ChE educator

Klaus D. Timmerhaus

of the University of Colorado

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THERE ARE SEVERAL Klaus Timmerhaus's. There is a patient, careful teacher much appreciated by his students. There is a researcher with varied, broadscale interests. There is a demanding, perfectionist administrator, somewhat abrasive toward his superiors but not towards his subordinates. There is an active officer and member of eleven professional and research societies known to a host of friends for both technical papers and analytic, what-is-ethically-required policy analyses. And there is a paradox: in most of these capacities Klaus appears to work full time!

In fact, Klaus's Spartan, efficient work schedule would be well worth study by anyone interested in maximum levels of human accomplishment. One item after another moves across his desk; written, edited, or marked for action with lead pencil in a minute script that can put more than 300 words on a page. Each item gets an allotted amount of time; drafting is so precise that revision is seldom necessary.

His day at the desk is unbroken except for three noon hours per week spent in equally efficient exercise: he does not jog; he runs. A brown-bag lunch at the desk later is not allowed to interrupt output. An additional pile of work goes home with him after a ten-hour day.

Klaus's research interests have concerned ultra-high pressures, cryogenics, or both. Since the energy crunch of 1973, they have also turned toward energy economics and conservation. His recent book, Energy Conservation in Arid Lands, **has drawn praise not only from colleagues, but also from some American Indians who inhabit arid lands.**

Said CU's former dean of engineering Max S. Peters, himself a widely known and honored chemical engineer: "I have known Klaus since 1951 and have worked closely with him for more than the past twenty years, and I can honestly say that he is the most conscientious and dedicated person I have ever known. He truly is a great chemical engineer in every aspect of our field in addition to being a true friend and a wonderful person."

Klaus graduated from high school in Palatine, Ill., winning three letters in track and serving as a student editor and student body president. As a chemical engineering student at the University of Illinois he worked in a hospital and became an ambulance driver and one of the few chemical engineers who has ever delivered a baby.

During World War II he served as a radar instructor and coached championship track teams. Back at the university after the war, he played hockey and competed in four track events. A neck fracture sustained in an auto accident in January of his senior year slowed him only briefly; at the end of April he was back in competition with a cast on his neck and his arm in a sling, winning the first race he entered. Later that spring he won the National AAU Junior Championship in the 1500 meter event.

He still runs in senior events, recently taking up speed walking at the urging of Max Peters and taking first in his age category in his first 5-k race. He has served for many years as an official in high school and college track events.

Klaus earned his degrees at Illinois, participating with his graduate adviser, H. G. Drickamer, and others on several papers—on high pressure science, appropriately enough. He joined the University of Colorado faculty in 1953 after nearly two years of employment by Cal Research (Standard Oil of California) in Richmond, California, as a project design engineer. He became associate dean of engineering in 1963. The College of Engineering and Applied Science of the University of Colorado is a three-campus organization, and Klaus's responsibilities extend to all three campuses. Primarily, they concern graduate and research activities, but in practice they involve most aspects of engineering education, from undergraduate accreditation to faculty evaluation.

Klaus is also director of the three-campus Engineering Research Center, whose grants in force have increased from less than $200,000 in 1953 to more than $9 million in 1984, while graduate enrollment has grown from 90 to 550. These research gains have involved extensive work with faculty members to develop research ideas and locate suitable funding sources. Klaus scrutinizes each research proposal that leaves the college, working with faculty members to increase clarity and ensure that each request tallies with the needs of the funding agency to which it is addressed. Not all possible projects are solicited: with the rare exception of projects serving Colorado groups, no research project is accepted unless it has clear-cut educational value.

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As a cryogenic consultant, Klaus has been involved with such projects as a major natural gas liquefaction plant in the Mideast and the nation's largest superconducting particle accelerator. Klaus sees good opportunities and a new future ahead for the chemical industries, even though he foresees that oil producing nations will see that it is not in their best interests to ship raw materials and will build the chemical plants and oil refineries that will permit them to export more valuable finished products. "Chemical engineering needs to diversify into many different industries that can benefit from the specialized training given to its graduates," he said. "For example, biotechnology holds great promise. It can produce chemicals, pharmaceuticals, coatings, paints, and plastics from renewable natural resources. These industries build on principles of mass and energy balance of chemicals and materials which are the heart of chemical engineering."

He recommends that some chemical engineers look for careers in the solid state area. "Electrical

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engineers have a big problem in obtaining ultrapure silicon wafers. This is a chemical engineering problem and not an electrical engineering problem and should be taught by chemical engineers." Similarly, he looks for chemical engineers to show the way in developing new separation techniques, augmenting dwindling energy reserves with unique renewable energy processes, perfecting new conservation approaches, developing greater reliability and safety in consumer products, and initiating entirely new manufacturing processes in outer space. He has been a proponent in AIChE of examining this situation and is active in the New Technology Committee that has been set up by AIChE to consider future directions and opportunities for chemical engineering. All in all, he sees myriad new areas for chemical engineers.

Among Klaus's current research interests is the thermal conductivity-convection relationship in porous insulation materials. Recent consulting experience has led him to believe that current values for convection in these materials are too conservative, and he is planning checks on the data. He is also studying the effect of a number of variables on the distillation efficiency of simple hydrocarbon mixtures.

As an educator, he also has some concerns about future trends in university research: "We should keep in mind that the university is not just a research facility: teaching is still our main function and teaching is getting short shrift in many

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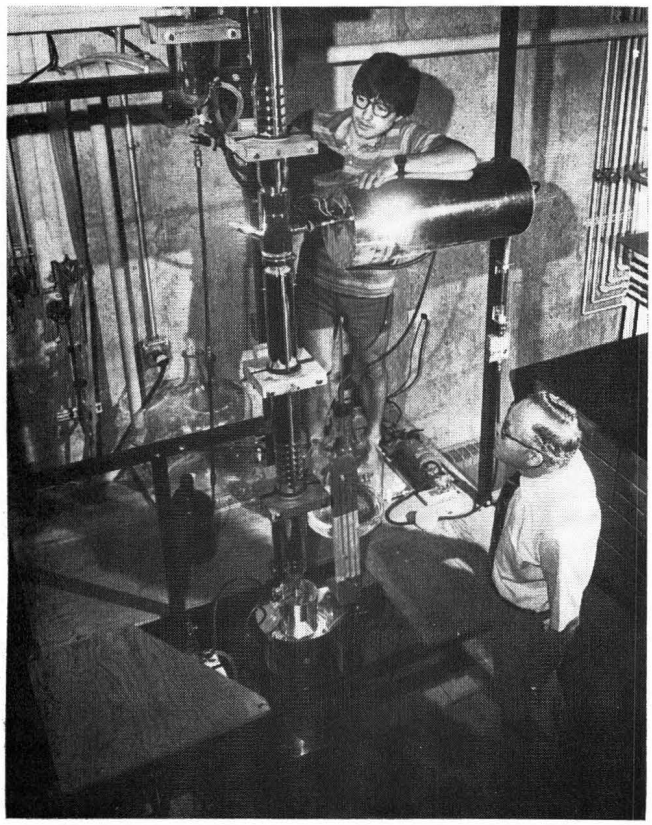
instances. We must keep a careful balance and not push the pendulum too far." He believes that all faculty should be involved in research to help them in their teaching activities. He stresses, however, that we need to be careful to maintain a balanced perspective.

"The better students will be successful in spite of this trend; however, students who are less



Dean Timmerhaus and graduate student Hasan Dindi check a fractional distillation column in which the separation of simple hydrocarbons is being studied.

academically inclined and/or who are not interested in advanced degrees will be the mainstay of industry. We must keep them capable or we will all lose out."

Some implications of the information revolution also concern him. "There exists among engineers the recognition that more and more our improving communications systems are transferring more and more data, so that we are getting clogged with information. We need to devise ways of sifting and picking out what is pertinent.

"Computers can help with this problem, but we need to avoid excessive reliance upon computers. A computer search is no better than the keywording that it is based upon. We need to remain aware that what comes out is no better than what is put in. Computer simulation also has pitfalls. Flawed models can lead to accidents and catastrophes. Simulations need to be checked against results.

"I believe that computers must be brought into education and integrated into it. We also need to integrate in other new concepts. We must take a new approach to teaching safety principles, and also economics, as an integral part of chemical engineering. Today, no part of a process or product can be allowed to remain unsafe. There will be serious and unpleasant consequences if we do not face up to the requirements of safety. If we are using a process that is unsafe because pressure is too high, or flow is too great, or the temperature is too high, we may need to change the process so that it is safe.

"We are likely to trip up on what we cut out for economy reasons. Safety relief valves should be placed in the right places and in the right numbers when the plant is designed—not after it is built.

"Therefore, in our design courses we must teach chemical engineering, safety, and economics all in the same problems. Safety and economics are subjects that we educators have wanted to leave to industry, while they wanted to leave them to us. Education is where they belong; if they are learned then they will be more likely to stick."

Klaus himself is a member of the Advisory Board for the National Institute of Occupational Safety and Health (NIOSH) and is incorporating what he recommends into a new book on cryogenic processes that he is preparing with Thomas M. Flynn.

Among Klaus's other achievements has been preparing a proposal for and securing an NSF matching grant worth $1.325 million (in 1966 dollars) for construction of CU's Engineering Center. As chairman, cochairman, or the like he

has been involved with securing other grants with a value of about $6 million. He has also managed from time to time to serve as college safety officer, acting chairman of the aerospace department, and on more than 70 campus committee assignments.

His output of professional publications is somewhat awesome: He has edited 25 volumes of *Advances in Cryogenic Engineering*; 17 in the *International Cryogenics Monograph* series; 4 of *Low Temperature Physics*, and 2 of *The Proceedings of the AIRAPT International High Pressure Conference*. He is coauthor with Max Peters of two editions of the very popular *Plant Design and Economics for Chemical Engineers*.

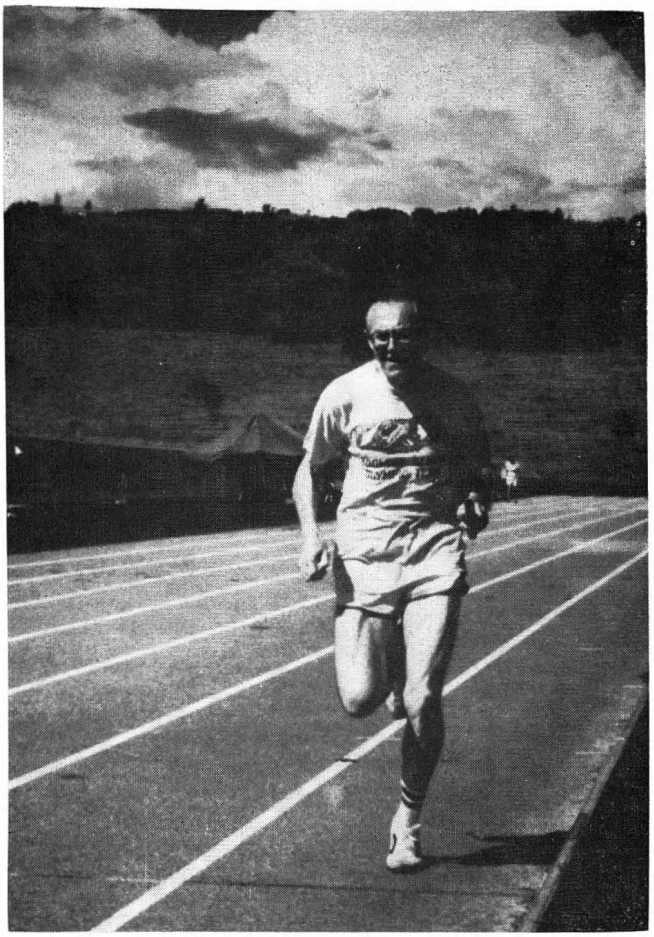
He has also published more than 70 technical publications in refereed journals, presented more than 70 technical presentations at national professional society meetings and has given more than 100 presentations to national, regional, and university audiences.

The variety of his service has nearly been matched by the varieties of honors it has brought him; if he doesn't hold the record for awards to a chemical engineering professor he must be a top contender.

He was one of three American academicians appointed as the first Foreign Corresponding Member of the Verein Deutscher Ingenieure, has been elected as a fellow of the American Society for the Advancement of Science and AIChE, and a diplomate of the American Academy of Environmental Engineering. He is an elected member of the National Academy of Engineering and the Austrian Academy of Science. The 1981 Cryogenic Engineering Conference was dedicated to him in recognition of his 25 years of service to cryogenics.

Among a few of his major awards are the second Samuel C. Collins Award of the Cryogenic conference, presented in 1967; the George Westinghouse award (for outstanding teaching) presented at the Diamond Jubilee meeting of the American Society for Engineering Education in 1968; the Alpha Chi Sigma Award of AIChE, which has also awarded him its Founders Award and named him in 1983 as an Eminent Chemical Engineer. His most recent award (at press time) was the Distinguished Public Service Award of the National Science Foundation.

His awards from the University of Colorado include the Distinguished Engineering Alumnus Award, even though he is not an alumnus of the University of Colorado, the Robert L. Stearns Award for distinguished faculty service, and numerous student-recognition awards for his teaching and service.



A familiar figure on the track.

Among the numerous professional society offices he has filled have been the presidency of the AIChE, membership on the National Science Foundation Advisory Council, and a regional directorship of Sigma Xi. He has served for many years on the U. S. National Committee for the International Institute of Refrigeration, and is its 1982-85 chairman. He is a vice president of the Scientific Council of the International Institute of Refrigeration and a former president of the Southwestern and Rocky Mountain Division of the AAAS.

Klaus's wife Jean keeps their life organized while he works, and accompanies him upon some of his constant professional travels. Hobbies the couple share include hiking and fishing in Colorado's mountains. □