propounded philosophies of model building requires a certain amount of maturity on the part of the students as well as teacher. The material can certainly be taught in abbreviated form as an undergraduate senior year elective, as the authors themselves do, but it would require a great deal of judgment and experience as well as enthusiasm on their part. Fortunately, the University of Arizona has a second-year graduate course in the area of process simulation, following first-year courses in transport phenomena and process dynamics and control; this text is quite successfully used in this graduate course. The material in this book is as important, or more so, to the terminating MS candidate as to the PhD student. Three semesters are normally required for such MS students and it should not be difficult to enroll them in the course during their final term.

Finally, this book should be on the shelf of every practicing engineer who is even remotely connected with the art of process simulation or must interact with those who are. Some books, by their language and format, widen the gap between the academic establishment and practicing engineers in industry. This book moves the two groups closer together.

University of Arizona
Alan D. Randolph

LETTERS (cont'd from p. 103)

Consider a gas filling an originally empty tank. If we assume the gas in the tank to be well mixed, the total internal energy of the gas is given, at any instant, by

$$U_{total} = m\,u \qquad [1]$$

where m is the total mass, and u the internal energy per unit mass. The internal energy per unit mass may be expressed in the following manner:

$$u - u_o = \int_{T_o}^{T} \left(\frac{\partial u}{\partial T}\right)_v dT = \int_{T_o}^{T} c_v\, dT \qquad [2]$$

where T_o is a reference temperature and c_v the heat capacity per unit mass, at constant volume. Then

$$U_{total} = m\,[\,u_o + \int_{T_o}^{T} c_v\, dT\,] \qquad [3]$$

Differentiating with respect to time

$$\dot{U}_{total} = \dot{m}\,u + m\frac{d}{dt}\int_{T_o}^{T} c_v\, dT$$

where

$$\frac{d}{dt}\int_{T_o}^{T} c_v\, dT = \left(\frac{d}{dT}\int_{T_o}^{T} c_v\, dT\right)\frac{dT}{dt} = c_v(T)\,\frac{dT}{dt}$$

by Leibnitz's rule. Hence we finally obtain

$$\dot{U}_{total} = \dot{m}\,u + m\,c_v(T)\,\frac{dT}{dt} \qquad [4]$$

It is thus incorrect to express U total in the form

$$\dot{U}_{total} = \frac{d}{dt}\{\, m\,c_v(T)\,(T-T_o)\,\} \qquad [5]$$

as noted by Dr. Davidson. In the case where $c_v \neq c_v\,(T)$, eqs. 4 and 5 are equivalent.

University of Florida
R. J. Gordon

ChE News

CACHE Committee Established by National Academy of Engineering . . . Goal Is to Accelerate Integration of Digital Computation into ChE Education

A panel of chemical engineering educators called the CACHE (Computer Aids for Chemical Engineering Education) Committee has been established by the National Academy of Engineering's Commission on Education. The purpose of the committee is to coordinate and encourage the development of computing systems for use in chemical engineering education. The National Science Foundation has provided a grant to support the activities of the CACHE Committee for a two-year period.

The 17 members of the committee are drawn from universities throughout the United States and Canada. Each member is actively concerned with the use of computers in chemical engineering and many of them have been at the forefront of the rapid developments in chemical engineering computing that have taken place during the past decade.

CACHE officers elected at a recent meeting in Ann Arbor are: W. D. Seider (Pennsylvania), chairman; L. B. Evans (MIT), vice chairman; and A. W. Westerberg (Florida), secretary. Other members of the committee are: B. Carnahan (Michigan), J. H. Christensen (Oklahoma), E. Elzy (Oregon State), E. A. Grens (California at Berkeley), E. J. Henley (Houston), R. R. Hughes (Wisconsin), R. V. Jelinek (Syracuse), A. I. Johnson (McMaster), R. L. Motard (Houston) M. J. Reilly (Carnegie-Mellon), J. D. Seader (Utah), P. T. Shannon (Dartmouth), R. E. C. Weaver (Tulane), and I. Zwiebel (Worcester Polytechnic).

The principal goal of the committee will be to accelerate the integration of digital computation into the chemical engineering curriculum by promoting inter-university cooperation in preparation of new courses, teaching aids, and computing systems.

A major stumbling block to widespread use of the computer in engineering education has been the difficulty in transferring computer programs developed at one institution for use at another. Incompatibilities in computer system conventions, data formats, and documentation have been responsible for duplication of effort at different schools. CACHE has established a Standards Subcommittee to devise mechanisms for facilitating easier inter-university interchange of computer programs.

Another factor that has slowed the use of computers in the classroom has been the problem of intergrating the computer use with the material covered in traditional courses. A CACHE subcommittee on curriculum is considering this problem. Its first major project will be to compile and publish a collection of one hundred computer programs representing the best of those that have been used successfully in undergraduate courses. The programs will be selected on the basis of a nationwide competition with entries solicited from students and faculty at every institution in the country.

Other CACHE subcommittees and task forces are looking at specific areas of computer applications, including estimation and retrieval of physical property data, computer-aided design, simulation of dynamic systems, on-line monitoring and control of experiments, and computer-aided process synthesis.

The idea to establish a committee such as CACHE originated with Professors Carnahan, Motard, and Seider who organized the first meeting of interested chemical engineering faculty members in Ann Arbor in April, 1969. The committee is patterned after the COSINE Committee which is also sponsored by the NAE and which serves a similar function in electrical engineering. Professor Carnahan served as acting chairman of the CACHE Committee during the two years prior to receiving NSF funding.

Dr. Newman Hall, Executive Director of the NAE Commission of Education remarked that "The most important challenge facing CACHE will be to find ways to achieve an impact on the chemical engineering programs at a large number of universities in addition to those represented by CACHE Committee members." The committee has already invited several additional people to serve on various subcommittees and task forces and many more will be involved as on-going projects develop. A specific CACHE representative will be designated at each of the 135 U.S. Chemical Engineering departments to coordinate communication between his institution and CACHE. A newsletter will be produced by the committee to report news of CACHE activities and other noteworthy developments related to the use of computers in chemical engineering education. Copies of the newsletter will be made available to all interested individuals.

Although there are no representatives of industry on CACHE, the committee plans to have close liaison with industry and to involve people from industry as members of its task forces. Many of the proprietary computer systems developed by industry for process simulation, design, and control have great untapped potential for use in education. Industry also has a special interest in the work of the CACHE Committee, because the ultimate benefit of accelerating use of computers in engineering education is to produce engineering graduates with the training to better meet the needs of industry.

Anyone who wishes to learn more about the work of the CACHE Committee may contact any member or Dr. Newman Hall, Executive Director, National Academy of Engineering, Commission on Education, 2102 Constitution Avenue N.W., Washington, D. C. 20418. The committee welcomes suggestions and contributions from all who are interested in any aspect of its work.