ChE educator

Richard C. Alkire

of Illinois

Prepared by his
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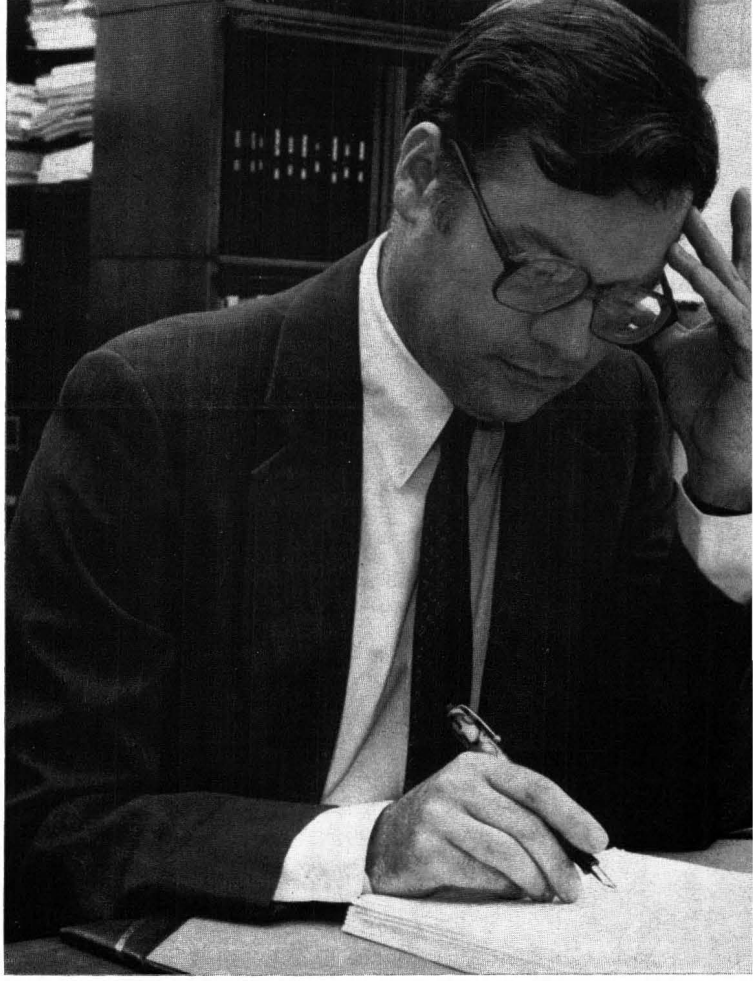


TO HIS PROFESSIONAL colleagues, Dick Alkire is known as an electrochemical engineer, to his students as an outstanding teacher and to others through many different perspectives, especially music.

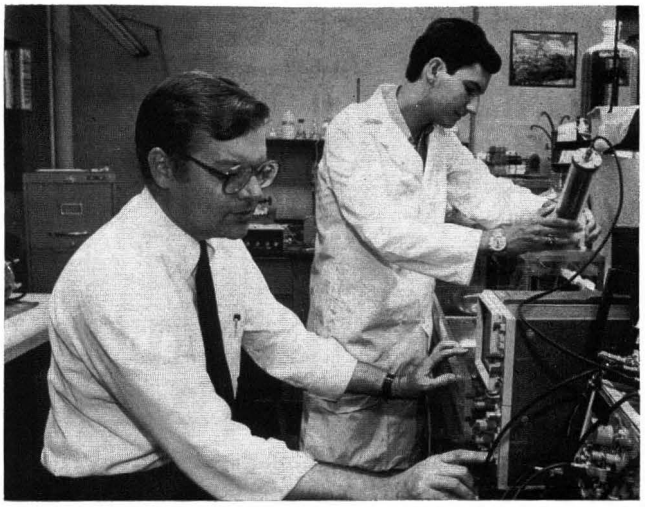
Though he now lives in the heartland of Illinois, Dick grew up in Easton, Pennsylvania, where he graduated from Lafayette College in 1963. For two years of his time at Lafayette, he was tutored on the subject of electrochemical corrosion by Zbigniew Jastrzebski. Traveling to the other coast, Dick attended the University of California at Berkeley to continue the study of electrochemical engineering. Working under the direction of Charles Tobias and Edward Grens, he carried out graduate research on transport processes in porous electrodes. Just to keep things in balance, he enrolled in a piano performance class where he met his future bride, Betty. They left Berkeley in 1968 to spend a post-doctoral year in Göttingen, at the Max Planck Institut für physikalische Chemie, where he studied thermodynamics of solid-state galvanic cells under the late Carl Wagner. A year later, Dick brought his young family back to the United States and took up a post as assistant professor at the University of Illinois. Promotion to associate professor came in 1975, and to full professor in 1977.

. . . it is Dick's philosophy that "you can't teach research creativity by telling everyone what to do." He gives students a great deal of independence in the pursuit of their thesis research . . .

During these early years, Dick was deeply influenced by his mentors Jastrzebski, Tobias, Grens and Wagner. Under Tobias he had experienced the excitement of a research group that moved steadily into uncharted waters, and with Carl Wagner had had long discussions on how to break open new problems. As a consequence, he embarked on a program of electrochemical engineering research, at Illinois, which continues to this day. At the time, however, the electrochemical field was not common to chemical engineers and it was John Quinn and Roger Schmitz who gave him strong encouragement to maintain his direction.

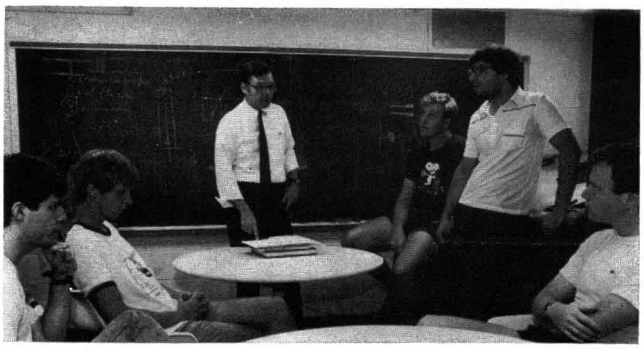
With these perspectives, Dick worked resolutely to broaden his capabilities and interests. He has emphasized application of potential distribution principles to complex electrochemical problems which involve coupled mass transport, ohmic resistance, and interfacial processes. Concentrating at first on electrodeposition, his work for over a decade in that area earned him, in 1983, the Research Award of The Electrodeposition Division of The Electrochemical Society. Also in the early seventies, he returned to corrosion problems where transport phenomena in the solution phase played a critical but unexplored role. Based on his Ph.D. dissertation on crevice corrosion, Dick's student,

David Siitari, was awarded the Young Author's Prize for the best paper in the 1982 Journal of the Electrochemical Society. During a sabbatical leave at Cal Tech in 1976, Dick formulated a new program in electro-organic synthesis, and introduced rigorous chemical engineering concepts to electro-organic reactor design and scale-up. These programs subsequently led to interactions with Robert Sani, at the University of Colorado, in finite element calculations of electrode shape evolution; with Mark Stadtherr, at Illinois, on electrolytic process simulation and optimization; and with Theodore Beck, of the Electrochemical Technology Corp. in Seattle, on corrosion. In 1983, Dick again used his sabbatical leave, this time at the University of Washington in Seattle, to develop a research program in plasma reactor design, where potential field and convective diffusion phenomena play a critical role.



Working with Steve Perusich, Dick investigates transport processes during corrosion. Here, they use focused ultrasound to trigger breakdown of protective surface films, and then study film repair in the presence of fluid flow.

A consequence of these broad and continuing interests is that Dick's research program is by now very large. Last Fall his group included twenty graduate students and a half dozen undergraduate laboratory assistants. Of necessity, a group of such size demands a meticulous management of time and resources. Dick is quick to point out that a major factor in this regard is the excellent reputation with which Illinois attracts truly outstanding graduate students. In addition, it is Dick's philosophy that, "you can't teach research creativity by telling everyone what to do." He



Dick supervises four seminars a week for his graduate students. Shown here (l. to r.) are Steve Lott, Mark Greenlaw, Dick, Bob Schroeder, Demetre Economou, and Kurt Hebert.

gives students a great deal of independence in the pursuit of their thesis research, but demands high standards of commitment, knowledge of the literature, and developing intuitive prowess for linking mathematics to the physical world. One of Dick's former research students observes that "he instills by personal example a deep commitment for achieving a high level of innovation and technical excellence." Another former student notes, "The advice Dick gave me in graduate school in all areas, technical and non-technical, has helped me immensely in my professional career."

To a significant extent, Dick's early years in music have shaped his character and attitudes. Dick and his brother Ed grew up in a family music business where performing came at a young age at the encouragement of Dad, the pro, and Mom, the supporter. Dad, Ed and Dick started playing professionally when Dick was twelve; by the time he was sixteen, they had performed throughout the East and had cut numerous records. Meanwhile, back at the family studio, Dick taught piano, guitar, bass, and vibes, helped run the wholesale and retail businesses, and did much of the art work for Dad's teaching publications. He turned down a four-year organ scholarship to attend Lafayette College to study chemical engineering, but nevertheless performed on over three hundred occasions in the college touring choir, in a barbershop quartet, in a jazz group, and as a solo pianist at weddings and receptions.

The time and energies invested in public performance, in music teaching, and in business-related affairs paid invaluable dividends for Dick's management of his massive research effort today. By the way, his brother is also a chemical engineer with Air Products & Chemicals. Ed is

. . . no matter how hectic the day . . . Dick will always give a student his total attention. His efforts were rewarded in 1982 with the Teaching Excellence Award of the School of Chemical Sciences at Illinois.

Manager of Technical Affairs for the Industrial Gas Division and has responsibility for safety and operating procedures, process engineering, quality assurance, engineering standards, and environmental compliance.

Dick takes it as a given fact that competence in research both requires and demands excellence in the teaching classroom. With a repertoire of a dozen lecture courses, he takes special pleasure in teaching the subjects and in dealing with students on a personal basis. Thinking back on his own training, he recalls that "I have been extremely fortunate to have had teachers who took a personal interest in me and who inspired me to standards which were beyond my awareness at the time. Sometimes those feelings of inspiration came from only brief moments in their presence when I felt that their entire energies were directed toward giving me an appreciation of the subject matter." As a result, no matter how hectic the day, in the classroom or in his office, Dick will always give a student his total attention. His efforts were rewarded in 1982 with the Teaching Excellence Award of the School of Chemical Sciences at Illinois.

Active in professional pursuits, Dick is the youngest Vice President in the history of the 82-year old Electrochemical Society, and will succeed to the presidency in 1985. He is also a divisional editor of the Society's journal. In the AIChE, he founded a group in 1974 for programming symposia in electrochemical engineering, and has also served as chairman of the Heat Transfer and Energy Conversion Division of the Institute. To quote one of Dick's colleagues, he applies "the same enthusiasm, integrity, and competence to Society affairs as he has to his own students and research."

These experiences, along with extensive consulting activity, serve as critical elements in the continual upgrading of teaching and research. With this activity, he has averaged an off-campus seminar every two weeks during the past four years. As one of his colleagues notes, "A hallmark of his work is his ability to translate results of complex calculations into a form easily understandable to practical users in the field." Like the family music business, Dick's life represents a total commitment to advancing the electrochemical engineering field so that others will be encouraged to follow.

One activity has brought him a special sense of satisfaction. Emeritus Professor Sherlock Swann, Jr. had been at Illinois since 1927 and had, for 45 of those years, meticulously compiled an exhaustively detailed bibliography of the electroorganic synthesis literature, beginning with the first known paper in 1801. Their friendship had begun, understandably, with a mutual love of music which found Dick spending evenings at Sherlock's home listening to old 78-rpm recordings of the masters. Through this musical bond of shared trust, Sherlock slowly revealed his incredible bibliography. Dick eventually raised over $90,000 to support a meticulous effort at indexing and publishing the collection through The Electrochemical Society. The result was deeply satisfying to Professor Swann, who passed away in 1983 after having seen an important part of his life's work brought to fruition.

Dick's students often spring surprise parties to bid an affectionate adieu to a graduating member of the gang.

Music continues to be the center of Dick's outside interests. It seemed ironic at the time that, within a few months of deciding on a college career in chemical engineering, his parents' music business took an upswing and they presented him with a Baldwin grand piano. During the years since, his main hobby has been keeping up a sound technique and broadening his knowledge of the literature. A few years ago, Dick built a two-manual harpsichord to gain access to four more centuries of keyboard literature. His daughters, now 14 and 16, play violin and cello and, in addition, are studying string quartets under Gabriel

Magyar, master cellist for 16 years with the Hungarian String Quartet. Meanwhile Betty, the Berkeley music major, continues the family tradition by operating her own music studio.

In summary, Dick has made a significant contribution by identifying electrochemical phenomena where chemical engineering concepts find welcome application. He has helped unify diverse electrochemical subfields so that intercommunication between them has been promoted. Through his research students and his professional activities, he has contributed significantly to the broadening horizon of chemical engineering. □

ChE book reviews

MASS TRANSFER IN ENGINEERING PRACTICE

By Aksel L. Lydersen
John Wiley & Sons, 1983, xiii + 321 pgs. $39.95

Reviewed by F. L. Rawling, Jr.
E.I. Du Pont de Nemours & Co., Inc.

This book is a companion volume to the author's previous book "Fluid Flow and Heat Transfer" (John Wiley & Sons, 1979). The aim of the present volume is to present a short refresher course in those areas of unit operations specifically dealing with mass transfer. The book consists of eight chapters: an introductory chapter on the principles of diffusion and seven chapters covering distillation, gas absorption and desorption, liquid-liquid extraction and leaching, humidification, drying of solids, adsorption and ion exchange, and crystallization. The introductory chapter on the principles of diffusion provides a summary of the major equations together with a short discussion of the various types of diffusion, i.e. diffusion with bulk of mass in motion, eddy diffusion, molecular diffusion in liquids, etc. A short discussion of the two film theory and the penetration theory is also presented. No attempt is made at providing a fundamental treatment of the subject of diffusion; rather, reference is made to the literature. Several problems, typical of those encountered in industry are worked out in detail. There are four problems to be worked by the reader. The chapter ends with a good bibliography, although half the references are pre-1970.

Approximately two-thirds of the book is concerned with staged operations, reflecting the industrial importance of this type of process. In general, each chapter follows the same outline: a short discussion of the theory involved together with the relevant equations, a discussion of the unit operation presenting the assumptions involved and the major design equations, a very general discussion on the various types of equipment employed, a series of worked examples, a set of problems to be worked by the reader, and a bibliography.

The worked examples in each chapter make this book worthwhile. They are well chosen to illustrate industrial problems and are worked out in detail, giving the assumptions and reasoning involved in arriving at a solution. In a few instances, a programmable calculator (Hewlett-Packard) is used in the solution of a problem. The calculator program is given.

I believe the book fulfills its goal, i.e. a refresher course in mass transfer. The many references adequately direct the user to the fundamental literature. Practicing engineers faced with a problem in an area of mass transfer that they have not been involved with for some time will find this a good, succinct review. Students will find the worked examples illuminating. Instructors should find this book to be a useful adjunct to their course. □