ac.jp/~cab7/.

5th IFAC Symposium on Dynamics and Control of Process Systems (DYCOPS 5)
Corfu, Greece
June 8-10, 1998

This IFAC conference was formerly known as DYCORD+, Dynamics and Control of Reactors, Distillation Columns, and Batch Processes. DYCOPS-5 will focus on the examination of new methodologies and challenging applications in reacting process systems, separation process systems, batch process systems, complex and industrial systems, and the integration of design and control. A substantial industrial involvement will contribute to a dialog about what is technically possible and what is technologically desirable. Main topics will include plant-wide dynamics, monitoring, and control, verification and calibration of dynamic models, modeling and understanding of complex dynamics, open- and closed-loop identification, novel and model-based controller design, testing and verification of control strategies, controller performance monitoring, real-time optimization methods and applications, modeling, monitoring, and control of complex multivariable systems, industrial-scale problems and solutions, design and control of modular plants, novel hard or soft sensors, economical benefits of control and real-time optimization, and novel technologies for control rooms and distributed hardware. Deadline for submission of draft six-page papers to dycops5@lehigh.edu is September 15, 1997. For more details, contact Christos Georgakis, Chemical Process Modeling and Control Research Center, Lehigh University, Bethlehem, PA 18015-4781, 610-758-5432, 610-758-5297 (FAX), cg00@ns.cc.legigh.edu or the DYCOPS-5 Secretariat, Department of Chemical Engineering, Aristotle University of Thessaloniki, PO Box 472, 54006 Thessaloniki, GREECE, 30-31-996-211, 30-31-996-198 (FAX), dycops98@alexandros.cperi.forth.gr, or browse http://lpre1.cperi.forth.gr/~dycops5/.

1998 American Control Conference
Philadelphia, Pennsylvania
June 24-26, 1998

The American Automatic Control Council will hold the seventeenth ACC at the Adam's Mark Hotel, Philadelphia, June 24-26, 1998. Held in cooperation with the International Federation of Automatic Control, this conference will bring together people working in the fields of control, automation, and related areas. The conference will include both invited and contributed presentations as well as tutorial workshops. Prospective authors of regular contributed papers should submit 5 copies of the complete manuscript and a manuscript form, to the AIChE Society Review Chair, B. Wayne Bequette, Department of Chemical Engineering, Rensselear Polytechnic Institute, Troy, NY

12180-3590, 518-276-6683, 518-276-4030 (FAX), beueb@rpi.edu by September 15, 1997. Prospective authors of short contributed papers should submit 5 copies of the short manuscript and a manuscript form, to the Program Vice-Chair for Contributed Sessions, Peter Meckl, Department of Mechanical Engineering, Purdue University, West Lafayette, IN 47907-1288, 317-494-5686, 317-494-0539 (FAX), meckl@ecn.purdue.edu also by September 15, 1997. Manuscript forms and additional information can be obtained from http://www.ece.nwu.edu/~ahaddad/aacc.

Third International Conference on Foundations of Computer-Aided Process Operations (FOCAPO-98)
Snowbird, Utah
July 5-10, 1998

The Foundations of Computer-Aided Process Operations Conference will be the third in a series of conferences dealing with the use of computers in support of process operations. Since the first two FOCAPO conferences in 1987 and 1993, there has been an enormous increase in interest in improving the efficiency and effectiveness of process operations. Given the likely continuation of this trend, FOCAPO-98 will bring together operations personnel, management, and researchers for a comprehensive look at the state of the art in computer-aided process operations, a discussion of strategies important to thriving in an environment of continuous change and rapidly advancing technology, and the important challenges to be overcome. The conference will provide a forum for operations personnel to share their experiences emphasizing presentations describing technology that is being reduced to practice or is likely to be in the next five years, provide an opportunity for industrial practitioners, academics, and vendors to interact, and hopefully motivate future research by describing problems that are intractable or expensive to solve with existing approaches.

Principal conference topics and issues will include plant-wide optimization, pilot and semi-plant operations, multiproduct plants, product integrity and risk management, environmental issues, continuous improvement, supply-chain management, and biological processes. Core enabling technologies to be discussed include optimization methods, planning/scheduling, process control as a tool for achieving high level operations objective, knowledge-based systems/neural networks, simulation software, information technology, probability and statistics, computer interfaces/software issues, on-line instrumentation/process monitoring, and abnormal/exceptional situation management, risk analysis, and accommodating data uncertainty.

In addition to invited sessions, conference participants are encouraged to submit papers to the contributed paper session. Deadline for contributed paper abstracts is December 1, 1997. For more information, contact the conference chairs Gary E. Blau, DowElanco, 9330 Zionsville Rd, Indianapolis, IN 46268-1053, 317-337-3137, 317-337-3215 (FAX), gblau@dowelanco.com or Joseph F. Pekny, School of Chemical Engineering, Purdue University, West Lafayette, IN 47907-1283, 765-494-7901, 765-494-0805 (FAX), pekny@ecn.purdue.edu or the contributed paper chair, Ignacio E. Grossmann, Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh, PA 15213-412-268-2228, 412-268-7139 (FAX), grossmann@cmu.edu or browse http://che.www.ecn.purdue.edu/FOCAPO98/. To preregister for FOCAPO-98, please send a statement of research and conference interests along with complete address information no later than January 2, 1998 to Janet Taylor, School of Chemical Engineering, Purdue University, West Lafayette, IN 47907-1283.

Automatic Control of Food and Biological Processes (ACoFoP IV)
Göteborg, Sweden
September 21-23, 1998

Following the success of ACoFoP I, II, and III held in Paris, the Food Working Party of the European Federation of Chemical Engineering is organizing another international symposium on Automatic Control of Food and Biological Processes to take place in Göteborg on September 21-23 1998. Proceedings will be published and distributed at the symposium. The conference language will be English. The objectives of the symposium will be to present results of recent research and industrial developments in process control of food and biological processes, and to promote discussions between process engineers and scientists from the food and biotechnology industry and process control engineers. The themes of the conference will include sensors including biosensors, image processing and machine vision, on-line measuring systems, software for sensors and estimators, sensor fusion, on-line quality control, in-line sensor applications in industry, simulation in connection to process control, simulation for training in production, computer-aided design of process control, use of artificial intelligence, decision support, robotics, optimal and adaptive control, simulation of continuous and batch processes including environmental aspects, process modeling, dynamic modeling, predictive modeling, scheduling, and computer-aided engineering/computer-integrated manufacturing. Authors wishing to present papers are invited to send their proposal as an extended abstract of one page before October 31, 1997 to Christina Skjöldebrand, SIK, PO Box 5401, S-402 29 Göteborg,

SWEDEN, 46-31-335-5600, 46-31-83-3782 (FAX). For additional information, browse http://www.sik.se/acofop/.

1998 AIChE Annual Meeting
Miami Beach, Florida
November 15-20, 1998

Meeting Program Chair: Stanley I. Sandler, Department of Chemical Engineering, University of Delaware, Newark, DE 19716, 302-831-2945, 302-831-4466 (FAX), sandler@che.udel.edu.

The CAST Division is planning the following sessions at the Miami Beach Annual Meeting which have been approved by the Meeting Program Chair. A fist call for papers for this meeting appears later in this issue. Deadline for submission of presentation proposals (electronically only) is March 1 or April 1, 1998 (depending on the Area review procedures). The entire CAST program in Miami Beach is being cosponsored by the Society for Computer Simulation.

CAST Division Plenary Session

1. Recent Developments in Computing and Systems Technology. Scott E. Keeler, DowElanco (Chair) and Kyriacos Zygourakis, Rice University (Co-Chair).

Area 10a: Systems and Process Design

1. Process Synthesis. Viswanathan Visweswaran, Mobil Technology Company (Chair) and Matthew J. Realff, Georgia Institute of Technology (Co-Chair).
2. Design and Analysis. Dennis D. Sourlas, University of Missouri, Rolla (Chair) and Michael L. Luyben, E. I. du Pont de Nemours & Company (Co-Chair).
3. Process and Product Design. Yinlun Huang, Wayne State University (Chair) and Luke Achenie, University of Connecticut (Co-Chair).
4. Design for Polymer Production and Processing. Steve Wilkinson, E. I. Du Pont de Nemours & Company (Chair) Costas D. Maranas, Pennsylvania State University (Co-Chair).

Joint Area 10a and Area 10c Sessions

1. Batch Processing. Christine B. Seymour, Searle Company (Chair) and Marianthi G. Ierapetritou, Princeton University (Co-Chair).
2. Design for Flexibility and Operability. Stratos Pistikopoulos, Imperial College (Chair) and Jorge A. Mandler, Air Products and Chemicals, Inc. (Co-Chair).

Joint Area 10a and Area 2g Session

1. Design of Reactive Separations. Michael F. Malone, University of Massachusetts (Chair) and Jeff DeGarmo, Koch Engineering Company, Inc. (Co-Chair).

Area 10b: Systems and Process Control

1. Process Control Applications. James B. Riggs, Texas Technical University (Chair) and Jorge A. Mandler, Air Products and Chemicals, Inc. (Co-Chair).
2. Process and Controller Performance Monitoring. Bhavik R. Bakshi, Ohio State University (Chair) and George N. Charos, Amoco Corporation (Co-Chair).
3. Batch Process Control. Masoud Soroush, Drexel University (Chair) and Sheyla L. Rivera, Stevens Institute of Technology (Co-Chair).
4. Nonlinear Control. Thomas A. Badgwell, Rice University (Chair) and Alex Z. Q. Zheng, University of Massachusetts (Co-Chair).
5. Plant-wide Control. Richard D. Braatz, University of Illinois (Chair) and B. Erik Ydstie, Carnegie Mellon University (Co-Chair).
6. State and Parameter Estimation. Kenneth R. Muske, Villanova University (Chair) and David H. Gay, E. I. du Pont de Nemours & Company (Co-Chair).
7. Data-driven Approaches to Process Control. Jay H. Lee, Auburn University (Chair) and Lloyd Johnson, University of New South Wales (Co-Chair).

Joint Area 10b and Area 3d Session

1. Modeling and Control of Particulate Systems. Anthony A. Adetayo, E. I. du Pont de Nemours & Company (Chair) and Martin Pottmann, E. I. du Pont de Nemours & Company (Co-Chair).

Joint Area 10b and Area 8e Session

1. Design and Control of Microelectronics Manufacturing Processes. Panagiotis D. Christofides, University of California, Los Angeles (Chair) and Dennis D. Sourlas, University of Missouri, Rolla (Co-Chair).

Joint Area 10b and Area 15c Session

1. Advances in Bioprocessing: Sensors, Control, and Optimization. Christos Hatzis, A. E. Staley, Inc. (Chair) and Michael A. Henson, Louisiana State University (Co-Chair).

Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing in the Chemical Process Industries (Cosponsored by the International Cooperation Committee of the Society of Chemical

Engineers, Japan). Shinji Hasebe, Kyoto University (Chair) and Bhavik R. Bakshi, Ohio State University (Co-Chair).
2. Advances in Optimization. Iauw-Bhieng Tjoa, Mitsubishi Chemical America, Inc. (Chair) and Nikolaos V. Sahinidis, University of Illinois (Co-Chair).
3. Uncertainty and Risk in Process Operations and Monitoring. Lloyd Johnson, University of New South Wales (Chair) and Viswanathan Visweswaran, Mobil Technology Company (Co-Chair).
4. High Performance Computing. Mark A. Stadtherr, University of Notre Dame (Chair) and Matthew H. Bassett, DowElanco (Co-Chair).

Joint Area 10c and Group 6a Sessions

1. Computational Fluid Mixing. Chair to be named by Area 6a and Richard D. LaRoche (Co-Chair)..
2. Computational Mixing in Process Operations. Alan B. Coon, UOP, Inc. (Chair) and a Co-Chair to be named by Area 6a.

Joint Area 10c and Area 15a Session

1. Computational Methods in the Food Processing Industry. Federico Carvallo, Kraft Foods, Inc. (Chair) and Matthew J. Realff, Georgia Institute of Technology (Co-Chair).

Area 10d: Applied Mathematics and Numerical Analysis

1. Population Balances and Applications. Doraiswami Ramkrishna, Purdue University (Chair) and Ka M. Ng, University of Massachusetts (Co-Chair).
2. Nonlinear Dynamics. Vemuri Balakotaiah, University of Houston (Chair) and Hsueh-Chia Chang, University of Notre Dame (Co-Chair).
3. Computational, Integral and Spectral Methods in Engineering Applications. Pedro Arce, FAMU/FSU College of Engineering (Chair) and Lakshmi N. Sridhar, University of Puerto Rico (Co-Chair).
4. Parallel Computing Applications. Antony N. Beris, University of Delaware (Chair) and Joseph F. Pekny, Purdue University (Co-Chair).

Joint Area 10d and Area 8e Session

1. Applied Mathematics in Materials Processing. Ioannis G. Kevrekidis, Princeton University (Chair) and T. J. Mountziaris, State University of New York at Buffalo (Chair), and Richard Dickinson, University of Florida (Co-Chair).

Joint Area 10d and Area 15d/e Session

1. Mathematical Modeling in Cellular Engineering. Sriram Neelamegham, State University of New York at Buffalo (Chair), and Richard Dickinson, University of Florida (Co-Chair).

CAST DIVISION POSTER SESSION

Section A. Recent Developments in Systems and Process Design. Michael L. Mavrovouniotis, Northwestern University (Chair) and Amy R. Ciric, University of Cincinnati (Co-Chair).

Section B. Recent Advances in Process Control. Dennis D. Sourlas, University of Missouri, Rolla (Chair) and Prodromos Daoutidis, University of Minnesota (Co-Chair).

Section C. Topics in Process Operations and Information Processing. Scott E. Keeler, DowElanco (Chair) and Nikolaos V. Sahinidis, University of Illinois (Co-Chair).

Section D. Advances in Applied Mathematics. Kyriacos Zygourakis, Rice University (Chair) and Pedro Arce, FAMU/FSU College of Engineering (Co-Chair).

Section E. Demonstrations of Software for Process Control Education. Douglas J. Cooper, University of Connecticut (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).

1999 CAST Division Programming

The CAST Division is expected to be actively participating in the 1999 AIChE Spring National Meeting in Houston and the 1999 Fall Annual Meeting in Dallas. Programming for these two meetings will be planned at the Los Angeles AIChE meeting in November. 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. Those who cannot attend the area program meetings are encouraged to bring their ideas to the attention of the Area Chairs at the addresses indicated on the masthead.

1999 American Control Conference
San Diego, California
June 2-4, 1999

The American Automatic Control Council will hold the eighteenth ACC at the Hyatt Regency Hotel, San Diego, June 2-4, 1999. Held in cooperation with the International Federation of Automatic Control, this conference will bring together people working in the fields of control, automation,

and related areas. Presentations will be both invited and contributed. The deadline for contributed papers will be approximately August 15, 1998. For more information, browse http://www.ece.nwu.edu/~ahaddad/aacc.

Fifth International Conference on Foundations of Computer-Aided Process Design (FOCAPD-99) July, 1999

Foundations of Computer-Aided Process Operations Design will be the fifth in the series of CAST-sponsored conferences dealing with the use of computers in support of process design and is scheduled for mid-summer 1999 at a site in the Western United States. To participate in the organization of this conference or for more information, contact the conference chairs Michael F. Malone, Department of Chemical Engineering, University of Massachusetts, Amherst, MA 01003-3110, 413-545-0838, 413-545-1133 (FAX), mmalone@ecs.umass.edu or James A. Trainham, E. I. du Pont de Nemours & Company, PO Box 80101, Wilmington, DE 19880-0101, DE, 302-992-3898, 302-992-2035 (FAX), trainham@a1.esvax.umc.dupont.com.

CALLS FOR PAPERS FOR CAST SESSIONS

Final Call for CAST Sessions 1998 AIChE Spring National Meeting New Orleans, Louisiana March 8-12, 1998

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, George Lappin. A complete call for papers for all sessions at this meeting may be accessed at http://www.aiche.org/meeting/1998/spring/cfp/.

AIChE is currently soliciting electronic submission of proposals-to-present via the World Wide Web or email. To submit via the web, access http://www.aiche.org. For information and instructions about submitting via email, send the following message to ptp-admin@www.aiche.org:

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get spring98 ptp_form
get spring98 ptp_instructions
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When submitting electronically, make note of the unique AIChE session number which will be provided for each session title listed below. Email submissions must be sent directly to spring98-submit@www.aiche.org. Do not send proposals-to-present to the session chair email addresses.

New Orleans Meeting deadlines:

August 1, 1997: Submit a proposal-to-present electronically to AIChE via email to spring98-submit@www.aiche.org or via web access at http://www.aiche.org. AIChE will forward proposals to the corresponding session chairs.

September 1, 1997: Session content finalized authors informed of selection. Authors of accepted proposals may update abstracts electronically.

February 6, 1998: Authors submit final manuscript (presentation record) to AIChE Headquarters.

March 8, 1998: Speakers bring 60 hard copies of visual aids to be distributed to the audience at the presentation. (This is a CAST Division policy, intended to improve the quality of the presentations and the benefit to the audience.)

Please note that there is an AIChE limitation that no person may author or co-author more than four contributions at any one meeting nor more than one contribution in any one session.

Authors submitting by the above deadlines will be notified of decisions on acceptance as close to October 1 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 written record of their presentation to AIChE Headquarters by the manuscript submission deadline. 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. Formal full-length manuscripts are encouraged. However, the minimal presentation record content acceptable to AIChE is an extended abstract including 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 written presentation record be a condition for presenting at AIChE-sponsored meetings.

Area 10a: Systems and Process Design

1. Design for Retrofit.

Technological developments and changing economic structure of the chemical industry forces the existing chemicals productions systems to be re-designed. One class of retrofit projects involves changes, additions and removal of equipment within a system to conform with environmental regulations, prevent pollution, reduce the energy cost of the systems or improve the overall economics. Another large class of retrofit problems is the debottlenecking of plants to increase capacity. These retrofits can also be accompanied with the aforementioned measures to improve energy efficiency and compliance with regulations. Additionally, plants are subject to modifications to improve controllability, operability, and flexibility. This session will focus on the practical approaches, new trends and new methods in the area of design for retrofit. Topics of special interest include tools and design packages for retrofit design, case studies and techniques. Industrial case studies were systematic approaches have been tested are especially encouraged to be submitted.

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2. Practical Approaches to Process Design.

Over the past two decades, significant progress has been made in developing systematic techniques for process design. In addition to their systematic nature, they have also gained industrial applicability. Examples of such approaches include energy integration, mass integration, scheduling, design of non-ideal separations, reaction systems and batch processing. The focus of this session is to provide an overview of the state of the art of these approaches and illustrate their industrial applicability. The presentations may be in the form of tutorials, review papers or new contributions. Presentations may target design techniques for retrofit as well as grass-root design scenarios.

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3. Tutorials in Batch Process Design and Operations.

Sudden increase in the production of high-value-added, low volume specialty chemicals and biochemicals in recent years have generated a renewed interest in batch processing technology. The most outstanding feature of a batch process is its flexibility. However, it is this flexibility and the unsteady state nature of operation which pose challenging design and operations problems. In view of the practical importance and in response to industrial needs for chemical engineers with a strong background in batch processing, more and more educational institutions are redesigning their curricula to include courses devoted to the subject. From both academic and industrial standpoints, therefore, a session dedicated to tutorials in batch process design and operations is of much significance, which is the motivation for the present undertaking. This session will focus on the issues related to design, operations and scheduling of batch plants. This session seeks papers dealing with all aspects of the design of batch processes including retrofit, trade-offs between design and operations, design under uncertainty, industrial case studies, new design strategies and methodologies etc. Also of interests are the topics related to sequencing and scheduling of batch plants such as resource-constrained scheduling, production planning, scheduling and planning in the face of uncertainties, and methodologies for scheduling.

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Joint Area 10a and Area 9d Session

1. Computer Applications in Chemical Engineering for the Environment.

Papers focusing on the development and application of computerized systems to solve environmental problems are solicited. Current implementations and contributions from industry in the areas of process simulation on risk analysis, optimization, and life cycle cost are especially encouraged. Applications using expert systems to solve environmental problems will also be included in this session.

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Area 10b: Systems and Process Control

1. Model Predictive Control.

Papers focusing on the development, analysis, and application of model predictive control systems are solicited. Experimental studies and contributions from industry are especially encouraged.

Session Chair
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Co-Chair
Martin Pottmann
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2. Applications of Process Control.

Papers focusing on the application of advanced process control strategies are solicited. Applications to novel process systems and experimental studies are especially encouraged. Papers focusing on model predictive control techniques should be submitted to the other Area 10b session on Model Predictive Control.

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Area 10c: Computers in Operations and Information Processing

1. Industrial Applications of Optimization.

Optimization plays an important role in all phases of process engineering activity, ranging from conception to design to operation. This session will focus on the

applications of optimization in synthesis, design, and operation of process plants. Optimization can be described as a four-step decision-making process, where the first step is the knowledge of the system and hence is related to the modeling of the process. The second step involves finding the measure of effectiveness and the third step is related to the optimization algorithms. The fourth step is the synthesis and implementation of the first three steps in order to solve a real world problem with significant economic implications. This session seeks papers dealing with all aspects of optimization steps including modeling, single objective, multi-objective system effectiveness, and new algorithms for solving large-scale process engineering problems. Also of interests are topics related to operation, planning, scheduling, and optimization under uncertainty. Special consideration will be given to papers that demonstrate actual practical application of these techniques resulting in measurable economic advantages.

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2. Tutorial/Survey of Issues in Process Operations.

Informative overviews on current or emerging issues in process operations are solicited. Possible areas of interest may include the utilization of the Internet by both academia and industry, statistical methods for process monitoring, the future of computer hardware/software for the chemical industry, etc. Submissions from both academia and industry are welcomed.

Session Chair
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First Call for CAST Sessions 1998 AIChE Annual Meeting Miami Beach, Florida November 15-20, 1998

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, Stan Sandler. A complete call for papers for all sessions at this meeting may be accessed at http://www.aiche.org/meeting/1998/annual/cfp/.

AIChE is currently soliciting electronic submission of proposals-to-present via the World Wide Web or email. To submit via the web, access http://www.aiche.org. For information and instructions about submitting via email, send the following message to ptp-admin@www.aiche.org:

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When submitting electronically, make note of the unique AIChE session number which will be provided for each session title listed below. Email submissions must be sent directly to annual98-submit@www.aiche.org. Do not send proposals-to-present to the session chair email addresses.

SPECIAL NOTE TO AUTHORS SUBMITTING ABSTRACTS FOR ANNUAL MEETING SESSIONS SPONSORED BY CAST AREAS 10A, 10B, and 10C:

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 1998 programming in CAST Areas 10a, 10b, and 10c must be submitted to AIChE ONE MONTH EARLIER than the generally published deadline in order to accommodate the Division Review process. Please note that CAST Area 10d and CAST sessions cosponsored with other AIChE programming groups DO NOT participate in the Division Review process, and therefore remain governed by the standard deadline.

CAST Division Review Procedure for Areas 10a, 10b, and 10c:

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

2. Each area will sponsor one section of the Division Poster Session. Some areas may develop a topical theme for their section 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.

Miami Beach Meeting Deadlines:

March 1, 1998 (10a, 10b, and 10c): Submit a proposal-to-present electronically to AIChE via email to annual98-submit@www.aiche.org or via web access at http://www.aiche.org. AIChE will forward the proposals to CAST for the Division Review.

April 1, 1998 (10d, and sessions cosponsored with other programming groups): Submit a proposal-to-present electronically to AIChE via email to annual98-submit@www.aiche.org or via web access at http://www.aiche.org. AIChE will forward proposals to the corresponding session chairs.

May 1, 1998: Session content finalized and authors informed of selection. Authors of accepted proposals may update abstracts electronically.

October 16, 1998: Authors submit final manuscript (presentation record) to AIChE Headquarters.

November 15, 1998: Speakers bring 60 hard copies of visual aids to be distributed to the audience at the presentation. (This is a CAST Division policy, intended to improve the quality of the presentations and the benefit to the audience.)

Please note that there is an AIChE limitation that no person may author or co-author more than four contributions at any one meeting nor more than one contribution in any one session.

Authors submitting by the above deadlines will be notified of decisions on acceptance as close to May 1 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 written record of their presentation to AIChE Headquarters by the manuscript submission deadline. 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. Formal full-length manuscripts are encouraged. However, the minimal presentation record content acceptable to AIChE is an extended abstract including 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 written 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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Co-Chair
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Area 10a: Systems and Process Design

1. Process Synthesis.

We invite papers that deal with methods for synthesis of chemical process systems. Topics of interest include (but are not limited to) flowsheet synthesis, reaction path and reactor network synthesis, synthesis of novel separation schemes, and integration of synthesis, design and control. The methodologies presented may involve conceptual approaches, mathematical programming and heuristic strategies, among others. Areas that have not received adequate attention in traditional process synthesis literature (such as environmental applications) are particularly encouraged.

Session Chair
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Co-Chair
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2. Design and Analysis.

This session focuses on the general topic of design and analysis for chemical processes, including both continuous and batch types. This involves conceptual design, economic evaluation, modeling, flowsheet optimization, and analysis of unit operations. Papers are sought which address these issues in design and analysis.

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3. Process and Product Design.

This session invites paper submissions reflecting recent advances in process and product design. Research areas include, but are not limited to, process design (e.g., pinch analysis applied to heat and mass exchanger networks, reactive distillation system design, attainable region concepts applied to reactor design, design for pollution prevention, and life cycle analysis) and product design (e.g., polymers, solvents, refrigerants, catalysts, and pharmaceuticals). To date, process and product design tools have included mixed integer nonlinear programming, global optimization, interval arithmetic, knowledge-based approach, simulated annealing, genetic algorithms. This session encourages the introduction of other tools outside the usual set. It has been the norm to discuss process and product design in the absence of uncertainties. We would like to encourage submitters to discuss the impact on, and the incorporation of model uncertainties in the suggested approaches. All areas are encouraged. Whenever possible the impact of the new research on industrial practice should be emphasized.

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4. Design for Polymer Production and Processing.

Papers are invited that address the wide range of design and operational issues associated with polymer production and processing. These include the optimal design of polymers, equipment or processes, taking account of the complexities

inherent in polymer systems (rheological, kinetic etc.). Also of interest are methodologies for the efficient design/scheduling of the flexible plants often employed in polymer production. Presentations of industrial success stories are particularly welcome.

Session Chair
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Co-Chair
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Joint Area 10a and Area 10c Sessions

1. Batch Processing.

Papers are sought in areas of concern for batch processing. Focuses may include batch process synthesis, design, modeling, optimization, retrofit, as well as sequencing and scheduling. Papers that include industrial case studies or applications are encouraged to be submitted.

Session Chair
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2. Design for Flexibility and Operability.

The focus of this session will be on the formal incorporation of operability objectives, such as flexibility, reliability, controllability, maintainability, safety and environmental risk, at the synthesis and design of processing systems. Both industrial and academic papers are sought describing general procedures, theoretical developments, methodologies, tools and case studies. Emphasis is placed on studies which will highlight the interactions of the various operability factors and demonstrate possible synergistic benefits of their inclusion in process design under conditions of uncertainty.

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Co-Chair
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Joint Area 10a and Area 2g Session

1. Design of Reactive Separations.

Papers are requested describing original research results on the design of reactive separation devices and systems. It is anticipated that the major focus will be on reactive or catalytic distillation, but studies of other technologies such as reactive extraction or absorption with reaction are also appropriate. Authors should emphasize design approaches, tools and results but original studies in support of design such as experimental testing of new models, the treatment of transport effects, operability and controllability of designs, etc. are also welcome. General approaches or specific studies of real systems, especially those of industrial importance, will be given priority.

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Area 10b: Systems and Process Control

1. Process Control Applications.

All interested persons are invited to submit papers that address the application of advanced control to the chemical processing industry. We are soliciting papers that demonstrate how industry has benefited or how industry could benefit from advanced control.

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2. Process and Controller Performance Monitoring.

The focus of this session is on the theoretical and application studies related to control system performance monitoring and process performance monitoring and diagnosis. It covers the methods to ensure process safety, high product quality, process operability, optimum process performance, economic viability, and process profitability. Industrial implementations are particularly welcome. Topics include but are not limited to multivariate statistical methods, neural networks, process chemometrics, fuzzy logic, artificial intelligence for monitoring and diagnosis, and statistical process control.

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3. Batch Process Control.

Contributions are sought in the general area of batch process control. Papers presenting new theoretical and/or application results are solicited. Higher priority will be given to real-time control studies and to contributions from the process industry. Areas of interest include, but are not limited to, nonlinear model-based control of batch processes, simultaneous optimization and control of batch processes, industrial challenges in control of batch processes, and control-relevant model identification in batch processes.

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4. Nonlinear Control.

Contributions are sought in the general area of nonlinear control including model predictive control, differential geometric control, modeling of nonlinear systems, and nonlinear dynamic analysis of control systems.

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5. Plant-wide Control.

This session will focus on recent advances in plant-wide control. Papers highlighting industrial experience or comparisons between theoretical predictions and industrial applications are welcome. Some areas of interest include, but are not limited to alternative formulations of the plant-wide control problem, comparisons between various approaches to plant-wide control, selection of manipulated, measured, and controlled variables, computational challenges associated with plant-wide control, and real-time optimization.

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6. State and Parameter Estimation.

Contributions concerning the development, application, and implementation of state and parameter estimation techniques for process control are sought. Areas of interest include, but are not limited to model-based control, process monitoring, fault detection, data reconciliation, and sensor fusion. Presentations describing novel approaches in process control are encouraged, with papers concerning industrial or experimental implementations of state and parameter estimation techniques particularly welcome.

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7. Data-driven Approaches to Process Control.

This session focuses on process control techniques that make novel use of plant data (either historical or test data). Modeling is a key step in implementing an advanced process control system, and the fundamental knowledge needed to build first principles models is often lacking. However, there often is an abundance of plant data that contain a wealth of useful information for process control. In addition, one can also conduct experiments to generate additional data that contain specific information about the process. We are interested in both the use of data, and the generation of data. Both theoretical papers that discuss general methodologies, and application papers that offer insights into the interplay between theories and practice, will be acceptable.

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Joint Area 10b and Area 3d Session

1. Modeling and Control of Particulate Systems.

Contributions are sought describing work in the areas of measurement, and online monitoring and control of particle transportation, formation, breakage, and growth processes. Processes of interest include, but not limited to, pneumatic and hydraulic conveying, crystallization, precipitation, grinding, agglomeration, compaction and extrusion. Presentations of industrial experiences with the monitoring and control of relevant product properties and critical discussions of limitations/advantages of current approaches are also welcomed. Abstract should summarize the scope of the work, the methodology employed, and significant accomplishments.

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Joint Area 10b and Area 8e Session

1. Design and Control of Microelectronics Manufacturing Processes.

Papers are sought which describe process systems engineering applications to microelectronic manufacturing processes including model development, reaction and transport simulations, model reduction, optimization, monitoring and model-based control.'

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Joint Area 10b and Area 15c Session

1. Advances in Bioprocessing: Sensors, Control, and Optimization.

The continuing industry-wide drive to reduce development time for bioprocesses while maintaining high product quality and yields has created an ever increasing need for sophisticated but practical approaches for the optimization and control of bioprocesses. Contributions are solicited describing the development and application of novel off-line optimization techniques as well as on-line sensors and control strategies. Fundamental or applied papers in the areas of biomedical, pharmaceutical, food and commodity biochemicals are invited. Suggested topics include but are not limited to bioreactor and process design for robustness and controllability, the application of empirical, model-based, and metabolic optimization techniques for process and organism design, and the use of statistical design or artificial intelligence applications to process optimization. Additional topics of interest include recent developments in on-line sensors and measurement techniques for property and rate measurements as applied to biochemical process identification and control. Contributions focusing on advanced modeling and control strategies for biochemical processes also are welcome.

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Area 10c: Computers in Operations and Information Processing

1. Computer Integrated Manufacturing in the Chemical Process Industries (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. Advances in Optimization.

Papers are solicited which describe recent advances in optimization theory and novel applications to the chemical process industries. Papers that address the following issues are especially encouraged: 1) new development of algorithms for nonlinear, mixed-integer, global and stochastic optimization, and 2) novel applications of optimization techniques for solving problems related to chemical process operations, scheduling and planning.

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3. Uncertainty and Risk in Process Operations and Monitoring.

This session focuses on methodologies for the planning, scheduling, operation and monitoring of processes that explicitly account for uncertainty and risk. In chemical processes, uncertainty is often present in many areas including the feedstock quality, process data, and behavior of the process. There are also inherent risks involved in operating processes, which can be magnified by the presence of uncertainty. These uncertainties and risks not only make the processes difficult to plan and operate, but also make it difficult to monitor the process. We invite papers addressing heuristic, deterministic and stochastic approaches to handling uncertainty and risk. Areas of interest might include (but are not limited to) planning and forecasting models, data rectification, fault diagnosis and statistical process monitoring for batch and continuous processes. Application papers that offer insights into the interplay between theory and practice, as well as presentations of industrial success stories, are particularly encouraged.

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4. High Performance Computing.

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: (i) novel numerical algorithms and codes that promote the use of high performance computing in process engineering, and (ii) 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, molelcular dynamics, etc. Industrial applications are particularly welcome.

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Joint Area 10c and Group 6a Sessions

1. Computational Fluid Mixing.

Co-Chair
Richard D. LaRoche

2. Computational Mixing in Process Operations.

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Joint Area 10c and Area 15a Session

1. Computational Methods in the Food Processing Industry.

There has been an explosion of new food and beverage products in recent years. As a result processors are constantly looking for methods to maximize the flexibility and agility of new and existing manufacturing facilities. To aid in the prioritization of potential improvements and assessment of new technologies, they are applying computer modeling tools to evaluate costs/benefits. Simulation, scheduling, and design software are being employed to optimize manufacturing layouts, material flows, and task sequencing. The food process industry, and innovative academic and industrial research which could lead to new areas of opportunity in the future.

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Area 10d: Applied Mathematics and Numerical Analysis

1. Population Balances and Applications.

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2. Nonlinear Dynamics.

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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3. Computational, Integral and Spectral Methods in Engineering Applications.

The current advances in computer hardware in conjunction with the advances in various experimental techniques capable of probing systems at the nanoscale level make a very exciting environment for the development of new and powerful algorithms and numerical strategies. There is a variety of problems ranging from the molecular and microscopic level to the meso and macroscopic scale that need the focus of an intense research in the design and implementation of such algorithms. Some of these problems are in connection with the design and characterization of new materials that may include, for example, composite and polymeric fluids, porous and structured media with a wide range of applications to new bioengineering and environmental processes. The accurate description of the fluid mechanics, transport and reaction processes require the use of sophisticated numerical schemes. This session will offer a forum where researchers from a variety of fields can share their experiences in the development of new and efficient computational strategies. Contributions in the general area of integral and spectral methods are particularly encouraged. As it has been the case in past sessions, a leading lecture is being planned and contributors are encouraged to make use of an integrated approach among analytical techniques, experiments and computational approaches if that is needed in the solution of a given problem.

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4. Parallel Computing Applications.

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Joint Area 10d and Area 8e Session

1. Applied Mathematics in Materials Processing.

Topics of interest include modeling of reaction kinetics and/or transport phenomena in materials processing, and nonlinear phenomena in materials processing. Of particular interest are: (a) large scale scientific computing; (b) model reduction for control purposes, and (c) hierarchical modeling: from molecular to mesoscopic (properties) or from mesoscopic to macroscopic (processes). Materials of interest include, but are not limited to semiconductors, ceramics, polymers, composites, nanoparticles and biomaterials.

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Joint Area 10d and Area 15d/e Session

1. Mathematical Modeling in Cellular Engineering.

The symposium will focus on the application of mathematics to bioengineering, with an emphasis to 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 DIVISION POSTER SESSION

Section A. Recent News 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. Recent Advances in Process Control.

Poster presentations are sought that describe new theoretical developments and/or application studies in the area of process control.

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Section C. Topics in Process Operations and Information Processing.

Posters describing recent original results of interest in the area of process operations, optimization, and computers in information processing are solicited.

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Section D. 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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Section E. Demonstrations of Software for Process Control Education.

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EDUCATIONAL COMPUTER SOFTWARE DEMONSTRATIONS (Joint Effort with Group 4)

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American Institute of Chemical Engineers
Computing and Systems Technology Division
345 East 47th Street
New York, NY 10017

American Institute of Chemical Engineers

1997 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.
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*A person may be nominated for only one award in a given year.

THE DEADLINE FOR AWARD NOMINATIONS IS APRIL 15, 1997

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, Lorenz T. Biegler

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THE DEADLINE FOR AWARD NOMINATIONS IS APRIL 15, 1997

CAST COMMUNICATIONS

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