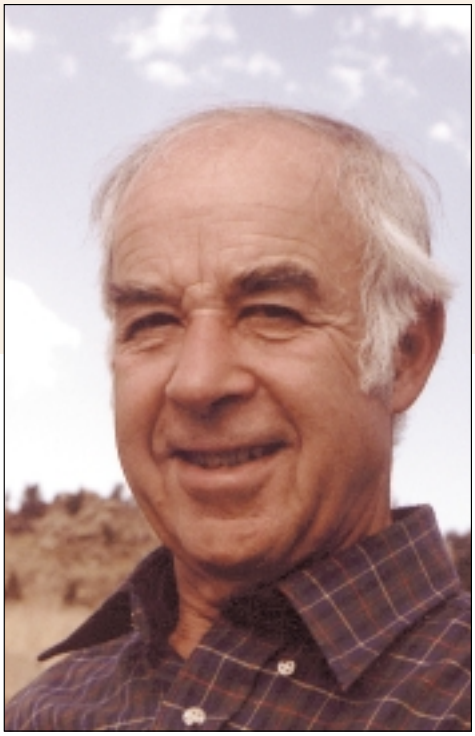
Profiles in Ceramics: Hans Thurnauer *Pioneer in Technical Ceramics*



Hans Thurnauer

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At age 90, Hans Thurnauer has much to share about the ceramics industry, especially as a pioneer in technical ceramics.

In a career spanning more than six decades, Thurnauer, who was born in Nuremberg, Germany, has worn many hats—engineer, researcher, industrial executive, technical advisor and consultant.

Although now retired, his decades-long role in the ceramics industry has left a mark for future generations of ceramists and ceramics students.

Numerous awards and honors have been presented to Thurnauer. These include the University of Illinois' Alumni Honor Award for Distinguished Service in Engineering (1987); Fellow of The American Ceramic Society (ACerS) (1945); ACerS Edward Orton Jr. Memorial Lecture (1977); and ACerS Distinguished Life Member (1996). Thurnauer is a still a member of the ACerS and the Electrochemical Society, the latter of which he served as both vice president and president during the 1950s.

Thurnauer's affiliation with other professional associations included membership in the German Ceramic Society; NICE; Gordon Research Conference (chair, ceramics, 1956–57); National Academy of Sciences (material advisory board vice chair, 1958–62); and chair of the *Digest of Literature on Dielectrics* for the National Research Council of the National Academy of Sciences.

The young German emigrant, who would proudly become an American citizen in 1940, was responsible for several patents from 1940 through 1963, and even more after. The early patented processes/discoveries include Ceramic Threadguide, Ceramic of Magnesium Titanate, Method of Forming TiO_2, Electrically Conductive Threadguide, Insulating Material (1947), Insulating Material (1953), and Ultrathin Glassheet. In addition, he published and/or co-published a number of papers on ceramic electric insulation and electronics, and high-temperature materials.

During his career years and attempts at retirement, he received offers too enticing to refuse. Subsequently, he formed professional affiliations that included the U.S. Government, for which Thurnauer served as materials consultant to NASA, AEC, Dept. of Defense and U.S. Airforce, as well as the International Executive Service Corps, with overseas assignments to Korea, Indonesia, Singapore and Turkey.

Hans, a happy 2-year-old in Nuremberg.

The College of Engineering at the University of Illinois wrote of Thurnauer in April 1987, "he has been a key figure in the development of new ceramic manufacturing processes such as automatic dry pressing, isostatic pressing, tape casting, and precision grinding." Quite an impressive roster of accomplishments from a man forced to leave the land of his birth and his cultural heritage because of the Nazi movement prior to World War II.

Born into Ceramics

Thurnauer traces an interest in ceramics to his early childhood in Nuremberg, inspired by paternal grandfather, Moritz Thurnauer, who started a factory that created gas burners from soapstone and Welsbach mantles for gaslight. It was one of the few technical ceramic companies devoted to the gas age.

Born in 1908, the second of two children to Lisa and Kuno Thurnauer, he recalls a rather traditional, middle class German lifestyle. It was happy and comfortable, but by no stretch of the imagination wealthy. Both father and grandfather were engineers, actively involved in the family business.

Life for the young Thurnauer and his sister, Gabriele, who was older by 18 months, was relatively serene and stable for the first several years of his life. Summers were spent vacationing with family and friends in a home not far from Nuremberg. When Thurnauer was six years old, his father, who had been ill for some time, died. However, life did not change drastically at that time. His mother would never remarry.

The emergence of World War I in 1914 brought sudden change into the Thurnauer family life, but not so much into the business, he recalled. "We were all very patriotic… tried to do things for the war effort, just like everyone else."

The hardest-felt effect of the war, according to Thurnauer, was in the lack of food, which affected their health more than their happiness. "We lived on potatoes. Nothing was imported. You didn't have chocolate, oranges, bananas."

After the war ended, life resumed its former sense of normalcy, and a diversity of food supplies resumed from the United States. To Thurnauer, everyday life was school—where he claims to have been an average student, "certainly not brilliant"—girls, sports, including soccer, swimming and hiking, and sometimes "too much girls."

Hans, at 5, cuts quite a figure on ice with his two girl friends.

World War I brought sudden change. Hans, six years old, sits on his uncle's knee.

His true love, however, was motorcycles. At age 16, Thurnauer found himself the owner of a small used motorcycle, one in need of much repair. This would become a summer project for him, a project that providentially led to learning the mechanics of the family factory. "That is were I worked on the motorcycle, and learned how to use the lathe, all the tools to manufacture machinery."

The first motorcycle was eventually traded in for a BMW motorcycle, and Thurnauer began to devote more hours to working at the factory as a summer employee. An older cousin, Martin Thurnauer, became a role model to Hans and somewhat a surrogate father, as well. "He had been in America, learned quite a few things and was somehow interested in me. He helped me learn about things in the factory."

It was upon Martin's advice that the younger Thurnauer decided to attend university in Berlin rather than Dresden after graduating gymnasium—the German equivalent of American high school. "I wanted to be in ceramics and he said there were more chances for ceramic studies in

It's 1934 and Thurnauer's last day in Germany.

Berlin," Thurnauer related.

During his time at the Technical University in Berlin, Thurnauer studied the general principle of all ceramics, specifically learning much about dinnerware because Meissen, a major manufacturer of ceramic dinnerware, was situated nearby. It also was in this period that a professor from the University of Illinois visited the German university, intriguing the students with the possibilities of studying in America.

The Thurnauer's Nuremberg apartment (second floor) after bombing in 1945.

Parmelee, the Mentor

It is that American professor, Cullen W. Parmelee, that Thurnauer credits with providing the motivation for his entering the ceramics industry, and the American way of life. Parmelee, who also was head of the Dept. of Ceramic Engineering at Illinois, initially inspired him to attend the University of Illinois for only one or two semesters.

However, Thurnauer would go on to earn his master's degree in ceramics in 1932 under Parmelee's tutelage. "He was very much a mentor."

To Thurnauer, what he learned from the professor surpassed far more than ceramics education—for Parmelee also broadened the young German exchange student's life in other ways. "He helped me financially—it was during the Depression and the bank through which I got my monthly income had closed."

After earning his masters from the University of Illinois, Thurnauer returned home to Germany. He worked as a ceramic engineer there and in England until political circumstances forced him to abandon Europe and return to America. A recommendation from Parmelee to the American Lava Corp. at Chattanooga, Tenn., helped Thurnauer land his first full-time job in America. During 1935–54, he would serve as a ceramic engineer, research director, vice president and director at the company.

His first areas of job responsibility were to develop new products and to set up a research laboratory, Thurnauer said. While a focus already existed in the gas and electric industries, he said new efforts were specifically needed to keep up with the fast-growing pace of these areas. "There was a need for all kinds of new techniques in ceramics for electricity and electronics, and high-temperature materials. Some of this had already started."

Quickly, Thurnauer learned his abilities and strengths were not in sales.

> *"I witnessed the ascendancy of the electronic age and participated in new ceramic developments so important for electronics. Among the new materials were the titanates, ferrites and hard refractory oxides."*

Asked to visit an engineer who was setting up a new gas plant in Louisiana, Thurnauer ventured into a remote area of the state in an attempt to speak with the man and get him to buy. Not only did he soon realize he was disturbing and interrupting the man and would make no sale, but he had difficulty finding his way back from the remote site. "I have other things to do than talk to you," the engineer told Thurnauer.

By whatever design the fates had in mind, two weeks later the American Lava Corp. did indeed get an order from the engineer, Thurnauer said—with strings attached. "We are sending you this order under one condition—never send that man out again. That was my only experience in sales," he said.

The New Electronic Age

A large part of Thurnauer's research efforts at that time was spent exploring the limits and properties of technical ceramics. "The challenge was to have materials that were strong." He contributed to the development of many technical ceramics, including high-frequency dielectrics, titanate capacitor dielectrics, and wear-resistant and refractory materials; e.g., cordeirite and single-oxide ceramics.

Thurnauer and his wife, Dolores, settle into retirement at Boulder, Colo.

"I witnessed the ascendancy of the electronic age and participated in new ceramic developments so important for electronics. Among the new materials were the titanates, ferrites and hard refractory oxides."

Work also focused on producing ceramics that were suitable for capacitors, which were useful in the war and especially in radio applications. "I worked pretty closely with Bell Telephone Laboratories to produce what was used mostly in radio applications at that time. That was the first of the new Electronic Age, and those processes, while they have been refined, are still used today."

The development of the research laboratory improved considerably during his early years with American Lava Corp., Thurnauer said.

In addition to capacitors, attention also was focused on abrasion-resistant materials to help the textile industry, specifically with thread guides. Using different materials, Thurnauer ultimately discovered that the capacitor material developed from titanium dioxide had a property to self-polish as it cut. "So the cutting edge did not affect the efficiency because the cut groove was still polished and smooth in comparison to other materials."

This discovery led to the formulation of Thurnauers first patent for the ceramic threadguide. "It is a patent that has stood up well for many years," he shared.

In 1935, shortly after Thurnauer began his career with American Lava Corp., he met and married Lotte Oettinger. The couple had three children — Peter, Dorothy and Marion; however, Lotte died of cancer when only in her early 40s.

U.S. Intelligence Work

Also during these years, Thurnauer accepted some consulting positions with a variety of government agencies, in large part due to the end of World War II, and serving the American Intelligence Service. "They were sending over engineers and scientists to find out about industry in Germany and Europe, in general," he explained. Thurnauer, a member of the team that investigated ceramic plants, was a natural because he spoke German and was somewhat familiar with the plants.

Thurnauer, an avid hiker, enjoys the Colorado mountains.

Thurnauer traveled to Korea in the mid-70s as a consultant and volunteer executive for International Executive Service Corp., Boulder.

"We went from factory to factory, particularly to find out about the electronic ceramics that they had, the transmitting tubes which used ceramic coatings—something the Americans had never made. We wanted to know how they were made and how successful they were, and also what equipment the Germans used in ceramics that Americans didn't."

A second trip, in 1954, to explore German factories was not as fruitful, Thurnauer explained, because by then, the Germans were in a recovery mode. "They were much more suspicious at that time. They would not tell us much."

Central Research at 3M

In 1955, American Lava Corp. was acquired by Minnesota Mining & Manufacturing Corp. (3M), and Thurnauer moved to St. Paul, Minn., to oversee the inorganics department of 3M's central research laboratory. It was also during these years that Thurnauer returned to Germany to earn his engineering Ph.D (1958).

While serving as a technical consul-

tant on ceramics and electrical insulations with 3M, he concurrently held the position of vice president of American Lava, now a 3M subsidiary. He would work with 3M until he first retired in 1964.

Retirement Put on Hold

Now married to Dorothy Benedict-Elliott, a woman he had met at 3M, Thurnauer left retirement and accepted a position with the United Nations as director of the Israel Ceramic and Silicate Institute of Haifa. Accompanied by his new wife, Thurnauer completed a two-year stint at the Israeli institute. His job was to find a permanent replacement for his position at the institute, which was owned and supported by the United Nations, so ownership and control of the institute could be transferred to Israel.

It was not a difficult job, but scintillating nonetheless. Responsible for research at the institute, Thurnauer's focus was on ceramic materials, glass and cement, and a metallic material for the state of Israel. "That had been pretty well developed at the time. I was interested in being there, visiting all the different factories, seeing places tourists would not normally go."

An avid hiker in 1964, Thurnauer holds fond memories of treks he and Dolores made around the Sea of Galilee and in the mountains surrounding the area. "That was probably the most interesting, visiting the places where the Crusaders built their castles and fortresses, seeing the antiquities. It really brought me back to my studies, not the new stuff, but the old. That was good."

Consultant at Coors

In 1966, again not yet ready for a permanent retirement, Thurnauer began a seven-year part-time consultancy with the Coors Porcelain Co. at Golden, Colo.— the state he would choose to reside in for the remainder of his life. At Coors, he served as an advisor to Joseph Coors Sr., company president, seeking ways to improve the factory and new products that centered around the manufacture of uranium pellet for beryllium oxide used at atomic energy plants.

From 1973–78, Thurnauer was a consultant and volunteer executive for the International Executive Service Corps at Boulder, Colo. In this new career, Thurnauer, accompanied by his wife, traveled to developing nations to assist in professional endeavors. As a ceramics expert, Thurnauer was sent to Korea to assist the Korean Traders' Association in the promotion of their materials for kilns, and the integration and utilization of more modern processes into the industry there.

One of Thurnauer's IESC assignments took him to the Hankook China plant. Here he watches as employees clean the ware.

Having the opportunity to ply his trade and experience the adventure of traveling to another country was all the incentive Thurnauer needed. And since his wife was an accomplished potter and artist with her own kiln, the opportunity was a match made in heaven.

For the past 20 years, the Thurnauers have taken life at a more leisurely pace, enjoying friends and family—which now includes six grandchildren—and activities and organizations in Boulder.

In retrospect, Thurnauer does not see himself as a major player in the ceramics industry in terms of an impact on the future, but believes he did only what was necessary. There are plenty of new things to learn, he said, and these discoveries are going to come from individuals and companies in all walks of life, with some nations having more of a competitive edge at times than others.

A Tribute to Parmelee

More recently, Thurnauer has come full circle, publicly and perpetually acknowledging Parmelee's actions as a mentor by creating the Professor Parmelee Scholarship Fund, a scholarship first awarded in the 1995–96 academic year. A financial gift of $250,000 by Thurnauer to the Dept. of Materials Science and Engineering at the University of Illinois is the basis for the scholarship which supports students studying ceramic engineering.

In 1995, Thurnauer told the University of Illinois, "I am deeply indebted to the Ceramics Dept., not only for the widening of my education in ceramics, but also for teaching me, a foreign student, the way of life through friendships which still last today."

Ceramics has been good to him and his family, Thurnauer declared, and modestly believes his success was all a matter of good karma. "I was always lucky. I never had to apply for a job, they always came to me by luck." ■