

Tim Anderson

at the University of Massachusetts-Amherst

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“Students come first.” When asked whether there is a key principle that he lives by, Tim Anderson provided this answer without hesitation. To Tim, students are the *raison d'être*, and their interests must come first in the decisions of a faculty member or administrator. This principle has guided Tim's contributions to chemical engineering education over the past 40 years as educator, scholar, and leader in the chemical engineering discipline.

Tim joined University of Massachusetts-Amherst (UMass) in 2013 as dean of the College of Engineering, following a highly successful 35-year career at the University of Florida (UF). He was recently awarded the title of distinguished professor at UMass, based on his “stellar record as one of the entire field of chemical engineering's most outstanding researchers, teachers, and university citizens.... He has pioneered the integration of the field of electronic materials processing with chemical engineering, improved on a national scale how engineering is taught and how engineering faculty are mentored, and helped lead important journals, institutes, and initiatives setting the course for the field's future.”^[1] Before moving on to UMass, Tim's time at the University of Florida—where he retains the title of distinguished emeritus professor—epitomized balanced excellence in education, professional service, and scholarly research. Remarkably, his highly visible research program in electronic materials was sustained throughout his administrative roles and continues strong at UF to this day. To those who know him, Tim Anderson is proof that it is indeed possible to contribute significantly to all facets of this profession and yet still be a kind, caring, and joyful person.

ADVICE THAT LED THE WAY

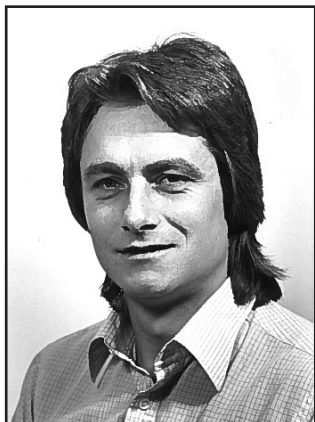
Tim wasn't always on the path towards chemical engineering. Born on July 13, 1951, in Ottumwa, Iowa, Tim spent the first 10 years of schooling in Catholic schools. Raised in a working-class family, Tim washed dishes in the school cafeteria to pay for his tuition before moving to a public school for his junior and senior years. In high school, he was active in tennis and the debate team. Tim credits his debate-team experience of giving extemporaneous speeches with little preparation time for his ability to think quickly



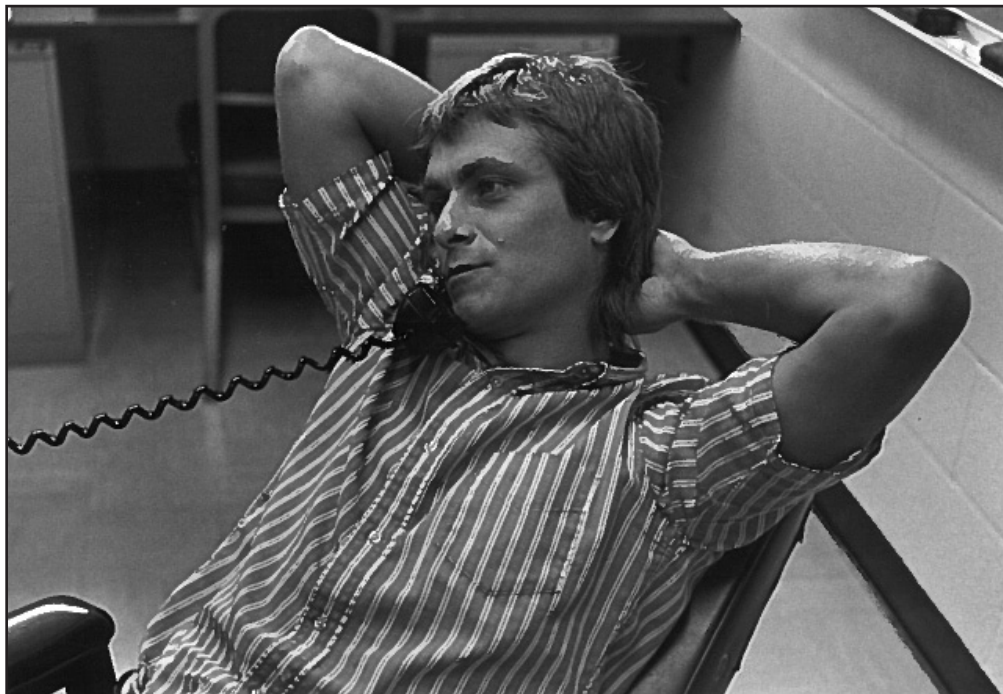
and speak on his feet, a skill that he later found invaluable in his academic career. The ability to express one's knowledge and understanding of a particular subject not only shakes out the fear of public speaking, but also allows one to become quickly well versed in those subjects to be able to teach and persuade others. As much as intellect and reasoning skills, Tim found that skill at communication was just as critical for success in academics.

Given his experiences in forensics in high school, Tim intended his future education path to be an English degree then on to law school. Early advising at Iowa State University, by a professor who was also a patent lawyer, steered him toward an undergraduate degree in chemical engineering. And this was the best advice he has ever received. Out of his three debate teammates, Tim was the only one who was not destined to law school.

As an undergrad at Iowa State University (B.S. in chemical engineering, 1973), Tim excelled in the Honors



Above, Tim's early faculty head shot for the UF Department of Chemical Engineering. Right, Tim in his UF office in 1989.



Program, which allowed him to design his own path in the core science courses and bypass the unit operations lab and capstone design requirements. To finance his education, he started work as a freshman at nearby Ames National Laboratory and ultimately spent four years in the research lab of first Dee Stevenson and then Renato Bautista in the work-study program. This research experience and a strong GPA earned Tim a fellowship offer from the University of California, Berkeley, to pursue his M.S. degree and then Ph.D. degree in chemical engineering (M.S. 1975, Ph.D. 1978). His love for competitive tennis followed him, as he stays actively involved to this day.

TIM AT THE UNIVERSITY OF FLORIDA

The Department of Chemical Engineering at UF lost three faculty members in 1976 and was searching for solid replacements. Tim was identified as a very attractive candidate, but as remembered by John P. O'Connell, who was then on the UF faculty, hiring Tim was considered a bit of a risk by some, since he worked in the non-traditional area of electronic materials. Nevertheless, it was clear that Tim was exceptionally bright and highly motivated, especially toward teaching. When Tim was hired at UF in 1978, he quickly became popular with the students and the rest of the faculty because of his enthusiasm and caring manner. For Tim, the decision to accept a position in the UF Department of Chemical Engineering was a no-brainer, since the department was known for its equally strong emphasis on both education and research. These values aligned perfectly with Tim's own.

As a new assistant professor, Tim quickly jumped into engineering education activities such as initiating the ASEE New Engineering Educator Committee and teaching undergraduate courses at UF, while working to establish his research laboratory. Most helpful for him as a new faculty member was mentorship from Professors O'Connell and Lew Johns, who helped guide Tim on establishing a research program and becoming an effective educator. Tim's first contribution to the engineering education literature came early in his tenure-track appointment. He teamed with John O'Connell to publish an article in *Chemical Engineering Education* arguing for the value of a required senior-level materials course given by chemical engineering faculty in the ChE curriculum.^[2] They noted that practicing chemical engineers were increasingly facing solids-related problems in areas such as polymer processing, semiconductor processing, and biomedical applications, and that chemical engineering faculty could best bridge the gap between the chemical engineering fundamentals and materials concepts. This materials course has persisted in the UF B.S. chemical engineering program through to today.

Because Tim's area of research in electronic materials was non-traditional and principally experimental, ramping up quickly to reach to a high level of research productivity turned out to be a challenge, and, although it may be difficult to believe in retrospect, his tenure case was no slam-dunk. Nevertheless, despite a bit longer lag time to get started, his research program quickly accelerated to become world-renowned in the area of electronic materials processing, producing high-impact papers,



Tim explains a PHASE diagram to his students in the UF ChemE conference room in 1989.

hosting numerous visiting scholars, placing of a large number of Ph.D. graduates into excellent academic positions and industry, and generating exceptional levels of research funding. His first sabbatical year in 1985-6 brought him to the Laboratoire de Thermodynamique et Physicochimie Métallurgiques in Grenoble, France, as a Fulbright Scholar and visiting professor.

It seems the one thing Tim lacked in these early years at UF was a sense of fashion. The AIChE Student Chapter was notorious for their creative thematic roasts of student leaders and faculty at the annual banquet. One year, the theme was “faculty phobias.” For example, John O’Connell, who taught in the Socratic manner, had the phobia of “not answering any question directly.” *Andersonphobia* was defined as the “fear of wearing clothes that fit.” Alumni from that era still recall Tim as the department’s young, enthusiastic, long-haired professor, who drove to work with a bright orange motorcycle on the nice days or a beat-up old VW bus on the rainy days.

Tim was tapped to lead the UF Department of Chemical Engineering in 1991, and he held the department’s helm for the next 12 years during its growth period until 2003. During Tim’s time as chair, the department modernized its graduate and undergraduate curriculum and hired a large fraction of the department’s current faculty, including Oscar Crisalle, Richard Dickinson, Fan Ren, Tony Ladd, Jason Weaver, Helena

Hagelin-Weaver, Jason Butler, and Anuj Chauhan. Tim also oversaw a large expansion in the size and activity of the department’s Advisory Board.

At the request of Dean Pramod Khar-gonekar (who is presently the assistant director of the NSF Engineering Directorate), Tim joined the College’s leadership team as associate dean for Research and Graduate Programs. Pramod recalls, “I truly enjoyed and appreciated working closely with Tim in his roles as chair of chemical engi-

neering and later as associate dean for Research. He brought a deep understanding of the research university, engineering education, and research, and his creative approach to all our initiatives and activities. I also was very impressed by Tim’s own great accomplishments as an educator and researcher.” Following his term as associate dean, Tim led the Florida Energy Systems Consortium—a statewide consortium that funds research that contributes to a sustainable energy economy for Florida—before moving on to head the College of Engineering at UMass-Amherst.

Despite a continuous succession of administrative responsibilities since 1993, Tim has maintained one of the largest and most productive research programs in the College of Engineering, and he simultaneously served as director of the NSF-funded Southeastern University and College Coalition for Engineering Education (SUCCEED) until 2003. Tim’s 35-year career at the University of Florida has left a tremendous legacy and positive impact that will be felt for many years to come. As observed by a UF Chemical Engineering Advisory Board member, James A. Trainham, who is the chief technology officer at JDCPhosphate, Inc., “One of the reasons UF has an outstanding ChemE department is because of Tim’s legacy of leadership, research excellence, teaching, and most of all he is an extremely good person.”

FAMILY

Married 44 years, Tim and wife Sandy (Lames) knew of each other as children growing up, but weren't very close even though they lived only 10 blocks away from each other and had the same birthday, one year apart. One day Sandy brought cookies to Tim's house, and he invited her to midnight mass, a wholesome beginning that set the stage for a long future together. They were married the next fall at ages 19 and 20. Sandy worked full-time so they could both go to school. As married students at Iowa State, they lived in a

Quonset hut, commonly recognized as the half-cylinder structures used for military barracks. Tim recalls the first wedding gift he and Sandy received, a \$100 bill—that he immediately took and mailed in for their first month of rent. Of course the ISU Bursar did not receive the payment—lesson learned. The lifestyle afforded by the graduate fellowship stipend at Berkeley seemed luxurious in comparison.

Tim and Sandy found Gainesville to be wonderful community in which to raise a family and build a career. Sandy enjoyed a long and successful career as a nurse, primarily working as an OB/GYN nurse and childbirth educator. Tim and Sandy raised two children: Thad (b. 1980), who received his Doctorate in Musical Arts at the University of Texas Austin and is now an assistant professor in the music department at the University of Central Florida, and Christy (b. 1982), who completed a residence in pediatrics at the University of North Carolina in Chapel Hill Medical and practices in Jacksonville Beach, FL. Both are married and Sandy and Tim have two lovely grandchildren.

CONTRIBUTIONS TO EDUCATION AND MENTORSHIP

Many in the chemical engineering community are familiar with Tim's commitment to education from his long tenure as editor of *Chemical Engineering Education* from 1996 to 2013. Indeed, Tim's guiding hand on the journal began earlier and was uncredited during a period in the late 1980s and early 1990s when the health of the journal's prior editor, Ray Fahien, declined due to Parkinson's disease. The current



Tim and his students at his annual Christmas party in 2009.

editor of *CEE*, Phil Wankat, recalls this period in the history of the journal:

“Unfortunately, Ray had Parkinson’s disease and, although he desperately wanted to continue, had increasing difficulty carrying out his duties as editor. Tim, who was the associate editor, and Carole Yocum, the managing editor, increasingly took over duties that Ray could not do, but in the most diplomatic way possible. Tim and Carole were able to continue to put out a first-class journal without making Ray feel he was being pushed aside. On the rare days that Ray could function, they took his advice and on other days did what needed to be done. Tim became de facto editor, in fact, in 1990—although Ray thought of himself as editor—and the masthead continued to list Ray as editor until his death in 1995. Ray was listed as editor in the Fall 1995 issue that includes his obituary.”

Tim's passion for ChemE education began much earlier than his involvement in *CEE*. Following his innovations in the chemical engineering materials course, Tim focused on promoting understanding of electronic materials processing to ChemE undergraduates by building on chemical engineering concepts they already knew. He drew easy-to-understand analogies between a chemical plant and an integrated circuit to illustrate the unit operational principles of electrons and holes (analogous to chemical species) being “processed” in electronic devices.^[3] Integrated circuits consist of capacitors (analogous to storage tanks), interconnects (pipes), diodes (check valves), and transistors (on-off valves). Tim shared his passion and innovative approaches to teaching electronic materials processing with his chemical engineering colleagues

at numerous conferences, leading to more than 80 publications and conference presentations in engineering education research to his credit.

Simultaneous with his duties as department chair, Tim also served as director of the NSF-Funded SUCCEED Engineering Education Coalition after Carl Zorowski of N.C. State stepped down. SUCCEED consisted of eight engineering colleges in the southeast seeking to test and implement innovative curricula that incorporated active learning and design throughout the curriculum while stressing faculty development and continuous improvement. As SUCCEED's director, Tim and his collaborators in the coalition had access to valuable databases that could be mined to evaluate the impact of curricular innovation with a focus on the student experience in lower division courses, particularly of women and minorities. Statistical analyses of these data lead to several studies published in the education literature regarding student retention. These studies had an impact at the University of Florida; they were cited by the College of Engineering Task Force to Improve Undergraduate Education to support their recommendation and ultimate implementation of new strategies for retention of female engineering students in lower-division basic science courses.

Tim learned early in his career the critical value of good mentorship of junior faculty. He was a founding member of ASEE's New Engineering Educator Committee (now a division), dedicated to helping junior faculty members adjust to academic life. In addition to providing earlier seminars to junior faculty on good grantsmanship, over the last 13 years Tim has organized the "New Faculty Career Development Workshop," given at academic institutions, at the AIChE Annual Meeting, and at the Chemical Engineering Summer School. As Phil Wankat describes it, "The material presented at these workshops is absolutely first class. Tim's presentation is interesting and really gets the attention of new assistant professors when he notes the amount of money they will have to raise to conduct



Tim (second from left), as chair of the Department of Chemical Engineering, celebrates the Unit Operations Laboratory ribbon cutting ceremony in 1992 with UF leadership and leaders from Dow Chemical.

their research at a reasonable activity level. I consider this part of his presentation to be so forceful and useful that I have borrowed it for my own presentations to new faculty." To be sure, many young faculty who are now being promoted to associate or full professor are now thankful for valuable information provided by Tim and his co-organizers of these workshops.

ELECTRONIC MATERIALS RESEARCH

Tim's research focuses on thin film deposition of a variety of materials, primarily by chemical vapor deposition, and electronic materials processing. His comprehensive research program has led to fundamental contributions to understanding the thermodynamics and thermochemistry in compound semiconductor systems and a broad impact on the manufacture practice of compound semiconductors, relevant to developing wide bandgap semiconductors for light-emitting diodes and thin film solar cells. His former collaborator and UF colleague, Distinguished Professor Fan Ren, describes, "Tim's seminal work in phase equilibria in III-V semiconductor systems defined new approaches to the standard-state selection and the application of local composition models. These contributions to theory were supported by novel experimental work that included the use of encapsulants to extend the range of temperature measurement in solid state emf measurements,

solid state titration of the homogeneity range in compound semiconductors, and definitive measurements of solution thermodynamics in pseudobinary systems. He has also been active in the area of chemical vapor deposition with his effort to determine reaction mechanisms using laser spectroscopy, the pioneering work in using InN nanorods and LiGaO₂ substrates for GaN growth, and the development of a novel chemistry to grow GaN at high growth rates.”

Research from Tim’s group has led to more than 240 scientific papers and journal articles, and his research accomplishments have been recognized through several awards, including the prestigious Charles M.A. Stine Award from AIChE Materials Division, recognizing outstanding contributions of chemical engineers in the field of materials science and engineering. During his time at UF, Tim supervised more than 60 Ph.D. students and 21 M.S. students, and collaborated with numerous post-doctoral research associates and visiting faculty, including 2014 Nobel Prize-winner Shuji Nakamura, who worked for a time with Tim’s students on material growth at UF as a visiting scholar. Several of Tim’s former Ph.D. students have risen to high-profile positions in industry, academia, or national labs. Examples include Wayne Johnson, vice president of Technology, II-V Group, Kopin Corporation (co-advised with Fan Ren); Billy J. Stanbery, founder of HelioVolt and currently president of Siva Power; Eric Bretschneider, director of Engineering at HeathCo; James Edger, department head and professor of chemical engineering at Kansas State University; Hyeon-Deok Lee, CTO of Samsung Electronics; and Terry Aselage, director of the Materials Science and Engineering Center at Sandia National Laboratories, to name a few. Terry recalls, “Tim was in the vanguard of chemical engineers who broadened the field to include research into the processing of materials. As an original member of this group, my career has followed in the materials science path that Tim and his colleagues blazed.”

IMPACT ON THE PROFESSION

Leadership and service in the profession comprise a continuous theme throughout Tim’s career. In addition to his administrative roles, and his directorships of FESC and SUCCEED mentioned above, Tim is founder and editor-in-chief of the *IEEE Journal of Photovoltaics*, associate editor of the *Journal of Energy Systems* and of *WIREs: Energy and Environment*, and of course former editor of *Chemical Engineering Education*. He has also held various leadership and advising positions in the Council for Chemical Research, NASA and CALPHAD working groups, the American Vacuum Society, and the American Association of Crystal Growers.

Tim has organized numerous technical sessions at professional society meetings, and held several national-level offices,

including serving on the Governing Board of the Council for Chemical Research, as a founding member of the Chemical Engineering Technology Council of AIChE, and as director of the Materials Engineering and Science Division. He has been active in ASEE including serving as chair of the Chemical Engineering Division (1991-92), chair of New Engineering Educators (1982-83), chair of New Engineering Educator Excellence Award Committee (1986-88), and program chair of the Chemical Engineering Division (1986). His extensive service activities have been recognized by several honors, including the Professional Progress in Engineering Award by Iowa State University (1993), the ASEE Centennial Certificate (1993), the AIChE Gary L. Leach Award (1996), and the ICEE Commemoration Medal (1999), among others. Tim is a fellow of the American Society for Engineering Education and the American Institute of Chemical Engineers (AIChE).

The Trustees of the University of Florida recognized Tim’s outstanding records in research, teaching, and service with the rank of distinguished professor of chemical engineering in 2008. The department chair at the time, Jennifer Curtis, formerly co-editor of *CEE* and associate dean of the UF College of Engineering, explains, “Tim’s contributions to chemical engineering have been enormous. From his research contributions in electronic materials processing, to his scholarly contributions in engineering education research, to his dedication to the career development of new engineering faculty, and to his stewardship of *CEE*, his impact has been both deep and broad.”

Tim’s consistent academic leadership and work in expanding the breadth and depth of chemical engineering education reflects his belief that students always come first. This principle has guided his approach to being an education leader who has excelled in research, teaching, and service, while still being a caring person. These traits set a great model to which students and younger faculty can aspire. As Jim Trainham says, “Tim speaks softly and leads by example. He sets high standards for himself and inspires all to do more.”

ACKNOWLEDGMENTS

The authors are grateful to Drs. John P. O’Connell, Pramod Khargonekar, Jim Trainham, Terry Aselage, Phil Wankat, Jennifer Curtis, Fan Ren, and of course, Tim Anderson, for their recollections of Tim’s career.

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