Photograph by Geoff Cook Studio, San Mateo, California.

A. Uno Lamm

# August Uno Lamm

1904–1989

By William R. Gould

August Uno Lamm, a distinguished engineer of international reputation and renown, a prolific inventor, and the man who is most properly called the father of modern direct-current electrical transmission, died on June 1, 1989, at the age of eighty-five.

Uno, as he was known to his many friends and associates, was born in Göteborg, Sweden, on May 22, 1904. All references to his childhood indicate that it was a happy one. He grew up as the second of three children in a home where the mother and father were both dedicated to the cultural arts of music, poetry, literature, and painting. His father, an engineer by profession, wrote poetry, played the violin, served on the local theater board, and designed clean-lined furniture as several of his many nonprofessional interests. He required all of his children to pursue the arts and study music. Under his guidance Uno learned to play the violin and developed a lifelong interest in music, the theater, opera, and the finer arts. It was also from his father that an early interest in engineering developed. This led to his pursuit of a technical education and his subsequent successful career as a distinguished engineer of world renown.

His early education was obtained at the Royal Institute of Technology in Stockholm, from which he received an M.S. in electrical engineering in 1927. Subsequently, while employed full time at the large Swedish industrial conglomerate ASEA, and involved in demanding technical program development, he

pursued a Ph.D. in his spare time. This was awarded to him at the age of thirty-nine by The Royal Institute in 1943. The subject of his thesis was "The Transductor, D.C. Pre-Saturated Reactor."

His employment began shortly after the completion of his master's degree and a short compulsory period of service in the Swedish military. As was customary for newly graduated engineers, he entered an apprentice program in 1928 with ASEA. His first assignments were in mechanical assembly in what today we would call the blue collar sector of the work force. Here he learned "hands on" the business of producing a product that had been conceived, designed, and planned by engineers.

This assignment was of short duration. After less than a year of service he was withdrawn from the apprentice program and asked to take charge of the development of a new product: the low-voltage mercury-arc rectifier. By 1929 he was named the manager of ASEA's newly formed rectifier department at the Ludvika manufacturing complex. Also in 1929 ASEA applied for a patent on Lamm's design for a mercury-arc "valve" (rectifier) that would operate at high voltages. This was to be the first of some 150 patents covering the work of his fertile mind.

With this impressive start, Lamm's career was firmly launched into what would be his lifetime's work. Over the years, he and his team of engineers at ASEA would evolve the technology that would make high-voltage direct-current transmission a reality: a technology that would permit needed transmission links to be constructed over many hundreds of miles in point-to-point distance, over all kinds of terrain, under the sea, and underground in populous areas. It would make possible the application of back-to-back alternating-current-direct-current-alternating-current (AC-DC-AC) links to overcome adverse effects of phase angle variations and circulating vars on large integrated alternating-current systems. It would provide the inspiration and incentive for others to develop the solid-state technology that would be a successor to the mercury plasma valves that were the result of this early work.

Many people in industry recognized the need for this technology before it was available. Some despaired that it would become a reality. But as in all things there had to be a beginning. For

some twenty years the management of ASEA funded the research and development work of Uno Lamm and his associates without near-term prospect of a product that would return a profit. That Uno was able to persuade the company to do this is a singular achievement in management.

Over those twenty years, the Swedish State Power Board maintained their interest and offered encouragement through the use of their system for experimentation. Finally in 1950 the power board ordered the first commercial DC transmission system in the world. It was to be built between the mainland of Sweden and the Island of Gotland. The venture was a success, and like all successes it was replicated and improved upon not only by ASEA but also by other manufacturers and power systems in the world. In less than twenty years there were DC systems in operation in Europe, Asia, North America, and elsewhere in the world.

A landmark achievement in direct-current transmission, and one that brought the technology to full maturity, was the building of the so-called Pacific Intertie. This was a transmission system built by a consortium of large electric power systems, public and private, on the Pacific Coast of the United States. It was also to be the high point in the use of mercury-arc technology—future systems would look to the emerging technology of solid-state, semiconductor, or transistor-type valves. In the engineering and construction of the Pacific Intertie, it was planned to build two parallel AC lines and one DC line. They would interconnect the hydro-based systems of the Pacific Northwest with the large market area served by the predominantly thermal-based systems of Southern California and the Southwest. It would be the first time that high-capacity AC and DC systems would be operated in parallel.

The problems in this venture were many and diverse. Advances in the state of the art in both AC and DC practice were to be made. Moreover, there were significant political problems, because the project involved entities of different regions of the western states and of different ownership format. In all of this Uno Lamm filled the role of technical consultant, political adviser, and peacemaker. While many individuals, corporate

entities, and political subdivisions of government made notable and enabling contributions to the success of the undertaking, that of Uno Lamm was salient in its importance. From this endeavor DC transmission emerged as a truly mature and established technology with Uno Lamm as the acknowledged founder, pioneer, and practitioner. Electrical engineering as a science and a profession would from that point forward be in his debt.

It would be misleading to represent the technical contributions and interests of Uno Lamm as limited to rectifier or direct-current technologies. His interests were many and his other contributions were significant. For example, in 1955 he organized the nuclear engineering effort for ASEA at Vasteras, Sweden, the location of the company's headquarters. He was subsequently their representative on the board of directors of the Swedish state-financed Atomic Energy Company. He saw the first nuclear reactors go into commercial operation and perform in a safe and successful manner. The situation at the end of the decade of the 1980s wherein more than 50 percent of Sweden's electric power needs were furnished by nuclear facilities is due in no small part to his participation in this venture. The fact that Sweden, beset with political and environmental controversy, subsequently made a political decision to phase out nuclear power production does not detract from the integrity of these plants or the achievements of Uno Lamm and his associates in these ventures.

It is not uncommon for technical and scientific innovators to add words to our lexicon. Such was the case with Uno Lamm. Perhaps he little knew when he wrote that early thesis and coined the word *transductor* that it would lead him to apply the word *transistor* casually to a similar device while making a speech on this technology. When William Shockley received the Nobel Prize for the invention of the transistor and applied this name to it, he was reported to have said that he had heard "some Swede" use the word in a technical presentation and thought it aptly applied to his new discovery. Today it is a household word in several languages. When Uno in 1970 introduced the semiconductor into Sweden to replace mercury-arc technology, he ap

plied the name "Thyristor" to it. This word is also in general use today.

Uno Lamm was also a prolific writer over his long and eventful life. Some eighty technical papers bear his name and enrich the technical literature of our profession. In addition he has contributed something on the order of one hundred articles, mostly in Swedish newspapers and magazines, on such diverse subjects as societal commentary, education, technology, political commentary, and economics.

The institutes, academies, and professional societies have also recognized him. He was elected to membership in the Royal Academy of Engineering Sciences, Royal Academy of Sciences, and the Royal Society of Sciences, all in Sweden. In the United States he was elected a foreign associate of the National Academy of Engineering in 1976. The Institute of Electrical and Electronics Engineers (IEEE) elected him a fellow and named him director-at-large for the years 1967 to 1988.

In 1973 his portrait was hung in Gripsholm Castle on the outskirts of Stockholm. In this he joined the King and Queen of Sweden and many of his distinguished countrymen who are thus honored for the credit and recognition they have brought to their country.

Awards, medals, and similar recognitions were numerous. They included the Gold Medal of the Swedish Royal Academy of Engineering, Knighthood of Sweden's Royal Order of Vasa, France's Ordre du Merite pour la Recherche et l'Invention, and the IEEE Lamme Medal. Lastly, the IEEE Power Engineering Society in 1981 established the Uno Lamm High Voltage Direct Current Award.

Now, just a word about the man of the notable career and the person behind the legends. Uno Lamm was known by legions of associates, peers, colleagues, and friends as a kind, gentle, person with a warm heart, a ready hand, and a friendly smile. He is remembered as being pleasant company in all social or business situations. He charmed all, especially the ladies, with his gallant manner. He was a loving father and a doting grandfather. The fondness for music, literature, the theater, and the arts with

which he was endowed in childhood persisted throughout his life and flowered in his later and less-active years. It was a sincere pleasure to have known him and a high privilege to have called him a friend.

In closing this inadequate tribute, we value a great man—one of the giants in our profession of engineering; a man with a fertile and prolific mind for innovation and invention; one who left the field better than he found it; a man without guile or offense, but capable of intolerance of mediocrity in societal, engineering, and political institutions. And above all he was a warm and true friend. We salute August Uno Lamm.