Larry Biegler wins 2007 ASEE/CACHE Award for Excellence in Computing in Chemical Engineering Education

Larry Biegler, Professor of chemical engineering at Carnegie Mellon University, received the 2007 ASEE/CACHE Award for Excellence in Computing in Chemical Engineering Education. This award, sponsored by the CACHE Corporation, is presented for significant contributions in the development of computer aids for chemical engineering education.

Larry Biegler was nominated for his pioneering implementation of the successive quadratic programming (SQP) method in the process simulator FLOWTRAN that was distributed extensively by CACHE for many years. This optimization capability allowed many students to optimize process flowsheets in their design projects. It should be noted that Larry also developed two CACHE Design Case Studies, Volume 3: "Design of an Ethanol Dehydrogenation Plant," and Volume 8: "Nitrogen from Air." The latter is the first and only web-version that has been produced for design case studies: http://www2.cheme.cmu.edu/course/06302/airsep2/

Larry Biegler has been a pioneer and world leader in optimization of process systems and has had great impact in theory, algorithms, software, as well as in chemical engineering applications, particularly in large-scale industrial problems. He has been very influential and highly cited (more than 2,100 citations).

Larry's optimization work in FLOWTRAN has been based in one of his major contributions to the literature, the conception and development of "infeasible path" strategies for the optimization of process flowsheets. In the past optimization was regarded as an interesting academic exercise but with little practical relevance due to the large computational expense that was required. Larry's initial pioneering research, developed the notion that simulation and optimization through sequential quadratic programming (SQP) can be performed simultaneously with substantial savings in computation time. The approach applies Newton-based solving simultaneously to the model equations and the necessary conditions for optimality, yielding an optimization in approximately the time to solve the model equations alone. The importance of these ideas has been recognized not only by academia through FLOWTRAN but also by industry. Larry's algorithms have been incorporated in commercial process simulators (like ASPENPLUS) so as to make flowsheet optimization a practical reality.

Through the significant theoretical and computational advances that he has made in SQP for large-scale nonlinear systems, the optimization of differential/algebraic systems has been made possible for the optimal control in major process applications that include continuous casting for steel-making, design of CVD reactors, operation of pressure swing adsorption, carbon sequestration, metabolic networks, and more recently simulated

moving beds. In addition, these techniques have been used very effectively for parameter estimation of dynamic systems.

Larry Biegler's most recent accomplishment has been to develop the interior point code IPOPT, which allows the solution of truly large-scale problem (http://www.coin-or.org/Ipopt/ipopt-fortran.html). The reason a code like IPOPT is highly significant is that it allows the solution of industrial scale dynamic optimization problems. As an example, Larry and his student applied IPOPT to the optimization of a system of differential algebraic equations, which when discretized, leads to a nonlinear optimization problem with 2,000,000 variables!

Larry Biegler has also been extremely active serving our profession. He is Past President of CACHE, he was chair of Area 10a of AIChE, Past Chair of the CAST Division, and co-chair of FOCAPD'94 and the IMA Workshop on Large-Scale Optimization. He is Associate Editor of Industrial and Engineering Chemistry Research, Associate Editor of SIAM Journal on Optimization and was chair of the ADCHEM 2000 Meeting in Italy. He has taught many industrial short courses at AIChE, Carnegie Mellon and MIT, and is co-author with Grossmann and Westerberg of the textbook "Systematic Methods for Chemical Process Design". He has also been the director of the Center for Advanced Process Decision-making at Carnegie Mellon (http://capd.cheme.cmu.edu).

The award consists of a plaque and a $1,000 honorarium and was presented at the Chemical Engineering Division awards banquet held at the June 18-21 ASEE Annual Conference in Chicago.