



Computer Aids in Chemical Engineering

M. Ierapetritou, E. Maginn, T. Edgar, M. Henson

Executive committee of
CACHE Corporation



About CACHE

- Founded in 1969
- Purpose

Not-for-profit organization whose purpose is to **promote cooperation** among **universities, industry and government** in the **development and distribution** of **computer-related and/or technology-based educational aids** for the **chemical engineering** profession.

- Current Board of Trustees – 28 members
 - 21 Academic; 7 Industrial or Government
 - Executive Committee
 - **Marianthi Ierapetritou – President** (Rutgers University)
 - **Michael A. Henson – Vice President** (University of Massachusetts Amherst)
 - **Thomas F. Edgar – Executive Director** (University of Texas at Austin)
 - **Ed Maginn – Secretary** (University of Notre Dame)

About CACHE: What does CACHE do?

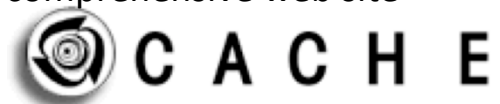
- **Awards: CACHE sponsors three major awards:**
 - ASEE Award for Excellence in Computing in Chemical Engineering Education
 - AIChE CAST Division Himmelblau Award for Innovations in Computer-Based Chemical Engineering Education
 - AIChE Evans Award for Chemical Engineering Practice.
- **Conferences.**

CACHE is a leading sponsor of chemical engineering conferences. Areas of interest include chemical process operations (FOCAPO, since 1987), design (FOCAPD, since 1983), and control (CPC, since 1986); molecular modeling (FOMMS, since 2000); and systems biology and engineering (FOSBE, since 2005)
- **Educational materials.**

CACHE develops computer-based educational materials to promote innovation in chemical engineering education.
- **Software.**

CACHE brings process modeling software into the curriculum and ultimately professional ChE practice. For example, CACHE is instrumental in the development and dissemination of software such as POLYMATH for solving ChE homework problems and ChemSep for separations courses.
- **Dissemination.**

CACHE communicates advances in chemical engineering education. We publish a semi-annual newsletter describing recent developments and we have established a comprehensive web site for chemical engineering education.

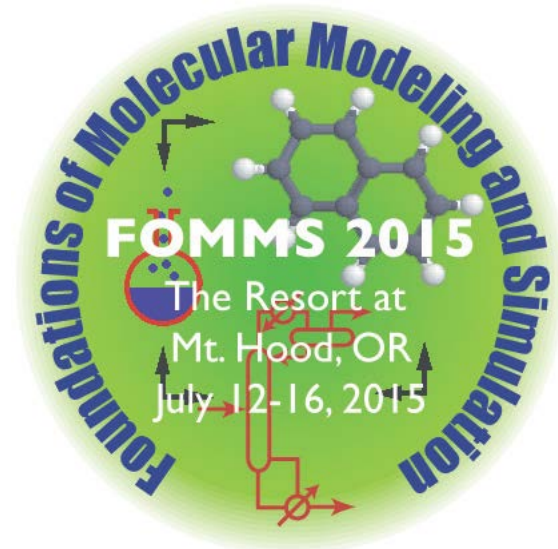


Awards – needs to be updated

- AIChE-CAST/CACHE Himmelblau Award
 - Administered by AIChE CAST division
 - Recognizes contribution to computer-based chemical engineering education made within the past decade
 - **John L. Falconer, Garret D. Nicodemus, J. Will Medlin, and Janet deGrazia**
- AIChE Evans Award
 - Institute-level award of AIChE
 - Recognizes lifetime achievement in chemical engineering practice
 - **Karl V. Jacob**
- CACHE/ASEE Award
 - Administered by ASEE
 - For significant contributions in the development of computer aids for chemical engineering education
 - **George Stephanopoulos**
- Please help with nominations each year!

Conferences

- On average, 1-2 held every year
- Financed by registration fees, federal grants, corporate sponsors
- Recent conferences
 - FOMMS July 2015
 - FOSBE August 2015
- Upcoming Conferences
 - FOSBE 2016 (Europe)
 - FOCAPO/CPC 2017
 - PSE 2018

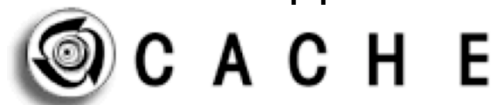


Educational Materials

- CFD simulation using Comsol in a process design textbook (plug flow / laminar flow / impact of mixing / helix designs, etc.)
- Wolfram simulations of parametric sensitivity in chemical reactor design textbook
- Biosystems modules
- Chemical engineering process design case studies
- Case studies developed for biofuels
- Solar energy modules
- Etomica molecular simulation modules
- Active updates to learning resource center



heat conduction
iPhone app



Dissemination

- CACHE addresses issues related to the communication of information
 - Website, newsletters, reports, conference proceedings, and computer programs
- ASEE Summer School materials
- CACHE News
 - Latest biannual edition released one month ago
 - Please bring new releases to the attention of your faculty
- CACHE Teaching Resource Center
 - Guide to teaching design with internet links
- cachet academic jobs posting site
 - Academic affiliates can post openings at no charge
 - Any faculty candidate can post a profile, at no charge
 - 37 faculty ads this fall



Computer Aids in Chemical Engineering



ABOUT CACHE

TEACHING RESOURCES

NEWS

AWARDS

PROJECTS

CONFERENCES

LIBRARY

STORE

Search

Go

News

[FOCAPD 2014](#)

[CACHE Mobile Device App](#)

[Competition](#)

[Sustainable Manufacturing Project](#)

[John Hedengren wins AIChE Himmelblau
award](#)

[Summer 2014 Newsletter](#)

[Fuel Cell Curriculum Project Website](#)

[Ansys CFD Curriculum](#)

Welcome to CACHE

CACHE, which stands for Computer Aids for Chemical Engineering, is a 501(c)(3) not-for-profit organization whose purpose is to promote cooperation among universities, industry and government in the development and distribution of computer-related and/or technology-based educational aids for the chemical engineering profession.

[Click here](#) for a complete introduction of CACHE.

CACHE promotes the development and distribution of technology based materials and software in chemical engineering education through projects applying computational chemical engineering, sponsoring conferences, recognizing outstanding contributions, and providing leadership in chemical engineering education.

During the 1960s the rapid growth of computer technology challenged educators to develop new methods of meshing the computer with the teaching of chemical engineering. In spite of many significant contributions to program development, the transferability of computer codes, even those written in FORTRAN, was minimal. Because of the disorganized state of university-developed codes for chemical engineering, fourteen chemical engineering educators met in 1969 to form the CACHE Committee. The CACHE Committee was initially sponsored by the Commission on Education of the National Academy of Engineering and funded by the National Science Foundation. In 1975, after several successful projects had been completed, CACHE was incorporated as a 501(c)(3) not-for-profit corporation in Massachusetts to serve as the administrative umbrella for the consortium activities.



Faculty Ads

[Main Page](#)
[Faculty Ads](#)

[Edit Dept Info](#)
[New Faculty Ad](#)
[Edit Faculty Ads](#)
[Candidate Bios](#)

Current Listings:
37 Faculty Ads
71 Candidate Bios

96 Registered Depts

[Feedback](#)

Sort by Filter by

	Department	Target rank	Posting Date App Deadline	Preferred Research Areas
	Chemical and Biochemical Engineering Rutgers University	Assoc. Prof., Prof.	Oct 23, 2015 none	Bioengineering
	Chemical and Biomedical Engineering Department Cleveland State University	Asst. Prof.	Oct 20, 2015 none	unrestricted
	Chemical Engineering Lehigh University	Asst. Prof.	Oct 19, 2015 none	Materials, Bioengineering, Modeling/simulation, Environment/sustainability, Process engineering, Dynamics/control, Nanotechnology, Energy, Manufacturing/logistics
	Chemical Engineering Lehigh University		Oct 19, 2015 none	Materials, Reaction engineering, Bioengineering, Thermo/stat-mech, Modeling/simulation, Environment/sustainability, Process engineering, Dynamics/control, Nanotechnology, Transport phenomena, Energy, Separations
	School of Chemical Engineering Purdue University	Asst. Prof., Assoc. Prof., Prof.	Oct 13, 2015 none	Energy
	Chemical and		Oct 13, 2015	

- Add Faculty Ads or other job openings
- Sort by research area
- Filter by Location
- Conference Schedule

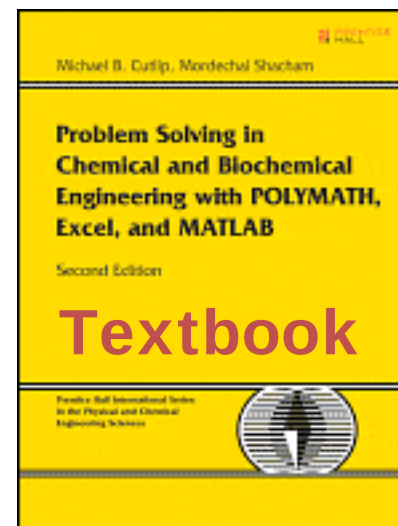
CACHE Resources

- Expenses
 - Awards and prizes, task force activities, trustee meetings, office operations, software development
- Income
 - Conferences
 - Grants
 - Software sales and licenses
 - Membership
 - \$200/year for membership
 - 105 academic affiliates in US, 28 in other countries (133 total)
 - Industrial affiliates (e.g. conference sponsorship)

Software: Polymath

- Numerical analysis software specifically for educational use – PC and Android
 - Linear, nonlinear equations, differential equations, data analysis and regression
 - Integration of selected physical property data from DIPPR database (AIChE)
 - **PolyMathLite – New Android apps on Google Play (both free and purchased)**
- Utilized by several leading ChE textbooks with discounted educational versions for individual students and faculty.
- Site licenses for academic departments with discounts for CACHE affiliates
 - Currently Licensed by CACHE to over 120 departments worldwide

PolyMath Authors: Michael B. Cutlip, Mordechai Shacham and Michael Elly (all chemical engineers)



www.polymath-software.com

NEW AFFORDABLE PURCHASE OPTIONS for Educational Version (Students only)

POLYMATH 6.1 - for Windows XP, Vista and Win7

POLYMATH is a proven computational system that has been specifically created for educational or professional use. The various POLYMATH programs allow the user to apply effective numerical analysis techniques during interactive problem solving on personal computers. Results are presented graphically for easy understanding and for incorporation into papers and reports. Engineers, mathematicians, scientists, students, or anyone with a need to solve problems will appreciate the efficiency and speed of problem solution.

POLYMATH utilizes a color-coded full-screen editor. All displays have been optimized for user efficiency. Also provided with Polymath 6.1 is the UNIQUE capability to automatically export any POLYMATH problem to Excel with a single keypress. Thus problems can be solved completely in Polymath or exported to Excel™ for solution. A POLYMATH ODE_Solver Add-In is included for solving ordinary differential equations in Excel. Automatic export to Excel includes all intrinsic functions and logical variables. Ordered equations can also be provided to assist with optional Matlab™ solutions of POLYMATH problems.

The Professional Version problem-solving capabilities include:

- Linear Equations - up to 264 simultaneous equations
- Nonlinear Equations - up to 300 simultaneous nonlinear and 300 additional explicit algebraic equations
- Differential Equations - up to 300 simultaneous ordinary differential and 300 additional explicit algebraic equations
- Data analysis and Regression - up to 200 variables with up to 1000 data points for each, with capabilities for linear, multiple linear, and nonlinear regressions with extensive statistics plus polynomial and spline fitting with interpolation and graphing capabilities

The Educational Version has more limited problem sizes that can be solved and is only available for students. [Details](#)

[Overview of Polymath 6.1](#)

POLYMATH 6.1 - for Windows XP, Vista and Win7

POLYMATH Software
[[home](#) | [overview](#) | [order](#) | [manuals](#) | [support](#) | [demos](#)]

Reasons to Use Polymath

PolyMath Authors Win National Award

Universities with Site Licenses

Related Publications

ASCE Materials 2007

ASCE Materials 2002

ASCE Materials 1997

Test Problem Library

Book Based on Polymath

Sample Worked Problems from Book



Mobile Device App Competition

[Translate this page](#)

- Undergraduate student teams will create an APP for a mobile device that is useful for an AIChE member. The APP must run on a mobile device such as a smartphone. Student teams can consist of any discipline, but at least half of the team must be members of AIChE.
- Two Awards
 - \$500 from CACHE for the first place winner of the best mobile device APP
 - \$500 from a corporate sponsor for the best APP that addresses safety
- Presentation
 - The competition at the AIChE annual meeting will consist of a poster competition where finalists will be selected to give a short presentation to a general audience at the conference in Atlanta
- **More information:**
 - <http://www.aiche.org/community/awards/mobile-device-app-competition>
 - Email: hesketh@rowan.edu

ABET Task Force: Overview and Motivation

- ABET mandates engineering departments to perform certain tasks to maintain accreditation
- Compliance requires collecting, organizing, and analyzing information from many people
- Many view this as a chore
- Tools that make this easier are not available, but would be welcome
- Based mainly on common sense, but also supported by dept head survey
- CACHE is well positioned to develop, test, and disseminate such a resource
- Relevant developments have been underway at Univ at Buffalo for many years

Assessment tool in development

- Database-driven, with web interface
- Features
 - configurable student outcomes, performance indicators, rubrics
 - centralized assignment of assessment tasks to courses
 - collection of data from instructors via web interface
 - analysis of results
- Some current questions
 - centralized service, or distributed software?
 - licensing fee – what is this worth?
 - interest to engineering schools?
- Tentative Timeline
 - Jan 2016: system ready for trustees to test
 - Fall 2016: roll out a full product for testing in trustee departments
 - Spring 2017: announce a broader distribution



Summary

- CACHE does a lot for the Chemical Engineering community
 - Software
 - Conferences
 - Educational Materials
 - Dissemination
 - Awards
 - Leadership