



F. Lindvall

Frederick C. Lindvall

1903-1989

By Ruben F. Mettler

Fred Lindvall was a man of many dimensions, including his long and dedicated association with Caltech, his national prominence in engineering education and the engineering profession, his wide range of engineering research interest, his many cultural and civic interests, and his love for family and friends. In this context, it is my privilege to write of Fred as one of his former students, touching on his role as a teacher, an academic advisor, and a personal friend.

Fred, professor of engineering, emeritus, at the California Institute of Technology, died January 17, 1989, in Pasadena.

He was born on May 29, 1903, in Moline, Illinois, and earned his B.S. from the University of Illinois in 1925 and his Ph.D. in electrical engineering from Caltech in 1928. He worked for the General Electric Company from 1928 to 1930 and joined the Caltech faculty in 1930 as instructor in electrical engineering. Subsequently he became assistant professor of electrical engineering, associate professor, and then professor of electrical and mechanical engineering, and from 1945 to 1969 chairman of Caltech's Division of Engineering and Applied Science.

After retiring as professor of engineering, emeritus, in 1970, Fred became vice-president for engineering at the Illinois-based Deere & Company.

Fred was elected a member of the National Academy of Engineering in 1967. He was also a member of the National Academy of Sciences, a fellow of the Institute of Electrical and Electronic Engineers and of the American Society of Mechanical Engineers, national president of the American Society for Engineering Education and of Sigma Xi, a member of the Engineers' Council for Professional Development and Tau Beta Pi, a director of the Stanford Research Institute, and a consultant for the President's Office of Science and Technology. During World War II, he supervised government ordnance research projects at Caltech and received the Naval Ordnance Development award and the Presidential Citation for Merit.

Fred served as a member of the board of directors of numerous firms and institutions, a member of the Jet Propulsion Laboratory's Advisory Board, and a trustee of Harvey Mudd College. From 1936 to 1953 he was also a lieutenant in the U.S. Naval Reserve.

My first contact with Fred was in the late 1940s when he was in the early years of his long service as chairman of the Division of Engineering and Applied Science. It was an exciting time for Caltech, and for engineering in general, and Fred was in the middle of the action.

He encouraged graduate students to spread their wings—academically and professionally. He emphasized applied science and applied mathematics as the underpinning of modern engineering and encouraged his students to take as many courses as possible in other departments and divisions at Caltech. For many of his students, their first acquaintance with concepts like "interdisciplinary research," "system engineering," and "management of technology" came from Fred. He made it seem very natural for me as an electrical engineer to do a thesis in aeronautics and have an Examination Committee representing a wide range of disciplines, especially in physics and mathematics.

Although Fred emphasized quantitative analysis, he made it clear that in practice, engineering (and especially engineering design) is a decision-making process that can lead by many

different paths to an effective solution, but with no exactly right or wrong answers. He made clear the differences between analysis and synthesis.

To this day, I do not need to consult a Caltech catalog to remember the advanced engineering course that Fred personally pioneered and taught, and in which he demonstrated these points. It was EE 226, and more than any other course I took at Caltech, it made a lasting impression on me.

Fred assigned general problems of a practical nature that students had never encountered before, often with a due date one or two months later so there was plenty of time to think about the problems and how to approach them. The student was left on his own and was to determine (and later defend) his underlying assumptions, his approximations, his methods, and the validity of his solution. The fact that the course had an EE label had no constraining influence on Fred's problem selection. I can recall problems that introduced us to long narrow bridges (like the famous Tacoma Narrows bridge), a dam in a canyon with a particular geology, high-voltage transmission lines, rocket motors, and analog computers. The key task was to take the problems all the way to final design solutions, supported by quantitative analysis.

What made this so exciting was that as graduate students we had just been introduced in our candidacy courses to the "magic" of Laplace transforms, the incredible scope and beauty of Maxwell's equations, the power of vector analysis, and the mysteries and uncertainties of fluid mechanics. Fred's course helped us begin to understand how practical engineering solutions could be developed from such abstract theories and analytical techniques if we could add enough common sense and engineering judgment.

After several years that had been like drinking out of an intellectual fire hose, we were able to sip and taste some of the water.

As one of Fred's students, I wish to salute and honor him as a giant of the engineering profession, one of Caltech's finest, and a trusted adviser and friend.